

TALLWOOD

DESIGN INSTITUTE

Advancing solutions for designers, manufacturers
and engineers of our built environment.

Mass Timber Construction in the USA: Lessons from Recent Research

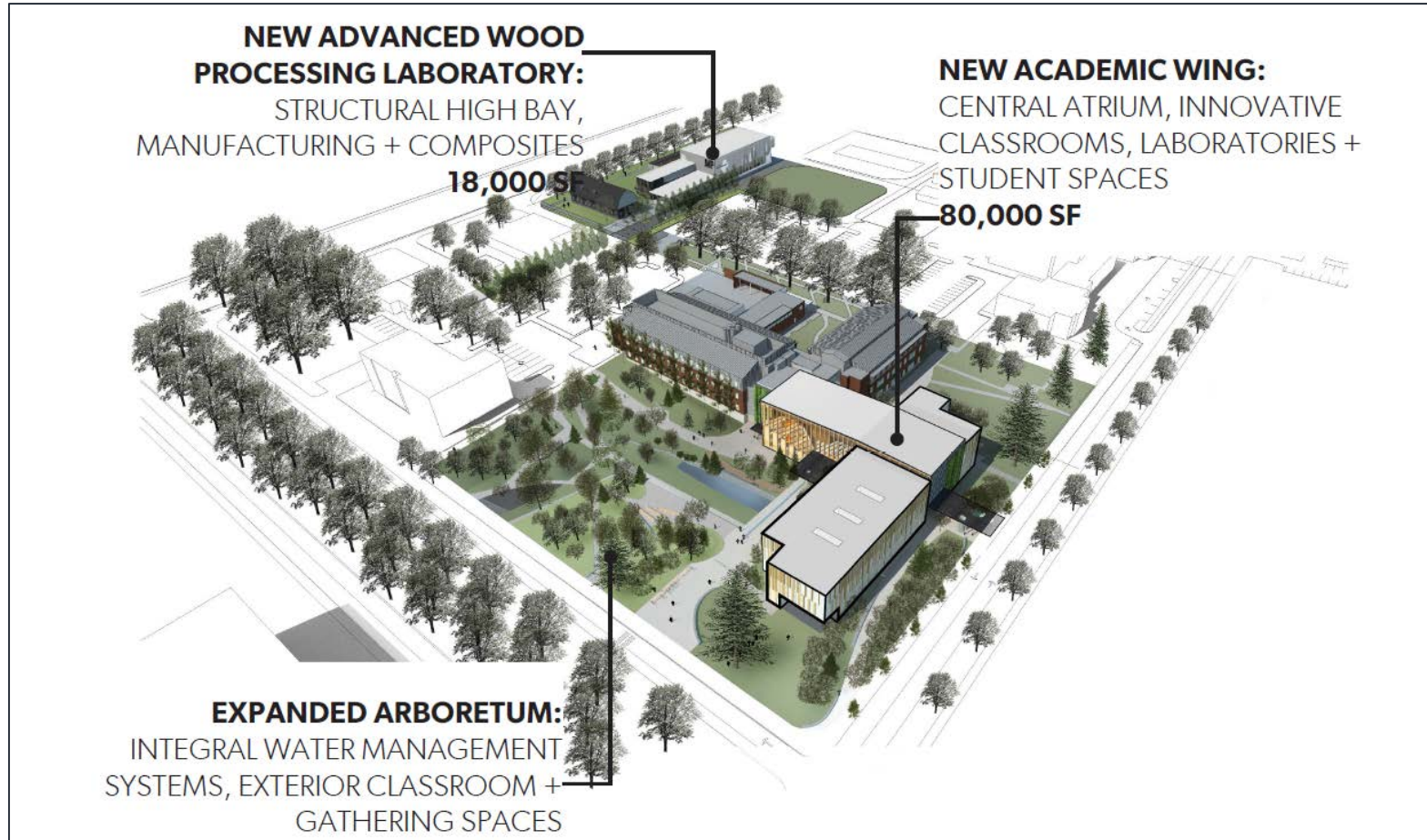
TallWood Design Institute

An industry-driven partnership between:

- College of Forestry, Oregon State University
- College of Design, University of Oregon
- College of Engineering, Oregon State University

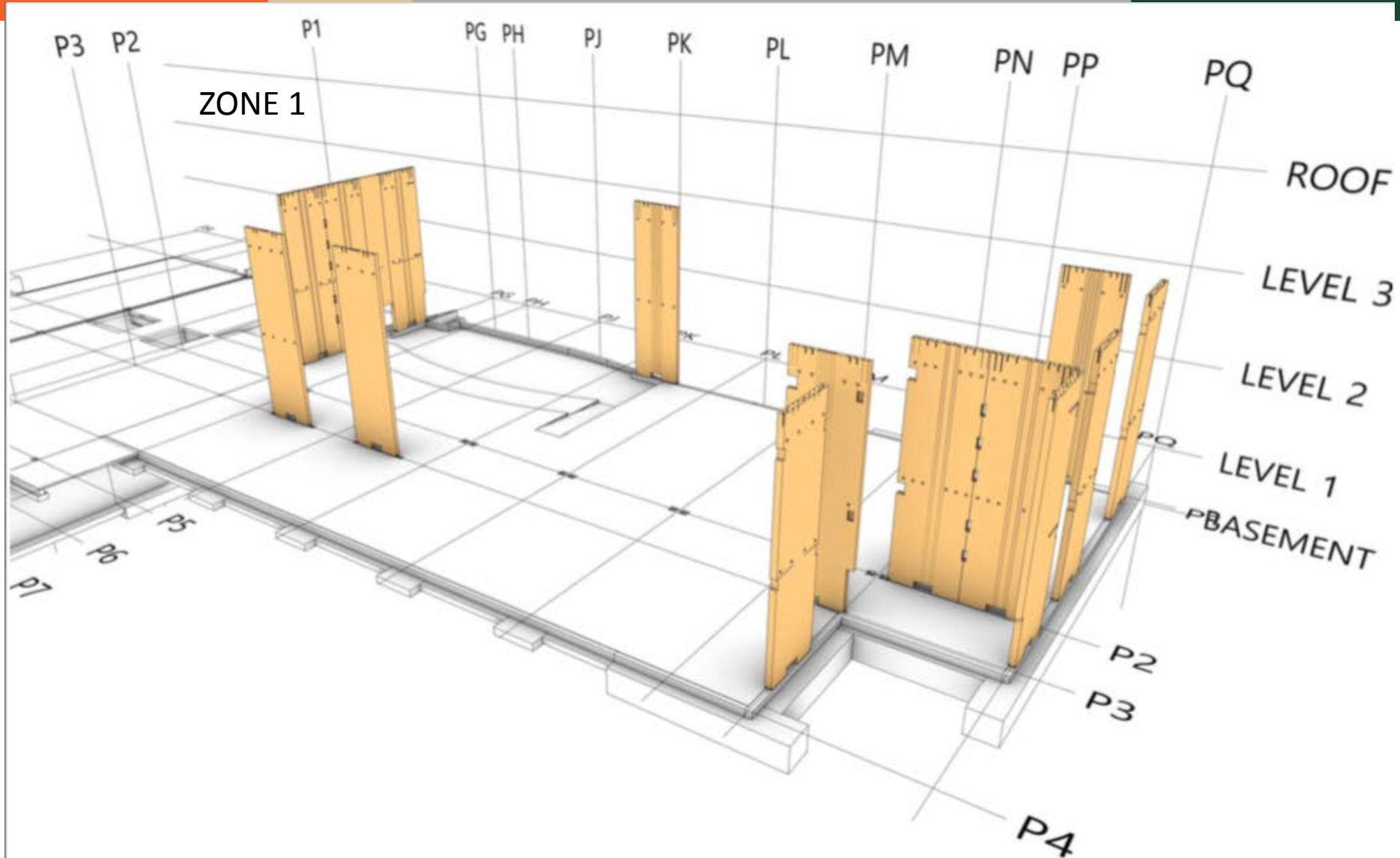


Oregon Forest Science Complex

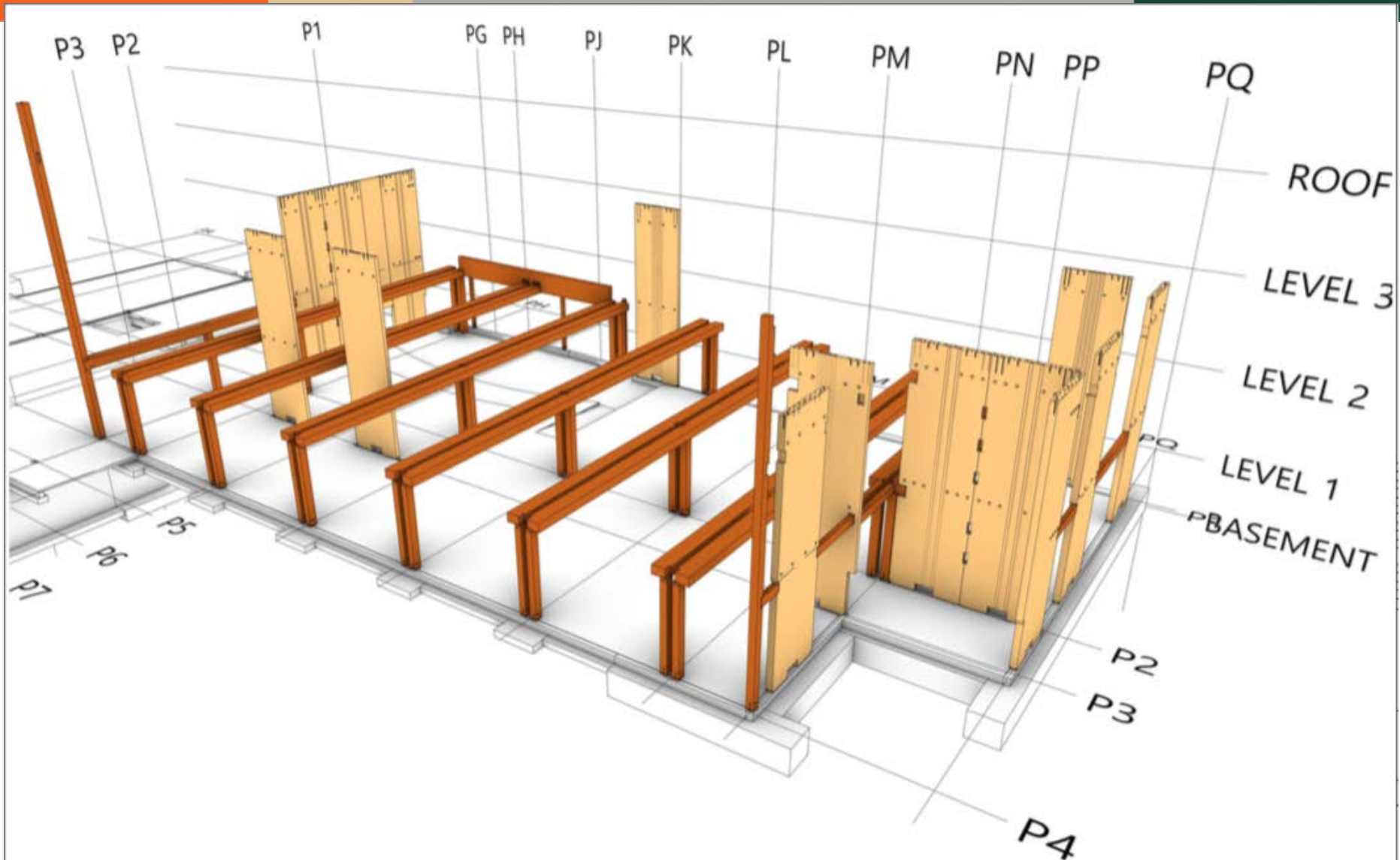


Peavy Hall – OSU College of Forestry

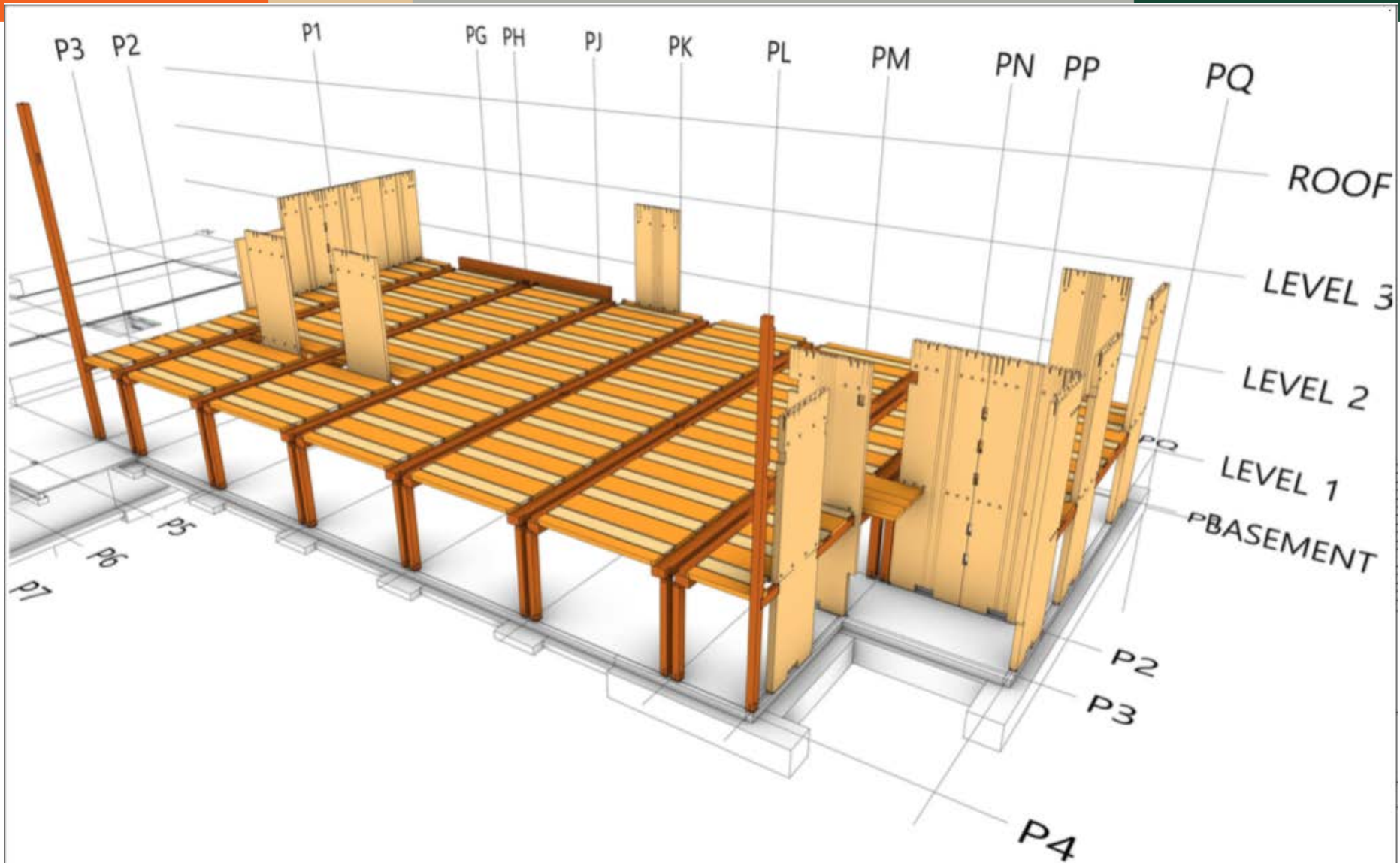




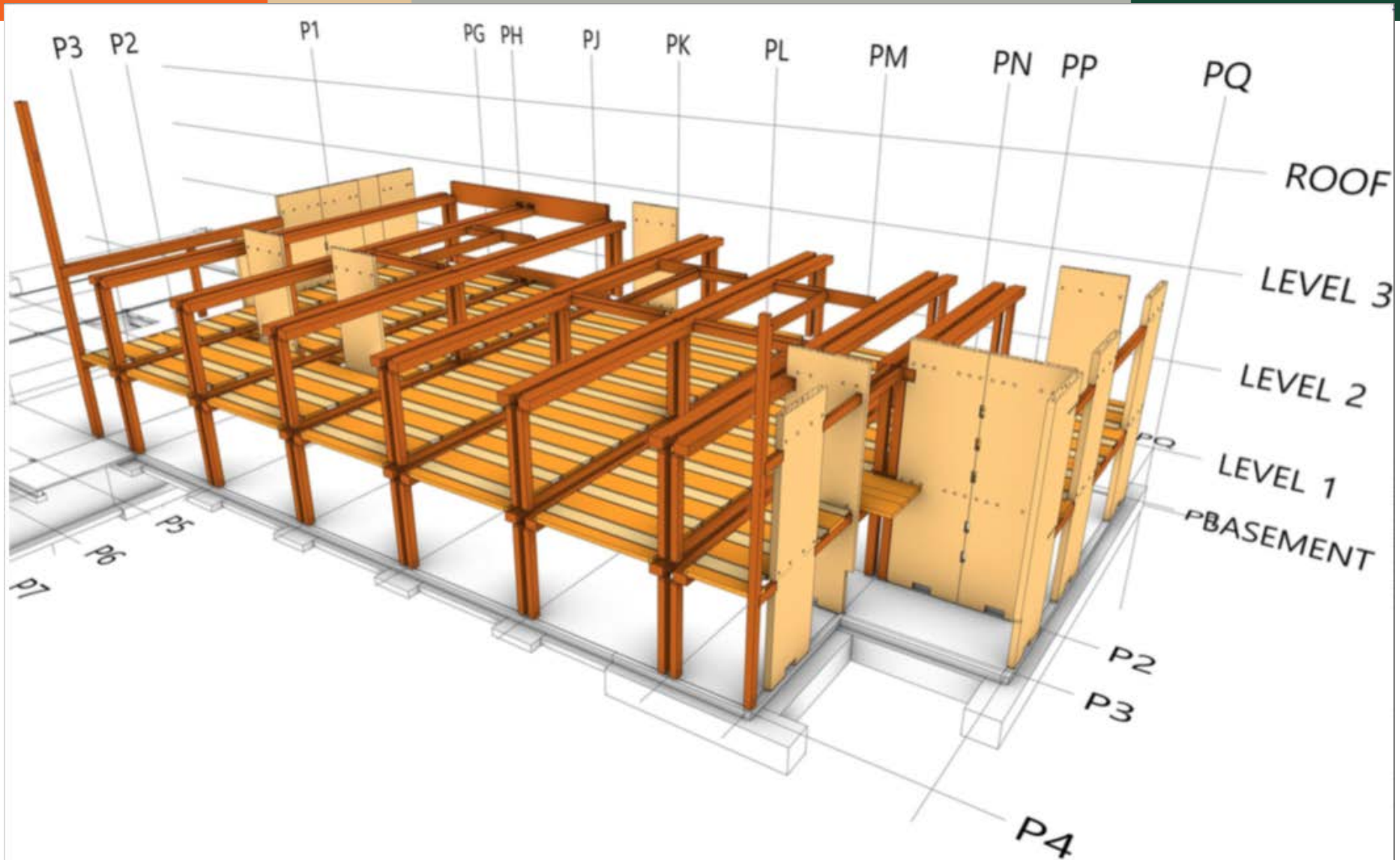
Source photo:
Courtesy of Structurecraft



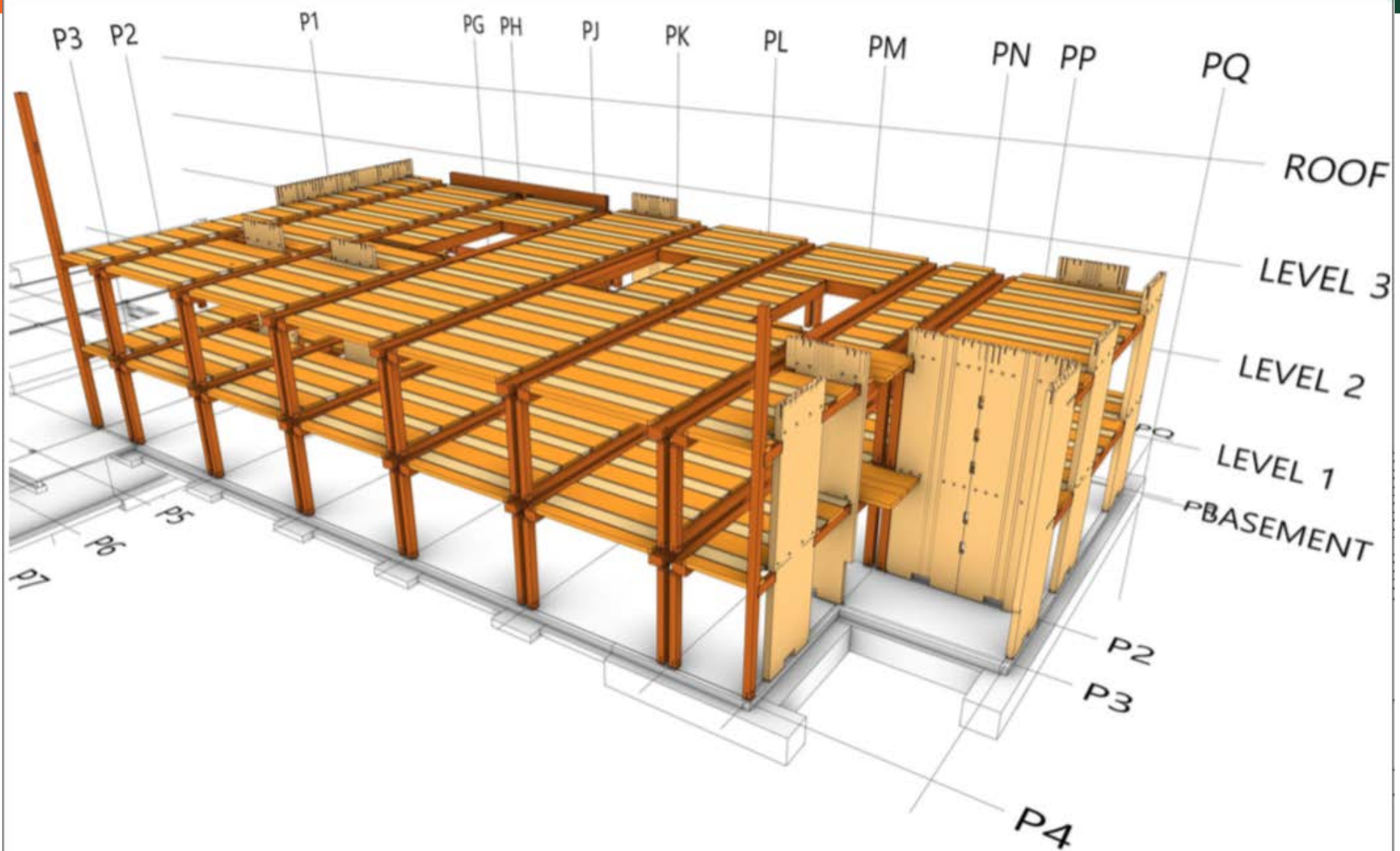
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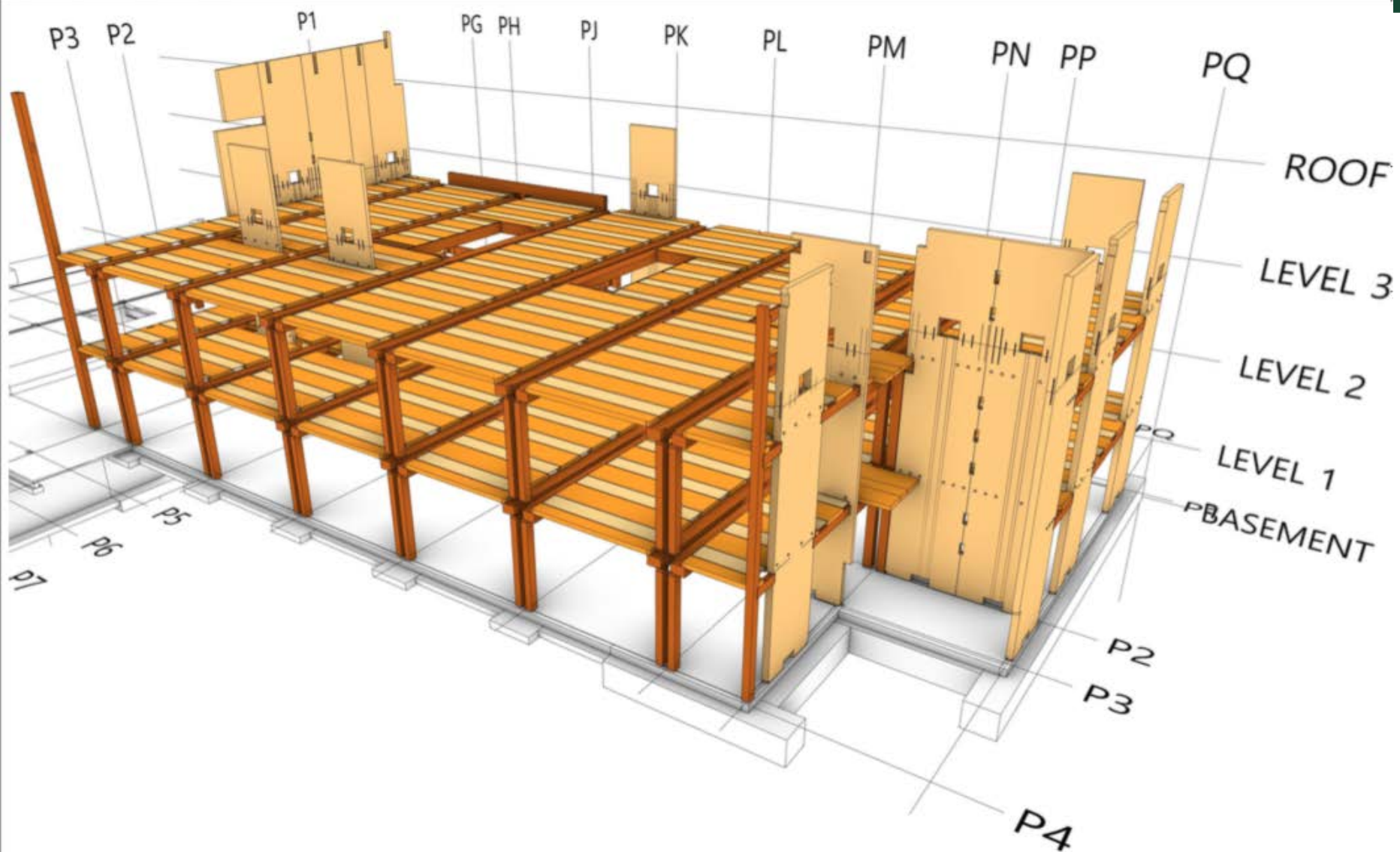
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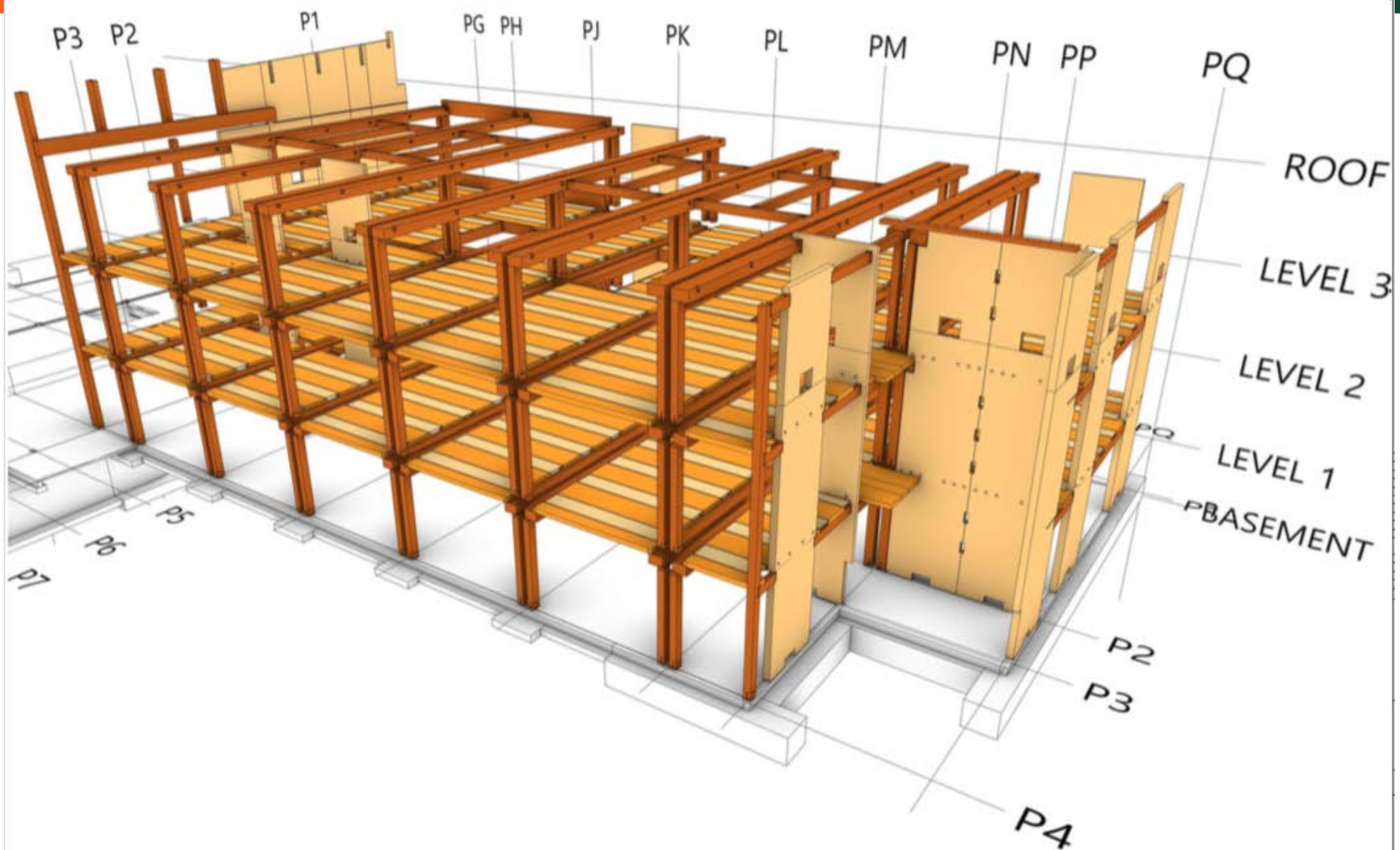
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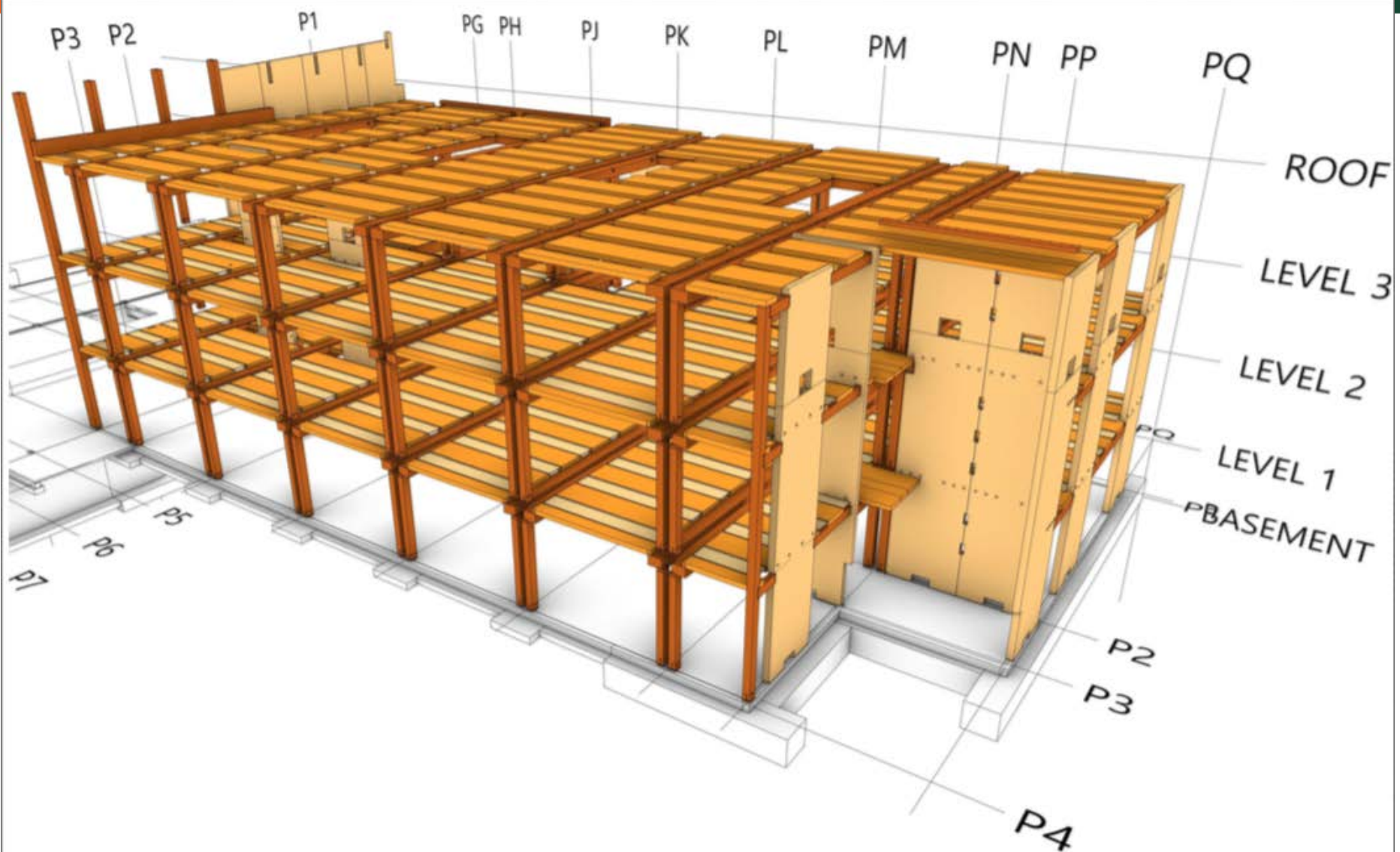
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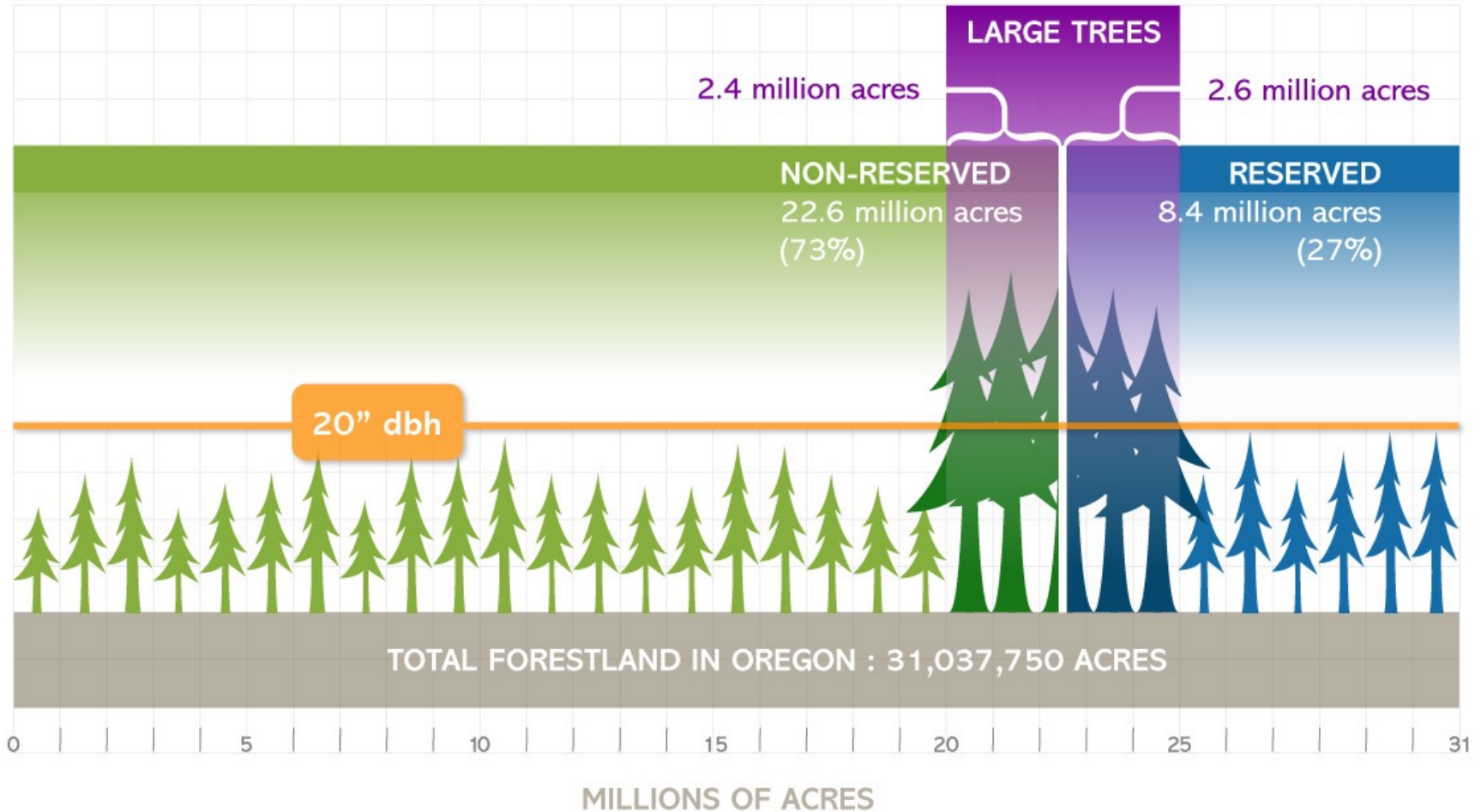
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Peavy Hall – OSU College of Forestry



Oregon has become a
focal point for mass timber
in the US for several
reasons...

OREGON FORESTED AREA - RESERVED LANDS & LARGE TREES



LEADING
LUMBER PRODUCER
IN USA

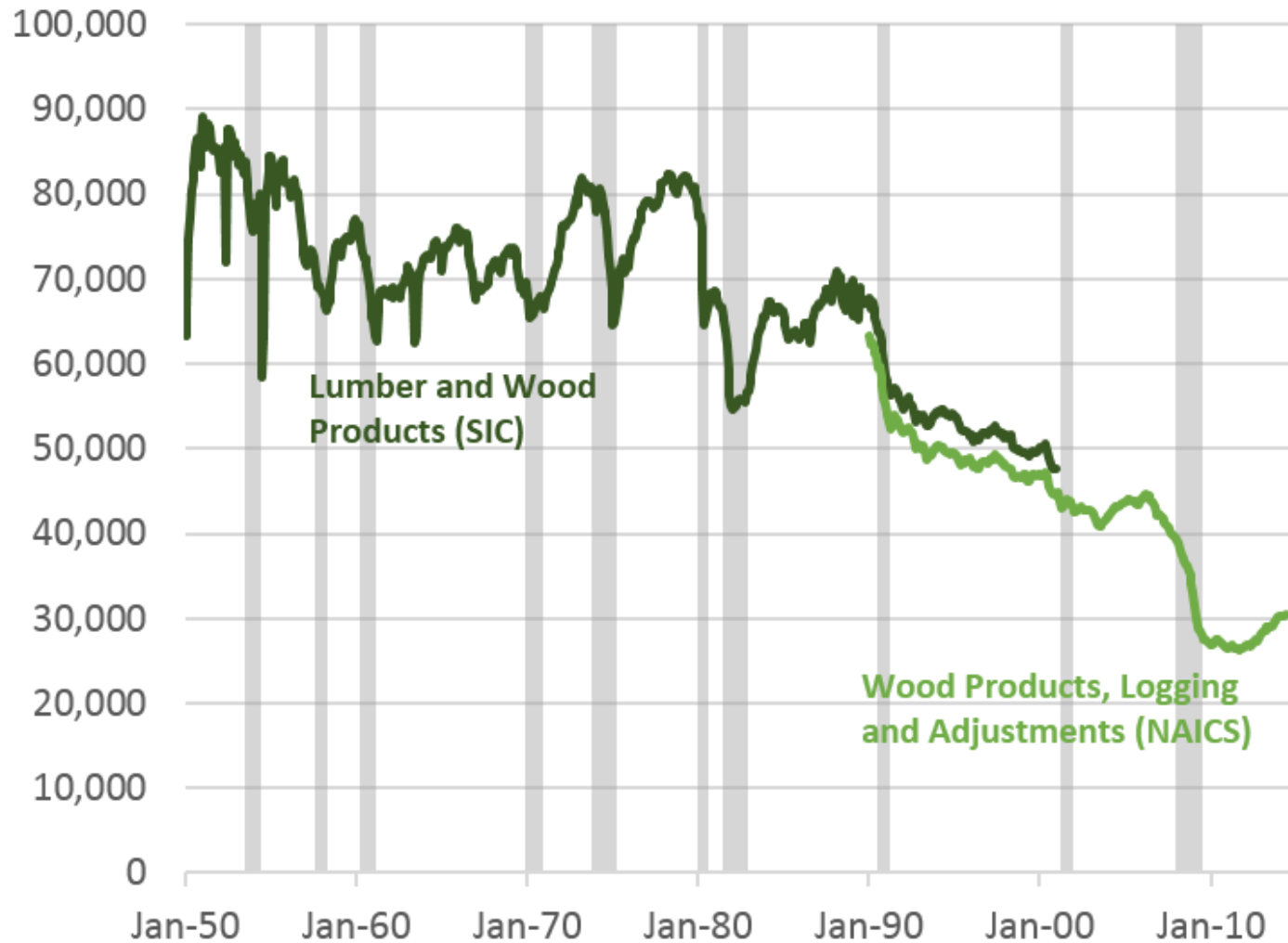
+76,000 JOBS

\$12.7 BILLION
IN OREGON'S ECONOMY
IN 2011

IN 2011 **NEARLY 16%**
OF TOTAL U.S.
PRODUCTION

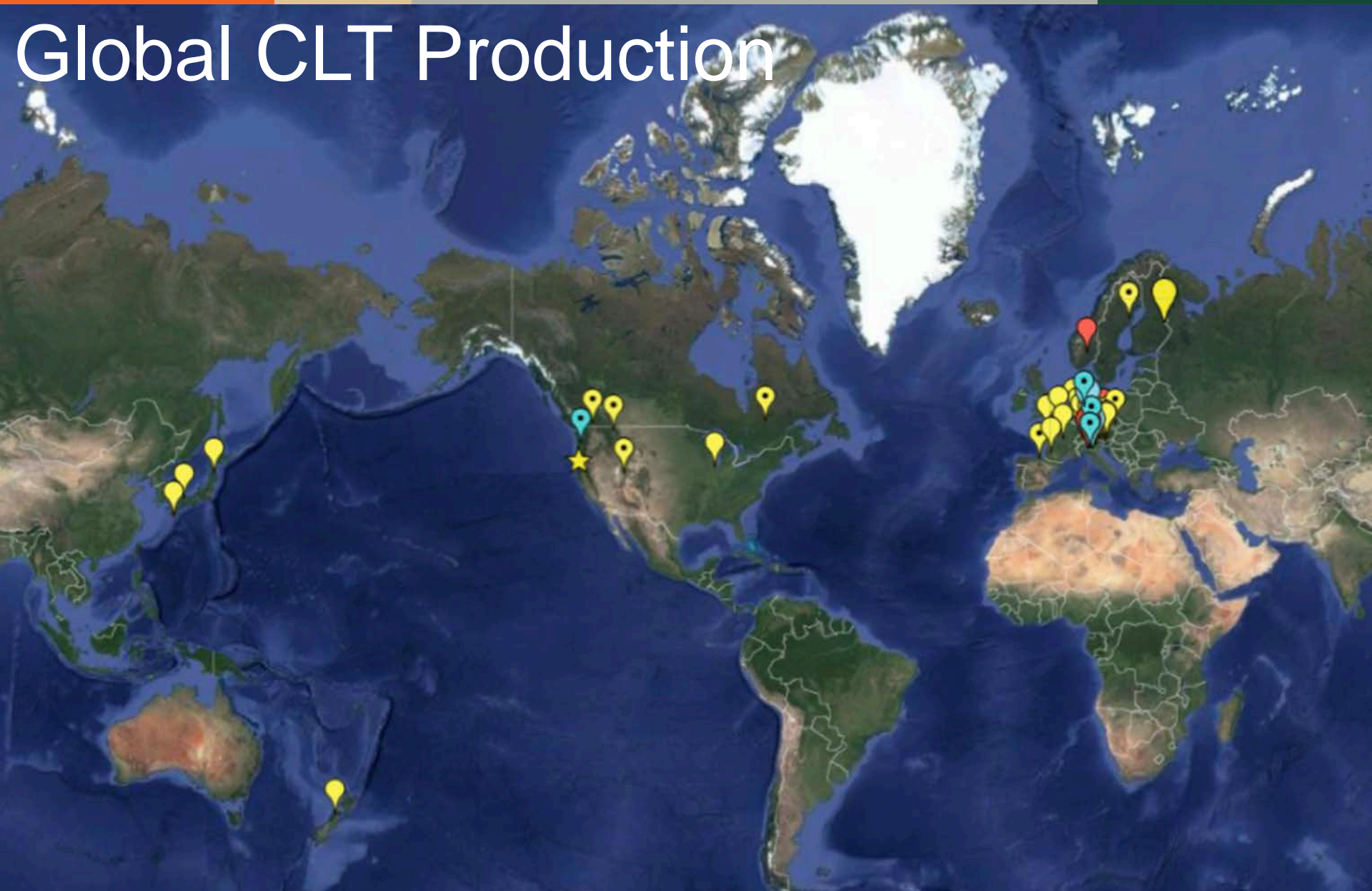


Oregon Wood Products Employment, 1950-2014

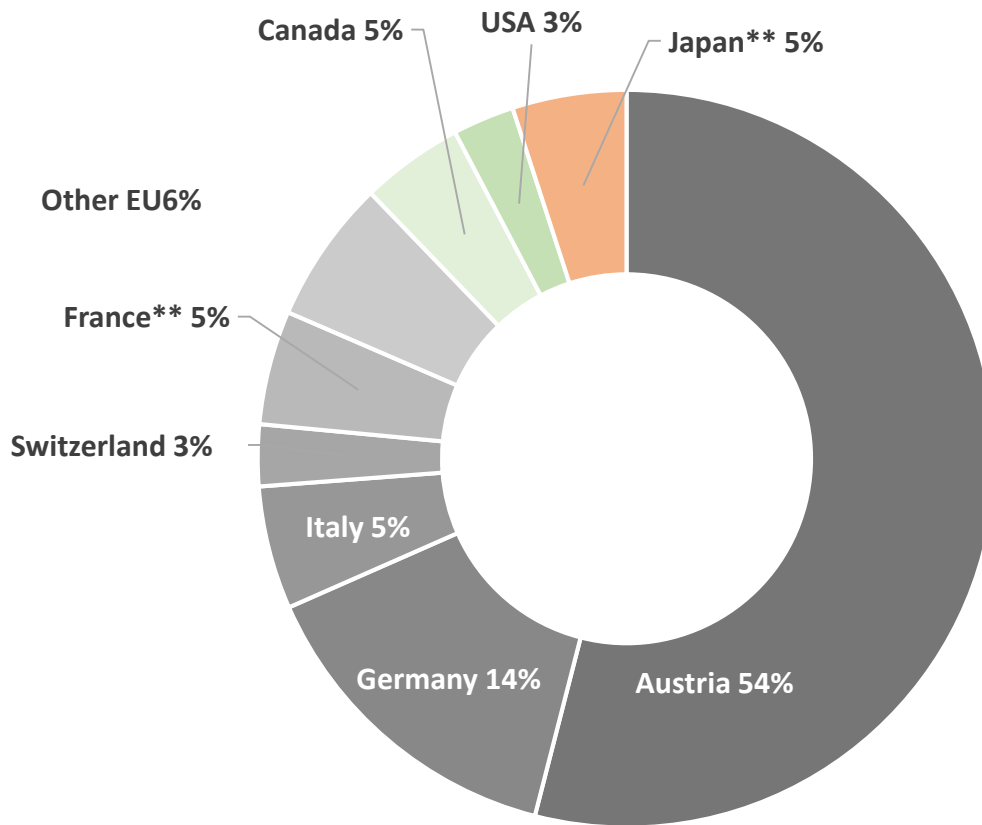


Mass Timber around the World

Global CLT Production

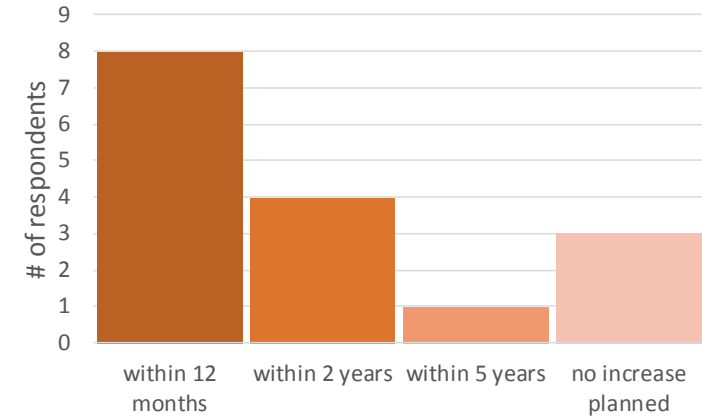
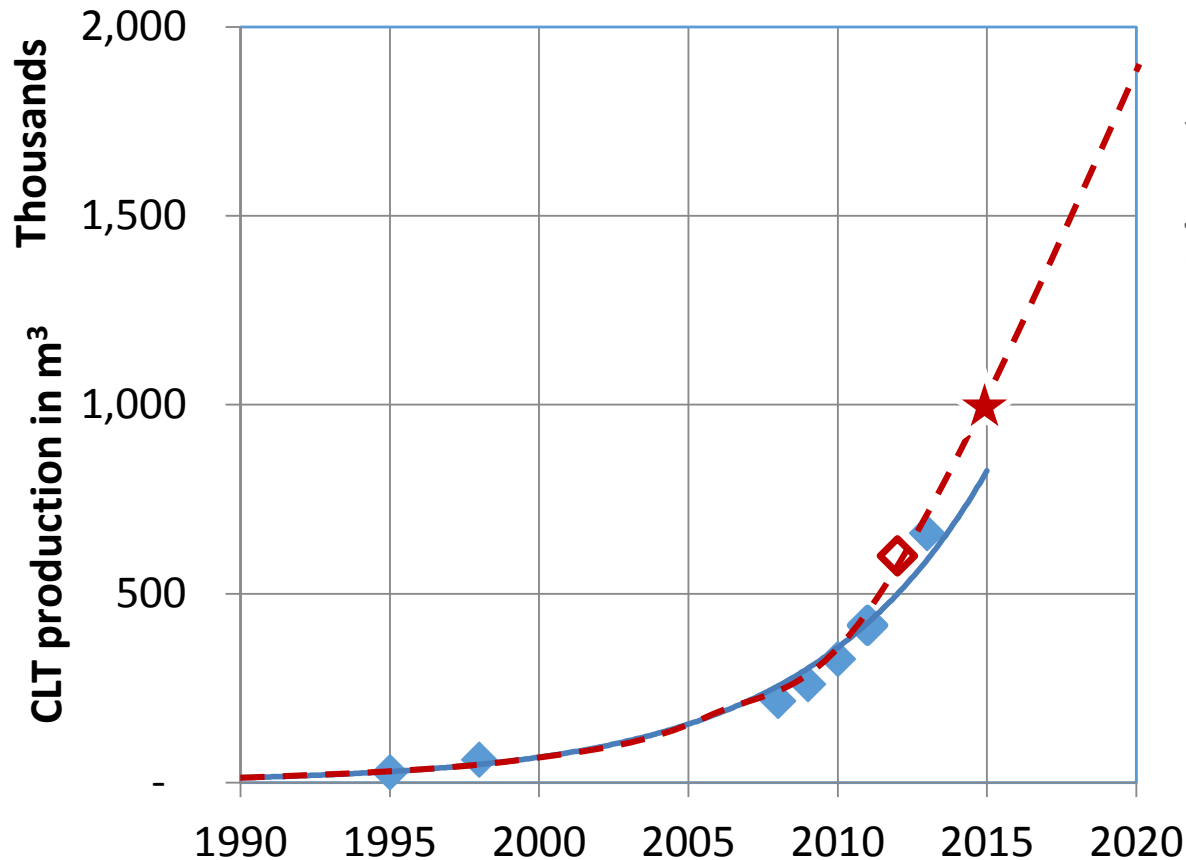


Estimated Global Output



Muszynski 2017

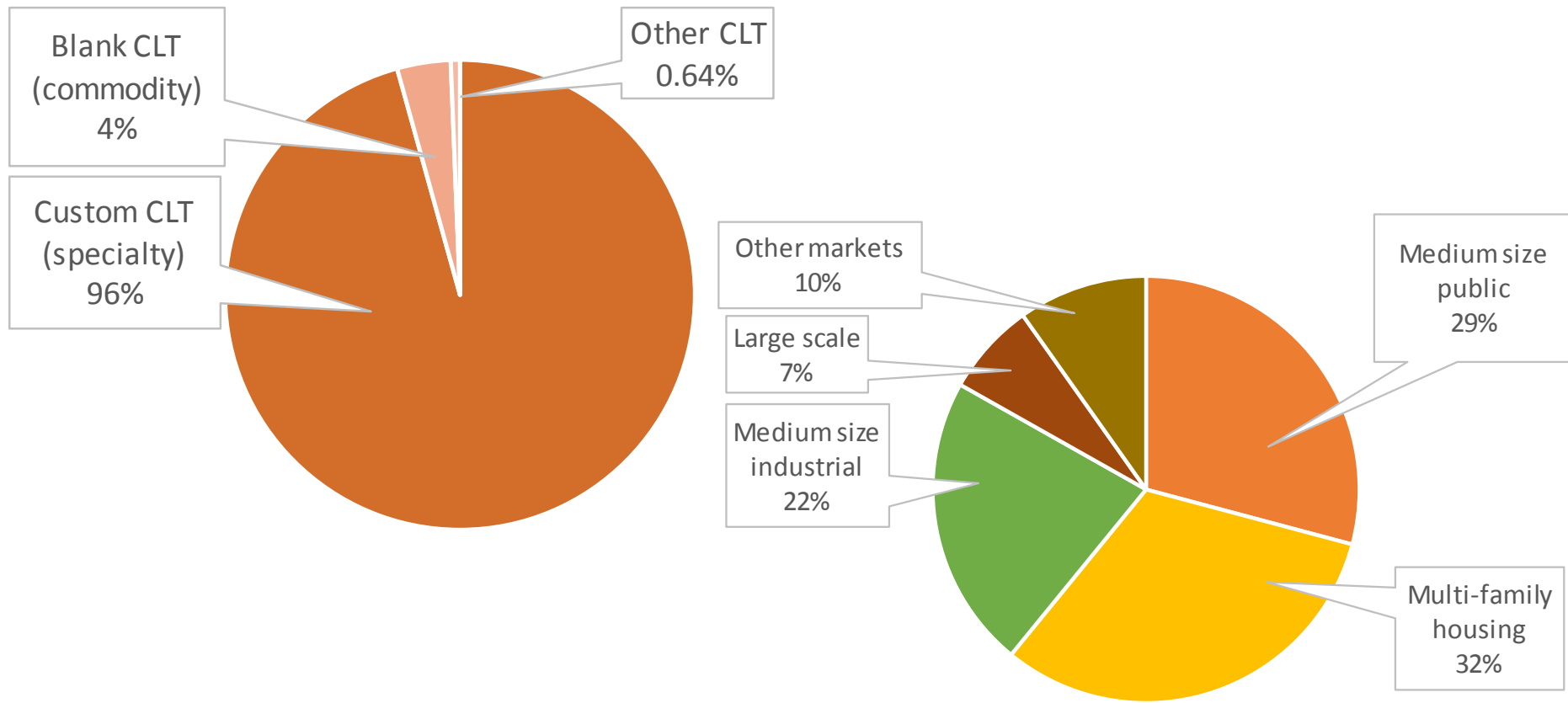
Market Growth

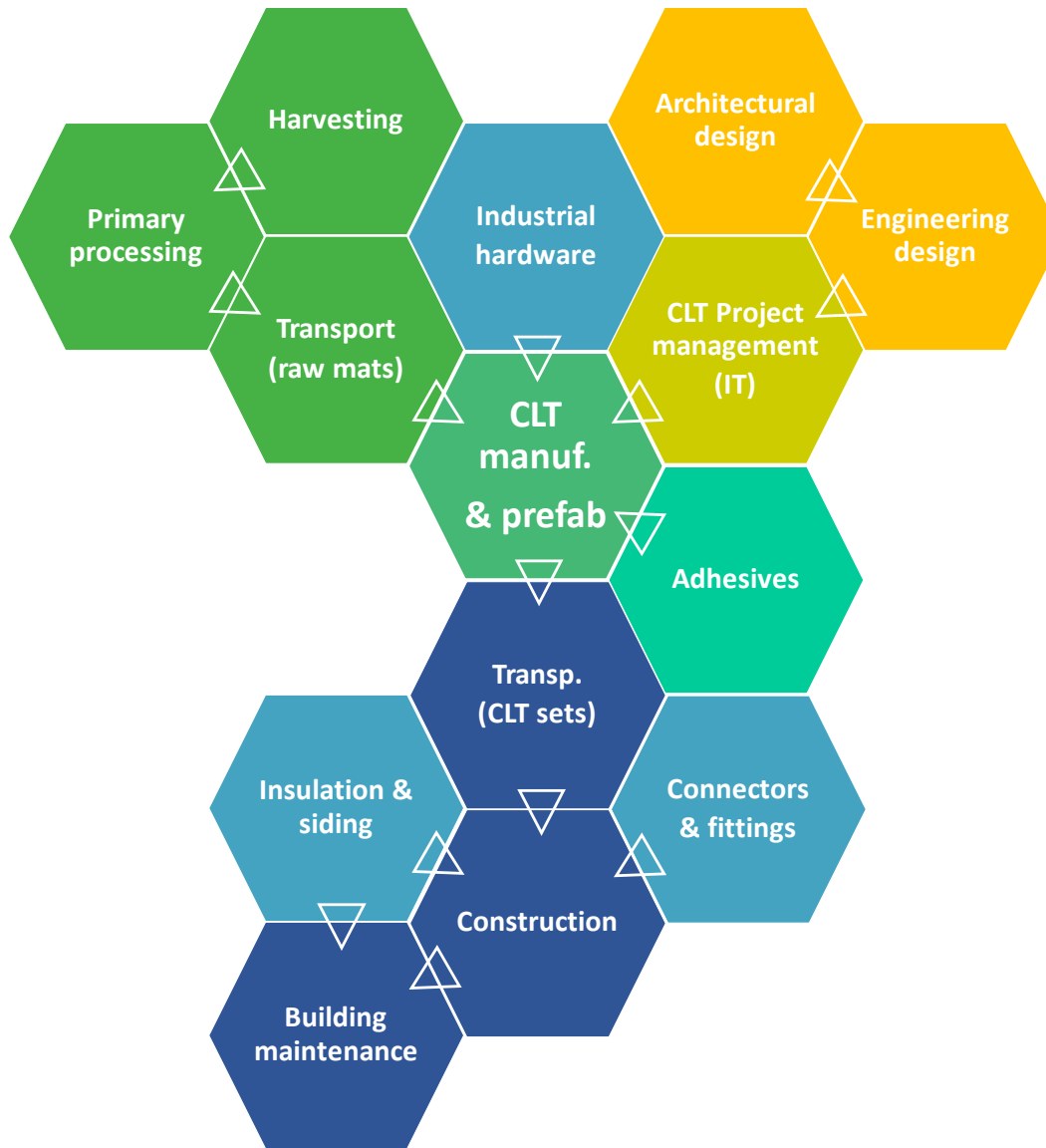


**35.3 M CFT
OR
424 M BF**

Muszynski 2016, based on Schickhofer 2010, Holzkurier 2011, 2015 & OSU Global Industry Survey 2016

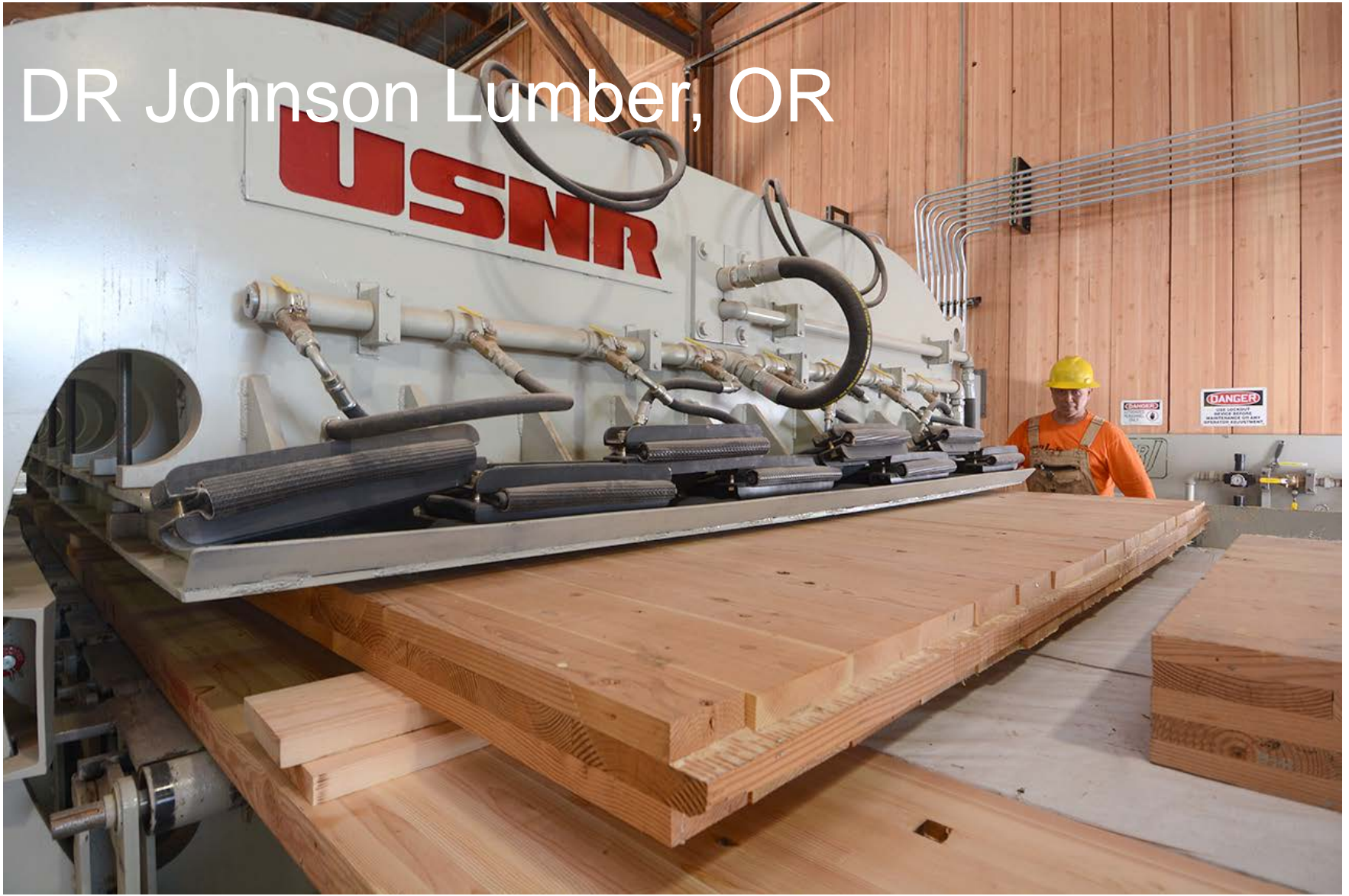
Over 80% of world production is used in structures allowed in current codes



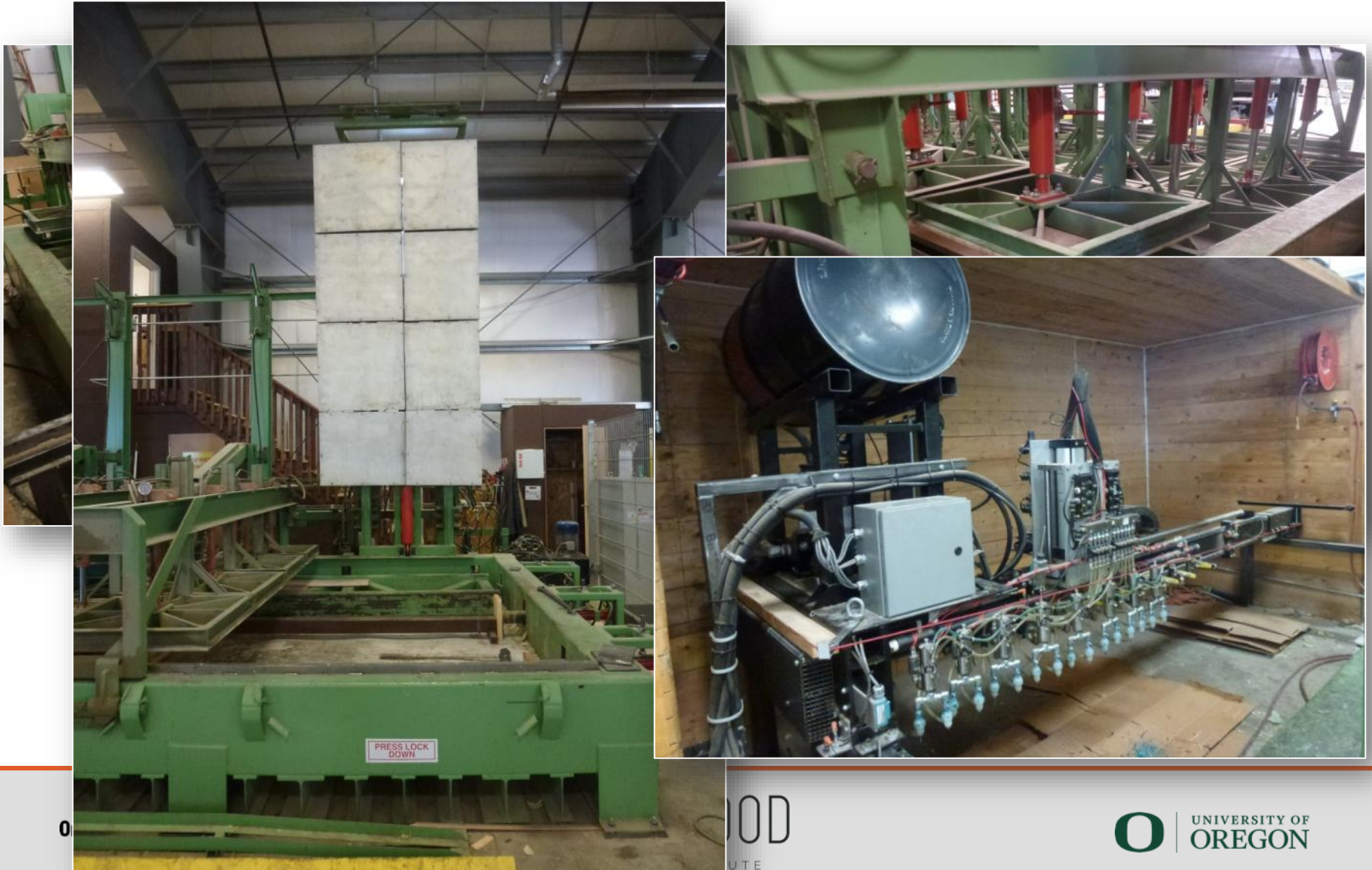


Supply Chains


DR Johnson Lumber, OR



SmartLam, Whitefish, MT



Mass Timber in the USA: the Future?

- 
- Freres Lumber Company – plant opens December 2017
 - SmartLam (Montana) – planning two more CLT plants in next two years
 - Katerra (WA) – planning two more CLT plants in next 2 years
 - Vaagen Timber (WA) – CLT plant announced for 2018
 - International Beams (Alabama)
 - Oregon – Columbia Pacific, American Laminators next?

TallWood Design Institute: Mandate

1. Grow the manufacturing base for structural wood products – especially mass timber - in Oregon and the Northwest US
2. Eliminate barriers and stimulate demand for structural wood products and building systems throughout the US

What are the barriers?

- Cost uncertainties and lack of familiarity among contractors
- Design: seismic, fire, durability (moisture), lack of standardized connector systems, etc.
- Manufacturing: computer aided design skills, computer numerical control fabrication machinery skills, digital integration from screen to machine and jobsite; aversion to capital investment risk; drying capacity
- Construction: different installation skills required than typical general contractors possess

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These span across disciplines and must be addressed through a coordinated approach

TallWood Design Institute

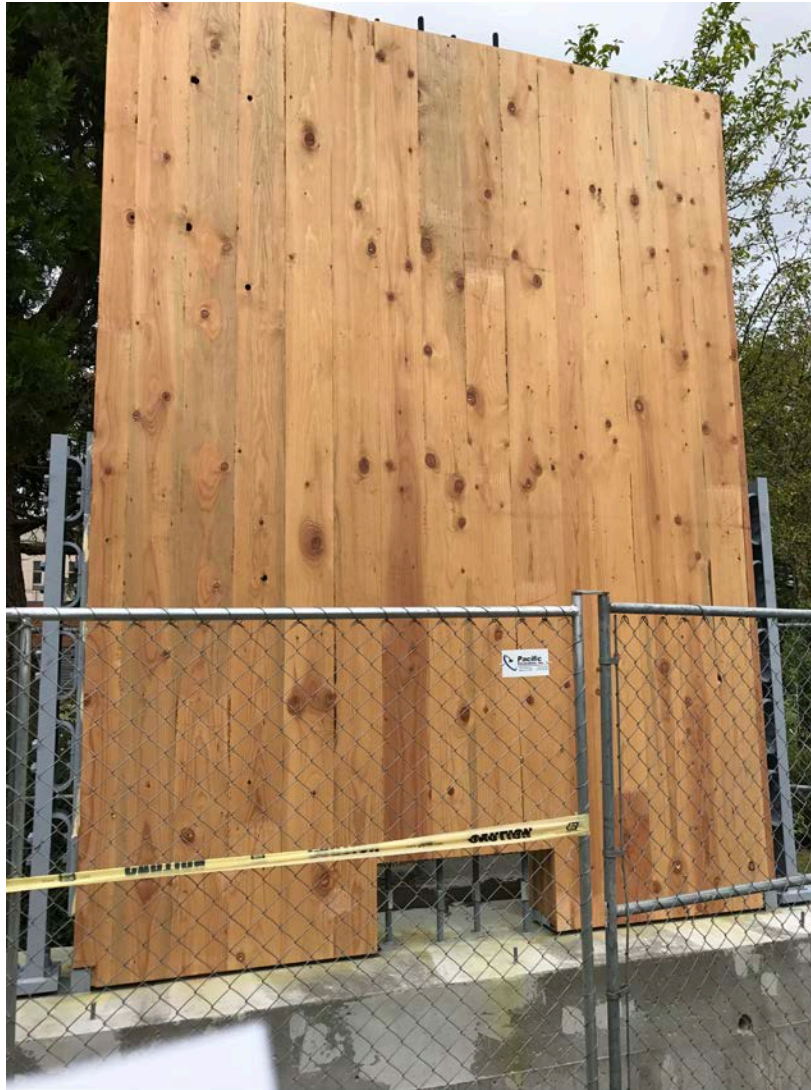
- Industry-focused applied research
- Product development and testing
- Training and education

Research

Seismic Testing of CLT Structures



CLT Rocking Wall System





OSU
Oregon State
UNIVERSITY



NEW PEAVY HALL BUILDING

ARCHITECT	MICHAEL GREEN ARCHITECTURE INC. PORTLAND, OR
STRUCTURAL ENGINEER	EQUILIBRIUM CONSULTING PORTLAND, OR
MECHANICAL/ PLUMBING	PAE CONSULTING ENGINEERS SEATTLE, WA
ELECTRICAL ENGINEER	AEI AFFILIATED ENGINEERS SEATTLE, WA
CIVIL ENGINEER	KPFF SEATTLE, WA
LANDSCAPE ARCHITECT	SWIFT COMPANY SEATTLE, WA
GENERAL CONTRACTOR	ANDERSEN CONSTRUCTION COMPANY PORTLAND, OR
PROJECT MANAGEMENT	OREGON STATE UNIVERSITY CAMPUS OPERATIONS

Fire Testing







Post Occupancy Monitoring



Image Credit: Evan Schmidt



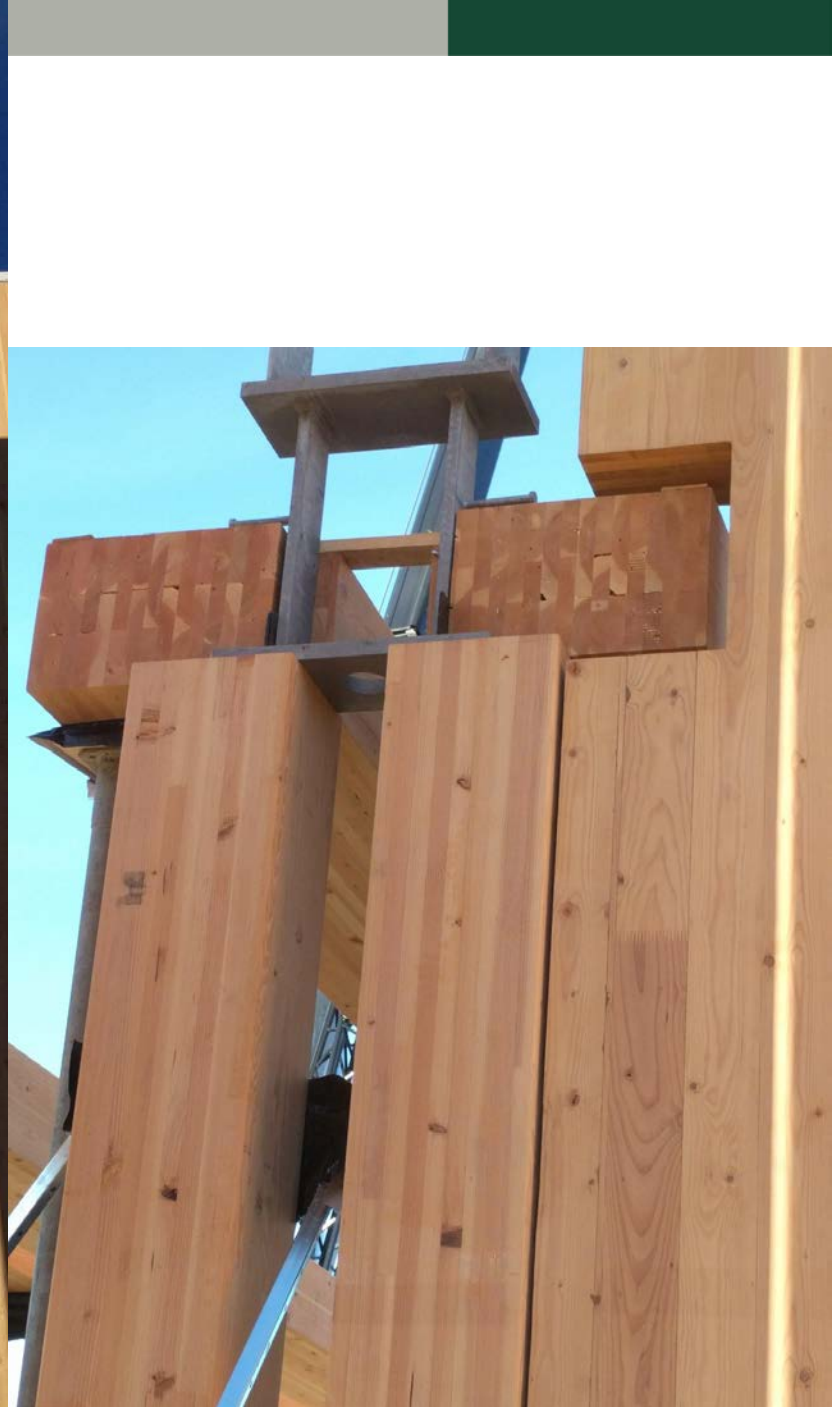


Image Credit: Evan Schmidt

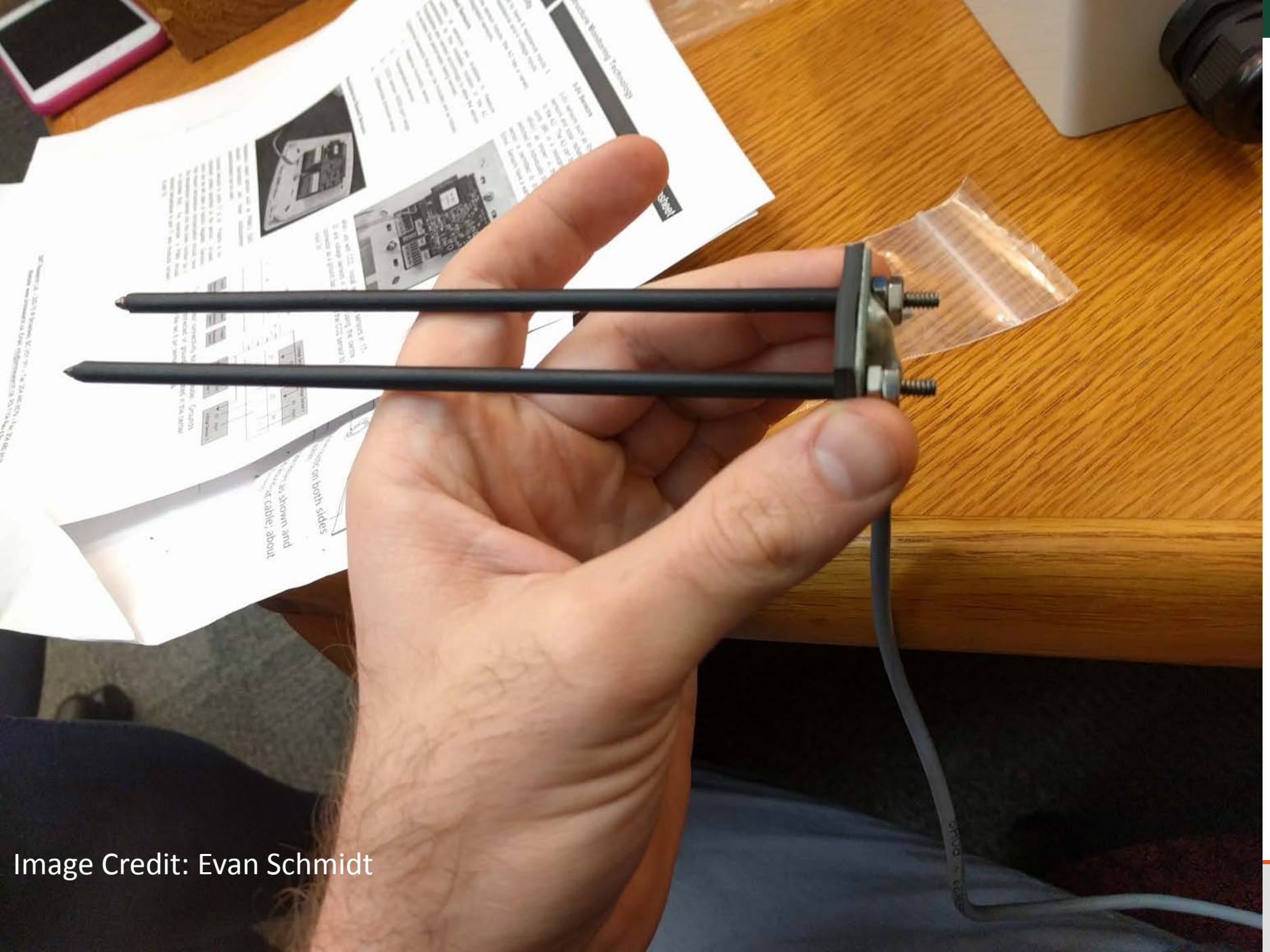


Image Credit: Evan Schmidt



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3

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Image Credit: Evan Schmidt



Image Credit: Evan Schmidt

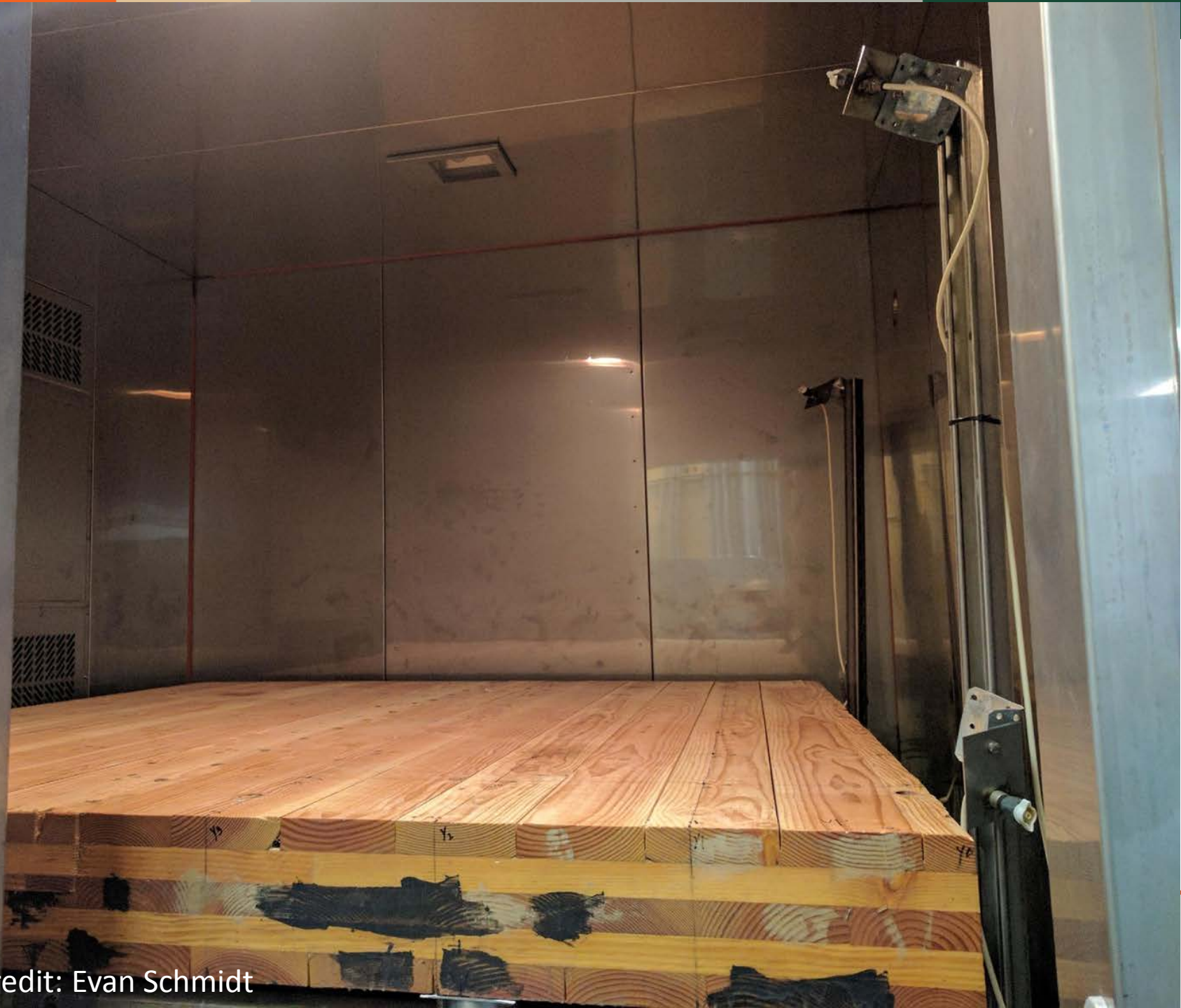


Image Credit: Evan Schmidt

Costing Research



Image Credit: Structurlam

Other Current/Forthcoming Research

- Modular hybrid buildings utilizing mass timber (military, disaster-relief, affordable housing)
- Improving adhesives (eco-friendliness, fire resistance, cure times)
- Coatings performance research
- Indoor air quality in mass timber structures
- Achieving net zero standards in mass timber buildings

Education



Education & Training

- Certificate program in mass timber manufacturing and construction:
 - Modular program for workplace learners
 - Joint delivery with community colleges
 - Online elements
 - Partnerships with software and machinery vendors
 - Design-fabricate build experiences at TDI's A.A. "Red" Emerson Advanced Wood Products Lab



Training

Translating research findings into plain language summaries for code officials, designers and other relevant audiences





TRANSPARENCE-V

Matthew Decker | Emily Rist | Keith Trine
Judith Sheine, Mark Donofrio, Faculty Advisors



MOMENTUM

Danae Burck | Kelly Elmore | Cara Mitchell | Stefanie Wibiasa
Judith Sheine, Mark Donofrio, Faculty Advisors



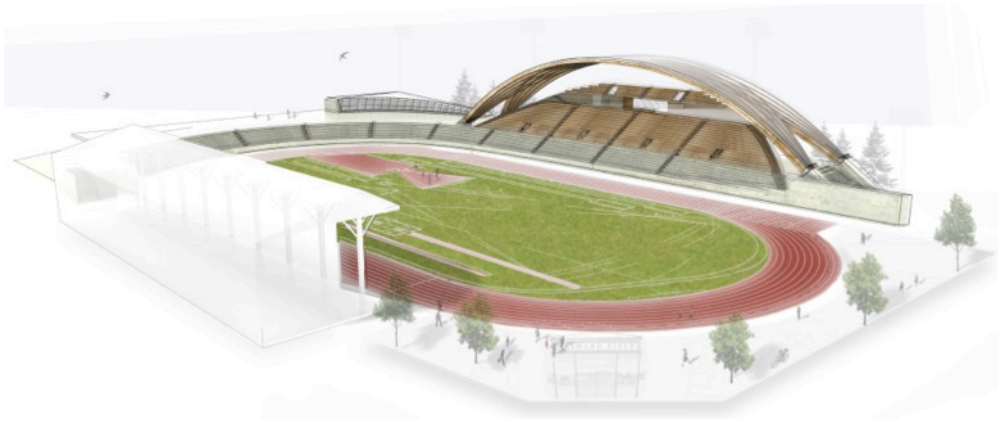
KAITO [box-kite]

Tom Adamson | Ryan Kiesler | Tom Moss
Judith Sheine, Mark Donofrio, Faculty Advisors



HISTORIC HAYWARD FIELD

MASS TIMBER WEST GRANDSTANDS



Judith Sheine
Department of Architecture
University of Oregon

Mikhail Gershfeld
Dept. 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
WAVY CANTILEVER

David Moreno | Russell Regulinski | Tim Sieroslowski
Judith Sheine, Mikhail Gershfeld, Faculty Advisors

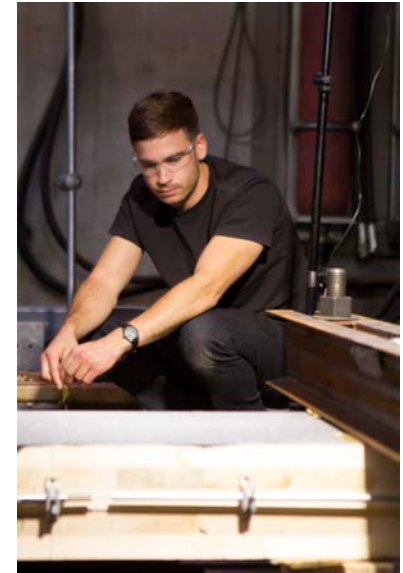


Hayward Field
ARCH

Nicole Giustino | August Lehnert | Max Moore
Judith Sheine, Mikhail Gershfeld, Faculty Advisors

Product Development & Testing

- Testing and product development for manufacturers (DR Johnson, Freres Lumber)
- Peer review service
- Testing for proposed projects
- Glenwood parking structure – durability technical support and testing







TALLWOOD

DESIGN INSTITUTE

Advancing solutions for designers, manufacturers
and engineers of our built environment.

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