

UIRF Application: Mass Timber Coalition

Project Description

Executive Summary

In response to the Economic Development Administration's Build Back Better Regional Challenge, a group of researchers, practitioners, and state and local administrators formed the Oregon Mass Timber Coalition. The aim of this group is to advance Oregon's established mass timber industry ecosystem and grow a regional cluster as it scales up innovative economic development projects that lead to economic recovery and address commonly shared challenges of low wages, inequality, and disparities of benefit. The team received the Phase 1 award and is in the process of preparing a Phase II submission. Only 60 groups out of 529 original applicants across the country moved on to this second stage, and we anticipate the EDA will fund about half of the Phase 2 applications. Funding is requested through the University Innovation Research Fund to help the two research universities involved in the Coalition—University of Oregon and Oregon State University—meet the steep cost share requirement (20% of total project costs).

The Oregon Mass Timber Coalition's (Coalition) vision is to tackle several of the region's interrelated challenges - climate change impacts (especially wildfires), social inequalities and homelessness, unaffordable housing, and the economic disruption caused by the global pandemic – all of which are affecting the health and prosperity of individuals and our communities. In response to these pressing challenges, the Coalition sees an economic opportunity unique to our region to expand Oregon's mass timber design, manufacturing, and construction sector through the development of a new product category – prefabricated housing systems using mass timber. By optimizing mass timber made from low-value logs for residential applications, the Coalition will demonstrate that these housing solutions can be more resilient and as affordable as light-wood-frame housing assemblies. Research and prototyping will demonstrate that a system of prefabricated mass timber can be aesthetically pleasing and potentially outperform light-wood-frame for durability, energy efficiency and thermal performance, speed of construction, acoustic privacy, embodied carbon, and fire resistance.

A key goal of this initiative is to link equitable housing production and job growth to reduction of forest fire risk. Housing can be made affordable via optimization of high-volume automated manufacturing processes and the utilization of low-value wood species from salvage and restoration forest projects as input materials in mass timber products. Through the production, development, and use of new kit-of-parts mass timber housing systems, we can also make our communities more resilient through meeting housing needs, improving forest management, and creating well-paying skilled jobs in both rural and urban communities.

The Port of Portland (Port) served as the lead organization in the Coalition's Phase 1 application. The other partners are the University of Oregon and Oregon State University through the TallWood Design Institute, Business Oregon, the Oregon Department of Forestry (ODF) and the Department of Land Conservation and Development (DLCD). The Port is proposing to build a Modular Housing Manufacturing Facility and Workforce Training Center at their Terminal 2 (T2) site in Portland and the UO and OSU are proposing a series of applied research projects and testing facilities to support the development and ongoing success of a mass timber prefabricated housing supply. ODF and DLCD are proposing, respectively, a major environmental audit to pave the way for increased forest restoration harvests, and a land use analysis aimed at reducing code barriers to modular housing deployment in Oregon.

Overview of University of Oregon Projects

1. Mass Timber Panelized Workforce Housing

The UO is collaborating with industry experts to develop panelized workforce housing prototypes using mass plywood panel (MPP) construction that leverages the cost efficiencies of computer-driven prefabrication. The designs will be optimized for aesthetics, affordability, whole life carbon net zero emissions efficiency, resilience, and biophilic benefits of wood and are planned to conform to the new higher-density zoning regulations required by Oregon House Bill 2001. The MPP, manufactured by Freres Lumber in Lyons, OR, can be made from logs with diameters as small as 5", thus creating a

market for otherwise low-value trees harvested from restoration forestry, which have climate, wildfire and rural economic co-benefits.

2. Panelized Mass Timber for Residential Multi-Story Buildings Seismic and Energy Upgrade Retrofits

UO (lead) and OSU are collaborating through the TallWood Design Institute (TDI) to upgrade aging, energy inefficient and seismically unprepared light-wood-frame multifamily housing stock by developing a mass plywood (MPP) retrofit panel assembly that employs digital workflows and small diameter logs (down to 5") to create an economically viable energy/seismic retrofit model for the West Coast and beyond. The project has broad potential to support forested federal land management agencies and the private forestry industry by providing a new market for small diameter logs while extending the useful life and increasing the energy efficiency and seismic resiliency of this stock of affordable housing.

3. Oregon Acoustic Testing Laboratory (OARL)

UO has developed plans for a state-of-the-art facility for conducting acoustics tests of mass timber assemblies. The lack of such a facility on the West Coast is a widely recognized barrier to the development of affordable mass timber multi-family housing. Certified acoustics tests need to be conducted for a large variety of mass timber assemblies for jurisdictional code approval and increased occupant satisfaction to further the adoption of mass timber panels in the residential construction market. The timber industry and design teams need easy and rapid access to the proposed facility, its equipment, and UO's research expertise to measure airborne and impact sound transmission of the building materials and construction assemblies and to develop new and improved products and assemblies.

Overview of Oregon State University Projects

1. Prototyping and Testing of Mass Timber Volumetric Housing Systems

OSU (lead) and UO are collaborating to develop, prototype, and test designs for factory-built volumetric mass timber modular housing. These designs will leverage the cost efficiencies of computer-controlled prefabrication and complete assembly in a manufacturing facility. They can provide permanent affordable replacement housing for low-income and wildfire-impacted populations, inclusive of Black, Indigenous and People of Color (BIPOC) communities, and have further application as multi-story affordable housing in high-density urban neighborhoods. These units sequester carbon, replace energy-intensive materials such as steel and concrete, and contribute to wildfire risk reduction and rural job creation.

2. Smart Forestry – Transforming Forestry and the Future Forest Workforce

OSU forest resources management researchers and collaborators at UO will perform an economic analysis of Oregon's timber supply available for mass timber products, with an emphasis on restoration thinning and proximity to transportation and processing facilities. This includes statewide fiber mapping, matching forest resources to available processing capacity, and analyzing the economics of the transportation and distribution supply chain. A pilot technology implementation project will be developed to assess efficiency gains and training needs related to state-of-the-art harvesting technologies in restoration harvesting operations. Workforce development is a theme that spans woodlands harvesting activities, mass timber manufacturing, housing manufacturing, and site assembly. OSU will develop training programs in all of these areas, leveraging existing curriculum that has been created using its own state funds and internal OSU grants.

3. Utilization of Low Value Lumber from Oregon Forest Restoration Programs

Testing is needed to determine viable pathways to commercial acceptance of lesser-utilized wood species in cross-laminated timber (CLT). Ponderosa Pine is a highly prevalent species throughout Oregon and the western US that currently lacks viable markets and contributes to wildfire risk. OSU researchers have tested the structural properties of CLT produced from this species, with promising preliminary results. A detailed testing plan and further work to define a custom grade specification is needed before this material can be manufactured and used commercially.

4. Construction and Installation of Fire-testing Chamber

Fire safety and performance is a critical topic in mass timber construction and a key area for ongoing research and development. OSU has significant research expertise in both structural and wildland fires, and results of mass timber fire tests have demonstrated that wood can be used safely in multi-family housing and other building types. However, Oregon currently lacks its own fire-testing capabilities, and fire tests must be carried out as far away as Texas and Ottawa, Canada. This has proven to be a barrier to further critical research on optimizing the performance and cost-efficiency of mass timber housing. A fire testing chamber, proposed to be sited adjacent to TDI's Emmerson Advanced Wood Products Lab on the Corvallis campus, will allow rapid and cost-effective fire testing within the US western region, benefitting both the mass timber sector and also researchers focused on wildfire risk reduction.

Match Requirement and Other Funding Sources

The total expected budget for the Oregon Mass Timber Coalition is ~\$100M. Table 1 identifies total project costs, funds requested from EDA, and required match for the University of Oregon and Oregon State University. Overall, \$6.25M is required to meet the 20% cost share obligations specified by the EDA. The University of Oregon and Oregon State University intend to provide a minimum of \$250K in matching funds, bringing the total UIRF request to \$6M.

Table 1: Summary of Budget and Cost Share

Institution	Total Project Costs	Total EDA Request	Total Cost Share Required (20% of total project cost)
University of Oregon	\$21.25M	\$17M	\$4.25M
Oregon State University	\$10M	\$8M	\$2M
TOTALS	\$31.25M	\$25M	\$6.25M

Table 2. Budget and Cost Share by Institution and Project provides further breakdown of EDA request and costs per project.

Institution	Project	Total Project Cost	EDA Request	Cost Share Required	Other funding
University of Oregon	Project 1: Mass Timber Panelized Workforce Housing	\$1.875M	\$1.5M	\$375,000	Leverages previous funding from UO, TDI, Providence Health, Energy Trust of Oregon and the US Forest Service (USFS)
University of Oregon	Project 2: Panelized Mass Timber for Residential Multi-Story Buildings Seismic and Energy Upgrade Retrofits	\$625,000	\$500,000	\$125,000	Leverages previous funding from USFS Wood Innovation Grant
University of Oregon	Project 3: Oregon Acoustic Testing Laboratory (OARL)	\$18.75M	\$15M	\$3.75M	Leverages previous funding from Business Oregon's High Impact Opportunity Projects (HIOP), TDI, USFS Wood Innovations Grant, and EDA
Oregon State University	Project 1: Prototyping and Testing of Mass Timber Volumetric Housing Systems	\$3.125M	\$2.5M	\$625,000	Leverages lessons learned from current state-funded volumetric prototyping underway at Port of Portland and led by Hacienda Community Development Corporation

Oregon State University	Project 2: Smart Forestry – Transforming Forestry and the Future Forest Workforce	\$3.75M	\$3M	\$750,000	
Oregon State University	Project 3: Utilization of Low Value Lumber from Oregon Forest Restoration Programs	\$1.25M	\$1M	\$250,000	Leverages previous funding from USFS Wood Innovation Grant
Oregon State University	Project 4: Construction and Installation of Fire-testing Chamber	\$1.875M	\$1.5M	\$375,000	Leverages facility investments by OSU and donors to construct and equip the A.A. Emmerson Advanced Wood Products Lab
TOTALS		\$31.25M	\$25M	\$6.25M	

Expected Outcomes and Evaluation

The economic development impacts of this effort, including the specific focus on advancing economic resilience for vulnerable communities, are far reaching and detailed in the Project Value attachment. Briefly, the Oregon Mass Timber Coalition’s vision is to enhance and expand Oregon’s established mass timber industry ecosystem, growing it into a more significant regional cluster. This effort will scale up innovative economic development projects, supporting economic recovery and development, while addressing economic challenges like low wages, inequality, sustainability, and disparities of benefit. The Coalition’s efforts are designed to transform and advance economic development, environmental stewardship, and social and economic equity across our state by: 1) creating new manufacturing infrastructure, and an affiliated training center, 2) supporting public and private decision-making through world class testing facilities, extensive research, and prototype development, 3) promoting workforce development through community outreach with emphasis on job pathways for underserved communities, and 4) contributing to sustainability of our forests through restoration, sustainable fiber supply, and low value species utilization.

The following outlines the expected outcomes and measures of success for the projects led by UO and OSU.

Affordable Housing: Metrics will address housing supply for underserved populations in urban, suburban and rural locations, including wildfire-affected communities and targeted project outcomes are to reduce housing costs and increase housing accessibility throughout Oregon. The UO panelized workforce housing project will produce development cost models and plans for panelized housing that will be made publicly available and designed to scale broadly into the single-family and multiplex residential housing market. Targets for cost of panelized mass timber workforce housing are \$205/sf including site costs, general conditions and insurance, for affordability to households at 80-100% of Area Median Income. The target for the volumetric mass timber modular housing units is \$126/sf for modules with plumbing and \$78/sf for those without, with the manufacturing facility able to produce tens of thousands of units annually. For the retrofit project, the goal would be to preserve affordable housing units while allowing residents to remain in place, with a cost significantly lower than replacement of units.

For both the acoustic and fire testing facilities, expected outcomes are the certification of the facilities for producing highly reliable test results accepted by jurisdictions for building permitting, as well as creating state-of-the-art facilities for furthering research in the areas of acoustic and fire performance with mass timber assemblies, and wildfire risk reduction. The acoustics laboratory is expected to test a high volume of assemblies and dramatically increase access to testing for West Coast manufacturers given the nearest current alternative is in Pennsylvania. Testing access is likely to increase investments into acoustical product manufacturing already present in Oregon and attract additional manufacturers. The acoustics laboratory will also spur a new degree offering and increase synergies between UO Architecture and OSU Architectural Engineering.

Manufacturing Training, Jobs and Regional GDP Growth: The Oregon Modular Housing Manufacturing Facility and Workforce Training Center and related demand increases for mass timber will increase manufacturing jobs, grow regional GDP in the mass timber sector, and expand career pathways and workforce equity for the region's underserved communities. The outcomes include: implementing training programs that build a stronger and equitable mass timber workforce and build partnerships with organizations that represent underserved communities; capacity building and technology transfer to existing Oregon modular builders (construction and fabrication know-how, skills upgrading); increasing the mass timber wood fiber supply, and reducing available forest fuel sources and lowering fire risk through restoration forestry projects; and creation of a pathway to commercial use of Ponderosa Pine, a highly prevalent but lesser-utilized western wood species, in CLT.