WASHINGTON STATE UNIVERSITY

Composite Materials and Engineering Center

2025 Annual Report

CMEC.WSU.EDU

LETTER FROM THE DIRECTOR

Greetings to all! It is my pleasure to share the Composite Materials & Engineering Center's (CMEC) Annual Report, highlighting an exceptional year of achievement, collaboration, and impact across our research, education, and industry engagement missions. As we reflect on 2025 and the past few years after COVID and look ahead, we are proud to highlight some of the hard work and dedication of our faculty, staff, and students, and the partnerships we continue to foster and ensure CMEC continues to provide leadership in sustainable materials innovation and structural engineering excellence.

A core focus of CMEC is training the next generation of engineers and scientists while maintaining active engagement with industry, agencies, and professional organizations. Undergraduate and graduate students work side-by-side with faculty and staff on projects spanning wood material characterization, panel manufacturing, structural testing, codes and standards, and performance evaluation — gaining experience that directly prepares them for careers in structural engineering, materials development, manufacturing, and building performance. The Center's ICC-accredited laboratories and testing capabilities serve as a regional and national resource, supporting industry partners with product evaluation, building code interpretation, certification data, and innovation in wood-based and composite solutions. These efforts — including an expanded lab scope covering seismic wall testing, joist hangers, hold downs, and CLT members — align with WSU's land-grant mission by providing hands-on learning, mentorship, and exposure to real-world industry challenges across multiple disciplines.

In 2023, we began with an important transition in leadership. In the summer of 2022, we honored the retirement of Professor Don Bender, longtime CMEC Director and Weyerhaeuser Distinguished Professor, whose career shaped national standards in timber engineering and advanced CMEC's stature in research and testing since he assumed the leadership position in 1997. His legacy continues to guide our work, and I am grateful for the opportunity to serve CMEC as Director alongside CMEC's Associate Director, Julia Day, Associate Professor, School of Design and Construction, starting in December of 2022.

CMEC continues to strengthen its leadership in engineered wood, biocomposites, and sustainable construction materials, with faculty leading multidisciplinary projects that span material characterization, product development, and structural performance. Across the year, projects reflected a balance of fundamental research and applied problem-solving, addressing industry needs in durability, code compliance, performance-based design, and circular use of wood and bio-based resources.

In this report, we will highlight our incredible faculty, staff, and student accomplishments.

Thank you for an extraordinary past several years. Together, we will keep working toward a more sustainable, resilient, and innovative future built on renewable materials. We love trees, and we are committed to using them wisely so future generations can enjoy them too.

Vikram Yadama
Director, Composite Materials & Engineering Center
Washington State University

WHO WE ARE AND OUR HISTORY

For more than seventy-seven years, CMEC has evolved from a pioneering wood-composites laboratory into a nationally recognized hub for advanced materials research. Originally founded in 1949 as the Wood Materials and Engineering Lab (WMEL), the center spent decades shaping the science of traditional engineered wood products while expanding its academic footprint, from joining the Department of Materials Science and Engineering in 1972 to becoming part of the College of Engineering in 1985. In 2008, this legacy of innovation broadened into the Composite Materials & Engineering Center (CMEC), reflecting a strategic move beyond wood to include cementitious, polymeric, natural fiber, and hybrid composite systems. Today, CMEC integrates cutting-edge material science, manufacturing research, and accredited industry testing, building on its historic foundation while driving the next generation of sustainable, high-performance composite technologies. To learn more about CMEC history, click on the following link https://cmec.wsu.edu/documents/2015/04/wmel-history.pdf/

MISSION STATEMENT

The Composite Materials and Engineering Center (CMEC) is an interdisciplinary research organization at Washington State University focused on developing new building materials and manufacturing technologies from recycled and renewable resources. We also develop innovative structural systems and design methods to effectively utilize new materials while maintaining economic viability and public safety.

THE GENESIS OF AN INDUSTRY

Just 70 years ago, lumber mills burned residual materials that, at the time, were perceived as waste. Tom Maloney transformed these wood "waste" products into particleboard, launching a new class of engineered materials — a materials and engineering legacy.

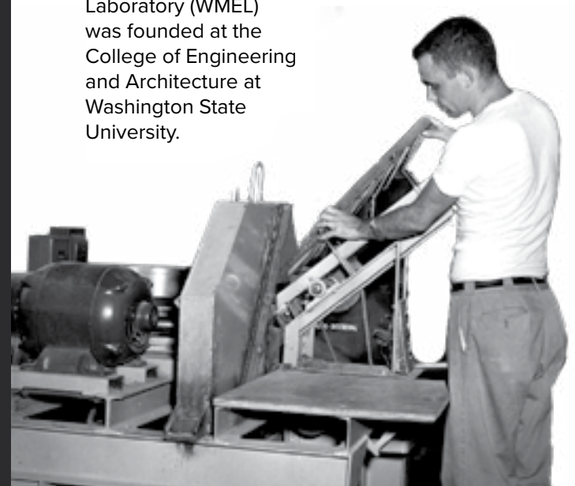
1950 — 1975 — 2000 — 2025

1949
The Wood Materials and Engineering Laboratory (WMEL) was founded at the College of Engineering and Architecture at Washington State University.

1972
Materials Science & Engineering

2008
Renamed to CMEC

The Next Wave
CMEC leads advancements in biofuels, bioplastics, and hybrid composites shaping a renewable, high-performance future.



2025 IMPACT, METRICS, AND OUTPUTS

The Composite Materials & Engineering Center (CMEC) partners with industry to turn innovative ideas into real-world solutions for the built environment. We combine applied research, advanced testing and prototyping facilities, and deep expertise in codes, standards, and manufacturing to accelerate product development, improve processes, and support market-ready innovation. Beyond performance and compliance, CMEC is committed to societal impact—advancing safer buildings, healthier indoor environments, resilient infrastructure, and sustainable materials that strengthen communities and reduce environmental impact.

$7.20
RETURN ON EVERY
$1.00
INVESTED* IN CMEC

*INVESTMENTS FROM STATE FUNDING

$3.2M
GRANT FUNDING SECURED

+

$475K
SERVICE CENTER REVENUE SECURED

34
UNDERGRADUATE STUDENTS EMPLOYED ON RESEARCH PROJECTS

+

11
GRADUATE STUDENTS (7 PhD & 4 MS) SUPPORTED ON RESEARCH PROJECTS

41
PEER REVIEWED JOURNAL PUBLICATIONS AND BOOK CHAPTERS

+

10
PATENTS AND TECHNOLOGIES DISCLOSED

*metrics and outputs for 2025**

OUR VALUE PROPOSITION

CMEC offers a wide range of services to industrial clients:

- ☑ Blue-sky development of new products: If you've got the idea, we've got the technical know-how to help you implement it.
- ☑ Design methodology consultation: We know the codes and standards and can help you be the first to market with your idea or project.
- ☑ Rapid prototyping: We've got the R&D facilities to help you innovate—we are nimble and responsive partners.
- ☑ Process improvement: We can find ways to improve your existing manufacturing processes to become more efficient and more profitable.
- ☑ Code-compliance testing: New products can be exciting, but code compliance is a necessity if you want to get to market; we can guide you through the maze to help you reach your goals.
- ☑ Standards development: our faculty are experienced in developing test standards for new materials and in developing design specifications recognized by building codes.

CMEC SERVICE CENTERS

In addition to our ICC-Accredited Structural Testing laboratory, CMEC has four other service centers to address the interdisciplinary aspects of building engineering, materials testing and building science:

Pressing Services
CMEC maintains and operates three large-scale presses at our Research Park facility. Our largest press is a pneumatic cold set Cross Laminated Timber (CLT) press that can fabricate 6x12ft panels and up to a 9-ply thickness (up to 13" in depth). We also have 2 hot presses (4x8' and 28x38") that are ideal for making many natural fiber composites, such as oriented-strand board (OSB), particle board, and fiberboard. We have the auxiliary equipment and capability of refining, drying, resin spraying and blending, and forming raw material into a finished product to be tested and evaluated for industry use. Our facilities can also provide a structural, physical, and chemical characterization of the raw materials and the final pressed products.

Fiber Refinement
Our fiber refinement capabilities allow for pilot scale processing of shreds, chips, fibers, flakes, particles, and flours to be manufactured by a variety of mills (ball, hammer, refiner disk), shredders/chippers, and flakers (disk, drum, and ring) for many end-use applications.

Advanced Materials Processing
We routinely use fibers, fillers, and extenders in our polymer and cementitious matrices and can process these materials into a final product through a variety of methods, such as extrusion and injection molding (IM), and resin transfer molding (RTM) and vacuum-assisted RTM (VARTM), to name a few. We are equipped to run full-scale extrusion and ring pelletization trials with customizable outputs. We provide structural, physical, and chemical evaluation of incoming and final products.

Analytical Services
CMEC maintains and operates various scientific instrumentation to perform high-level material analysis. Services include chemical and physical property analyses, material characterization, performance testing and evaluation through energy absorption (pyrolysis), thermogravimetric analysis, microscopy (optical and atomic force), spectroscopy, molecular particle sizing and electrokinetic (zeta) potential, diffraction and chromatography.

AREAS OF RESEARCH AND SERVICE

WOOD & NATURAL FIBERS ENGINEERING

STRUCTURAL ENGINEERING

POLYMERIC MATERIALS

CEMENTITIOUS & BITUMINOUS MATERIALS

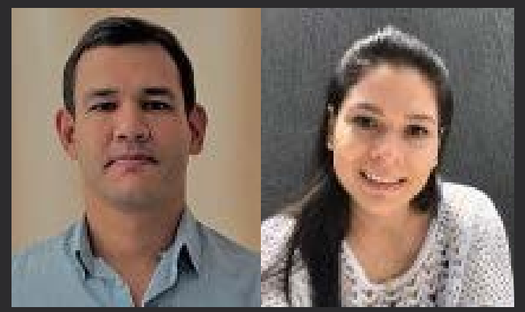
BUILT ENVIRONMENT

FACULTY LEADERSHIP

The Composite Materials & Engineering Center (CMEC) is driven by a group of distinguished faculty whose expertise spans sustainable materials, polymer and composite engineering, structural systems, cementitious and bituminous materials, and the built environment. CMEC researchers lead nationally recognized programs in renewable composites, circular material systems, mass timber innovation, infrastructure materials, and performance-driven building systems. Faculty collaborate across Civil, Environmental, Mechanical, Materials, and Biological Systems Engineering, Chemistry, the School of Design + Construction, Apparel, Merchandising, Design & Textiles and more, creating a truly interdisciplinary research environment. Their work integrates materials science with applied engineering, computational modeling, life cycle analysis, and full-scale testing to improve the structural, environmental, and human performance of buildings, materials, and infrastructure.

VISITING FACULTY

GUSTAVO DE FIGUEIREDO BRITO AND LOUISE BRASILEIRO QUIRINO BRITO
Professors at Universidade Federal de Paraíba



LOUISE & GUSTAVO'S RESEARCH AREAS

- Thermoset polymers
- 3D printing
- Industrial and Manufacturing Engineering
- Materials Chemistry

NEW FACULTY

CECILE GRUBB, PHD.
Assistant Research Professor

DR. GRUBB'S RESEARCH AREAS

- Sustainable and bio-based composites
- Reactive extrusion
- Size reduction technologies
- Plastics and composites recycling
- Life cycle analysis

AVISHEK CHANDA, PHD.
Assistant Research Professor

DR. CHANDA'S RESEARCH AREAS

- Mechanics of wood and natural fiber composites
- Sustainable composite solutions
- Modeling of engineered wood and lignocellulosic composite systems
- Fire performance analysis

BAOMING ZHAO, PHD.
Assistant Research Professor

DR. ZHAO'S RESEARCH AREAS

- Bio-based polymers
- Chemical recycling of polymers and polymer composites
- Sustainable and circular 3D printing

Dr. Yadama and Professor Chanda developed bamboo roofing panels in partnership with Ocean, a Tacoma, WA startup founded by Alexa Bednarz.

EXPANDING FACULTY, ADVANCING IMPACT

Over the past three years, CMEC has strategically expanded its research capacity with the addition of three Research Assistant Professors — Avishek Chanda, Baoming Zhao, and Cecile Grubb. Together, they strengthen CMEC's leadership in sustainable composite materials, polymer and composite engineering, and performance-driven materials research. Their expertise spans fire performance and computational modeling, bio-based polymers and chemical recycling, composite manufacturing and processing, materials recycling, and sustainable composite development. By integrating materials science with scalable manufacturing, life cycle analysis, and applied performance testing, they advance translational research that directly supports industry innovation and public-sector priorities.

This expanded expertise builds upon the strength of CMEC's broader faculty and research community. Across the Center, investigators are advancing renewable and circular-material technologies, strengthening mass timber and engineered wood systems, and accelerating polymer innovation and recycling. Recent efforts include expanded predictive modeling to increase structural applications of lower-grade lumber, Department of Defense–supported shake table testing of modular Cross-Laminated Timber systems for resilient deployment, and continued progress in modular hybrid construction to improve affordability, durability, and carbon performance in housing. Faculty are also advancing commercialization of three-dimensional wood strand composite technologies and developing panelized construction systems that enhance structural, energy, and hygrothermal performance across the built environment and emerging modular construction systems.

The following pages highlight representative projects across CMEC's research focus areas, illustrating the depth, diversity, and real-world impact of the Center's work.

WOOD MATERIALS & ENGINEERING

Modular Mass Timber & Affordable Housing

Addressing the growing housing affordability crisis, CMEC's Dr. Pouria Bahmani is leading innovative research on modular mass timber hybrid construction to transform how affordable housing is designed and built in the United States. Supported by the U.S. Department of Housing and Urban Development (project H21765CA), this work integrates mass timber and light wood frame systems to create durable, cost-effective modular housing that can be manufactured efficiently and assembled quickly on site. The research focuses on improving transportation, reducing labor demands, and lowering overall construction costs through advanced design strategies. Current efforts include developing dual-purpose modules that serve both as structural building components and part of the transportation system, reducing waste and increasing efficiency. The team is also exploring adaptable module designs that can be repurposed for different uses over time, supporting long-term sustainability. By combining advanced materials, engineering innovation, and industry collaboration, this work aims to expand access to affordable, resilient housing nationwide. See more about the project here: https://www.huduser.gov/portal/pdredge/pdr-edge-trending-060525.html.

In partnership with industry and public agencies, the project evaluates structural performance, transportation logistics, and constructability through full-scale prototyping and testing. By aligning innovative timber systems with evolving building codes and market demands, this research is helping establish scalable pathways for modular mass timber adoption across diverse regions, modalities, and housing typologies.

Structural performance of modular mass timber hybrid construction systems is tested during a stress test.

Leveraging its expertise in construction methods, force protection and building technology, the ERDC, a department of the US Army Corps of Engineers, is studying how thermally modified structural timber can be used for military projects.

"We need to build this knowledge base, develop the building codes, and convince the construction industry that yes, anybody can design and build with mass timber."

—Vikram Yadama

Mass Timber for Resilient Infrastructure

Recent coverage in Wood Central highlights innovative work led by Dr. Pouria Bahmani and collaborators to advance cross-laminated timber (CLT) shelters for the U.S. Army (project W9132T239C004). The research explores the use of Western Hemlock and thermally modified mass timber to create rapidly deployable, resilient structures capable of withstanding seismic events equivalent to a 250–500-year earthquake. Beyond structural performance, the work emphasizes dimensional stability, biological resistance, and logistical flexibility, key factors for military and remote applications.

Full-scale testing and material characterization validate system performance under extreme loading conditions, reinforcing confidence in timber-based solutions for mission-critical use. Dr. Bahmani's contributions position mass timber as a credible, high-performance platform for next-generation contingency and defense applications.

Passenger jets wait on the tarmac to take off.

Sustainable Aviation & Bio-Renewable Materials Leadership

Professor Michael P. Wolcott, Regents Professor and internationally recognized leader in bio-renewable materials and fuels, continues to shape CMEC's impact through research and strategic leadership. He has led large interdisciplinary programs with the Federal Aviation Administration, US Department of Agriculture, and the Office of Naval Research that have advanced commercialization of bio-based materials and fuels through extensive public–private partnerships. As Director of the Northwest Advanced Renewables Alliance (NARA), he led efforts that demonstrated cross-country flights powered by cellulosic biofuels, illustrating how laboratory innovation can scale into real-world aviation solutions.

Wolcott now serves as Center Director and Technical Lead for Alternative Jet Fuels Research within ASCENT, the FAA Center of Excellence for Alternative Jet Fuels and the Environment (https://ascent.aero/). ASCENT is a cooperative research partnership of 16 leading U.S. universities and more than 60 private-sector stakeholders, conducting research that informs industry sponsors on emerging aviation technologies and operations.

"Energy transitions require contributions from many disciplines to achieve real change. Like so much of CMEC's work, our aviation leadership has been built on assembling teams from diverse backgrounds. I am so grateful to have the opportunity to work with and learn from colleagues from around our university."

—Michael P. Wolcott

STRUCTURAL ENGINEERING

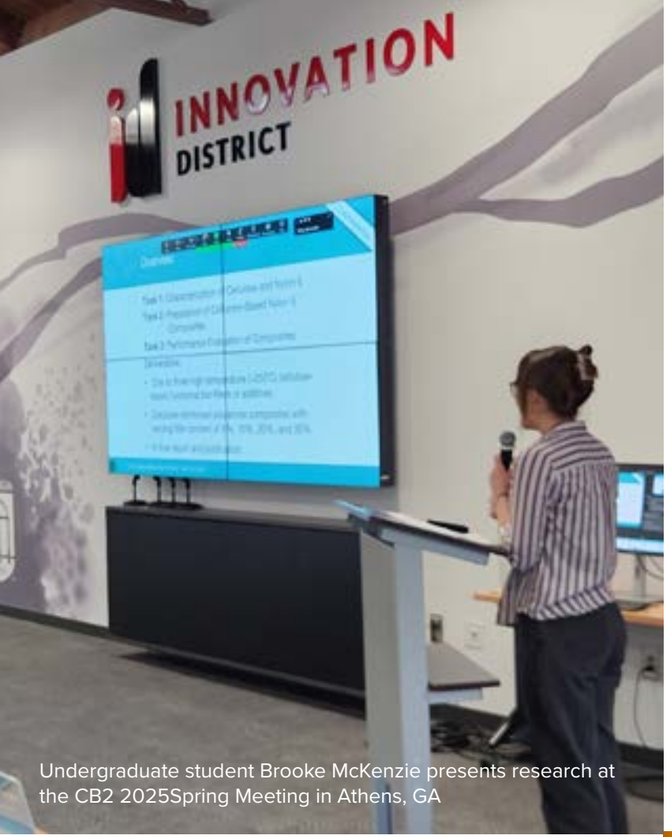
Human-Centered Modeling for Wildfire Resilience

Dr. Ji Yun Lee is advancing wildfire resilience through innovative predictive modeling that captures how people actually behave during evacuations. Using machine learning and behavioral data from the 2019 Tick Fire in California, her study—published in *Fire Technology,* —integrates resident decision-making with traffic and engineering models to improve evacuation planning in fire-prone communities. Surveying more than 700 residents across California, Oregon, and Colorado, research revealed significant variation in evacuation decisions based on prior experience, preparedness, and perceived risk. Many individuals rely on familiar routes rather than GPS navigation, contributing to congestion and delayed evacuation when conditions shift rapidly. By incorporating human decision-making and behavior into engineering and transportation models, this research aims to help emergency managers identify bottlenecks, refine evacuation strategies, and ultimately reduce loss of life. The project was supported by the U.S. Department of Transportation through the Pacific Northwest Regional University Transportation Center (PacTrans).

"A lack of long-term citizen engagement and limited information flows in community-level wildfire risk management plans presents a barrier to informed decision-making of both local governments and individuals."

—Ji Yun Lee

A forest engulfed in flames. Incorporating behavior information into engineering decisions can decrease congestion during evacuation.



Undergraduate student Brooke McKenzie presents research at the CB2 2025Spring Meeting in Athens, GA

POLYMERIC MATERIALS

Bio-Based Polymers & Composite Innovation

Hui Li, along with Karl Englund, continued their work as WSU Site Co-Directors for the Center for Bioplastics and Biocomposites (CB^2). Hui, now at North Carolina State University, was awarded funding for his project, “Cellulose-Reinforced Polyamide Composites,” during his time at WSU. The research explored how varying cellulose crystallinity can enhance nylon reinforcement performance. The project received a second year of funding in 2026, demonstrating strong technical progress and industry relevance. Moving forward, Baoming Zhao will co-direct the site program. Undergraduate researcher Brooke McKenzie presented the work at the CB^2 Spring Meeting in Athens, GA, highlighting CMEC’s commitment to student research engagement.

Center for Bioplastics and Biocomposites


Hang Liu inspects conductive thread

Wearable Sensing & Responsive Textile Systems

Dr. Hang Liu is advancing the next generation of smart textiles by developing fibers and fabrics that sense, respond to, and interact with the human body and surrounding environment. Her research integrates advanced fiber spinning, additive manufacturing, and conductive material development to produce responsive textile systems. Applications span health monitoring, athletic performance optimization, military readiness, and protective equipment for first responders. Current projects include conductive fibers for chemical sensing, heat-resistant cellulose-based flexible fibers for high-performance protective gear, and conductive fabrics designed to monitor posture and detect motion. By bridging materials science, manufacturing innovation, and wearable technology, Dr. Liu’s work expands the role of engineered textiles in supporting safety, resilience, and responsiveness.

CEMENTITIOUS & BITUMINOUS MATERIALS

Sustainable Pavement Innovation & Infrastructure Resilience

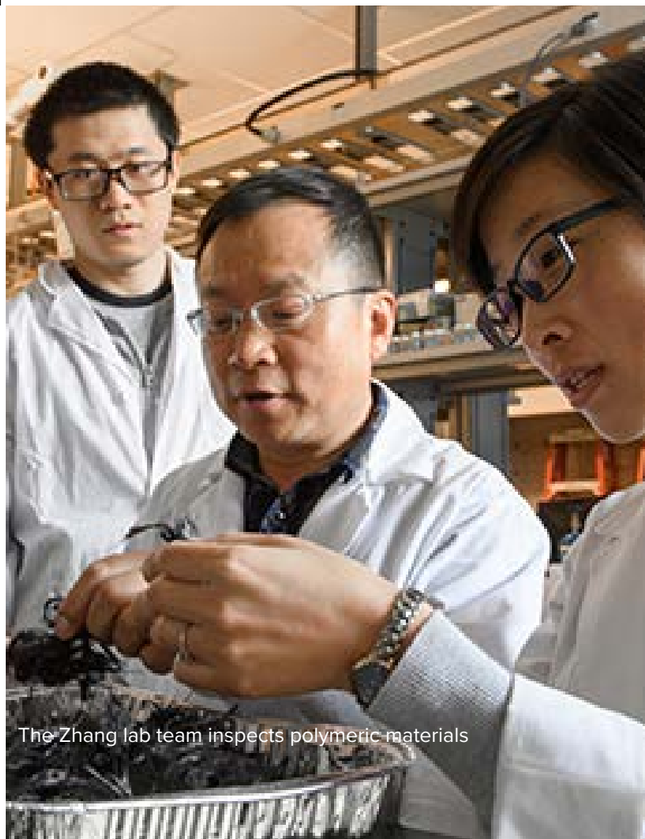
Dr. Karl Englund and Dr. Somayeh Nassiri of UC Davis were awarded two patents in 2025 for collaborative research on advanced permeable pavement systems. The patents protect both the engineered pavement composition and its method of application, supporting scalable use in transportation infrastructure.

This innovation improves stormwater management, enhances surface durability, and reduces runoff-related environmental impacts in urban settings. By integrating materials science with performance requirements, the team is advancing solutions that address flooding, heat mitigation, and long-term pavement resilience. The work reflects CMEC’s commitment to translating laboratory discoveries into deployable technologies.


Permeable pavement samples

Circular Material Systems

Our senior faculty continue advancing innovative research on sustainable materials for the built environment. Professor Jinwen Zhang was named a National Academy of Inventors Senior Member, recognizing his accomplishments in patents, licensing, and industry-driven innovation. In 2024, he secured two major federal awards: a $1.65M U.S. Department of Energy grant to recycle carbon fiber–reinforced polymer waste into recyclable structural automotive components, and a $591K USDA grant to develop recyclable non-isocyanate polyurethane foams and elastomers. Together, these projects address a major challenge in advanced materials engineering: maintaining high performance while enabling true material circularity. By designing polymers and composites that can be recovered, reprocessed, and reintegrated into manufacturing streams, CMEC researchers reduce landfill waste, lower lifecycle emissions, and strengthen domestic supply chains.


The Zhang lab team inspects polymeric materials

RESEARCH IN THE BUILT ENVIRONMENT

Neuroscience, Energy, and Climate-Responsive Building Design

During her sabbatical, Dr. Julia Day completed advanced training in neuroscience and neuroarchitecture in Stockholm and Helsinki, deepening her work at the intersection of energy, health, and human-centered design. She also collaborated with faculty at the WSU Elson S. Floyd College of Medicine in Spokane to connect emerging neuroscience research with built environment applications. Through international partnerships, interdisciplinary study, and research interviews led by Shelby Bauer, the ID+CL team examined how sensory and cognitive processes shape interactions with the built environment. These efforts are informing new research directions focused on vulnerable populations, climate resilience, and the health impacts of building design.

Scandinavian Dino pictures for Julia's daughter, taken while away on sabbatical

In 2025, the ID+CL concluded two multi-year U.S. Department of Energy workforce development initiatives (BENEFIT), one with WSU's ECC Program, and another with Northeastern University, delivering training for high school students and building operators on grid-aware buildings, energy performance, occupant comfort, and effective communication. Julia also continues to co-lead the International Energy Agency research network on Human-Centric Buildings for a Changing Climate. That same year, she and WSU hosted the network's second experts' meeting and co-led the third in Switzerland, strengthening global partnerships and advancing climate-adaptive, human-centered design. See https://annex95.iea-ebc.org/.

Third HCB Network Expert Meeting in Lausanne, Switzerland — September 2025

3D model of the WSU Pullman Spark Building created using reality capture technology.

Automation, Reality Capture, & Innovation

Advancing the future of construction through digital innovation, Dr. Hongtao Dang leads work integrating automation, reality capture, and data-driven decision-making into the built environment. In 2025, his efforts improved construction efficiency, sustainability, and workforce readiness through technologies such as UAV imaging, LiDAR scanning, photogrammetry, and digital twins. As Principal Investigator on a PacTrans-funded project, Dr. Dang is developing automated systems to track construction progress and enhance project performance, strengthening partnerships with industry and transportation agencies.

CMEC's commitment to experiential learning is equally impactful. Dr. Dang's courses and initiatives connect students with real-world challenges, including collaborations with Habitat for Humanity and Reality Capture and Digital Twin projects that build advanced technical skills. These efforts prepare graduates to lead in a rapidly evolving construction industry while reinforcing CMEC's role as a hub for innovation and workforce development.

Hongtao Dang collects digital twin data

CMEC STUDENT SUCCESSES AND CONGRATULATIONS

A core focus of the Center in partnership with our academic departments is training the next generation of engineers and scientists through coursework, laboratory experiences, and structured research opportunities; It is central to CMEC's mission. Undergraduate and graduate students worked side-by-side with faculty and staff on projects involving wood material characterization, panel manufacturing, structural testing, codes and standards, and performance evaluation of new products and systems. CMEC-supported students gained experience that directly prepares them for careers in structural engineering, materials development, manufacturing, and building performance, while also contributing meaningfully to sponsored projects. These efforts align with WSU's land-grant mission by providing hands-on learning, mentorship, and exposure to real-world industry challenges for students from multiple disciplines.

Excellence of CMEC's students, its greatest strengths, can be seen through a few examples. Abiola Adeniran successfully defended his Ph.D. dissertation on borate-treated Douglas fir and grand fir laminates to improve CLT durability. Maximiliano Wagemann Herrera defended his Ph.D. dissertation on the structural performance of simply supported CLT diaphragms. Evan Gonzalez was selected as a 2025 member of the prestigious PNNL–WSU Distinguished Graduate Research Program (DGRP). Joseph Roberson successfully completed his MS in Civil and Environmental Engineering on composite mass timber panels of thermally treated wood strands of balsam fir, supported by USFS funding. Mohammad Mezbah Ul Hoque was the Outstanding Biosystems Engineering Graduate Student (2024-2025) and received several other awards in 2024, including Arnie and Marta Kegel Fellowship and SWANA Deborah Lambert Memorial Scholarship for outstanding research. These achievements reflect not only individual dedication but also the mentorship and support provided through CMEC's research ecosystem.

GRADUATE RESEARCH MILESTONES

DOCTORAL DEFENSES

- *Abiola Adeniran,* Ph.D. (MSE) *"Borate Treatment of Douglas Fir and Grand Fir Laminates for a More Durable Cross-Laminated Timber."*
- *Monther Nayfeh, Ph.D. (CEE) "Design Considerations and Performance Evaluation of Timber-Concrete Composite (TCC) Floor Systems Subjected to Negative Bending Moment "*
- *Maximiliano Wagemann Herrera,* Ph.D. (CEE) *Structural Performance of Simply Supported Cross Laminated Timber Diaphragms."*
- *Zihui Zhao,* Ph.D. (IIDP) *"The Development of Textile-Based Conductive Wearables via DIW 3D Printing Technology,"* , now an Assistant Professor in WSU's Department of Apparel, Merchandising, Design and Textiles.

MASTERS DEFENSES

- *Kundavi Thanda,* M.S. (MSE) *"Developing Cellulose-Based Foams From Cotton Waste,"*
- *Ashish Shrestha,* M.S. *"Investigating The Performance Of Connections In Cross-Laminated Timber (Clt) Panels Constructed From Thermally Modified Western Hemlock Lumber"*
- *Amos Black,* M.S. *"Experimental Study of Low Damage Shape Memory Alloy Bridge Columns in Long-Duration Earthquakes"*
- *Joseph Roberson,* M.S (CEE) *"Analysis of Thermally Modified Wood Strands and Thin Strand Veneers for Low-Value Balsam Fir,"*

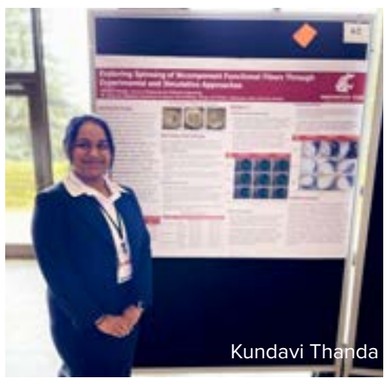
STUDENT RECOGNITION

- *Mohammad Mezbah Ul Hoque*: Outstanding Biosystems Engineering Graduate Student (2024–25), Arnie and Marta Kegel Fellowship, and SWANA Deborah Lambert Memorial Scholarship, 2024
- *Evan Gonzalez*: *PNNL and WSU Distinguished Graduate Research Program (DGRP) cohort.*

PUBLICATIONS

- *Adhikari, R., Chanda, A., Bakri, M.K.B., Akinnuoye, M.M., Pelaez-Samaniego, M.R., Aro, M, & Yadama, V. 2025. Performance of thermally modified wood strands and thin veneers for use in durable mass timber panels. Case Studies in Construction Materials, 23, e04920."*

Abiola Adeniran


Kundavi Thanda

CMEC STAFF

CMEC's technical staff are essential to everything we do. Joshah Jennings, Scott Lewis and Shu Cai provide day-to-day technical and management support at our PACCAR and RTP facilities, maintain ISO-17025 accreditation, and oversee structural testing that generated significant industry-sponsored work between 2022 and 2025. Across our facilities, CMEC staff maintain rigorous safety standards, coordinate experimental schedules, and ensure that industry partners and research teams can rely on consistent, high-quality results. Joshah's work in safety and quality management was recognized with the WSU President's Safety Award in 2025, while Scott serves as our in-house expert on manufacturing equipment, hydraulic systems, and data acquisition, supporting nearly every experimental project. Shu is the lab manager for the Analytical Services lab and provides robust support for all researchers using the labs. He keeps our lab equipment calibrated and operational.

Equally important to CMEC's success is the professionalism and dedication of the staff who keep our research enterprise running every day. Our administrative staff are truly CMEC's "life support." Principal Assistant Suzanne Hamada and Fiscal Specialist Sarah Dossey provide vital support for grants, budgets, purchasing, personnel, and day-to-day operations. Their expertise with federal funding rules, contracts, and international purchasing keeps our projects on track and allows faculty and students to focus on research and teaching. Suzanne is known for her efficiency, proposal support, outstanding quality of work, and positive, "can do" attitude. Sarah's contributions are marked by an outstanding volume of work and exemplary working relationships with colleagues and clients. Everyone relies on her expertise regarding contracting and international purchasing, and she is the go-to person for all PACCAR-related matters. Lastly, it is with great joy that we recognize Sharon Stout, long-time WSU custodian. Sharon retired this year after +40 years of diligent work and, while we will miss chatting with her in PACCAR, we are excited for this next stage in her life! Congratulations, Sharon!

Joshah Jennings
Laboratory Manager

Scott Lewis
Associate in Research

Shu Cai
Laboratory Manager

Suzanne D. Hamada
Principal Assistant

Sarah Dossey
Fiscal Specialist

Shelby N. Bauer
Research Associate

INTERNATIONAL ACCREDITATION SERVICE (IAS) ACCREDITED STRUCTURAL TESTING FACILITY

The Composite Materials and Engineering Center (CMEC) operates unique structural labs that are accredited through the International Code Council (ICC) and can perform various material and structural testing and evaluation for industry approval. Our high-bay lab has 2,400 sq ft of strong floor lab space, an 18 ft tall strong wall, and houses hydraulic actuators ranging from 7 to 330 kips, all dedicated for large-scale structural testing. We also have four universal test machines with capacities ranging from 2 to 60 kips for smaller-scale projects. We have a total of eight conditioning rooms that maintain temperature and humidity which allows for stabile conditions while preparing and testing wood products. We provide nondestructive evaluation, engineering and fabrication of test fixtures, specimen preparation, mechanical property assessment, evaluation of structural system performance, and data analysis.

Our structural laboratory at Washington State University has been continuously accredited by ICC/IAS since 2002. This accreditation uniquely positions our facility among university laboratories in the U.S., as it allows us to perform code-recognized testing and produce reports that can be submitted directly to ICC-ES or other authorities having jurisdiction for product evaluation and certification. Our lab is equipped to test a wide range of building products and structural systems, from component-level tests (such as fasteners and connectors) to full system-level evaluations (including shear walls, diaphragm segments, full scale mass timber connections, and mass-timber assemblies). We are accredited to conduct testing under relevant ASTM and ICC ES standards and guidelines and can generate sealed, confidential reports suitable for submittal to ICC-ES in support of developing ICC-ES Evaluation Reports (ESR's).

Learn more about the WSU ICC-Accredited Testing Laboratory

Certificate of accreditation and scope of accreditation

Full-scale cyclic testing of wood shear wall (ASTM E2126)

Flexural testing of 5-ply CLT panel (ASTM D198)

Full-scale cyclic testing of CFS shear wall (ASTM E2126)

Accreditation by IAS as a testing laboratory indicates that we meet the highest international quality standards. Applicants for an evaluation report may use our reports and services as evidence of building code compliance. Scope of accreditation includes:

- Fasteners and connections
- Deck board and guardrail systems
- Full-scale wall and floor assemblies
- Physical/structural testing of wood and wood-based products
- testing of plastics and wood-plastic composites

SCOPE OF ACCREDITATION

ANSI A315.6
Hardboard Siding

APA PRP-401
Performance Standard for APA EWS Rim Boards

ASTM D 143
Standard Test Methods for Small Clear Specimens of Timber

ASTM D 198
Standard Test Methods of Static Tests of Lumber in Structural Sizes

ASTM D 1037
Standard Test Methods for Evaluating Properties of Wood-Based Fiber and Particle Panel Materials

ASTM D 1761
Standard Test Methods for Mechanical Fasteners in Wood

ASTM D 2395
Standard Test Methods for Specific Gravity of Wood and Wood-Based Materials

ASTM D 2915
Standard Practice for Sampling and Data-Analysis for Structural Wood and Wood-Based Products

ASTM D 3737
Standard Practice for Establishing Allowable Properties for Structural Glued Laminated Timber (Glulam)

ASTM D 4442
Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials

ASTM D 4761
Standard Test Methods for Mechanical Properties of Lumber and Wood-Based Structural Materials

ASTM D 4933
Standard Guide for Moisture Conditioning of Wood and Wood-Based Products

ASTM D 5456
Standard Specification for Evaluation of Structural Composite Lumber Products

ASTM D 5652
Standard Test Methods for Bolted Connections in Wood and Wood-Based Products

ASTM D 5764
Standard Test Method for Evaluating Dowel-Bearing Strength of Wood and Wood-Based Products

ASTM D 6815
Standard Specification for Evaluation of Duration of Load and Creep Effects of Wood and Wood-Based Products

ASTM D 7031
Standard Guide for Evaluating Mechanical and Physical Properties of Wood-Plastic Composite Products

ASTM D 7032
Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrails Systems (Guards or Handrails)

ASTM D 7147
Standard Specification for Testing and Establishing Allowable Loads of Joist Hangers

ASTM D 7989
Standard practice for demonstrating equivalent in-plane lateral seismic performance to wood-frame shear walls sheathed with wood structural panels

ASTM E 72
Standard Test Methods of Conducting Strength Tests of Panels for Building Construction

ASTM E 330
Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E 455
Standard Test Method for Static Load Testing of Framed Floor or Roof Diaphragm Constructions for Buildings

ASTM E 564
Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings

ASTM E 2126
Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings

ASTM F 1575
Standard Test Method for Determining Bending Yield Moment of Nails

ASTM F 1679
Standard Test Method for Using a Variable Incidence Tribometer (VIT)

ICC-ES AC 47
Acceptance Criteria for Structural Wood-Based Products

ICC-ES AC 116
Acceptance Criteria for Nails

ICC-ES AC 120
Wood-frame horizontal diaphragms, vertical shear walls and braced walls with alternative fasteners

ICC-ES AC 130
Acceptance Criteria for Prefabricated Wood Shear Panels

ICC-ES AC 155
Acceptance Criteria for Hold-Downs (Tie-Downs) Attached to Wood Members

ICC-ES AC 162
Acceptance Criteria for Structural Bamboo

ICC-ES AC 174
Acceptance Criteria for Deck Board Span Ratings and Guardrail Systems (Guards and Handrails)

ICC-ES AC 273
Acceptance Criteria for Handrails and Guards

ICC-ES AC 424
Acceptance Criteria for Wood-Based Exterior Composite Trim Treated with Zinc-Borate (ZB) Preservative by a Non-Pressure Process.

ICC-ES AC 455
Cross-Laminated Timber Panels for Use as Components in Floor and Roof Decks, Floor and Roof

USDC PS 2
Performance Standard for Wood-Based Structural-Use Panels

For more information about the *CMEC Service Centers*, reach out to us at *cmec@wsu.edu*

TEACHING & STUDENT ENGAGEMENT

Dr. Day and her team advanced multiple applied research initiatives with the Northwest Energy Efficiency Alliance (NEEA) focused on high-performance buildings, occupant behavior, and industry training. The Integrated Design + Construction Lab's workforce development materials received national recognition through an award from the Hydraulic Institute that highlighted an educational module on smart pumps using professional training tools.

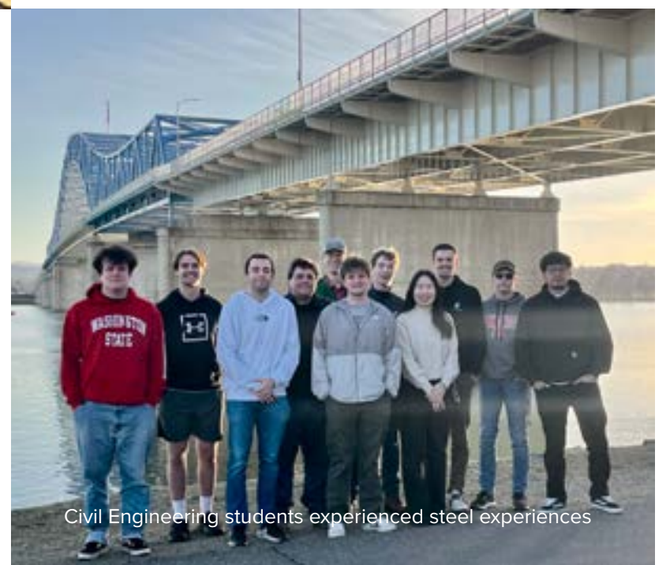
Shelby traveled to Palm Springs to accept the ID+CL's Excellence in Education Award from the Hydraulic Institute.

Ocean staff show off their bamboo engineered panels

CSTM 483 students partnered with Habitat for Humanity

Dr. Hongtao Dang's CSTM 483 Building Information Modeling (BIM) class completed 3D-printed house models for presentation at Palouse Habitat for Humanity's fundraising event, Beans 'n' Jeans. WSU's Construction Management students used past Palouse Habitat housing plans and budgets to create digital models and 3D-printed models of homes. This partnership blends academic objectives with volunteer service, offering students a platform to make meaningful community impact while learning BIM tools.

Dr. Koh's undergraduate Steel Design class (CE431), with the ASCE student chapter, recently visited the Pioneer Memorial Bridge (Blue Bridge) in Richland. The trip was led by WSDOT bridge engineers and began with a seminar on the fundamentals of steel bridge design and construction, followed by an on-site visit to the bridge. The graduate Steel Design class (CE530) visited Metals Fabrication Company in Spokane, where students saw real steel members and the fabrication process. These experiences gave students valuable opportunities to connect classroom learning with real-world steel design.



Civil Engineering students experienced steel experiences

INDUSTRY PARTNERSHIPS AND OUTREACH
Building Connections. Advancing Innovation.

CMEC is deeply grateful for the strong network of industry and alumni partners who continue to support our students, faculty, and research. Through mentoring, advisory board service, site visits, competition sponsorship, and scholarships, our partners help ensure that CMEC's work remains relevant, responsive, and aligned with evolving industry needs. Their engagement connects students to real-world challenges and career pathways while strengthening the next generation of the built environment workforce.

Throughout the year, CMEC maintained active collaboration with industry, agencies, and professional organizations through technical assistance, outreach, and applied research. The Center's laboratories and testing capabilities serve as regional and national resources, supporting partners with product evaluation, certification data, interpretation of building codes and standards, and innovation in wood-based and composite materials. CMEC's ICC-accredited structural testing laboratory continues to expand its scope, including seismic wall testing, joist hangers, hold-downs, and cross-laminated timber members, reinforcing its role in advancing resilient and high-performance construction.

CMEC also supports industry innovation through collaborative research and commercialization. A recent example is our work with Ocean (formerly Eco-Shelter), a startup focused on sustainable structural bamboo products. In partnership with CMEC, Ocean achieved a major technical milestone by manufacturing commercial-scale, patent-pending panels at WSU and secured additional National Science Foundation funding to advance prefabricated, energy-efficient wall systems. This collaboration demonstrates how CMEC bridges research, entrepreneurship, and global impact.

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STAYING CONNECTED

In addition to ICC Accredited Testing, we also provide other testing and evaluation services in traditional wood-based composite panels and CLTs, fiber refinement, full-scale extrusion, injection molding, compression molding, and material characterization (including rheology, thermal analysis, chemical and physical property analyses, spectroscopy, molecular particle sizing and electrokinetic potential, microscopy, and chromatography). Experienced CMEC faculty offer consulting services for modeling, experimental design, conducting scientific studies, interpretation of codes and standards, product development, process improvement, analysis, and interpretation of test data, and collaborating on proposals.

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SCAN TO LEARN MORE ABOUT CMEC

CMEC WEBSITE

SERVICE CENTER

ICC ACCREDITED TESTING

CMEC LINKEDIN


4-sided surface planer


6-ft x 12-ft USNR CLT press

GO COUGS!