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Hello Readers,

In this edition of MBI’s *Modular Advantage*, we turn our focus to research and innovation in the construction industry. For many years, MBI has developed and maintained relationships with several universities across North America to help educate the next generation of construction professionals.

These programs include the University of Alberta Hole School of Engineering’s Industrialized Research Centre which focuses on the industrialization of building construction. MBI has financially supported this program since its inception in 2011.

MBI has also collaborated with Clemson University to develop a course called “Introduction to Commercial Modular Construction.” This course is available as a self-paced online course worth 1.5 continuing education units at Clemson.

Other MBI collaborations and initiatives are discussed in this edition of the magazine, including announcement of the winners of the American Institute of Architecture Students (AIAS) design competition sponsored by MBI.

As always, if you have any questions, concerns, or ideas, please reach out to the MBI staff to share. Thank you for your continued support of our industry trade association.

Sincerely,

Roland Brown

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Industry News
Engineers are increasingly adopting offsite construction methods from prefabricated components ranging from heating, ventilation, and air conditioning ducts. Centuries after prefabricated structures were shipped from England to the United States in the 1670s, offsite construction is more popular and innovative than ever.

A 2014 survey conducted by the National Institute of Building Sciences found that 93 percent of construction firms surveyed had used prefabricated components during the previous year.

The numerous benefits of offsite construction make it an appealing method to adopt. According to offsite advocates, it shortens construction schedules, improves predictability of construction costs, reduces the amount of wasted material and carbon emissions, lessens site disturbances, and improves conditions for workers and equipment.

However, offsite construction comes with its own set of potential challenges. Offsite components can affect floor heights and wall thicknesses. Items built in one state may not be compliant with regulations in another. Component sizes and configurations are limited by the size of available transportation. Prefabricated components can make inspections challenging, for example, by concealing the interstitial spaces of a building that normally would be visible prior to finishing for occupancy.

“In a conventional site-built building, the Authority Having Jurisdiction can inspect the plumbing, mechanical and electrical before they put the drywall over the framing, for example,” said Mike Pfeiffer, the International Code Council Senior Vice President for Technical Services. “When you deal with offsite construction, the local inspector no longer has control of certain aspects of the inspection.”

Despite its increasing popularity, there is no industry-wide code based around offsite construction methods. Nationally, the widely adopted International Building Code was written based on traditional on-site construction practices. Some states have adopted building codes based on offsite construction; however, each state’s standards are different.

The lack of standardized code sometimes leads to difficulties for manufacturers of modular components, causing delays and inefficiencies that offsite methods aim to avoid. For example, shipping
containers are popularly used as modular building components. However, some states allow the use of re-purposed containers while other states only allow the use of new containers.

At its July 2018 meeting, the Code Council Board of Directors of the ICC approved a proposal to develop tools for the offsite construction industry. Two standards were proposed: one for the planning, design, fabrication and assembly of offsite construction, and another for inspection and regulatory compliance. In addition, the Code Council is also proposing a guideline for the transportation of modular components to the construction site.

“The Code Council could have simply maintained a posture that regardless of where something is built and how it’s transported, it must fit within the current code format,” said Pfeiffer. “But the association felt that a set of dedicated standards would give people a better appreciation of how off-site construction really works and the underlying benefits.”

The Council is partnering with the Modular Building Institute to ensure the standards reflect the latest in industry best practices and to jointly develop these new resources for the construction industry. The two organizations have signed a memorandum of understanding cementing their commitment to “jointly advance and promote the mutual interests of streamlining the use of off-site construction.”

The Code Council met in early 2019 to begin developing the new standards and guidance and expects to have them done within the next year.

“At the end of the day, regardless of how a building is built, it still needs to comply with the code,” said Pfeiffer. “Our goal is to try to ease the regulatory burden a little bit and make people more comfortable with the idea that this is a viable way of doing business.”

To learn more about the development of these standards, visit: https://www.iccsafe.org/products-and-services/standards/is-osmc/

ABOUT THE AUTHOR

Karl Aittaniemi, P.E., is the Director of Standards at the International Code Council. He supervises the Standards Department staff in their roles supporting the development and support of ICC’s Codes and Standards out of ICC’s Central Regional Office in Country Club Hills, IL. Karl has an extensive professional background in fire protection product evaluation and has managed fire protection investigation projects in accordance with nationally and internationally recognized model codes and standards. He has experience as a forensic engineer and is a licensed professional engineer in several states.
World’s Tallest Modular Building Soars in Singapore

Clement Canopy, a project consisting of two 40-story, 459 feet high residential towers, was recently completed in Singapore, making it the world’s tallest volumetric modular building. Together, the towers make up 505 luxury residential apartments consisting of nearly 1,900 precast concrete modules.

Eighty-five percent of the building was completed offsite, and the entire project was completed in 30 months, about six months quicker than initially expected. Concrete was cast at a yard in Senai, Malaysia and then taken to Tuas, West Singapore where up to 40 different trades including plumbing,
electricity, and painting completed the modules. Forty-eight different shaped modules were required. Concrete casting took five days while the rest of the fit-outs took 15 days.

Clement Canopy was built by Bouygues Batiment International, a more than 40-year-old global construction company with focus on complex construction, and Dragages Singapore, a leading engineering and construction firm in Southeast Asia and a member of Bouygues Construction.

“This is the first time in the world that full concrete PPVC units have been designed to build to 40 stories,” said Kevin Lai, Senior Production Manager at Dragages.

Craning the modules into place was a major feat, with modules weighing from 37,000 to 64,000 pounds.

Bouygues has completed 40 modular projects in Singapore, France, and the United Kingdom. The company believes modular construction is a more innovative alternative to traditional building methods and its benefits include cost effectiveness, safety improvements, reduced site disturbance, waste reduction up to 70 percent, and speedier completion of projects.

“Whether concrete, steel, or wood, developers around the globe are realizing the huge advantages modular construction offers in terms of schedule, predictability, safety, and efficiency” said Modular Building Institute Executive Director Tom Hardiman.

But there’s no time for rest, as the Clement Canopy towers will soon be surpassed. In the UK, Tide Construction is completing work on two towers, one of which will be 44 stories high, claiming the new record for World’s Tallest Modular Building. The project will consist of 550 residential apartments located 101 South George Street in South London. From start to finish, the buildings will take two years, about half the time it would take if it were built on-site. The final module was placed the last week of October 2019 and the project will be completed in 2020.
As modular construction continues to gain momentum in North America, many developers and owners are starting to look into their first modular project. Ensuring success on the first build often starts with good design. Here are a few other tips to consider when designing a modular building.

Focus on these three key elements from the start:

1. **Select and Hire the Right Team:**
   - Either hire an experienced Modular Design Team (Architect, Structural Engineer, MEP) or have an in-house design team being supported by an experienced Modular Design Team
2. **Sweat the Details:**
   - LOD, BIM, DfMA
3. **Implementing the Modular Mindset**
4. **Select an experienced modular design team**
5. **Hire an experienced modular design firm**

To evaluate a design firms’ capabilities, focus on key requirements needed to manage a modular project:

1. Modular design experience
2. Factory manufacturing experience (Actual factory design team experience)
3. Manufacturing process and sequencing experience
4. Willingness to document Means and Methods within design documents.
   - Typically Means and Methods are not addressed within traditional design packages but are required throughout Modular Design to establish intent and compliance with traditional building codes and assemblies. As of today, there is no Modular International Building Code or prescriptive assemblies geared toward the unique assemblies within Modular Construction, so frequently Means and Methods need to be exemplified within the design documents.
5. Offsite Permitting and Inspections associated with the Modular Construction process.
   - It’s common that the design team not only has to manage the process, but they are responsible for educating the jurisdiction on the scope delineation and review process as well. These requirements need to be summarized in a clear scope of work and a list of deliverables needs to be created to ensure that the items are being addressed throughout the design phases.

Consider a hybrid team

That said, many developers and GC’s have strong ties with design professionals and may want to continue that relationship. Many of the predesign, entitlements and design review processes can be handled by the current design team with an experienced Modular Design Team being engaged at the Design Development phase.

While many traditional design teams embrace the concept of modular design, but they often struggle with the implementation phase. This “gap” occurs within the design coordination phase (LOD 350) when the building model is fully vetted to address MEP Coordination & Clash Detection, Structural Sequencing and Assembly, Module Variable Analysis, and so on.
experienced Modular Design Team should be able to provide a clear list of deliverables and scope analysis to complete this phase.

By approaching a project with a split scope, the hybrid team can maximize the value of each design consultant while minimizing the potential rework or post-design changes in preparation for the manufacturing process. Teams should use a Responsibility Matrix that clearly defines the roles and responsibilities for each team-member involved throughout the entire scope of the project.

This hybrid team could be several firms working together or a single firm with specialized teams in house.

**Sweat the Details: LOD, BIM, DfMA**

**Design for Manufacture and Assembly (DfMA)**

The shift from Unit Types to Module Types mirrors the shift in the construction industry to DfMA. DfMA makes perfect sense to the contractors, but it represents a sea of change in the mindset of many designers. Rather than designing for a specific milestone, the team must design with the fabrication process in mind. Understanding how the components are assembled, sequenced, and fabricated is critical to designing a building for the modular construction process. Having knowledge of the benefits and constraints of the manufacturer are essential from the first stage of design to the last to avoid rework of design, delays in manufacturing and additional costs.

**Leverage your Building Information Model (BIM)**

BIM technology allows the team to add the components and layouts to your model in the early stages of design. These critical details will act as a template throughout the process and flow directly into the factory construction workflow for shop drawings and manufacturing. DfMA is an intentional process to ensure that the building is designed for the factory protocols.

Model Development also helps shift the understanding of the building from “Unit Type” development to “Module Type” development, which is how the factory builds. By placing a
focus on Module Types, the team is conscious in their efforts to reduce the number of unique module types. The focus is then on re-use and repetition throughout the building to maximize the efficiencies of offsite construction.

**Level of Development (LOD) vs Traditional Design Phases**

Focusing on the BIM LOD rather than the traditional design phases is important and allows the team to speak a universal language specific to the Model Development.

This is a critical component to ensure the proper steps are being implemented throughout the Design Phases to prepare for Factory Construction. The Traditional Design Processes involves Schematic Design, Design Development and Construction Documents (Permit Submittal Docs). While these Traditional Design Phases outline a process and deliverables, they aren’t adequate to identify the BIM Level of Development (LOD) associated with each phase. To take things a step further, the team needs to define the BIM Level of Development. This is referred to as the LOD Structure and associated examples to ensure the team is clearly defining the LOD 100 – 400 for each phase.

**Implementing the Modular Mindset**

Modular Construction involves a significant amount of coordination and integration not only upfront, but throughout the entire design, fabrication, and construction phases. By applying the key elements shared in this article, a team can bridge any scope gaps that arise on projects by partnering with an experienced and knowledgeable team throughout the entire process.

With a modular project, designers must recognize that their role has new and varying degrees of responsibilities that go far beyond those traditionally assumed by the architect. Incorporating a hybrid team solution with a modular design professional ensures that the values and benefits associated with Modular Construction are achieved on a consistent basis. By establishing the right team from the beginning and implementing a modular mindset any offsite construction build can be successful.
Innovation Matters.

That was the conclusion of Congress when it recently appropriated funds for the US Department of Housing and Urban Development’s (HUD) first-ever “Office of Innovation,” which is devoted to driving innovation through industry. Simultaneously, HUD released “Building Even Better Homes: Strategies for Promoting Innovation In Homebuilding” which focused heavily on the capability of offsite construction (manufactured, modular and panelized construction) for solving pressing needs in the industry: labor, affordability, and schedule. This summer the National Mall in Washington, DC featured an inaugural “innovation showcase” filled with offsite construction processes, as well. Indeed, many believe that innovation will be a significant part of the housing industry’s future.

Professor Joe Wheeler and the Center for Design Research (CDR) are redefining the essence of modular design and construction as the ideal delivery mechanism for smart buildings. Dr. James Jones and the Center for High Performance Environments (CHPE) are exploring mass-customized manufacturing strategies to meet growing housing demand. Dr. Andrew McCoy and colleagues at the Virginia Center for Housing Research (VCHR) are working with state leaders to leverage technology, economic impact, and the production process towards affordable housing options across levels of income.

The research team has been exploring all aspects of modular construction. They believe modular is a particularly ideal way to deliver smart buildings in a digital age that demands better integration of electronic technologies. By building homes in factories, like we build cars, smart design and construction stakeholders are able to better integrate sophisticated technologies we increasingly expect to see in our future, smart homes. CDR’s latest prototype, the FutureHAUS, took full advantage of the prefab “smart cartridge” process to deliver a smart home to the Solar Decathlon Middle East in Dubai.

The energy positive, solar powered smart house was assembled and fully functioning after only two days of construction. After winning the international championship, the team demonstrated the versatility of the prefab system by deploying the 900 square foot house at their main campus for one month, then at Times Square in New York City for two weeks and finally in Alexandria, VA for two months. In Alexandria, the home has piqued local interest and received tens of thousands of visitors wanting modular design and smart technology solutions.

Under the direction of Dr. James Jones, the Center for High Performance Environments (CHPE) at Virginia Tech, in collaboration with Dr. Bandar Alkahlan of the King Abdulaziz City for Science and Technology (KACST), is exploring mass customized manufacturing strategies to meet growing housing...
demand internationally. In the initial phase of the work, researchers and designers from the CHPE and KACST are developing solutions that consider performance and low-energy consumption, appropriate modular dimensioning, new and emerging materials, and future technologies to meet a Saudi Arabian vision for 2030. The researchers are sourcing material options, such as recycled plastics and phase change layers in roofs and walls, to increase performance while keeping the shipping weight low.

Dr. Jones and his team has adopted a unique version of the “Choosing By Advantages” technique to support efficient and effective decision-making and selection of alternative, future technologies for thermal comfort, advanced lighting, security and convenience. CHPE’s vision is also being realized in Charlottesville, VA, where housing developers are using these advanced techniques as the basis for early decision-making that will drive affordability and technology choices across their projects.

Dr. McCoy and his colleagues at the Virginia Center for Housing Research (VCHR) are researching the need for manufactured, modular, and panelized construction innovations in terms of technology, economy, and production feasibility. Virginia’s Governor issued Executive Order (EO) 32, “Advancing Virginia’s Housing Policy,” to “identify and implement actions to enable quality, affordable housing, which will strengthen families and communities and foster economic growth.”

Led by VCHR, the EO 32 study convened a Virginia Coalition of Housing and Economic Development Researchers to focused on offsite construction technologies as a central tenant in the housing industry’s future need for driving economic benefits through housing technology.

The recent report “Building Even Better Homes: Strategies for Promoting Innovation In Homebuilding,” a recent report by Urban Institute and VCHR, focused heavily on the policies, people, and programs that drive innovation in the homebuilding industry. The research team listed offsite construction as an innovative solution to labor, affordability, and scheduling issues that plague construction. The study established a baseline for HUD’s first-ever “Office of Innovation,” whose purpose is to drive innovation through the housing industry for affordable alternatives to our current building processes.

Simultaneously, Secretary of Housing Dr. Ben Carson, hosted a first-ever innovation showcase on the National Mall in Washington, DC filled with offsite construction processes. VCHR is also working with the Virginia Housing Technology Group, comprised of state leaders, to advocate for proactive and decisive planning and policy that supports workforce housing and embraces offsite technology as a competitive advantage in Virginia.
Globally, innovation matters in the housing industry. Offsite construction has been touted as a solution to problems that hinder progress and reduce access to affordable options. At Virginia Tech, we are innovating a future that leverages offsite construction to deliver smart buildings, provide mass-customization, and prove the economic and industrial benefits of these techniques.

Andrew P. McCoy, Ph.D., is Head of the Department of Building Construction, Associate Director at the Myers-Lawson School of Construction, and Director of the Virginia Center for Housing Research at Virginia Tech.
The Industrial Research Chair (IRC) in the Industrialization of Building Construction Department at the University of Alberta in Edmonton, Canada has served as a hub for novel research on industrialized construction methods and technologies for nearly 10 years. Chairholder Dr. Mohamed Al-Hussein is leading a number of ongoing research initiatives in collaboration with a consortium of industry partners to improve the productivity and quality of modular and offsite while reducing the environmental footprint.

One of the pillars of this research program is productivity improvement for modular construction manufacturing enterprises through improved plant layout and identification and mitigation of process waste. This research applies lean principles together with tools such as simulation, work study, and value stream mapping to gain a detailed understanding of existing processes and propose and evaluate alternative plant layout scenarios and work processes. The fundamental goal of this work is a culture change within offsite construction enterprises, and, ultimately, a formalized guideline for optimizing plant layout and streamlining work processes in order to increase the predictability and productivity of the construction process. As an example of a recent success, a process improvement initiative with one of the IRC’s industry partners resulted in an actual project outperforming the bid by over 10 percent in terms of hours incurred.

Dr. Al-Hussein and his team have also been working with institutional owners on improving the RFP process for modular classrooms. After facilitating a number of surveys and focus groups soliciting input from owners, operators — including 67 school boards operating in Alberta, Canada — and contractors, the research team’s current work seeks to document “lessons learned” with respect to the existing RFP process for modular classrooms. As part of this research, contractors have had the opportunity to identify issues with the selection criteria used to award projects (where a lack of clarity has deterred contractors from bidding), while operators have shared valuable insights concerning the technical challenges encountered by the end-user, especially in terms of system controls compatibility when making connections to a school’s “core”. Given the potential of modular classrooms to increase schools’ versatility and responsiveness to demographic shifts, this research will establish clear guidelines for owners for the RFP process in order to encourage participation and ensure a competitive process and a finished product of uncompromised quality.

The IRC team has also been working on applications of virtual reality (VR) in construction, such as the use of VR for training in modular construction manufacturing, and the use of VR and motion capture for ergonomic
analysis of construction tasks for the purpose of identifying and mitigating safety hazards. To date, this has involved capturing and analyzing video footage to capture joint angles for ergonomic analysis, as well as an experiment testing the effectiveness and accuracy of VR compared to manual training tasks. The preliminary results have been promising and have been published in two conference papers, with a third manuscript currently under review by a leading scientific journal. The next phase in this research involves the establishment of motion capture for ergonomic analysis and the development of computer applications for both training and ergonomic analysis purposes. This work will culminate in the integration of these VR-based training and ergonomic analysis tools so that workers can receive realistic training prior to being deployed on the production floor, and so that any potential ergonomic issues with respect to the way the trainee is completing a given construction task can be identified at the training stage in the VR environment in order to minimize ergonomic risk.

Industry support and participation continue to be critical to the success of the IRC research program. The Modular Building Institute has been a supporting partner of the IRC since its establishment in 2011.

This article was written by Jonathan Tomalty, Project Management Administrator in the Department of Civil and Environmental Engineering at the University of Alberta.
University of New Brunswick Launches the Off-site Construction Research Centre

New Brunswick is a small Canadian province with a large transportation network and a skilled workforce. It’s relatively nimble and can adapt to the needs and demands from certain industries. It’s also the home of the University of New Brunswick (UNB), which has leveraged the benefits of its geographical location and partnered with various educational institutions, associations, and industry leaders to create the Off-site Construction Research Centre (OCRC).

The Centre was made possible with the help of OSCO Construction Group (OSCO) who completed a two million dollar start-up investment in July 2018. OSCO has partnered with UNB to pursue a research initiatives Off-site Construction with a mission of “challenging current Design for Manufacturing and Assembly (DfMA) off-site practices to leap ahead and deliver even better performance and a superior end product”.

“The ‘industrialization’ of construction has begun with the goal of moving substantial on-site activities into a factory environment. We believe UNB, with its research and innovation...
capabilities and our investment, will become an international leader as this transformation unfolds.”
—Hans O. Klohn, President, OSCO Construction Group

UNB leveraged the OSCO investment and established the OCRC. The OCRC is being led by Dr. Zhen Lei, the OSCO Research Chair in Off-site Construction department. Dr. Lei completed his PhD (2014) in Construction Engineering and Management at the University of Alberta. Dr. Lei worked as a Postdoctoral Fellow, where he developed decision support systems using simulation, data analytics, and Building Information Modeling (BIM) for construction companies. He then began his career in private industry, working with PCL Industrial Management (PCL) in Edmonton, Alberta. While with PCL, Dr. Lei developed several decision support and data analytics tools which helped PCL improve on-site logistics as well as on-site and off-site productivity.

The OCRC is governed by a joint industry-university advisory group that includes visionaries in practice that represent owners, designers, and builders, and understand the fundamental changes that the construction industry is experiencing through the digitization of the construction process. Within the scope of off-site construction, research opportunities are being pursued in: i) Data-driven Decision Support in Off-site Construction; ii) Resilient and Sustainable Design and Material in Off-site Construction; and iii) Automation and Robotics in Off-site Construction.

Currently, the OCRC research focus includes Dr. Zhen Lei’s strengths in data-driven decision support in off-site construction. The focus of Dr. Lei’s current research stream is to enable an intelligent decision-making process in off-site construction activities.

- Work improvement based on data analytics
- Data mining and machine learning of construction data
- Simulation and optimization of construction processes
- Visualization and real-time human interaction in the built environment

A few examples of the industry driven research projects that Dr. Lei is pursuing since arriving at UNB include a research project with Ocean Steel & Construction Limited (Ocean Steel) in Saint John, New Brunswick. Through time studies and process analysis tools (virtual simulations of the current and future processes using a digital twin of the plant) the research is identifying inefficiencies and bottlenecks in the current steel fabrication process at Ocean Steel's structural steel and platework division.

Dr. Lei is also collaborating with Concordia University and PCL Construction to examine the data analytics of scaffolding. The research is leading to a better understanding of productivity metrics for improved estimation and planning, predictive modeling, and integrating with workface planning for budgeting. Using data processing and model development techniques, Dr. Lei and his team are identifying the areas on a heavy industrial construction site with increased worker hours and inefficiencies.

The OCRC is structured to leverage its institutional expertise and collaborative partnerships both provincially and nationally to help transform the regional construction industry. Starting with
UNB Engineering, the OCRC is applying expertise in construction and structural engineering, logistics and transportation, advanced materials and manufacturing, and the application of sensors and advanced digital technologies to name a few. UNB is home to several research Centre’s and Institutes with programs of applied research in off-site construction areas.

- Marine Additive Manufacturing Centre of Excellence
- Wood Science and Technology Centre
- Emera & NB Power Research Centre for Smart Grid Technologies
- Ballistics and Mechanical Testing Lab
- Institute of Biomedical Engineering
- Canadian Institute for Cybersecurity
- J. Herbert Smith Centre for Technology Management & Entrepreneurship

Through these Centres and Institutes, the OCRC will collaborate in areas such as 3D printing technologies and manufacturing, wood composite materials for construction, data analytics and cybersecurity, ergonomics in construction, ballistics testing on the building envelope and can then focus on bringing new technologies to market by leveraging the strong entrepreneurship spirit at UNB.

To manage its research and industry partnerships the OCRC has Mr. Brandon Searle as its Innovation Director. The OSCO Research Chair and Innovation Director are

OSCO Construction Group is invested two million dollars in the University of New Brunswick to establish a new Centre for Off-site Construction and to fund research led by the new OSCO Chair in Off-site Construction.
responsible for managing the OCRC and growing and developing the OCRC. Mr. Searle’s background in civil engineering and consulting has provided him with experience in strategic planning and business development.

Since joining the OCRC, Mr. Searle has been focused on engaging with industry throughout Atlantic Canada, attending and planning regional engagement events, organizing mission trips, and building both a strategic and financial plan for the OCRC.

Beyond the Atlantic Canadian Region, the UNB OCRC is also working on a national network of researchers in off-site construction at the University of Victoria, the University of Alberta, the University of Manitoba, University of Waterloo, Concordia University, and École de technologie supérieure. With the Modular Building Institute (MBI) as a focal point, researchers from across the country will contribute to an ongoing industry benchmarking program with the goal of defining where the industry stands today, where we see ourselves in the future and how we get there.

To support the OCRC’s research initiatives, the OCRC hired an Operations Engineer. Mr. Jeremy Bowmaster is currently pursuing the creation of a collaborative engagement studio at UNB. This engagement studio will support and allow for innovative research in simulation and visualization, 3D printing, BIM, and augmented and virtual reality. Mr. Bowmaster’s background, including operations manager, drafting and design,
Wells Fargo Incubator Brings Innovation to the Housing Market

Launched in 2014 with an initial $10 million commitment by the Wells Fargo Foundation, and expanded in 2017, the Wells Fargo Innovation Incubator (IN²) is now a $30 million program supporting innovative technologies and forward-thinkers. The program is managed and run out of the National Renewable Energy Laboratory (NREL) in Golden, Colorado.

The goal of the program is to provide technical assistance that leverages the capabilities, facilities, equipment, and the deep expertise that exists at NREL to help companies de-risk technologies and ease their path to market adoption and deployment.

Each company selected to be in the IN² program is given $250,000 in non-dilutive capital. Most of the funds are used to provide technical assistance for a project at the lab run by an expert researcher and scoped and agreed upon by the company. Some of the funds are used for project support including any project supplies or travel needed by the company.

For this round of funding, the focus was on addressing energy efficiency, environmental impact, and housing affordability specifically through the advancement of construction processes and advanced manufacturing innovations including:

- Streamlined construction logistics
- Innovative use of BIM for construction management and planning
- Augmented virtual reality apps for design and construction
- End-to-end software solutions that address comprehensive workflows, which include building design, digital fabrication, site preparation, site assembly, etc.
- Offsite construction (panels, pods, units)
- Automated fabrication (offsite or onsite)
To select the ten finalists for funding, an External Advisory Board (EAB) was formed. Board members were selected for their subject matter expertise as well as their networks within the buildings and housing community. MBI Executive Director Tom Hardiman said “I was honored to be selected to serve on the EAB along with experts on housing, energy efficiency, and construction. The level of innovation in the industry is exciting and we want to help bring some of these new innovations to the market.”

“The initial review of company innovations by our NREL research team is extremely critical, but I believe the external advisory board has been the key to our ongoing success,” said NREL’s IN2 program manager, Trish Cozart.

“Having outside industry experts like Tom and his peers dig into the applications and give us an honest assessment of how these companies and innovations might fair in the market of the future is invaluable to the IN2 program.” —Quote from Ramsay Huntley, Vice President, Clean Technology and Innovation Philanthropy Program Officer Sustainability and Corporate Responsibility at Wells Fargo.
The Modular Building Institute Educational Foundation (MBIEF) recently sponsored the Spring in-studio model competition hosted by the American Institute of Architecture Students (AIAS). The MBIEF has a mission of expanding opportunities, increasing awareness, and fostering growth in the commercial modular construction industry by supporting research and development, providing scholarships for students, and developing partnerships and alliances with complementary organizations.

The contest ran from February 15th through June 1st with over thirty students participating. The contest was done completely over Instagram—the primary communications tool that AIAS uses. Thus, students had a lot of freedom and the entries are basic, feature little text, and rely heavily on images. The only criteria that students had was to demonstrate through a physical model a basic understanding of modular construction. AIAS has asked the foundation to identify several finalists of which the AIAS president will pick three (3) entries to receive first, second, and third places.

At the close of the competition, a jury selected three winners from the submissions with cash prizes of $500, $250, and $100 for first, second and third place, respectively.

The winners were:

1st Place: $500 – Caleb Lawrence (pictured)
2nd Place: $250 – Nate Violette
3rd Place: $100 – Erin Langan
The Modular Building Institute, along with Clemson University, developed “Introduction to Commercial Modular Construction” over two years with the goal of introducing the reader to an innovative and exciting construction method. This book discusses the modular building process compared to traditional site-built construction and is designed to help the reader understand terminology and concepts of modular building including client needs, design, fabrication, transportation, and installation.

Introduction to Modular Construction is also available as a self-paced online course. This course is worth 1.5 CEUs and discusses the modular building process compared to traditional site-built construction and is designed to help the participant understand terminology and concepts of modular building including client needs, design, fabrication, transportation, and installation.

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Join MBI December 10th - 12th in Dallas, TX for a 2.5 Day live training course that will cover all the principles, participants, and project phases of modular building.

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