2022 COAA PROJECT LEADERSHIP AWARD

MICHIGAN STATE UNIVERSITY STEM TEACHING & LEARNING FACILITY

MICHIGAN STATE UNIVERSITY

COAA PROJECT LEADERSHIP AWARD

SECTION 1 - GENERAL PROJECT INFORMATION

GRANGER

ADVANCE THE ART OF BUILDING

SECTION I - GENERAL PROJECT INFORMATION:

Name of Project: MSU STEM Teaching and Learning Facility

Location of Project: Michigan State University, East Lansing, MI

Name and Address of Owner:
Michigan State University
Infrastructure Planning and Facilities-Planning, Design, and Construction
1147 Chestnut Road, Suite 101 East
Lansing, MI 48824

Name and Address of Design Professional(s):
Integrated Design Solutions, 1441 West Long Lake, Suite 200, Troy, Michigan 48098
Ellenzweig, 230 Congress Street, Boston, MA 02110

Name and Address of Construction Professional(s):
Granger Construction Company
6267 Aurelius Road, Lansing, Michigan 48911

Other Consultants or Professionals:
Structural Design, Inc./SDI (Structural)
Becket & Raeder (Civil Design)

Type of Project:
(Commercial, Institutional, Industrial, Governmental, Medical, etc.)
Institutional / Higher Education

Delivery Method:
(Design Bid Build, CM Agency, CM at-Risk, Design Build, Multiple Prime, etc.)
CM at Risk, with Design Assist

General Project Description:

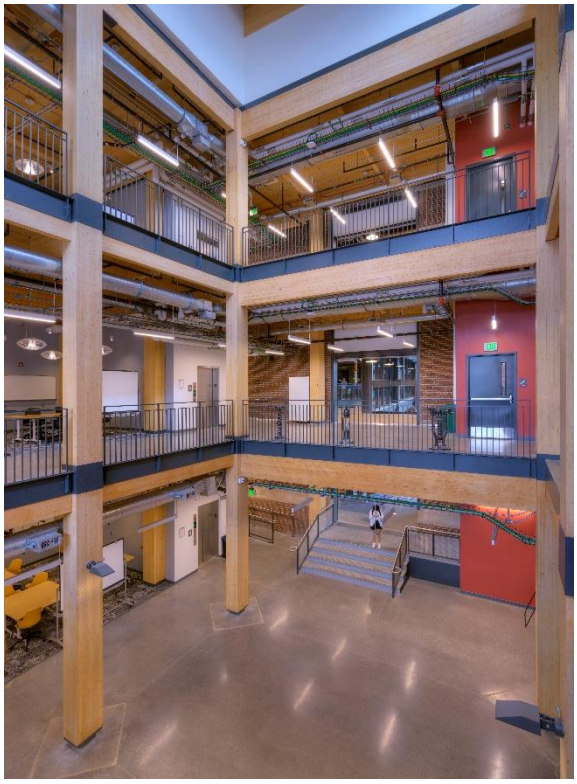
(Provide a brief narrative of the project scope of work, not to exceed one (1) page.)

What began as an overarching goal to improve and enhance the undergraduate learning experience at Michigan State University resulted in an historic victory with the 2021 completion of MSU's STEM Teaching and Learning Facility. Not only is this the first building on campus and the first in Michigan to be constructed with a newer mass timber framing product called cross-laminated timber (CLT), but the entire facility is situated on the site of MSU's decommissioned Shaw Lane Power Plant, demonstrating an exemplary blend of adaptive reuse with state-of-the-art infrastructure and flexible learning spaces.

By selecting a high-profile site next to the MSU football stadium, opting for an innovative adaptive re-use approach and choosing a hybrid mass timber and steel structural system for the facility, the University has created an inspirational landmark that emphasizes the value of STEM curriculum, serves as a transformational learning environment and – as Michigan's first mass timber building and one of only a few in the Midwest – serves as a beautiful bastion of innovative and sustainable building design.

Encompassing 124,000 SF of new construction with 49,000 SF of renovated space, this project utilized the existing decommissioned power plant as the central portion of the building, with large additions on the north and south sides. Once the University settled on the site and the adaptive re-use approach, collaboration between the various MSU stakeholders, the design team (IDS) and Granger Construction led the team to switch to a mass timber hybrid structural system – instead of the steel and concrete system originally planned – for the two new classroom and laboratory wings. For everyone involved – architects, engineers, construction managers, erectors and University representatives – this was their first mass timber building and they embraced the challenge, as well as the opportunity, to harness the project as a learning laboratory to inform future mass timber projects on campus and across Michigan.

Despite the project team having no prior experience using mass timber, combined with additional challenges like site logistics, the COVID-19 pandemic and adaptive reuse involving abatement of hazardous materials, salvaging and repurposing artifacts and coordinating select architectural components to integrate the historical significance of the building into the overall design and character of the new facility, the project was delivered on time and within budget.



Michigan State University's new STEM Teaching and Learning Facility offers a mix of unique and flexible classrooms, teaching labs and collaborative spaces. This project is a historic victory for MSU on multiple fronts. It's the first new classroom building on campus in over 50 years. It's the first building on campus and first in the state constructed with mass timber. And it incorporates a decommissioned power plant as the central portion of the building, with large additions on opposite ends, creating an inspirational landmark and demonstrating an exemplary blend of adaptive reuse with state-of-the-art infrastructure and learning spaces.

The STEM Teaching and Learning Facility opened its doors in July 2021 to a small cohort of summer students and to a robust population of fall students on September 1, 2021. The MassTimber@MSU program will monitor and report on students' reactions to learning in the transformational space. In addition, the program will leverage lessons learned from the first mass timber project in Michigan, as well as ongoing mass timber research at the University, to support new mass timber projects through an array of education, outreach and engagement activities.

Project Duration:

(Calendar Days)

1373

Project Start Date:

6/29/2017

Project Completion Date:

(Planned Completion Date, Actual Completion Date)

Planned Substantial Completion Date: 7/31/2020

Actual Substantial Completion Date: 2/19/2021

Changes in Schedule:

(Briefly Describe Reasons for Delay or Acceleration)

The COVID Crisis significantly impacted schedule. Pandemic-related problems included construction shut down, staffing shortages and material delays.

Initial Construction Cost ($):

$97,500,000

Final Construction Cost ($):

$110,100,000 - the final budget was amended to accommodate growing programming requirements.

Percent of Change Orders:

(Percentage of Final Construction Cost)

12% (due to owner directed scope enhancements and material price increases during COVID)

SECTION II - OVERALL PROJECT MANAGEMENT

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SECTION II - OVERALL PROJECT MANAGEMENT:

(Entire section should not exceed four (4) pages.)

Project Management:

(Provide two (2) examples which demonstrate project management excellence by the Owner's Project Manager.)

1. **CREATED A COLLABORATIVE & COHESIVE TEAM**

The STEM Teaching and Learning Facility Projects overarching goal was to improve and enhance the undergraduate learning experience, support experiential teaching and learning, attract, and retain more students in STEM disciplines, and better prepare those students for professional careers in fields of science, technology, engineering, and math. The design and construction of the facility needed to accomplish this goal utilizing the adaptive reuse of an old power plant, along with the addition of 120k sqft of mass timber/clt. constructed space. This project was to be financially funded through a State of Michigan grant and internal MSU funds. To complicate things further, much of the construction took place through a worldwide pandemic. To accomplish the program goals under these conditions took excellent project leadership skills.

The high-profile and complex nature of this project meant planning, coordination and communication were essential to meeting schedule, budget and other expectations for MSU STEM. By continuing the collaborative mindset embodied by MSU and model that model that for the entire team, all partners were able to work together to successfully navigate the complexities of coordinating numerous stakeholders and shepherd the massive decision-making process throughout the design and construction process. The MSU Project Manager provided clear direction to all project team members and created an environment of shared accountability, collaboration and trust. He also developed monthly executive stakeholder meetings with key internal executives and project leaders(consultants/contractors) which facilitated timely decision making and kept the University's project goals front and center at all times.

2. **MAINTAINED SAFETY OF CAMPUS COMMUNITY & CONSTRUCTION SITE**

This project was located directly adjacent to one of the largest collegiate football stadiums in the nation, as well as in the middle of campus with a high volume of pedestrian and vehicular traffic. The team developed numerous site logistics plans, with flexible pedestrian walkways. On event days like home football games, the jobsite would shut down early and modify the site fencing, creating significant pedestrian thruways in the middle of the site to accommodate heavy traffic. During the academic semesters, the team utilized gate attendants to guide construction traffic in and out of the site to ensure student/pedestrian safety. The project team was also in constant communication and coordination with campus police, Athletics and other key stakeholders.

This was a large project, with over 150 tradespeople onsite daily at peak times, and a significant portion of construction needed to occur in the midst of the COVID-19 pandemic. We faced many new challenges from mandatory shutdowns to new site operation and safety requirements. MSU worked with the CM to develop a taskforce charged with navigating changing conditions. The STEM team implemented guard shacks, paper forms and other physical safety measures, including hiring a full-time health screener and increasing daily cleaning practices onsite. The team also implemented an application that utilized QR codes for easy check- in across the jobsite, and also made the check-in link available remotely for an all- electronic health screen questionnaire. This paperless process meant fewer transmission risks from physical objects on site, like paper, pens, etc. and allowed the team to collect data for who was on site and validate that they had truly checked in and were cleared to be on the site.

3. **COORDINATION OF ADAPTIVE RE-USE**

When MSU learned it would receive almost $30M of DTMB funding for this project, they chose to incorporate the rich history of the former coal fired plant by transforming it into a student inspiration hub anchoring the new STEM facility. The adaptive reuse plan included abatement of hazardous materials, salvaging and repurposing artifacts and coordinating select architectural components to integrate the historical significance of the building into the overall design and character of the new facility. The level of planning, detail design and logistics

required to safely remove hazardous materials while salvaging artifacts prior to renovating the space was substantial. MSU and the team conducted several site investigations and full 3D scans with point mapping of the existing building prior to starting demolition to ensure a successful outcome.

4. **SUCCESSFULLY COMPLETED FIRST MASS TIMBER PROJECT IN MICHIGAN**
Early in the project, MSU expressed a desire to explore using mass timber materials, which was a new material for all team members involved. Evaluating the various options and making a final decision was a massive effort that was accomplished by:
   - Engaging subject matter experts in three workshops to evaluate differences between structural steel, mass timber or a hybrid approach. Discussions covered various topics including: 1) first and life cycle cost, 2) construction schedule, 3) building systems coordination, 4) code compliance, 5) sustainability, 6) aesthetics, 7) adaptability of design, 8) trade availability, 9) demonstration of innovation, 10) relations to MSU pedagogy, 11) local economic impact, 12) systems reliability, 13) pests and more.
   - Engaging three mass timber vendors to provide input on budgeting, conceptual estimating, realistic scheduling and technical support. This included multiple site visits with a timber manufacturer and design-assist engineers to vet and validate ideas.
   - Visiting UMass Amherst to tour its mass timber facility and learn what worked and did not work for the owner and builder.

   These early efforts proved extremely helpful in planning, bidding and installing this portion of the work and avoiding costly mistakes in the field.

Scheduling:

(Provide two (2) examples which demonstrate the owner's expertise in managing the schedule; that is, identify some steps taken by the Owner which contributed to the management of the schedule.)

The largest schedule challenges the STEM project faced were COVID related. This project was originally scheduled to start summer 2018 and finish in fall 2020. However, due to Covid-19 complications, the schedule was extended, with the substantial completion moved to February 2021. Even then, this was an aggressive schedule considering the resultant manpower shortages and supply chain issues. MSU embraced numerous Lean strategies to keep the project on schedule including:

1. **VIRTUAL DESIGN AND CONSTRUCTION (BIM)** which helped identify and resolve clashes and other issues prior to construction. Unlike concrete floors, CLT requires steel strapping to evenly distribute load across the floor throughout the building. Therefore, cutting through a single strap compromises the building's structural integrity. To overcome this challenge, the project team heavily utilized Building Information Modeling (BIM). With BIM, the team could show exactly where the straps would be placed, in 3D view, and coordinate through-slab utilities to avoid clashing. Similarly, because MSU STEM's design is open-concept, where much of the conduit and ductwork is showing, it was especially important to make sure these design elements were both aesthetically and functionally correct prior to construction. This level of detail was instrumental in mitigating errors and keeping the project on schedule and budget.
2. **PREFABRICATION** significantly reduced field fabrication and cutting and provided a more controlled and predictable installation process. The largest prefab component was the entire building structure, made of glue-laminated timber and CLT decking that was delivered to the project in the sequence it needed to be installed, creating a highly efficient construction process. Other prefab components included:
   - water closets for the restrooms which came prebuilt as one large assembly,
   - Utility hangers - by the use of tremble, the trades would shoot the anchors in the deck and mark them with a point; the corresponding point is then referenced to a pre-fabricated hanger, allowing for quick installation
   - Manifolded general duct – this process eliminated all field cutting and allowed for direct installation as it arrived on site

3. **LAST PLANNER SYSTEM** led to smooth and predictable hand-off between trade contractors.
4. **TABLET-BASED TECHNOLOGY (PLANGRID)** made information more readily available on site for faster and more informed decision making.
5. **WEEKLY WORK PLANS** were implemented to review schedules, manpower projections and material lead times, submittals and shop drawings, change orders, etc., which kept issues from snowballing and impacting the schedule.
6. **KANBAN BOARDS AND COLOR-CODED PHASING PLANS/VISUAL SCHEDULES** were posted for all team members to see, which helped all parties visualize the workflow and keep everyone accountable.

In addition to the above measures, MSU effectively worked with the CM through pull planning activities to put over $5M of self-performed work into to place. This work was seamlessly coordinated with contractor and owner labor working together, creating huge efficiencies and schedule savings in a market with extensive labor shortages. MSU also coordinated commissioning and quality control issues throughout the project to quickly resolve any field issues that kept the project moving and resulted in fewer issues down the stretch.

Cost Management:

(Describe what action the owner took with the project team to manage the project costs.)

Like most publicly funded projects, budget is always a major point of emphasis and concern. The total project budget was amended from $97M to $110M to accommodate growing programming requirements, and consisted of multiple funding sources including a State of Michigan Grant.

Cost Management was a significant challenge on this project, especially in light of 1) the adaptive reuse component which tend to produce significant unknown issues, 2) utilizing a new structural material that none of the team members were familiar with and 3) the uncertainly and highly volatile market resulting from COVID, which exacerbated both trade worker shortages as well as material costs and supply chain issues. Below are a few key strategies that helped to complete the project within budget.

- To ensure a high level of budget certainty, the team engaged three mass timber vendors early on for input on budgeting and conceptual estimating, eliminating the guess-work on mass timber costs. The team also helped balance cost of structure vs. cost of program, another critical step in the early pre-construction planning stages.
- The pre-construction effort included evaluating over $20 million in different budget ideas to allow key stakeholders to consider various scopes and programming for this space. As design was completed, the owner developed a Risk Management Log to track and manage requests and changes to ensure the project would stay on budget. The assigned cost to each risk was tcalculated as a debit to the project contingency balance. The risk log was reviewed weekly. As time passed if an identified risk did not transpire the risk was retired and corresponding cost was credited to the contingency line item. If the risk came to reality the actual cost of the risk was debited from the contingency. As new risk was realized they were added to the log. The risk log was also shared and discussed with executive stakeholders. This log also helped with decision making on potential scope increases and scheduling options.
- The owner's cost and self-performed work was closely monitored by the MSU project manager. He kept in close communications with internal service providers to ensure work was completed on time and on budget. account check ins consisted of a scheduled biweekly check in with capital project accountant on the project to ensure work was classified and billed correctly for grant, identify any lingering contractor/consultant payment issues, and to go over owner cost including self- performed work. The MSU PM also closed out work orders as work was completed to reduce erroneous charges to the project.

Quality Management:

(Provide a brief narrative describing the methods of quality control/quality assurance and the Owner's participation in this area.)

MSU manages dozens of construction projects on campus each year and has a well-developed and highly effective Quality Management system for design and construction management. Some of the key components which contributed to the success of the STEM project include trade specific inspectors, electrical/mechanical commissioning and inclusion of subject matter experts. The trades specific inspection team consist of MSU tradespeople who review design documents and do continuous quality inspection during construction. This allows for early detection of potential issues, and assurance of compliance with MSU construction standards and technical standards. MSU also employs mechanical and electrical commissioning agents who lead commissioning activities closely with the MSU Project Manager. MSU also has their own subject matter expert team of engineers and architects who review design documents and assure proper installation and start of equipment. All the quality management activities are closely coordinated with the consultants and CM. The MSU PM on this project ensured that these activities took place in a timely manner consistent with the schedule.

By choosing to use CLT mass timber materials, MSU ensured the STEM building would offer best-in-class features in terms of fire resistance, sustainability, efficiency and strength. However, implementing CLT on such a complex project, and as the first mass timber facility in the state, brought with it many quality-related challenges. The project team engaged a variety of subject matter experts early in pre-construction to begin identifying the challenges that must be considered when using mass timber in place of traditional materials. Discussions covered a wide range of topics, including structural, envelope and MEP systems coordination, code compliance, sustainability, aesthetics, adaptability of design, systems reliability, material handling and protection, moisture control, insurance, final cleaning, pests and more.

Significant planning and coordination early and across all team members, from owners to architects, contractors and subcontractors, ensured this first-of-its-kind facility was constructed with excellent craftmanship. A couple key examples where this was evident include:

BIM COORDINATION: When placing CLT floors instead of traditional concrete, our team needed to secure steel strapping to evenly distribute load across the floor throughout the building. Cutting through a single strap would have compromised the building's structural integrity. BIM modeling allowed us to see exactly where the straps were placed, in 3D view, so we could coordinate through-slab utilities and avoid clashing.

Similarly, because MSU STEM's design is open-concept where much of the conduit and ductwork is showing, it was especially important to make sure these design elements were both aesthetically and functionally correct prior to construction. This level of detail was instrumental in mitigating errors and keeping the project on time and on budget. All CM and design team members, along with MSU representatives, were involved in BIM Coordination Meetings throughout all components of the project beyond just that of mass timber. This collaborative team environment resulted in productive discussions when areas were flagged as potential issues so all parties could be involved in making informative and timely decisions.

HIGH PERFORMANCE ENVELOPE: There are several factors that lead to leaks that can spread into a facility, such as faulty weather and vapor barriers, the use of incompatible materials in the envelope or schedule compression. This was something MSU wanted the team to study, improve upon and avoid at STEM, so they agreed to build envelope mockups for testing and commissioning. After careful consideration, the team selected an insulated composite backup panel system. This system provides an effective air, water, thermal and vapor barrier within a single barrier wall component. This solution offered a quick and easy one-step installation that reduced the number of installers and manufacturers, consolidating the responsibility. Lastly, the product isn't weather dependent which offered great schedule flexibility.

SECTION III - OVERALL PROJECT SUCCESS

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SECTION III - OVERALL PROJECT SUCCESS:

(Identify and briefly explain the factors that contributed to the success of the project such as the selection of the A/E, Prime Contractor and Subcontractors, approach to decision-making, handling end user requests, etc. Entire section should not exceed two (2) pages.)

What began as an overarching goal to improve and enhance the undergraduate learning experience at Michigan State University resulted in an historic victory with the 2021 completion of MSU's STEM Teaching and Learning Facility. This was the first building on campus and the first in Michigan constructed with a newer mass timber framing product called cross-laminated timber (CLT). Additionally, the entire facility was constructed in and adjacent to the remains of MSU's decommissioned Shaw Lane Power Plant, demonstrating an exemplary blend of adaptive reuse with state-of-the-art infrastructure and flexible learning spaces. MSU STEM was designed as a gateway to academics, specifically to STEM disciplines. The building houses entry-level courses in Chemistry, Computer Science, Physics, Biology and Material Science and sits at the junction between the athletic and academic zones of the campus. Prior to the opening of this facility, these courses were offered in a variety of locations on the campus, with no link between the disciplines. In the new building, science is on display like never before, and students and faculty are able to mix, fostering greater understanding and a deeper knowledge than in the previously separate buildings.

MSU's STEM Teaching and Learning Facility opened its doors in July 2021 to a small cohort of summer students and to a robust population of fall students on September 1, 2021. The MassTimber@MSU program will monitor and report on students' reactions to learning in the transformational space. In addition, the program will leverage lessons learned from the first mass timber project in Michigan, as well as ongoing mass timber research at the University, to support future mass timber projects through an array of education, outreach and engagement activities.

Key factors that led to the success of this project include:

RIGHT TEAM: There are numerous factors that led to the overwhelming success of this first-of-its-kind project in Michigan. First and foremost was the CM and A/E team that MSU selected for the project. Granger and IDS had worked together on several other key projects on campus and had a proven record of success of working with MSU to plan and execute highly complex and/or fast-track projects requiring innovative solutions, shepherding numerous stakeholders and working in a highly transparent manner. Based on past experience, MSU trusted these firms to do what is in the best interest of the project, and they did not disappoint on the STEM project. This mindset of putting the project's success ahead of individual success carried over to all participants. The entire team - owner, consultant, contractors and subs - all owned this commitment to success by being held accountable regardless of circumstances, not just for their own contracted portions of the work but for the overall project. This "team first" attitude led to a highly collaborative and solutions-focused environment where everyone's ideas were heard and considered.

All team members where open to innovation and lean practices, including design assist, extensive building modeling, last planner system, prefabrication, utilization of a common construction document management tool (PlanGrid) and use of a hybrid mass timber structure. Additionally, from an Owners perspective heavy involvement from an MSU Architect during the design and construction to help set the vision was critical. Another critical contributor to success was including a dedicated project team member who represented the end users of the facility. This helped with quick decision-making and buy in from the stakeholders he represented.

RIGHT START:

- The team utilized a RIGHTStart Kick-Off Meeting upon selection of the A/E and CM where key project goals were identified, responsibilities were outlined and check-in points were set up within the schedule to ensure project goals were always reviewed and kept at the forefront.
- Throughout the pre-construction phase, the team evaluated over $20 million in different budget ideas to allow key stakeholders to consider various scopes and programming for this space. The level of research and attention to detail during this important planning process was instrumental in developing the best possible

solutions to meet MSU's overarching goals of the project. Once MSU settled on the use of Mass Timber, the team engaged three mass timber vendors early on for input on budgeting and conceptual estimating, eliminating the guess-work on mass timber costs. The team also helped balance cost of structure vs. cost of program, another critical step in the early pre-construction planning stages.

RIGHT FINISH: This was the project team's first experience using mass timber. Numerous additional challenges required the team to be nimble: complex site logistics; the COVID-19 pandemic; adaptive reuse involving abatement of hazardous materials; salvaging and repurposing artifacts and coordinating select architectural components to integrate the historical significance of the building into the overall design and character of the new facility. Despite all this, the project was delivered on time and within its original budget.

ADVANCED LEARNING OPPORTUNITIES:

- The MSU STEM team worked together to create innovative educational materials for students, the local community as well as other statewide organizations. Early on, we developed informational Story Boards to provide a historical look at the Shaw Lane Power Plant and key information about the project and the benefits of Mass Timber. These boards were placed along busy pedestrian walkways outside the project construction site to inform and educate passersby about the project and the history of the coal plant. We also designed a 12-page informational booklet for the MSU Board of Trustees building tour which was then reprinted and used for several other group tours throughout construction, including one high-profile tour with a Congresswoman, top University stakeholders and multiple community members.
- The team also hosted building tours for various groups and informational discussions for MSU undergraduate construction management classes studying adaptive reuse. Team members also served as guest lecturers in a graduate level scheduling class on campus to discuss the difference between designing, procuring and installing mass timber compared to traditional means and methods like steel or cast-in-place. They also learned about the extensive up-front planning and execution required along with some benefits associated with using timber.

ADVANCED MASS TIMBER USE: Because this was the first-ever mass timber project in Michigan and one of the largest in the Midwest, it received a lot of attention from the University, the media and various state and local officials. It was also located in a high-profile location on the MSU campus, directly adjacent to the MSU Spartan Football Stadium and along one of the main thoroughfares through campus. And it was the first new classroom building constructed on campus in over 50 years. All of these factors led to this project being in the spotlight and receiving extensive interest when it began, throughout construction and, of course, when it was completed. It was a massive effort to manage this attention to ensure the project was received in the best possible light, and this was done expertly by MSU and its partners.

Many conservation organizations including the Nature Conservancy in Michigan, the Michigan Department of Natural Resources (DNR) and the Michigan Forest Biomaterials Institute (MIFBI) have been actively promoting mass timber construction. Our team consulted with and worked with these organizations to promote this project and the benefits of mass timber, whether through informational print materials, building tours, seminars or presentations. These efforts serve as a catalyst for additional mass timber construction in the state and beyond. This, in turn, is expected to lead to establishing mass timber/CLT manufacturing in Michigan, which is ideally situated to become a leader in this area due to its abundant forest resources and manufacturing know-how. This would not only create green jobs using sustainable resources, but also provide financial resources and incentives to restore and conserve healthy, diverse and productive forests.

INDUSTRY RECOGNITION: This project is not just a success in the eyes of MSU and its partners. Organizations within the wood/forestry/sustainability and the design and construction industries have recognized MSU STEM with numerous state, regional and national awards – 11 and counting to date. Most notably, MSU STEM was named Best Construction Project of 2021 by the Associated General Contractors of America, receiving the Build America Grand Award which is the most prestigious construction industry award in the country. Completing a project like this requires a special combination of skill, tenacity, innovation and finesse, and that award speaks volumes about the STEM team's success on all fronts!

SECTION IV - PROJECT COMPLEXITY

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ADVANCE THE ART OF BUILDING

SECTION IV – PROJECT COMPLEXITY:

(Provide a brief narrative (i) in bullet form and (ii) maximum of one page; describing the complexity of the project including challenges, constraints and the solutions.)

Key challenges and solutions:

FIRST MASS TIMBER PROJECT IN MICHIGAN

- There were no CLT manufacturers in Michigan capable of fabricating and executing a project of this scale. Further, CLT manufacturers were using their own locally-sourced timber fiber materials, and not yet sourcing from Michigan. In addition, few area firms had the necessary experience or willingness to undertake installation of a timber project this large. The team cast a wide net, networking aggressively to secure experienced partners early.
- Unlike concrete floors, CLT requires steel strapping to evenly distribute load across the floor throughout the building. Cutting through a single strap would compromise the building's structural integrity. The team utilized BIM to show exactly where straps would be placed, in 3D view, and to coordinate through-slab utilities to avoid clashing. Similarly, because MSU STEM's design is open-concept, where much of the conduit and ductwork is showing, it was especially important to make sure these design elements were both aesthetically and functionally correct prior to construction.
- Numerous details must be considered when using mass timber in place of traditional materials. Major considerations included structural, envelope and MEP systems integration, along with smaller details like final cleaning, material handling and protection, moisture control and insurance. Mass timber is a finished product, meaning there should be no need to sand, stain or paint. It's also softer than steel, thus more susceptible to dings and scrapes. At MSU STEM, the team rigged protective plywood layers around mass timber columns in high- traffic areas after installation to prevent damage during construction.

ADAPTIVE RE-USE – UTILIZING A PIECE OF HISTORY

When MSU learned it would receive almost $30M of DTMB funding for this project, they chose to incorporate the rich history of the former coal fired plant, built in 1945 and decommissioned in1975, by transforming it into a student inspiration hub anchoring the new STEM facility.

- To achieve this adaptive reuse plan, the project team coordinated significant demolition and reconstruction of the existing 40,000 square foot power plant, as well as coordinating select architectural components to integrate the historical significance of the building into the overall design and character of the new facility. The level of planning, detail design and logistics required in order to safely remove hazardous materials while salvaging artifacts for reuse prior to renovating the space was substantial. The team conducted several site investigations and full 3D scans with point mapping of existing building prior to demolition, used BIM coordination and invested in robust safety measures.
- It was a major goal of the University to integrate the historical significance of the Power Plant into the overall design and character of the new facility. Salvaging and reusing several artifacts was a key part of this. The first floor exterior shell of the power plant's existing boiler was reimagined to house an interactive digital art installation commissioned by artist Refik Anadol. The former Ash Silo that served the three coal fired boilers was renovated on the 2nd and 3rd floors to provide additional meeting rooms to foster collaboration or for students to relax between classes. Many power plant relics were upcycled into unique furniture items for the new building. Metal handles, springs, wheels and covers have a new life as table bases, while former coal conveyor links serve as the foundation for a one-of-a-kind recliner. A fixed bench was crafted from CLT (donated by Nordic), control arm levers, Detroit Rotogate stoker plates and motor mount brackets.

SITE LOGISTICS

The site had a very minimal footprint and was located in the center of campus, directly adjacent to a Big 10 collegiate football stadium, with high volumes of pedestrian and vehicular traffic. The team developed numerous site logistics plans, with flexible pedestrian walkways. On event days like home football games, the jobsite would shut down early and modify the site fencing, creating significant pedestrian thruways in the middle of the site to accommodate heavy traffic. During the academic semesters, the team utilized gate attendants to guide construction traffic in and out of the site to ensure student/pedestrian safety. The team was also in constant communication and coordination with MSU Police, Athletics and Infrastructure Planning and Facilities.

SECTION V - SUSTAINABILITY ELEMENTS/EFFORTS

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ADVANCE THE ART OF BUILDING

SECTION V – SUSTAINABILITY ELEMENTS/EFFORTS

(Provide a brief narrative (i) in bullet form and (ii) maximum of one page; describing sustainability elements/efforts, if any.)

SUSTAINABLE DESIGN FOR THE FUTURE:

- MSU STEM demonstrated the University's commitment to minimizing its carbon footprint through the use mass of timber. Among other benefits, mass-timber promotes forest health and reduces carbon emissions. The mass timber on this project, made from sustainably harvested FSC-certified Black Spruce, totals 3,082 cubic meters of glulam and CLT which store an estimated 1,856 metric tons of carbon dioxide equivalents (CO2-e). This translates to avoiding 4,664,495 miles driven by an average vehicle or not burning 2,051,406 pounds of coal. Finally, since the mass timber arrived pre-fabricated, those components produced very little waste on the construction site. Additionally, the building's tight connections, combined with building insulation and a glazing on the windows to reduce solar glare and heat, are expected to result in energy efficiencies.
- The adaptive reuse of the former Shaw Lane Power Plant and immersion of existing artifacts also contributed greatly to sustainability efforts. The new facility leverages existing shared spaces, structures and utilities, such as a commons area, loading docks and mechanical rooms, while also incorporating many historic artifacts. A former boiler was reimagined to house an interactive digital art installation, an ash silo was minimally renovated into meeting rooms, metal salvage was up-cycled into tables and other furniture and interesting relics were repurposed across various art installations. Additionally, the team found significant water conservation opportunities by utilizing an existing 13,000-gallon expansion tank as a water source during interior demolition, abatement and power washing activities.
- Many conservation organizations including the Nature Conservancy in Michigan, the Michigan Department of Natural Resources (DNR) and the Michigan Forest Biomaterials Institute (MIFBI) are actively promoting mass timber construction and this project has helped serve as a catalyst for additional mass timber construction in the state and beyond. The expectation is that this, in turn, will lead to establishing mass timber/CLT manufacturing in Michigan, which is ideally situated to become a leader in this area due to its abundant forest resources and its manufacturing know-how. This would not only create green jobs using sustainable resources, but also provide financial resources and incentives to restore and conserve healthy, diverse and productive forests.

ENVIRONMENTAL CONSCIOUSNESS

Building with wood products like CLT generates fewer carbon dioxide emissions and requires less fossil fuel consumption during manufacturing, transport and construction than alternative steel or concrete building components. CLT is strong enough to compete with concrete and steel, and its increased use would help reduce greenhouse-gas emissions in the construction sector. CLT is arguably the first major structural innovation since the invention of reinforced concrete more than 150 years ago. The carbon-reducing impact of green building with mass timber goes beyond the sustainable forests that produce these products and the carbon they lock away. While concrete is essential in foundations, timber buildings are lighter so those foundations can be smaller. Mass-timber products are modular and can be produced in a factory, which means faster construction, fewer trucks delivering materials and less disruption to communities around building sites.

FLEXIBLE SPACES

The long-term view of where science education will go is foggy at best. The STEM Teaching and Learning Facility strived to plan for ultimate flexibility to allow it to adapt to the unknown. The laboratory spaces are designed constructed to be divided and combined with relative ease. To facilitate this, the primary structure is split along column grid lines which allow for future flexibility by allowing construction of new partitions on the lab module while still permitting the penetration of plumbing and electrical systems into and out of the wall. Additionally, the laboratory services in the "wet" labs of South STEM are suspended via service columns hanging from an extruded aluminum overhead grid with quick connections strategically spaced around the labs. The service columns are provided with "whips" that are sized which permit the columns to be placed in any location under the grid.

SECTION VI - CONFLICT RESOLUTION

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SECTION VI – CONFLICT RESOLUTION:

(Provide a brief narrative (i) in bullet form and (ii) maximum of one page, describing the owner's role in minimizing and resolving conflicts.)

1. **Selected a team with previous successful experience with the University and with each other.** MSU selected experienced and competent team members in Granger and IDS - a team that has worked together on previous complex projects on campus and who MSU had excellent working relationships with. All members of the team had to work together, and at times make compromises, so this initial decision was a key factor in minimizing any potential conflicts among the team. MSU was confident in selecting this team for such a complex project because it was a very cohesive team, with ALL members fully committed to the overall goals and needs of the client.

2. **Successfully Utilized a RightStart Project Kick-Off Meeting.** The goal of any construction project is to see successful completion of the job on time and within budget. When conflicts arise, it can seriously threaten achieving that goal. One of the best ways to minimize conflicts is to make sure all team members are on the same page from the start of the project because stakeholders have different opinions and interpretations on how things are supposed to be done. Those differing opinions often lead to conflicts.

3. **Clear and Constant Communication.** Poor communication on the jobsite is one of the leading causes of conflict. MSU made sure that expectations were always clearly communicated to everyone on the project. There were many times when decisions were required, and not everyone agreed on what the best solutions were to a problem. Once a resolution had been decided upon, MSU made sure everyone involved understood the decision and was clear on what was expected moving forward. They kept everyone on the same page and up to date with any changes or alterations being made to the project or schedule. There were no surprises, and therefore, conflict among team members was not an issue.

4. **Presented a Culture of Cooperation and Collaboration.** MSU set the standard early on by making their expectations clear and by leading by example to ensure the team was willing to compromise and work together to solve problems and make decisions that were in the best interest of the project. Construction is all about cooperation and collaboration, and this team was an excellent example of that from day one through completion.

5. **Daily Involvement.** MSU was on site, attended all meetings and was readily available so that when issues arose, they could help mitigate them in a timely manner before they became detrimental to the project. Their heavy involvement and ability to make immediate decisions were key factors in alleviating most of the issues that came up on this project. For example, when the exterior precast panels arrived on site and it was discovered some of them were cracked, MSU's availability to inspect the panels and quickly make a decision allowed the team to re-sequence the installation of those panels from east to west using the good panels instead of west to east, giving the manufacturer time to reproduced the cracked pieces.

Because of MSU's proactive approach to exceptional project communications and its longstanding ability to work, in partnership, with our team members, owner and team member disputes are typically very minimal. Our attitude and operations method is to have a dispute-free process. However, sometimes disputes cannot be avoided. When this occurs, our role is to resolve disputes as expeditiously as possible.

For the MSU STEM project, the MSU Project manager brought conflicts to a quick resolution by implementing no-fault, solution-based discussions around conflict. Some conflicts resolved during the project include:

- Design Fee A/E ASR resolutions.
- COVID Related change order request resolution and agreement.
- Stakeholder issues with building occupancy related to chemical and fume hood safety.

Once resolved, those involved moved forward without ill will or rancor, but rather with trust and understanding.

SECTION VII-CUSTOMER SATISFACTION

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ADVANCE THE ART OF BUILDING

MICHIGAN STATE
UNIVERSITY

August 30, 2021

TO: Mr. Jeff Bonk
Infrastructure Planning and Facilities
Planning Design & Construction
Michigan State University
1147 Chestnut Road
East Lansing, MI 48824

FROM: Barbara J. Kranz, Director *Barbara J Kranz*
Facilities Planning & Space Management
Office of the Provost

SUBJECT: MSU STEM Teaching &Learning Facility and Shaw Lane Power Plant Renovation - CM Recommendation for COAA Project Leadership Award

Dear Jeff,

On behalf of Facilities Planning and Space Management and the Office of the Provost, I would like to thank you and Infrastructure Planning and Facilities for your partnership in the design and construction of the STEM Teaching and Learning Facility. This new facility will enable Michigan State University to advance new and innovative pedagogies in the delivery of gateway STEM courses including biological sciences, chemistry, computer science, engineering, and physics. The adaptive reuse and renovation of the former Shaw Lane Power Plant, seamlessly connecting the new STEM additions, has created collaborative, and learning support spaces for STEM education, a vibrant student commons and opportunities for collaborations across the arts and sciences. The successful adaptive re-use of the former Shaw Lane Power, combined with the use of mass-timber as a key structural and design element in the new STEM additions, and the flexible laboratory design creates a robust teaching and learning environment that will support our students and faculty now and well into the future. The response from students, faculty and staff has been overwhelmingly positive and enthusiastic.

The STEM Teaching and Learning Facility is poised to foster the success of our students, support on-going research in teaching and learning, encourage the use of sustainable design and construction, and serve as a benchmark for STEM teaching and learning facilities.

OFFICE OF
PLANNING AND
BUDGETS

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August 30, 2021

Construction Owners Association of America
5000 Austell Powder Springs Road, Suite 206
Austell, GA 30106

Dear COAA Awards Committee:

I am pleased to describe how Michigan State University's Infrastructure Planning and Facilities (IPF) representatives contributed greatly to the success of the STEM Teaching & Learning Facility – Addition 2 and Renovations to Shaw Lane Power Plant (SLPP) Project. The project includes the pairing of two new mass timber STEM additions in combination with the renovation of a former Power Plant intended to support and promote interdisciplinary and collaborative opportunities for students, staff and alike.

IPF exhibited world class leadership in several ways including: preserving a decommissioned Power Plant for future reuse, selecting mass timber by using the LEAN Construction tool Choosing by Advantage, and creating a safe workplace in the middle of a global pandemic. While there are several more examples that can be described in detail regarding MSU's leadership, I'd like to focus on vision as an exemplary example of leadership.

The Shaw Lane Power Plant started providing utility service roughly 80 years ago and while the plant sat empty for nearly 50 years. MSU had a vision for future use of the decommissioned power plant and refused to take the easy route by demoing the asset. Instead, MSU took the necessary steps to protect the asset against irreparable decay and inevitable demolition. After conducting leadership in design charrettes with up-and-coming next generation stakeholders at MSU, the power plant became a target to implement concepts of place making, pride, innovation and entrepreneurship.

IPF consistently provided guidance and vision as it related to the STEM project and while it sounds a bit too cliché, the power plant became the arts and humanities link between the STEM wings and truly became a STE(A)M project. With the unwavering drive and passion of IPF design leadership, one of a kind, never to be manufactured again, elements began to find their way into the project. Boiler valve wheels, cast hinged doors, and other power plant artifacts became design elements to create a provocative view of the future. This forward-thinking implementation scheme created a strong framework to design the new additions.

The project ultimately became an exploration of dichotomy. The project utilized several techniques to illustrate its core concept including: exposing the contrast between a new addition and use of old materials (the timber used from trees 80 years old); high tech and revolutionary teaching contrasts the simplicity of flexibility and modularity; weaving the industrial aesthetic of the power plant creates the theme, building as a STEM teaching tool, while also maintaining sophistication; and finding a balance between museum and inspirational learning environment.

Overall, IPF became champions of the project concept with an energy and excitement that was both influential when tough decisions needed to be made and inspirational when others found it easier to quit. To me, leadership is having a vision and determination to see it through.

Sincerely,

Integrated Design Solutions, LLC

Jeffrey D. Johnson, AIA
Vice President

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August 25, 2021 via email

Mr. Jeff Bonk
Michigan State University
Planning Design & Construction
1147 Chestnut Road
East Lansing, MI 48824

RE: MSU STEM & Shaw Lane Powerplant Renovation
CM Recommendation for COAA Project Leadership Award

Dear Jeff,

On behalf of the entire Granger Construction project team, we would like to thank MSU for the opportunity to be a part of a truly special project. Granger Construction was the Construction Manager At-Risk for this project and we strongly recommend MSU for a COAA Project Leadership Award.

The MSU STEM project was one of the most complex and unique projects we've ever constructed. From the beginning, the MSU STEM project exemplified teamwork, innovation, exceptional project management and overall high-performing project execution.

In particular, Michigan State University contributed to the success of the MSU STEM project by:

- Engaging the design and CM firms at nearly the same time (Program stage), which allowed us to build a better project team and optimize the overall project outcome.
- Pushing for innovation and never hitting the "easy button" on key decisions – as best exemplified using CLT Mass Timber as the primary structural system and transforming a decommissioned powerplant into student collaboration spaces.
- Promoting a culture of teamwork, professionalism, and accountability always. MSU's project leadership team held project stakeholders accountable, but always with respect and reasonableness.
- Maintaining an engaged and active project prescence, as demonstrated in many ways including ongoing design and constructability input from MSU's inspection team, participation in weekly and daily "huddles" to ensure timely decisions were made, and urgent follow through on change issues and payment applications.
- Ensuring timely completion of major owner provided work including FFE, IT/AV, and perhaps most importantly – complex lab commissioning and TAB services.

Thank you again for allowing us to be part of this one-of-a-kind project!

Sincerely,
GRANGER CONSTRUCTION COMPANY

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AFFIRMATION AND RELEASE:

Nomination is submitted by: On behalf of Michigan State University
Name: Lorraine Ross
Company: Granger Construction Company
Street Address: 6267 Aurelius Road
City, State/Province, Zip/Postal Code: Lansing, MI 48911
Phone Number: 517-887-4145
Email Address: lross@grangerconstruction.com

In submitting this application, I affirm to the best of my knowledge, that the information contained herein is accurate and correct. I also agree to grant permission for COAA® to use the nomination materials in their entirety (including photographs) for promotional purposes which may include, but not be limited to, the COAA® website and the *Owners Perspective* magazine.

SIGNATURE Lorraine Ross DATE 8-29-2022

TITLE : Proposals Manager