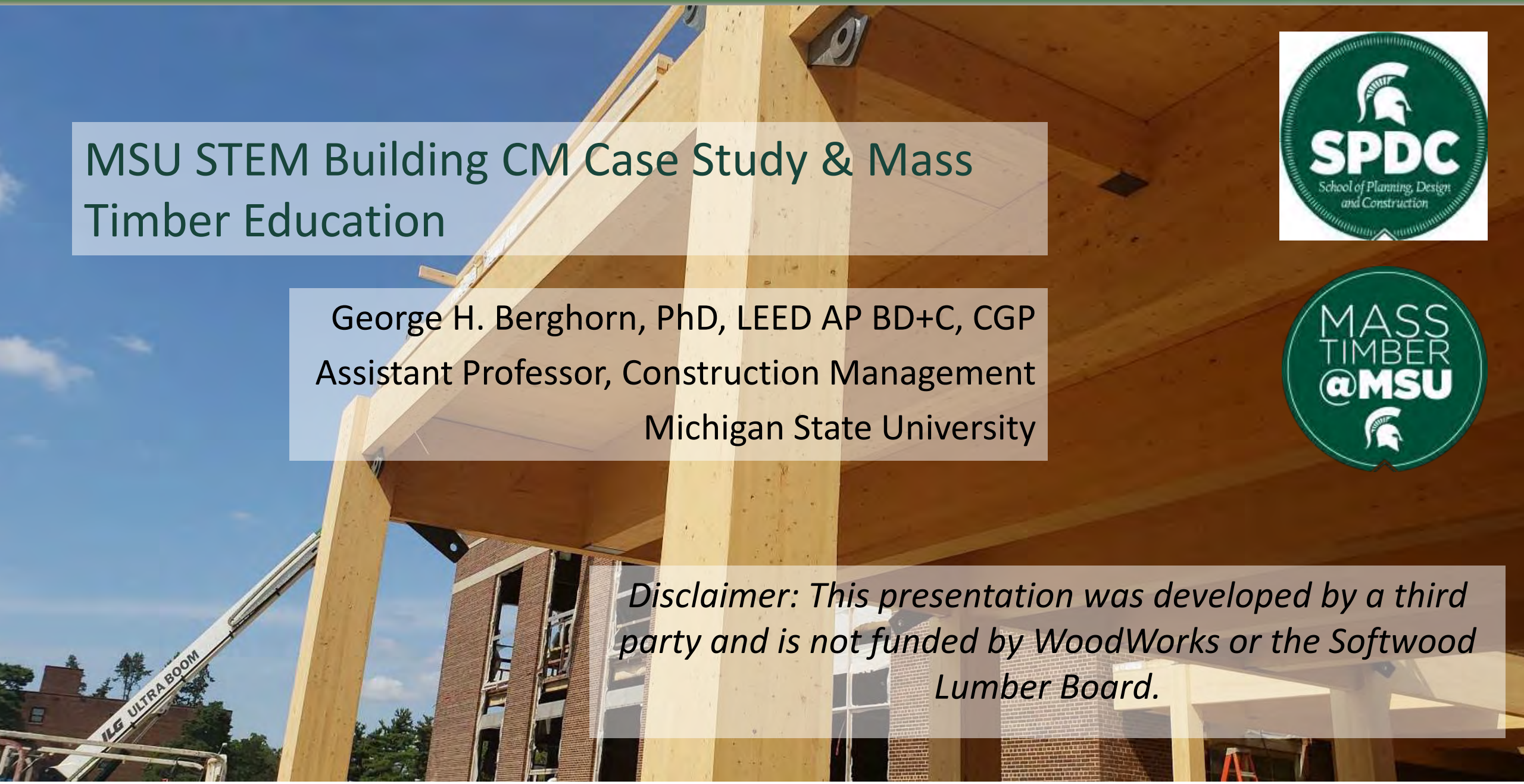


MSU STEM Building CM Case Study & Mass Timber Education

George H. Berghorn, PhD, LEED AP BD+C, CGP
Assistant Professor, Construction Management
Michigan State University

Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.

MSU STEM Building CM Case Study: Project Overview


LLENZWEIG

MICHIGAN STATE UNIVERSITY: STEM

PROGRAM GOALS

1

Improve and enhance the undergraduate learning experience, support teaching and learning, attract more students in STEM disciplines, and better prepare them for professional careers in STEM fields

2

Bring together outdated teaching laboratories and instructional support spaces; support changes in STEM curriculum and teaching methods.

3

Create a campus hub for teaching and learning across the sciences, arts and humanities.

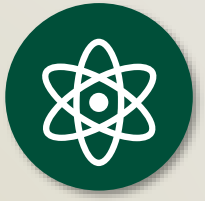
BUILDING PROGRAM

- Undergraduate Teaching Laboratory space of approximately 120,000 GSF
- Modular, flexible active learning teaching labs
- Student breakout spaces, project labs in support of curriculum innovation
- STEM Gateway courses in:

Biology

Chemistry

Computer Science



Materials Science

Physics

MICHIGAN STATE UNIVERSITY: STEM

$110.1

MILLION BUDGET

SCHEDULE
COMPLETION DATE:

Spring 2021

120,000 Sq. Ft.
new construction

40,000 Sq. Ft.
renovation space

16,000 Sq. Ft. new
classroom space

The HUB For Innovative Teaching and Learning

College of Agriculture and Natural Resources

Board of Trustees

College of Natural Science

Infrastructure Planning and Facilities

Forestry Department

Police and Public Safety

Associate Provost for Teaching, Learning, and Technology

Resource Center for Persons with Disabilities

Office of Planning and Budgets/Facilities Planning and Space Management

MICHIGAN STATE UNIVERSITY

IT Services

College of Engineering

Athletics Department

Partially funded by the State of Michigan

Campus Infrastructure Work Group Planning Committee

iDS

GRANGER

ADVANCE THE ART OF BUILDING

ELLENZWEIG

Lansing Glass

RAM Construction Services

Building Controls Integrated

Couturier Iron

SDI Structures

Bornor Restoration

Thyssen Krupp Elevators

Sasaki

Commercial Contracting

TCI Excavations

Nordic Timber

Schiffer Masonry

Waldner Equipment

Farnell Equipment

Gunthorpe Plumbing

Kirby Steel

IDEO

Beckett & Raeder

Detroit Spectrum Painters

Summit Electric

Nicholson Foundations

Asbestos Abatement, Inc

Architectural Metals

Total Fire Protection

Fessler Bowman

DC Byers

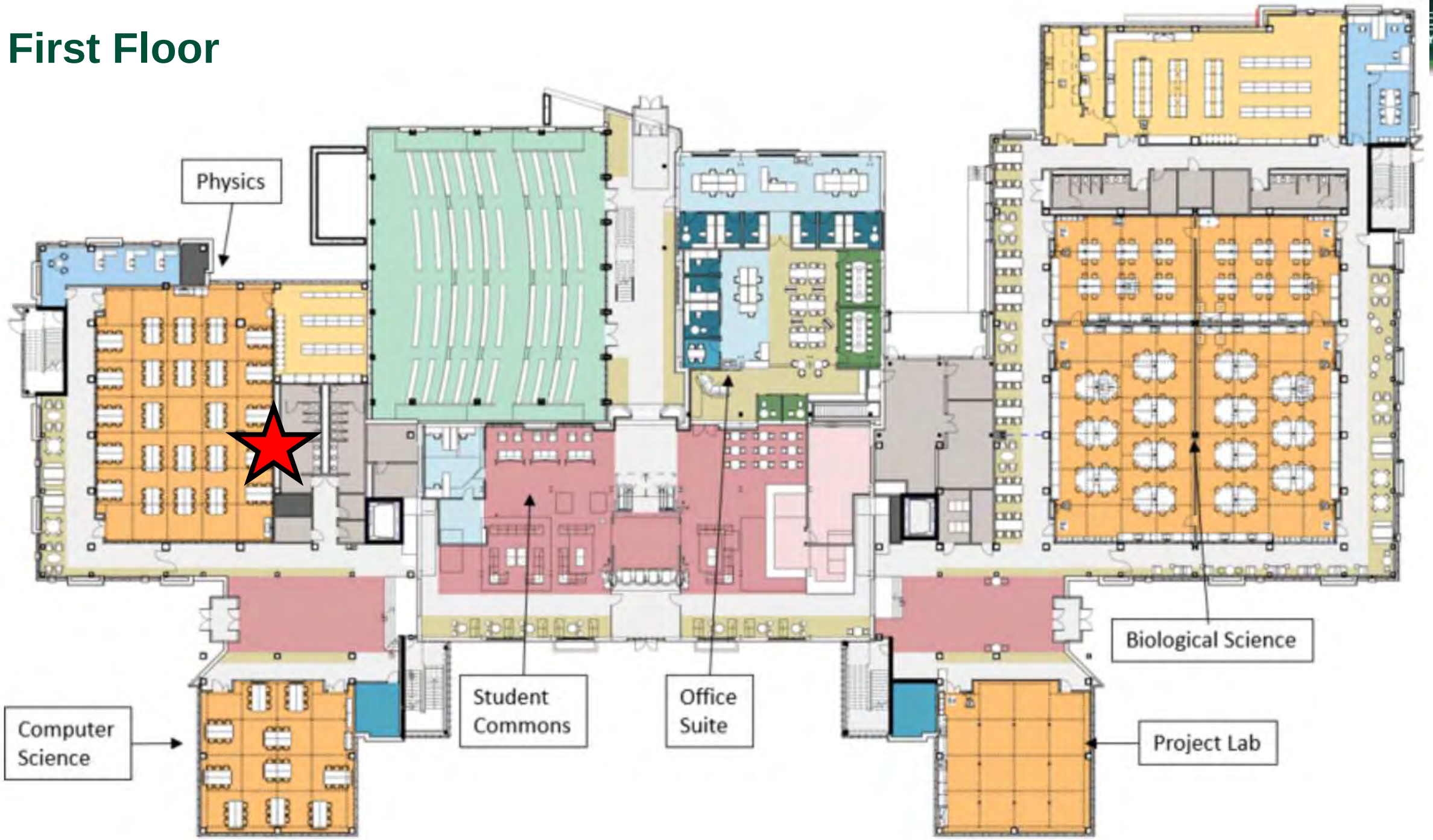
William Reichenbach Co.

Ideal Steel

Dobie Contracting


Spartan Stadium
Wells Hall
Parking Area 56
SPARTANS

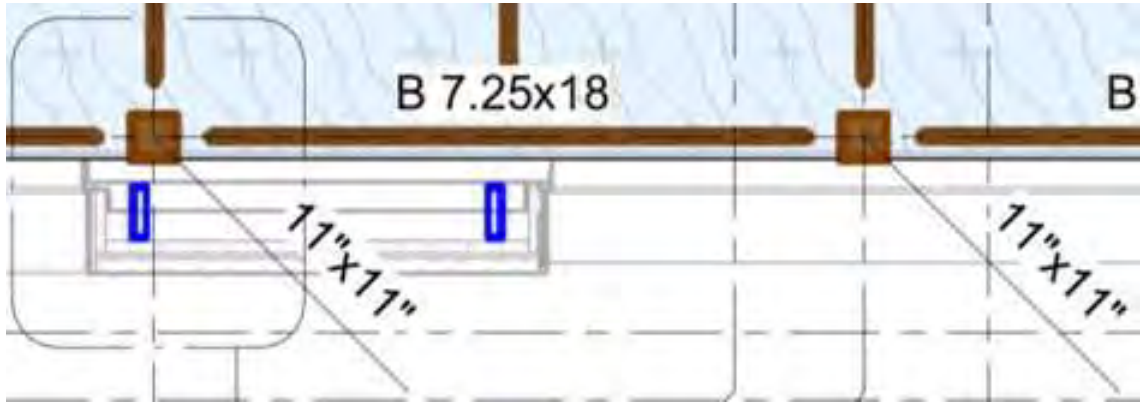
First Floor


Physics
Student Commons
Office Suite
Biological Science
Computer Science
Project Lab

MSU STEM Building CM Case Study: Lessons Learned

Early Team Integration is Critical

- Timber design and fabrication



Column Label Conventions: 15 1/2"x18 3/4"

actual square dimension(in) of glulam column on floor indicated on sheet u.n.o.

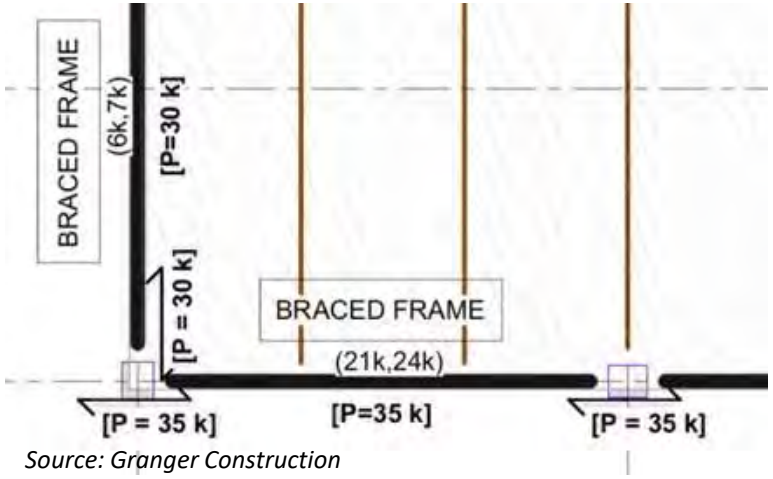
Column designation 50 SP N1D14 with assumed allowable axial stress Fc = 2300 psi and modulus of elasticity E = 1.9x10^6 psi are required for columns sizes greater than 20"x20".

Column designation 48 SP N2D12 with assumed allowable axial stress Fc = 2200 psi and modulus of elasticity E = 1.7x10^6 psi are required for column sizes less than 20"x20".

Source: Granger Construction

Early Team Integration is Critical

- Timber design and fabrication
- Early transition to delegated design



Source: Granger Construction

Source: Granger Construction

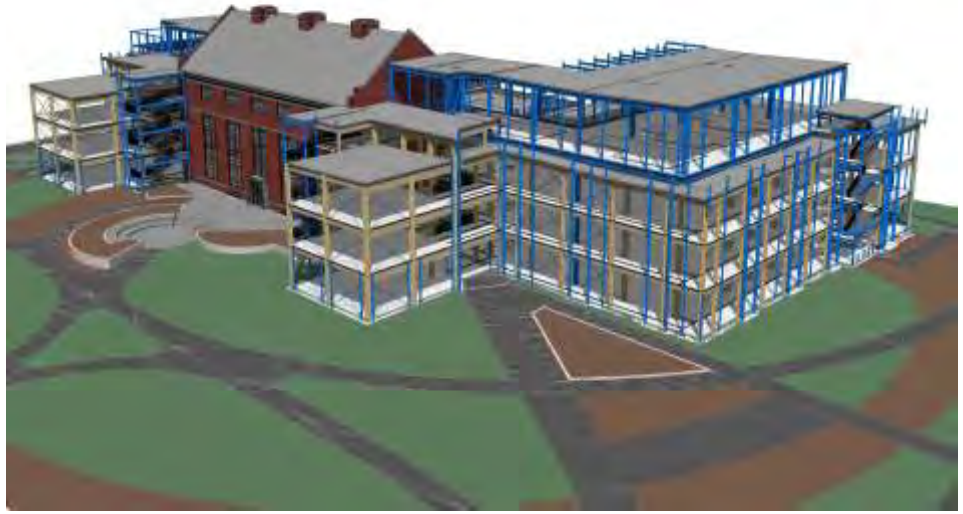
Early Team Integration is Critical

- Timber design and fabrication
- Early transition to delegated design
- Lean out process between engineer-mfg/fabricator-shipping for JIT delivery

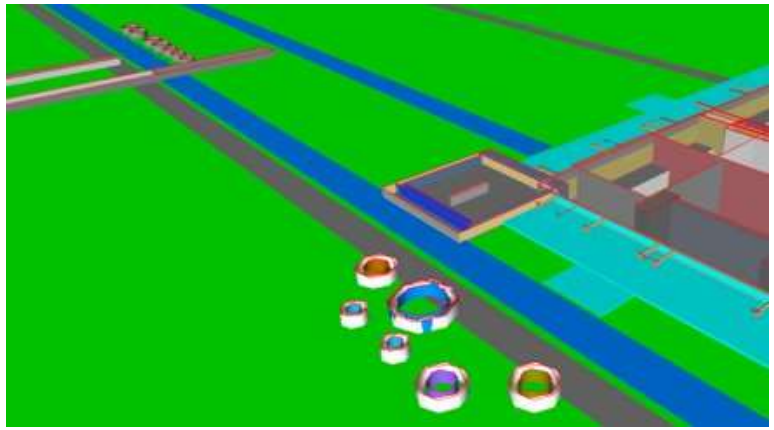
Source: Granger Construction

Early Team Integration is Critical

- Timber design and fabrication
- Early transition to delegated design
- Lean out process between engineer-mfg/fabricator-shipping for JIT delivery
- Early implementation of VDC

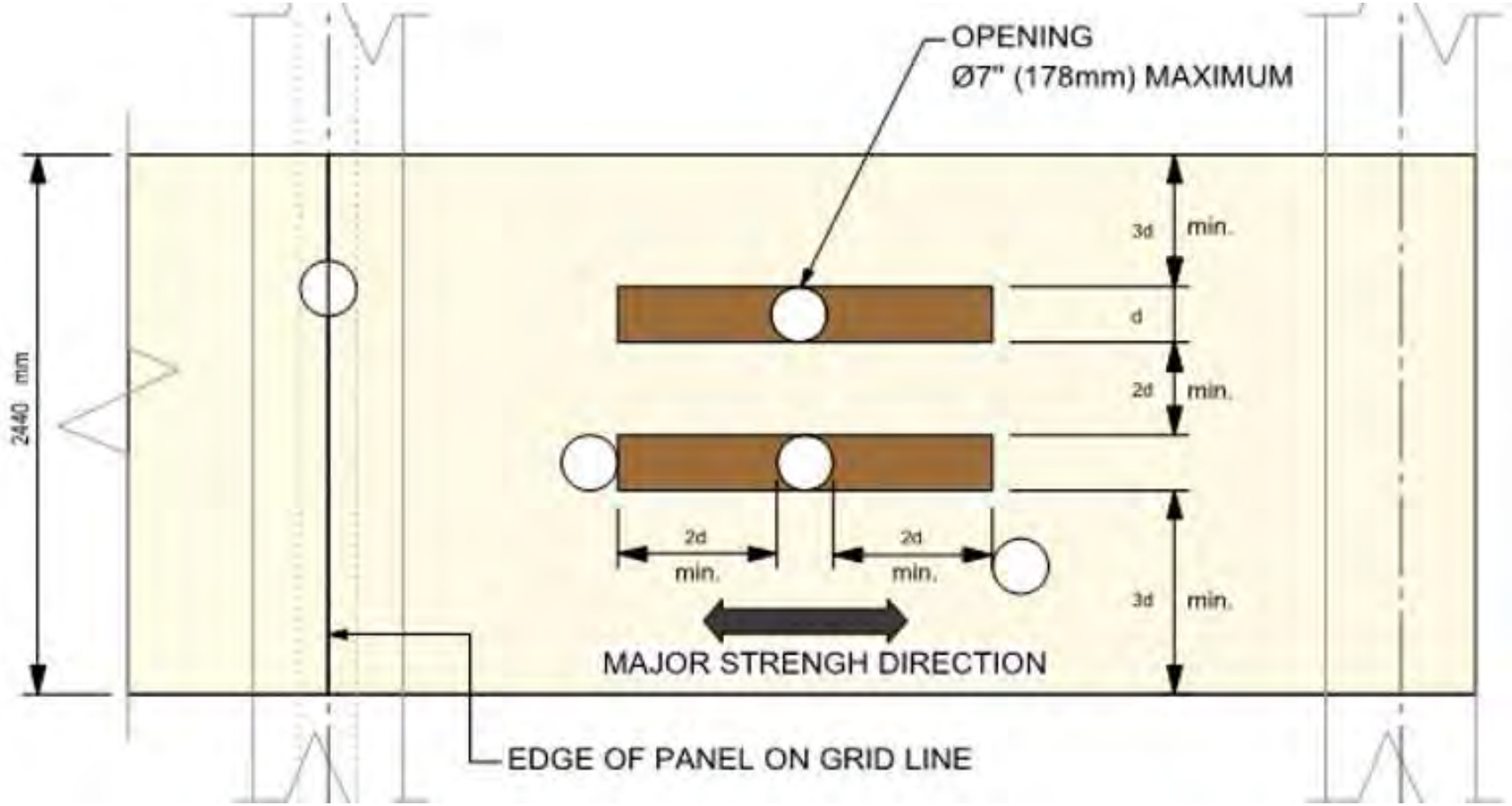


Source: IDS, Inc.



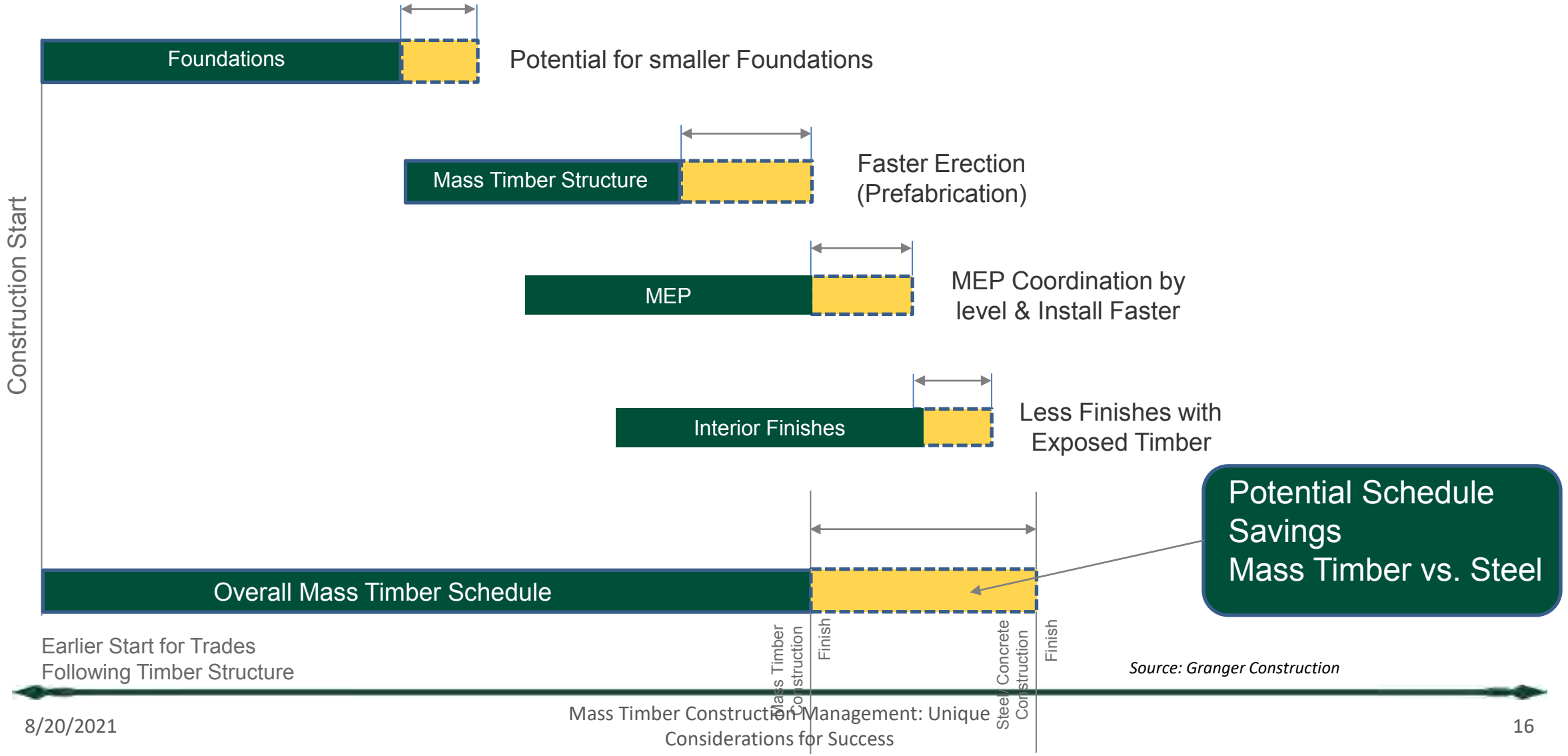
Source: Granger Construction

Early Integration because Coring Locations Matter



Source: Granger Construction

Early Integration to Gain Schedule Compression



Insurance

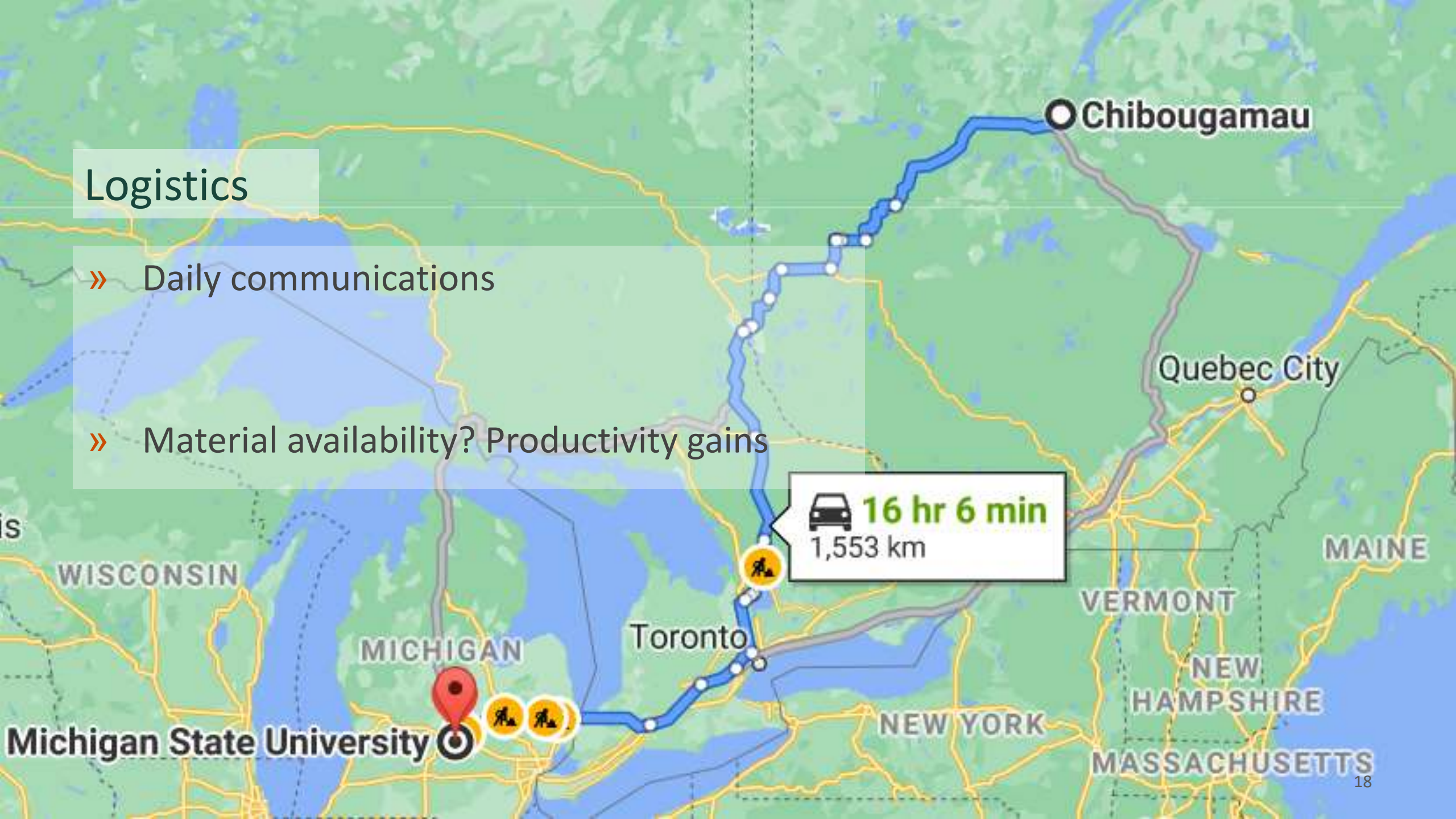
Source: George Berghorn

IS NOT

Source: Pixabay.com

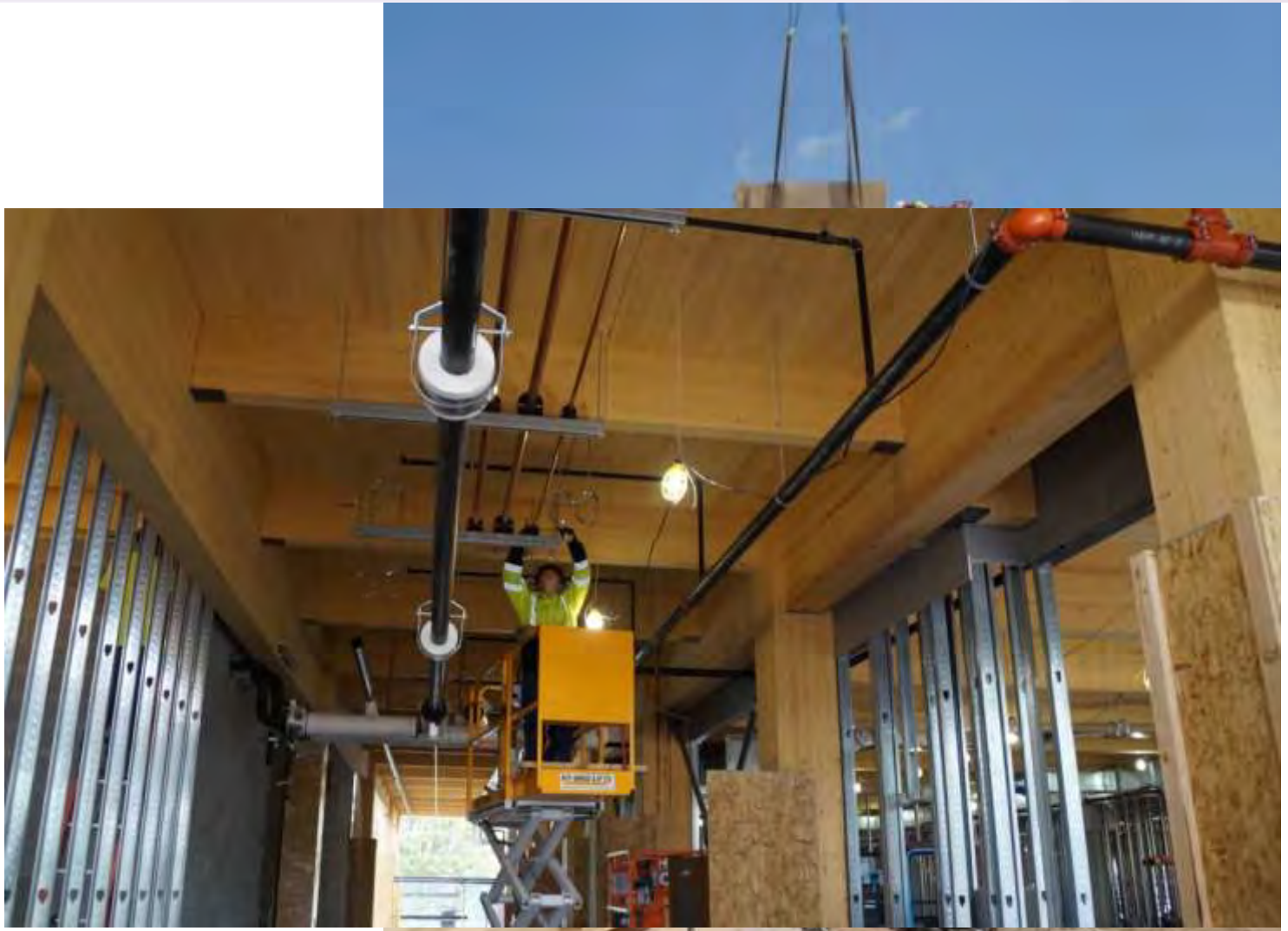
Logistics

- Daily communications
- Material availability? Productivity gains



Trades Coordination

- Local coordination
- Faster turnover
  - Pull planning
  - Work pace
  - JIT delivery criticality



Source: Granger Construction

Source: Granger Construction

Steel Integration

- Delineate scope
- Color-coded drawings
- Phasing plan

Source: Granger Construction

Protect Work in Place

- Assigned to subcontractor work scopes
- Moisture management
- Physical protection
- Cleaning

Source: Granger Construction

Bottom Line

- Communications was critical – direct tie to integration
- Dedicated, documented planning systems
- Document the details – “buildings fail at the intersection of contracts”

Mass Timber Education

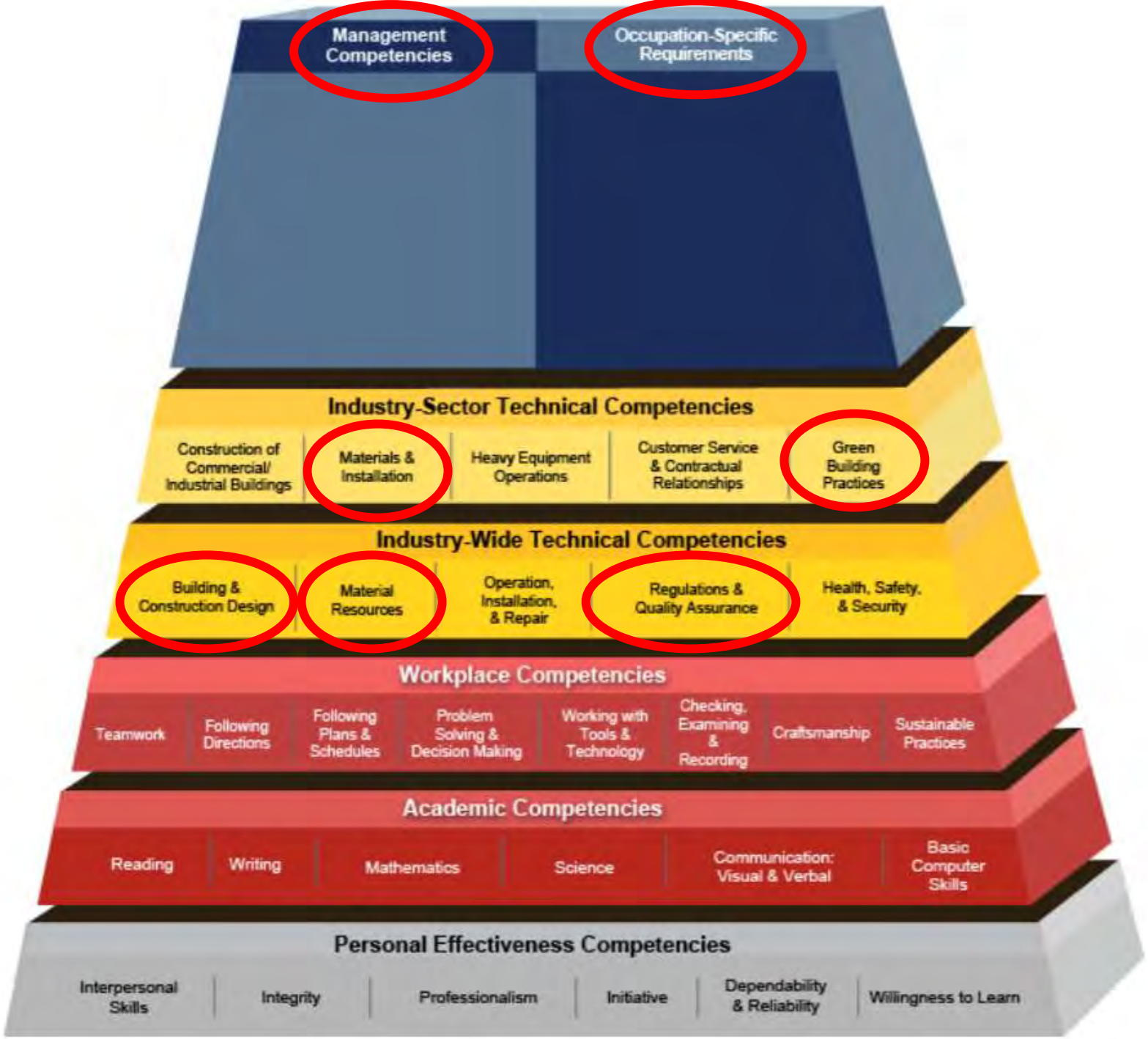
Source: MSU CM Program

Goals of Mass Timber CM Education

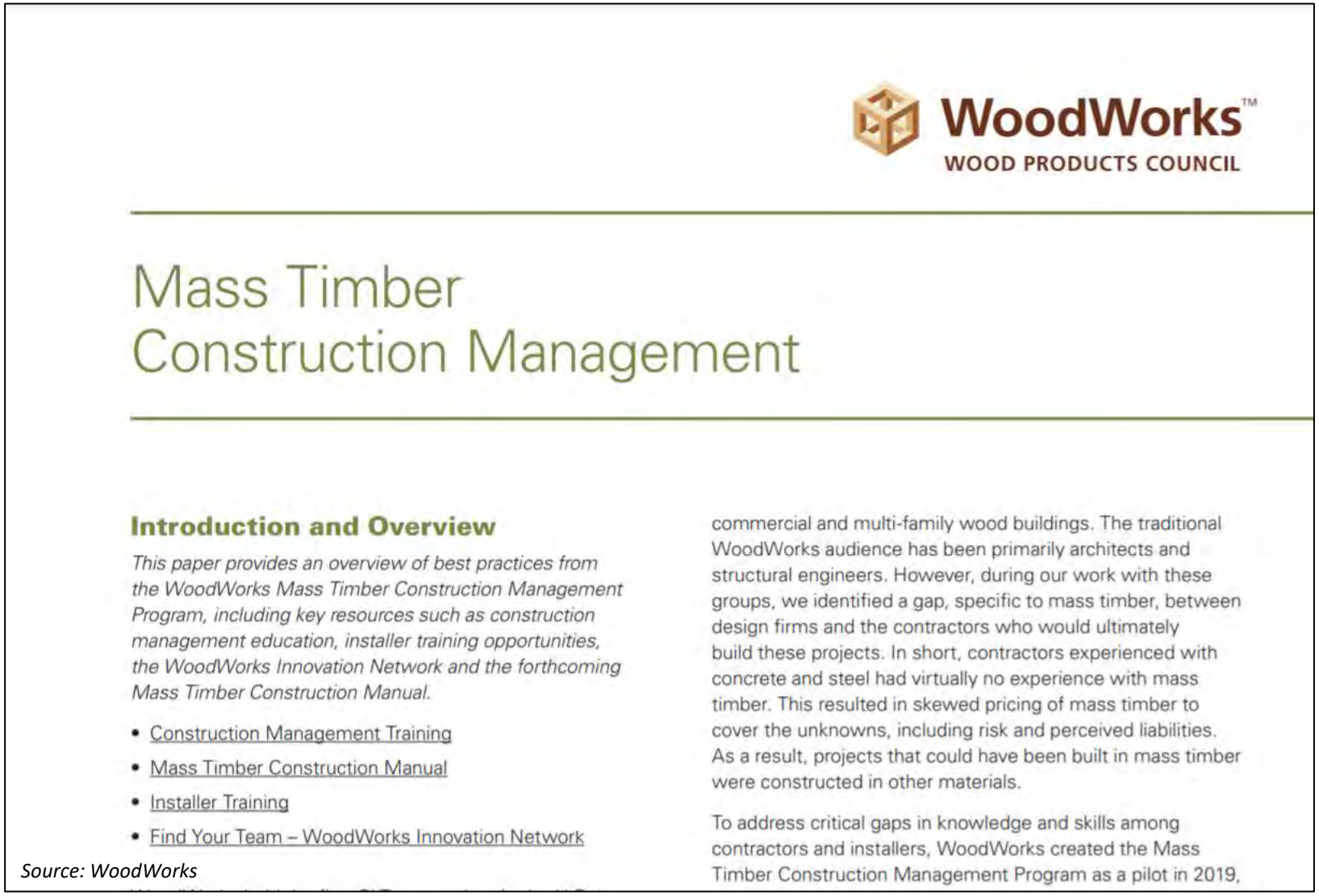
- Consistency with program accreditation
- Industry standard- and practice-based
- Blend of theory and practice with hands-on elements
- Case- and project-based learning
- Integrated concepts/systems-focused
- Create scalable, replicable, national model curriculum

Industry Standards: USDOL Competency Model Framework

- Add focused content at mid-upper levels
- Builds on core CM knowledge



Practice-Based



WoodWorks™
WOOD PRODUCTS COUNCIL

Mass Timber Construction Management

Introduction and Overview

This paper provides an overview of best practices from the WoodWorks Mass Timber Construction Management Program, including key resources such as construction management education, installer training opportunities, the WoodWorks Innovation Network and the forthcoming Mass Timber Construction Manual.

- Construction Management Training
- Mass Timber Construction Manual
- Installer Training
- Find Your Team – WoodWorks Innovation Network

commercial and multi-family wood buildings. The traditional WoodWorks audience has been primarily architects and structural engineers. However, during our work with these groups, we identified a gap, specific to mass timber, between design firms and the contractors who would ultimately build these projects. In short, contractors experienced with concrete and steel had virtually no experience with mass timber. This resulted in skewed pricing of mass timber to cover the unknowns, including risk and perceived liabilities. As a result, projects that could have been built in mass timber were constructed in other materials.

To address critical gaps in knowledge and skills among contractors and installers, WoodWorks created the Mass Timber Construction Management Program as a pilot in 2019,

Source: WoodWorks

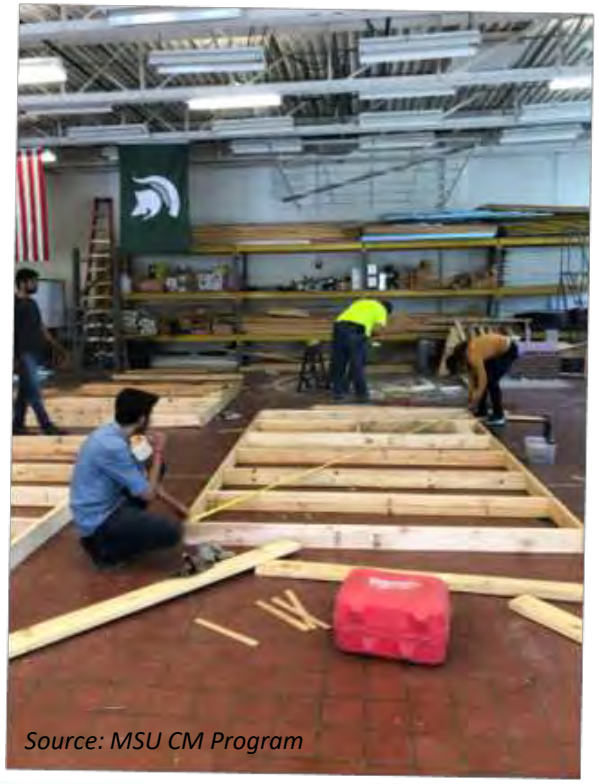
Theory, Practice, and Hands-On

Source: George Berghorn

Source: George Berghorn


Source: MSU CM Program


Source: MSU CM Program


Source: MSU CM Program


Source: George Berghorn


Source: George Berghorn


Source: George Berghorn


Source: George Berghorn

Source: WoodWorks

Thank You!

Questions?

berghorn@msu.edu
masstimber.msu.edu
spdc.msu.edu

Acknowledgements
Portions of this presentation were developed with project team members from Granger Construction Company and IDS, Inc.