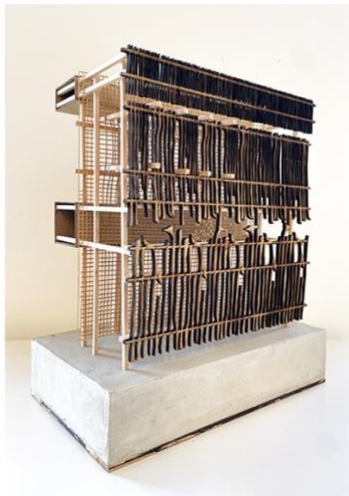


## Mass Timber as *Naked Material*

Professors Jordan Kanter and Ray K Mann  
2024 Timber Education Prize



Colleen Tulley, *Flower Mapping*, Grad Design IV



Anita Ghorbani + Jeyestha Naval, *Final Model*, Grad Design IV

*“The architect’s work confronts technology with desire and thus explores the true potential of new materials. It is by definition new because it is not preconceived; it is a discovery occurring at the intersection of the potential abstraction inherent in modern consciousness with the ground of figuration inherent in the human body itself.” – Alberto Perez-Gomez*

For more than a century, the American building industry has relied on steel and concrete construction for mid- and high-rise buildings. These materials require extensive energy to produce and are significant contributors to global carbon emissions. Despite their ubiquity, steel and concrete require considerable expertise to design and construct and yet are often enclosed, partitioned, and fireproofed by various infills and layers. Physically hidden away in buildings and conceptually obscured by a (perceived) lack of expertise, there is an inherent detachment for many students from these materials.

Contemporary mass timber, on the other hand, is a comparatively *naked* material system. It is designed, in many cases, to be exposed, unencumbered by fireproofing and other enclosures, warm and inviting in its material affect. But it is also naked in a deeper sense. Wood is a material that is intuitively understood. Almost everyone has some experience cutting and putting pieces of wood together, whether in a wood shop or assembling Ikea furniture. Wood is tactile, malleable, part of our everyday experience; it is *ready-at-hand*. As a result, mass timber construction represents both a new addition to our repertory of building materials and a fundamental and opportunistic shift in our conception of spatial organization, material tectonics and construction methodologies.

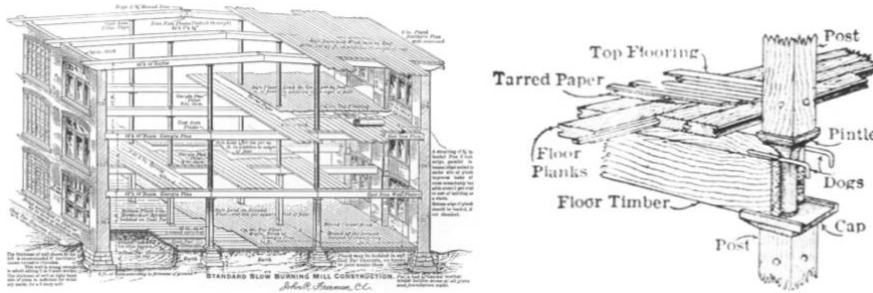
The nakedness of mass timber presents a unique and timely pedagogical opportunity to more fully integrate structural and material thinking into the design process. In particular, it presents the opportunity for students to engage with materials in a more hands-on, direct, and engaged way, an essential skill in the context of the climate

crisis and ever accelerating technological change. These skills constitute a process of generating embodied knowledge, achieved through an active engagement with the material world.

Key points of focus for this pedagogy:

- **Fully integrating structural thinking** – the inherent limitations of wood set clear criteria for structural systems, and yet the malleability of the material and the increasing innovation in engineered wood products, open a wide range of potential applications that can be directly tested through hands-on model-making.
- **Empathy with materials** – Understanding where a material comes from, its characteristics and what processes were involved, how much carbon is taken from as well as put into the atmosphere, as well as the labor and handling of those who harvest and process the wood as well as replant and care for the forests.
- **Old / new construction** – Understanding mass-timber as a material with deep historical roots as well as incredible potential for future innovation. Developing abilities for skilled analysis and approaches to integrate adaptive reuse and new construction as a sustainable strategy, as well as an attunement to the relationship of material systems to their environmental, social, economic, and historical context.

## COURSE PROPOSAL



*Historic Mill Heavy Timber Construction Details (Wermiel 2004)*

The Graduate Design IV studio is the first course in the two-semester Comprehensive Design Studio sequence. The studio emphasizes the integration of building systems, including structure, mechanical systems, and building envelope. For the Spring 2025 iteration of this studio, **we propose to engage with mass timber as the conceptual and material basis for the adaptive re-use of historic brick and timber mill buildings emblematic to our region of New England.** As one of the origin points of Type IV construction, these remarkable structures will serve as a jumping off point for analyzing the legacy of heavy-timber and the future of mass timber. Students will explore the potential of mass-timber—in all its capacities to infill, clad, span, support, brace and extend—as a material framework to develop fully integrated building solutions from site to detail. The site of the studio project will be in Turner Falls, Massachusetts, which has an extensive Paper Mill complex in various states of repair. The brief will include interventions into the existing buildings, as well as development of new structures on and over the site, with a program that will include about 40,000 SF of mixed-use R+D labs, offices, and assembly spaces.

## STUDIO OUTLINE

**Phase 1 – Reconsidering the old – “site” analysis:** Students will examine the existing mill architecture as a starting point for developing an understanding of the tectonic and social-economic logic of this historical application of mass timber, modeling and analyzing the history of site and its urban form, resource management, infrastructure, economic and social development, and ultimate decline. Students will then develop a series of theoretical interventions into the mill’s material system with the goal of stabilizing the structures as well as opening new programmatic opportunities in the existing buildings. [3 weeks]

**Phase 2 – Engaging with the new – “precedent” analysis:** Students will study examples of innovative uses of mass timber, mass timber products and architectural precedents, including visits to/with regional mass timber buildings, fabricators and experts. They will study fabrication processes, material properties, and will be introduced to the principles of embodied carbon accounting, creating a collective research dossier. Students will then develop a series of inventive physical material prototypes exploring the structural, spatial and material potential of their system. [3 weeks]

**Phase 3 – Envisioning an old/new – project design:** Building on the first two phases, partner teams will embark on the design projects, developing both adaptive use strategies for the existing buildings in concert with the development of new structures built on/over/through/around existing structures on the site. The inherent modularity of mass timber construction and capacity to act as structural armatures will be harnessed. In-studio sessions with additional technical experts will be integral to project development. [7 weeks]

### **Faculty development:**

- Timber Design Faculty Development Workshop, May 20 - 22, 2024, Clemson, SC
- Mass Timber+ - Offsite Construction Conference - Nov. 12-14, 2024, Philadelphia, PA
- 2025 International Mass Timber Conference March 25–27, 2025 Portland, Oregon

### **SELECTED READINGS + CONTACTS**

- Arup. <https://www.arup.com/perspectives/publications/research/section/rethinking-timber-buildings>
- Benjamin. 2017. *Embodied Energy and Design: Making Architecture between metrics and narratives*. Columbia University GSAPP ; Zurich.
- Clouston, P. L., & Quaglia, C. P. 2013. Experimental evaluation of epoxy based wood plank-concrete composite floor systems for mill building renovations. *The International Journal of the Constructed Environment*, 3(3), 63–74.
- Ibanez, Daniel, Jane Hutton, and Kiel Moe. Wood Urbanism: From the Molecular to the Territorial. Actar Publishers, 2019.
- Kieran, Stephen. “Evolving an Environmental Aesthetic.” Essay. In *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life*, edited by Stephen R. Kellert et al, 243–51. New York: Wiley Publishers, 2008.
- Liotta, S.J. and Belfiore, M. 2012. *Patterns and Layering: Japanese Spatial Culture, Nature and Architecture*. Berlin: Gestalten.
- Perez-Gomez, Alberto. 1987. “Architecture as Embodied Knowledge.” *Journal of Architecture Education* 40, no. 2 (Winter 1987): 57-58.
- Wermiel, S. E. 2004. Heavy timber framing in late-nineteenth-century commercial and industrial buildings. *APT Bulletin*, 35(1), 55.

Outreach to existing and new contacts with expertise, in industry and at peer institutions:

- Leers Weinzapfel, architects of the Olver Design Building (mass timber)
- Gray Organschi Architecture, New Haven, CT
- Bensonwood, Walpole, NH
- Nordic Structures, Montreal, Canada
- Sean Mahoney, MA State Markets and Utilization Forestry Program Director
- Boston Planning & Development Agency ([BPDA](#))
- Boston Society for Architecture (BSA) Mass Timber Accelerator initiative

UMASS Olver Design Building, known as a pioneering mass-timber building by Leers Weinzapfel was designed to be used as a teaching tool. In addition, the UMass Amherst campus is embarking on the construction of two additional mass timber buildings—the Manning College of Information and Computer Sciences and the Sustainable Engineering Laboratories Building that will further supplement our “living library” of resources.

## FACULTY BIOGRAPHIES

**Jordan Kanter** is an Assistant Professor in the Department of Architecture. He teaches design studios and seminars focused on building technology, architectural representation, and computational design and fabrication approaches. Jordan's research focuses on the intersections between built and natural environments, and the ways these systems interact, overlap, and map onto one another. His work spans a variety of scales and domains, from interactive architectural installations, modular housing typologies, to region-scale infrastructure systems.

Jordan holds a Master of Architecture from the Southern California Institute of Architecture, and Bachelor of Science in Biology from the Massachusetts Institute of Technology. Jordan was an Associate at Michael Maltzan Architecture in Los Angeles, where his work included several projects employing mass timber or prefabricated wood systems in housing projects. This included housing for the formerly homeless in LA, Olympic housing proposals for Milan, and a research project aimed at retrofitting existing non-ductile concrete office mid-rise office towers with mass timber additions. He was also a Senior Designer at MAD in Beijing, where he led the design for the award-winning Harbin Opera House and other significant cultural projects. Jordan is a senior researcher at Solar River, a research initiative focused on transforming the water-energy nexus by placing solar structures over water infrastructure, and has his own design practice, foundCity.

**Ray K Mann** is a Professor in the Department of Architecture at the University of Massachusetts Amherst. She teaches studios and seminars focused on sustainable design, building technology and social history. Mann's research and practice intersect with focuses on public engaged design/build, net-zero compact housing development and systems thinking. She has co-developed and co-taught the G4 Comprehensive Studio with Professor Kanter for two years, and with him is part of a university-funded (ADVANCE) initiative to envision greater integration of building technology and equity into the studio curriculum. Mann was a recipient of the 2022 College of Humanities and Fine Arts Distinguished Teaching Award.

Educated at Harvard-Radcliffe (B.A. Environmental Design/Engineering) and The Harvard Graduate School of Design (M. Arch I, *with distinction*), Mann is one of the founders of UMass' accredited master's degree program in architecture. Mann has engaged with heavy timber in various forms for over 30 years, working closely with regional timber harvesters and fabricators. In 2023 she participated in Timber Faculty Development Workshop hosted by Leers Weinzapfel Associates at the UMass Design Building, and her BIM-based practice Ko-LAB is currently engaged with the design of two Mass Timber projects, including a Passive Building museum for the Six Nations Iroquois Culture Center in New York State. She is Chair of the Faculty Senate Campus Physical Planning Council and on the Board of Craig's Doors, a non-profit serving the unhoused.

**Additional Collaborators / Affiliations** We will coordinate our curriculum with Building Construction Technology—in particular with Dr. Peggi Clouston, pioneer of structural engineering research in mass timber, Professor Alexander Schreyer BIM expert from the construction industry perspective, and Dr. Munkaila Musah who researches bio-based building materials with a global perspective. Dr. John Mullin, Professor Emeritus in the Department of Landscape Architecture and Regional Planning, a pioneer in mill adaptive re-use, will also be engaged.