

CIRC-LAM

Small-Scale Mass-Timber and The Circular Economy

Description

Introduction

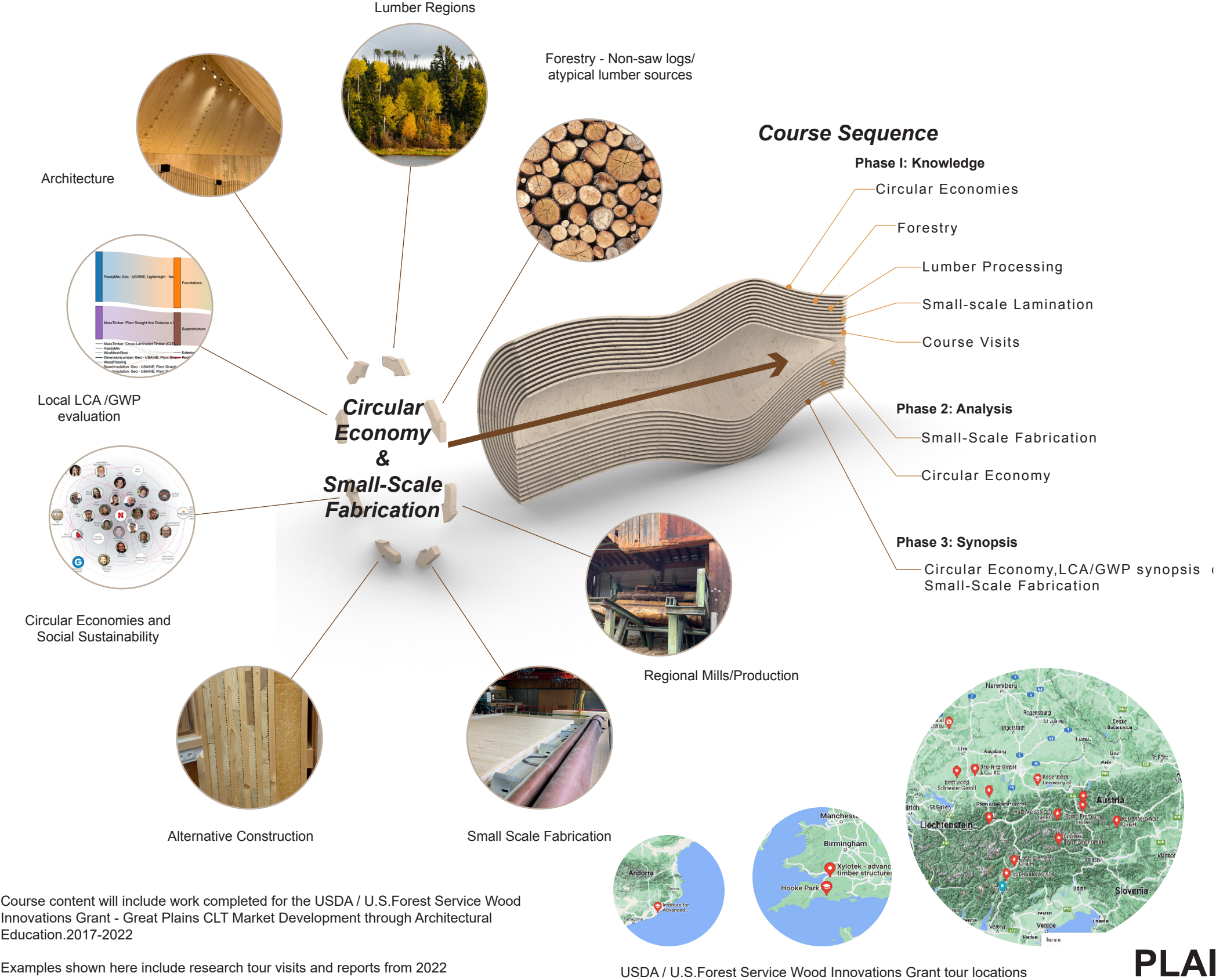
In a recent interview Prof. Bohumil Kasal (director of the Fraunhofer Institute for Wood Research) suggested that the ability for mass timber to effectively reduce carbon emissions now depended on global diversification.

While it is clear that the rapid increase in production of mass timber (40K to 1.8 million m3 of CLT in 10 years) has produced a major contribution to carbon reduction, it still has a long way to go. While much of the discussion on GWP has centered upon large-scale mass production (Austria produces over 70% of global CLT), far less attention has been given to the production of localised, regionally specific facilities. From this perspective, mass timber has no comparable equivalent to concrete production, which, today, is a widely available, regionally adaptable construction material. For mass timber to challenge concrete in a meaningful way, it needs similarly adaptable forms of available technologies.

CIRC-LAM is a new course that provides students with knowledge of small-scale mass timber fabrication technologies and their impact on circular economies. It is a three-credit course that teaches students how to establish models of socially sustainable mass timber architecture. It explores how small-scale production (CLT, DLT, NLT, Glu-Lam etc.) can broaden outcomes in terms of sustainable futures.

The course is based on the following outcomes:

- Small-Scale Production – Students will learn about techniques and impact of small-scale production including vacuum forming, nail lamination, mechanical press (Sources include IAAC, Wooden Haus/ Stoltze Timber). It will include lectures by established mass timber companies like Holz Meissnitzer & Holzbau Unterrainer(Austria) Novatop (Cech) Wooden Haus (Montana)
- Regionalism - Students will study examples of regionally specific (Great Plains, UK, Uruguay etc) alternatives to high-production regions (i.e Pacific NW and SE lumber regions)
- Milling – The course will provide knowledge of forestry production techniques for non-saw logs, pre-commercial thinning's and remote milling.
- Atypical Wood - It will provide knowledge of the architectural outcomes of atypical timber species on lamella patterns, thickness and visual/finished grade i.e. Tulipwood (Smile), Larch (Novatop) Eastern Redcedar (PLAIN)
- Buildings - It will provide knowledge of socially sustainable mass-timber buildings within short geographical radii of harvesting and consumption (for example Meissnitzer Holtz also develop local housing and supplies biofuel energy from their timber fabrication facility). Students will learn basics of defining measurable GWP using EC3 and with SIMA PRO consultants.



CIRC-LAM Small-Scale Mass-Timber and The Circular PLAIN D*B Curriculum

The course will provide direct learning and visits based on completed work for UNL College of Architecture's PLAIN Design-Build organization.

“CLT’s collaborative component compels us to consider new models of practice beyond the conventional orbit of mainstream construction. These models are driven by non-standardized alternatives and the regional nature of wood-based architectural culture in the US”

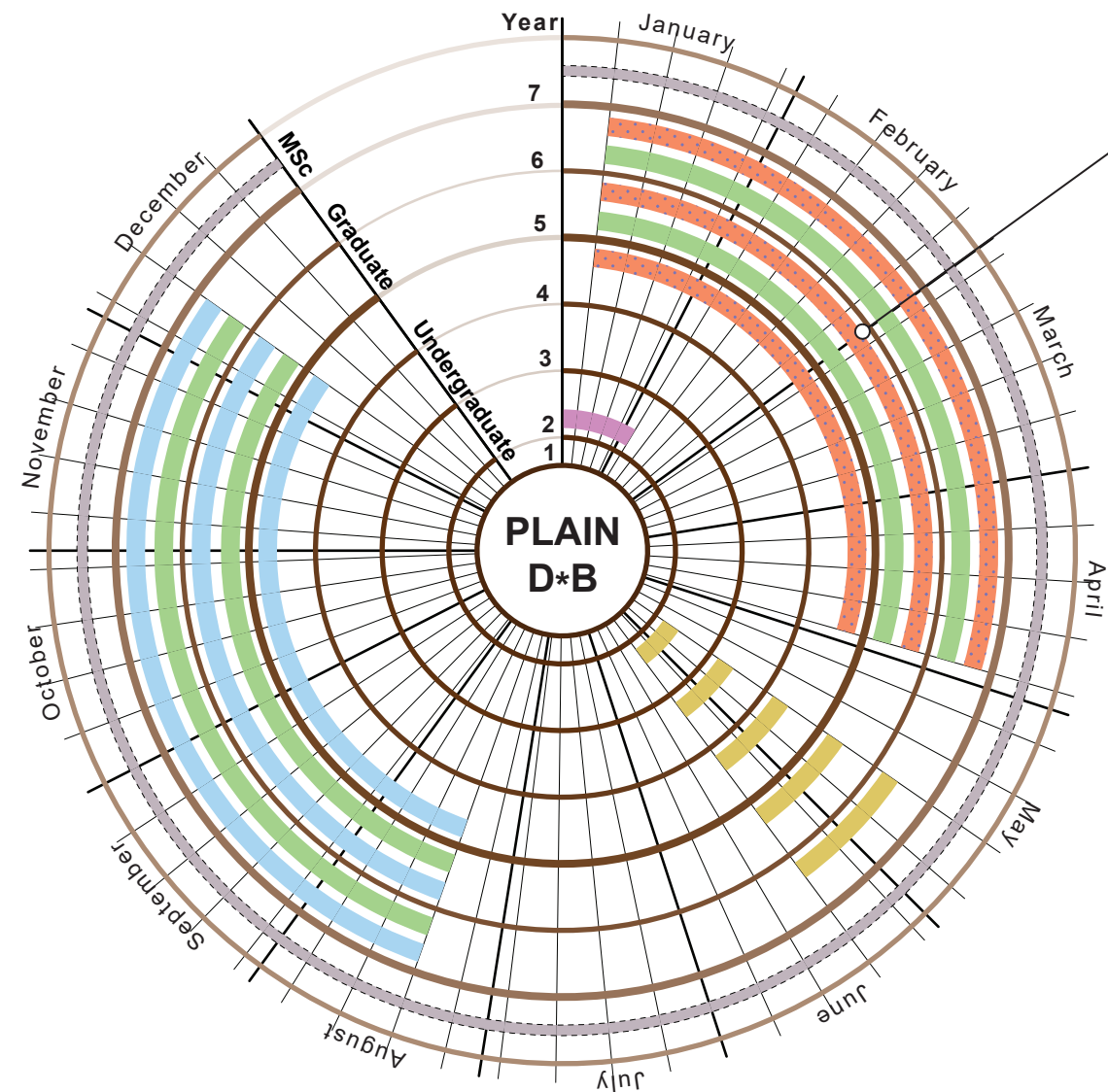
CIRC-LAM will address this by adding to the PLAIN Design-Build course sequence and strengthening the current specialization in engineered lumber throughout the undergraduate and master’s programs. The current sequence begins with components of required classes in year 2 (3-credit Materials and Assemblies), a CLT Professional Elective Innovative Timber Construction (Level 4,5,8), Collaborate Studio (Level 4 DB themes), and Design-Build Design Research Studio’s (Level 5/6). These classes contribute to current grant-funded projects being built by students as part of PLAIN Design-Build. CIRC-LAM is proposed as the most recent program in a phased introduction of specialist courses in the future. These include an undergraduate minor, graduate certificate and an MSc in mass-timber currently under consideration.

While the current 3-credit profession elective (*Innovative Timber Construction*) provides specialized professional knowledge (history of stud construction, CLT panelization, Industry standard digital fabrication, “design-assist” contracting, workflow, specification, delivery, and assembly), there is also a need to address aspects of social sustainability associated with advanced lumber fabrication. The introduction of this elective in the spring semester will complement the fall elective and add consistency to the academic year as a whole. This consistency is needed to deepen the levels of learning.

This course will build on work by PLAIN by integrating an established model of analysis demonstrated through completed projects in local Nebraskan communities. These models are based on grant reporting from the current USDA / U.S.Forest Service Wood Innovations award for the *ASHED* project in South Sioux City and a current report on the effort and impact of the *Mizer’s Ruin* currently on site in Ogallala NE.

PLAIN is a design-build collective based in the College of Architecture at the University of Nebraska Lincoln. It provides opportunities for students who want to experience architecture from inception to completion and who are interested in “learning by doing”. PLAIN constructs buildings for non-profit organizations in the Midwest, Oregon and India and offers students the experience of building with engineered lumber (particularly cross-laminated timber CLT) and locally sourced lumber. It supports the role of making in architecture and promotes the social significance of work within regional communities.

PLAIN is coordinated by associate professor Jason Griffiths (Jason Griffiths Architecture) and supported by the USDA U.S. Forest Service Wood Innovations and the Cecil D. Steward Professorship.



Potential Course Site Visits



★ ASHED
South Sioux City, NE



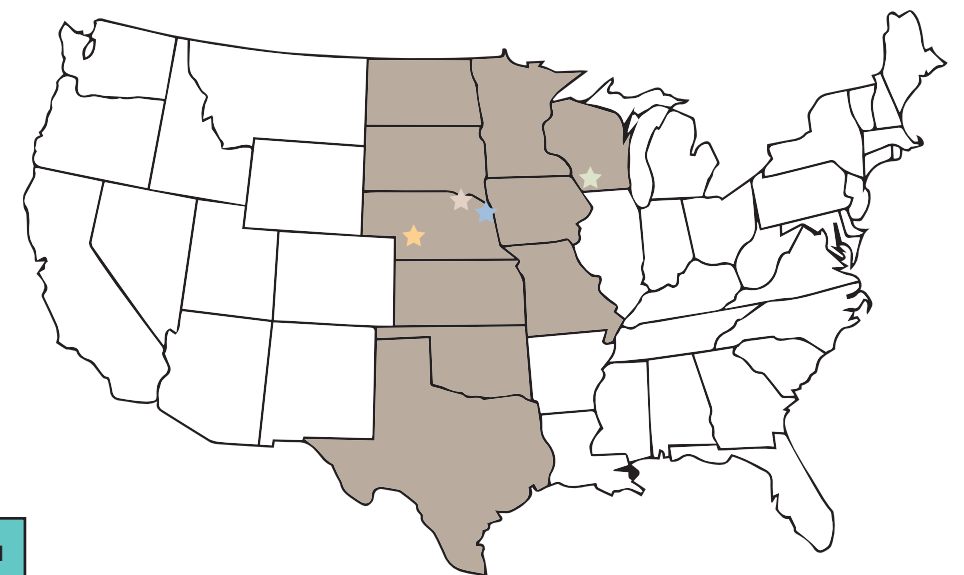
★ Santee Sioux Child Resource Center
Santee Sioux Reservation



★ Immersion 17
Taliesin, Wisconsin



★ BAXA
Ogallala, NE



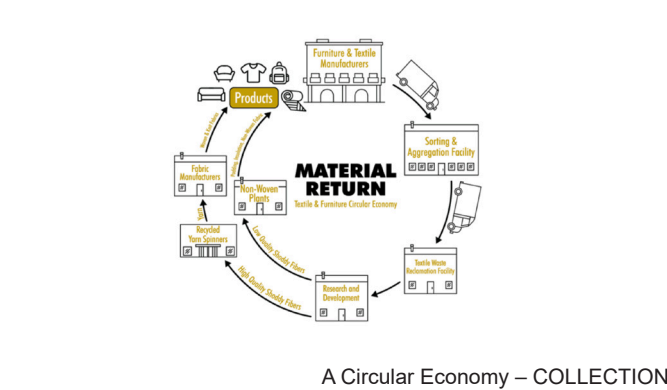
PLAIN D*B

CIRC-LAM

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Work Plan

PHASE I - Knowledge



P1.1 THE CIRCULAR ECONOMY

WEEK 1

This section of the course provides knowledge of circular economies that explore resilient strategies for regional communities. It exemplifies activities that do not “extract” from a community but provide a system where work, economics, production, and the built environment are self-sustaining. It draws on examples of worker-own companies and nano tourism where local economies, production and visitors complete a form of circular economy.

Readings

Stephanie Wakefield - Anthropocene Back Loop
Matthew B. Crawford - Shop Class as Soulcraft - An Inquiry into the Value of Work
John Thackara - How to Thrive in the Next Economy. Designing tomorrow's world today - Intro



P1.2 FORESTRY

WEEK 3

This section explores small-scale forestry from a cultural and historical perspective. It incorporates local scenarios through Nebraska’s Forest Action Plan, which includes an assessment of “locations considered to be priority forest landscapes; the strategies that will be implemented to address the threats and challenges in these areas; and how the agency’s resources will coalesce to bring the state’s trees and forests to a healthier and more sustainable condition.

Readings

Nebraska Forest Service - Eastern Redcedar in Nebraska: Problems and Opportunities
Jabr, Ferris -The Social Life of Forests New York Times.
Eduardo Kohn - How Forests Think: Toward an Anthropology Beyond the Human

PHASE II- Analysis



P1.3 LUMBER PROCESSING - SMALL MILLS

WEEK 4

This section is based on alternative models for milling demonstrated in different regions, including the Great Plains (USA), Tacuarembó (Uruguay) and South Tyrol (Italy). It explores examples of small-scale, family own mills and provides knowledge of harvesting and milling techniques within each context. It focuses on the supply chain from local forestry through its design and application and then offers comparisons to similar mills in the Pacific North West (particularly the Bauman Family Tree Farm near Eugene and PLAIN’s Emerge Project)

Readings

<https://nfs.unl.edu/publications/nebraskas-sawmill-industry>
Nic Crawley Cross Laminated Timber: A Design Stage Primer



P1.4 SMALL-SCALE LAMINATION

WEEK 6

This section applies the instructor’s research activity that explores best practices and manufacturing models from successful European producers. It is specific to small diameter timber production that supports new economic atmosphere within the cross-laminated timber industry. It also explores small-scale lamination procedures and alternatives to hydraulic press production, including vac-forming, mechanical press, and ICT, and includes examples of single and double curvature. It includes presentations from NOVATOP (Czech Republic) and Stoltz Timber (Montana), Holz Meissnitzer & Holzbau Unterrainer

Readings

Pat Clarke - Small Diameter CLT Fabrication Facility Feasibility Study.
Joseph Mayo - Solid Wood: Case Studies in Mass Timber Architecture, Technology and Design

PHASE III - Synopsis



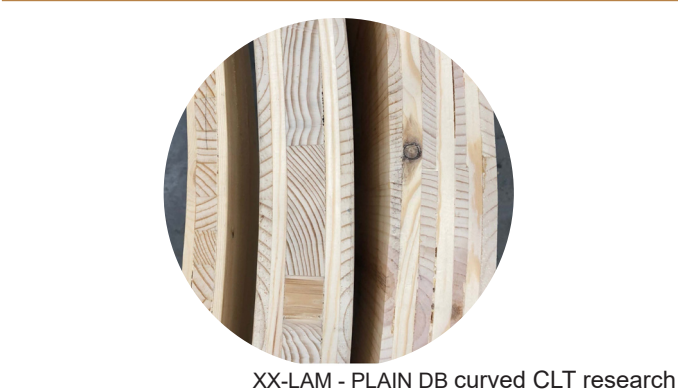
P1.5 COURSE VISITS

WEEK 8

This section will provide students with the opportunity to travel and experience project(s) that provide evidence of CLT construction and local production. These projects will be within Nebraska and drawn from completed PLAIN Design-Build studio projects. These include ASHED (ASCA BD award), The BAXA Cabin (ASCA BD award) and Santee Sioux Child Resources Building. Visits also include local lumber mills that including Timberlyne, Wayne NE and Big Red Palmyra NE.

Readings

Swedish Wood - The CLT Handbook
Vaugh Thistleton Architects- 100 CLT Projects UK CLT



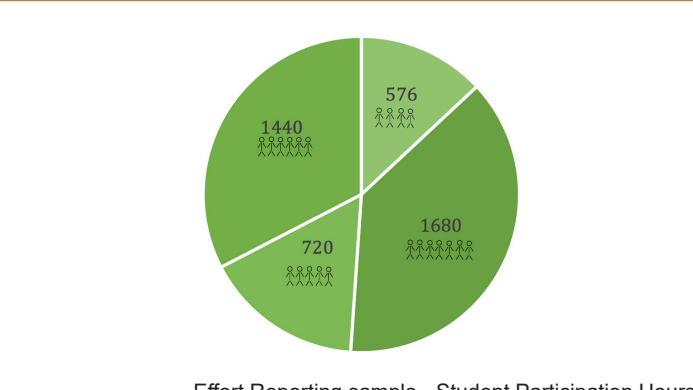
P2.1 SMALL - SCALE FABRICATION ANALYSIS

WEEK 10

In this analytical phase, students will report on a chosen example of regional forestry and fabrication procedures from course lectures. This report will be based on similar reporting for the completed research for XX-LAM curved CLT research and include equipment, resources, and time allocation.

Readings

Pat Clarke - Stoltz Timber Report for USDA Wood Innovations.
Steven L. Sanders - Behavior of Interlocking Cross-Laminated Timber (ICLT) Shear Walls
FPIInnovations. - Introduction to cross-laminated timber. CLT handbook.



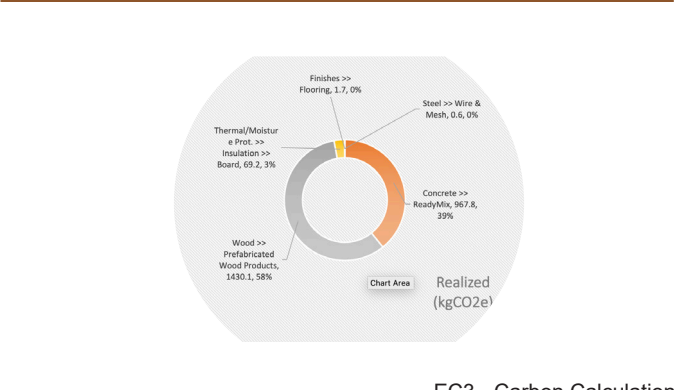
P2.2 CIRCULAR ECONOMY ANALYSIS

WEEK 12

This is followed by an analysis of the social impact within a chosen region. Students will report on the impact with local agents, collaborative partners and user groups that explores social equity, work environments and legacy.

Readings

John Thackara - How to Thrive in the Next Economy. Designing tomorrow's world today. (Selected sections)
The Mizer’s Ruin - CPBS Microdwellling NET Grant Report 20-22



P3.1 LCA AND GWP ANALYSIS

WEEK 16

In the final stage of this course, students will require students to make a comparative study for a future project that applies the analytical models of Phase II. This study will be based on a typical structural bay that demonstrates local forestry production and alternative fabrication for a chosen circular economy. It will also incorporate GWP & LCA metrics and will be carried out in conjunction Christina Bjarvin, PhD /CINTRA-FOR, using embodied energy calculators EC3, SimaPro and Wood Works Carbon Calculator.

Readings

<https://www.cc.woodworks.org/>
<https://buildingtransparency.org/ec3>
David Benjamin - Embodied Energy and Design: Making Architecture Between Metrics and Narratives

Association of Collegiate Schools of Architecture

November 22, 2022

1735 New York Avenue, NW (3rd Floor)
Washington, DC 20006

RE: Jason Griffiths – Letter of Support

Dear 2023 ACSA Timber Education Prize Jury,

I am enthusiastically writing this letter with full support for Jason Griffiths' **CIRC-LAM** course submission for the 2023 ACSA Timber Education Prize and support offering the course in future academic years.

Professor Griffiths's pedagogical approach to small-scale mass-timber and circular economy is exceptional. His work, research, engagement efforts, and student-centered focus have garnered top grants and awards from national organizations, including ACSA (2019 & 2020 Design-Build Award), Nebraska Environmental Trust – Eastern Red Cedar Design-Build Micro Dwelling, and U.S. Forestry Service Wood Innovations Grant. Griffiths utilizes completed and in-construction design-build projects to introduce students to the study and analysis of circular economies. Professor Griffiths' proposed **CIRC-LAM** course brings a fresh and novel lens to the mass-timber conversation by focusing on the impacts of circular economies in the central state's region. I am confident the course will broaden student exposure to this topic, have a regional impact, and garner additional research and scholarly outcomes in the coming years.

In conclusion, Professor Griffiths is an excellent candidate for the 2023 ACSA Timber Education Prize.

Sincerely,



David Karle

Associate Professor of Architecture and Landscape Architecture
Director of Architecture Program
College of Architecture
University of Nebraska

Faculty Bio

Jason Griffiths

BA Hons. Dip. Arch. UK

Associate Professor, The College of Architecture, UNL.

W. Cecil Steward Professor.

2015 Hyde Chair for Excellence.

Jason Griffiths is a UK registered architect and associate professor in the College of Architecture at the University of Nebraska, Lincoln. In 2015 he was awarded the Hyde Chair for Excellence and is currently W. Cecil Steward Professor of Sustainability.

Griffiths' work explores a transdisciplinary approach to engineered lumber, normative systems of architecture and forestry production. His work combines the study of "ordinary" buildings with the emerging technology of cross-laminated timber construction through built projects, architectural writing and funded research. His teaching practice engages architecture students with design-build projects in collaboration with non-profit organizations, CLT manufacturers and academic institutions.

Griffiths received his Masters in Architecture with distinction from the Bartlett School of Architecture, UK in 1994 and began a career that mixed practice with teaching and competition work. After his first competition win he was invited to teach with Sir Peter Cook on the Bartlett's M. Arch. and Dip 9 Unit with Professor David Greene. During the 90s he built a portfolio of competition prizes and teaching positions in London and Oxford. He co-directed graduate studies at the University of Westminster and was senior lecturer at Oxford Brookes University. In 2003 he moved to North America and taught at the Tech de Monterrey, UT Austin, Iowa State and ASU. He has also held visiting positions at ESTAM in Madrid, the AA Visiting School in Chengdu, Sharda University in Delhi and Nirma University in Ahmedabad and from 2017-19 was Professor of Summer Immersion at The School of Architecture at Taliesin in Wisconsin. Mr. Griffiths has lectured widely throughout Europe, Asia and North America.

Griffiths' teaching career is paralleled with architectural competition work winning prizes in eleven competitions including first prize in both the *AA FAB 2009*, *Temple of Laughter*, *Millennium Café* competitions. Other competition prizes include *Future Visions of Kyoto*, *Aomori Housing*, *Shinkenichiku Residential Design* (three times) and the *Oklahoma Memorial*.

In 2018 he established *PLAIN Design-Build* to integrate engineered lumber construction with design-build pedagogy at the University of Nebraska in Lincoln. He is responsible for the first three CLT buildings within Great Plains region with projects for The Baxa Fellowship Residence, the South Sioux City Orchard Facility and the Santee Sioux Child Resource Center. Other projects include *Emerge* at the Bauman Tree Farm in Eugene, Oregon and *Mazo* in Wisconsin along with recent projects in Delhi and Ahmedabad.

His work with PLAIN has been recognized by 2017 WoodWorks/ Wood Products Council Wood Design Award, the 2019 and 2020 ACSA Design-Build Awards. Mr. Griffiths also received a 2017 USDA Forest Service Wood Innovations grant and 2020 Nebraska Environmental Trust grant.

Griffiths' book *Manifest Destiny – A Guide to the Essential Indifference of American Housing* Published by the Architectural Association Press explores a visual anthropology of the North American suburbs. Following its publication Mr. Griffiths received the Deutsches Architekturmuseum (DAM) book award (Typology) at the Frankfurt Book Fair and was included as one of the ten entries in "2011 year in review: Best in architecture" by Los Angeles Times architecture critic Christopher Hawthorne. Other publications include chapters in recent issues of *306090* through Princeton Architectural Press, *Volume Magazine*, *Mas Context* and regular contributions to *UnCube*. He has also been published in *AA Files*, *Architecture*, *JA*, *JAE* and the *Sunday Times*.

Griffiths' professional practice is based on a multidisciplinary approach to architecture working through buildings, competitions, public art, writing and photography. Built work includes *The Lowest House* and the *Duerinckx Residence* along with public art and furniture installations for the City of Tempe. He has exhibited work in London and North America including the solo exhibition *Not What We Bought* at Project Row Houses in Houston.