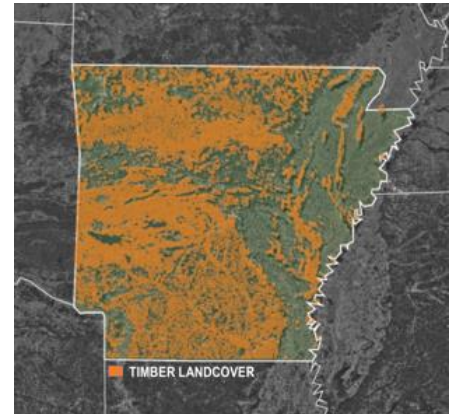


UDBS AR HOME LAB: STREET LEGAL

A BROADER CONTEXT: With nearly 19 million acres of forest land in Arkansas constituting 56% of land cover, architectural design that utilizes wood and timber construction provides a significant opportunity to impact the state's economy. The Fay Jones School of Architecture + Design Urban Design Build Studio (UDBS) has initiated exploration of innovative mass timber technologies that capitalize on the abundance of wood products materialized within the state. Specifically, the *STREET LEGAL* advanced design-build studio will explore the potential of Wave Layered Timber (WLT) as a viable enclosure/structural system to address the affordable housing crisis in the Northwest Arkansas Metropolitan Region. The prototype designed and constructed through the studio will demonstrate the use of the technology for the first time in the United States, offering an opportunity to influence broader-scale implementation by making it *STREET LEGAL*.



ADVANTAGES OF THE TECHNOLOGY: Wave Layered Timber (WLT) is an innovative, transparently simple, and highly efficient technology developed and tested in Scandinavia by project partner WLT Capital. The system relies on the use of standard dimensional lumber, processed through a planer/molder to produce a wave pattern in the longitudinal direction. Stick-by-stick, processed boards are threaded together without chemical adhesives or sealant, and post-tensioned to form structurally integral, architectural elements such as floors, walls, and roofs. These aggregated mass timber elements are entirely Designed for Deconstruction (DfD), minimizing construction waste and enhancing the reusability of processed lumber in the afterlife of dwellings. Reliant on locally sourced and processed dimensional lumber, WLT construction has the potential to enhance carbon sequestration exponentially using a technology that presents a low barrier in job skill training necessary for the development of a missing labor force that can influence construction at scale. The thermal integrity of the enclosure also promotes lower maintenance and utility costs.



Images of processed dimensional lumber composed into a Wave Layered Timber mass timber structural system, photos, IP, and technology WLT Capital .

CONTEXT OF CRISIS AND OPPORTUNITY: By 2040, 80,000 families will move to Northwest Arkansas' four largest cities. To accommodate this growth, the region will need to build 2,900 housing units a year. At present, the four largest cities are only averaging production of 1,400 housing units per year, well below current and projected regional demands. Analytical studies recommend that at least half of the housing units will need to be appropriate for workforce households, defined as a family of four earning less than \$78,000 a year. The reality is that many workers in the region are relying on hourly wages between \$15.00 and \$18.00 per hour (\$31,200 to \$37,440 per year). There is a critical need for focus on those workers represented in the lower end of the economic strata including laborers, teachers, firefighters, health care

workers, and other productive pursuits that contribute to the community every day. Residents increasingly find obstacles in attaining decent housing at affordable rates relative to their incomes, which often prevents people from living in and contributing to the vitality of communities where they work. Ensuring residents have quality homes that support economic diversity must be a priority in forging Northwest Arkansas' future. In addition to potential viability as a vehicle for workforce home construction, WLT construction promises an opportunity for 1) local labor force development, 2) promotion of a regional renewable resource to advantage economic development, and 3) contribution to climate change mitigation. There exists an opportunity to address multiple social, economic, and environmental challenges.

THE PATH: *STREET LEGAL* is the fourth in a series of sequential UDBS AR HOME LAB Advanced Design Studios offered by the Fay Jones School of Architecture + Design focused on an innovative solution to the region's housing crisis. Focusing on scatter site infill development that leverages community assets in mixed-income settings. Specific focus has been placed on Washington County, looking at the municipal boundaries of Fayetteville, AR, and Springdale, AR. Each of the preceding studios has focused on a different dimension of the challenge with a long view – 1) to understand the problem, 2) explore and evaluate potential solutions methodically with a constellation of community partners represented in the newly formed AR HOME LAB, and 3) explore the potential of a selected material system and spatial conditions in support of a pilot demonstration project. The three previous studios that contributed to the identification of a specific *UDBS Workforce16* home prototype that will be developed and constructed through the *STREET LEGAL* studio were:

- **NO DIRECTION HOME**, (Fall 2021) focused on demographic research, stakeholder engagement, partnering networks, regional zoning, and land use analysis, neighborhood contexts, existing home typologies, translated design strategies, and community engagement methods/opportunities.
- **BRINGING IT ALL BACK HOME**, (Spring 2022) capitalized on regional research executed the previous semester to develop a series of broader design intentions that guided the design development of sixteen separate workforce housing prototypes. The studio explored a wide range of programmatic, cultural, spatial, material, and constructive dimensions of consideration before identifying a single, adaptable set of conditions for focus in subsequent studios.
- **PLANET WAVES**, (Fall 2022) focused on the evolution of regionally specific design development of a home that would utilize Wave Layered Timber (WLT) as the primary constructive technology. The proposed prototype has been considered in the context of multiple solar orientations and site conditions and a set of strategies developed that will promote the construction of the pilot project.

A WAY OF THINKING: The *UDBS Workforce16* home prototype is predicated on a Design-to-Income (DTI) strategy. The design is driven by private sector market costs for land, construction, development, and design fees without subsidies, attainable on a local workforce income of \$16.00 per hour. The design of the prototype and land utilization strategies employed consider the bare necessities of what an individual or individual family living off \$16.00/hour needs to provide a threshold step forward in homeownership and generational wealth building. Predicated on the concept of adaptive expansion, this housing prototype will focus on a smaller footprint, with a core conditioned area of 500 GSF, expandable to 1,200SF based on the shell provided.



UDBS AR HOME LAB Developmental drawing of three Workforce 16 Homes on a site in Springdale, Arkansas, Fall 2022

INTENTIONS SPRING 2023: The *STREET LEGAL* Advanced Design Studio will engage students in the refined design and construction of a UDBS *WORKFORCE16* Home chassis in Fayetteville, Arkansas. The Pilot project will be constructed utilizing WLT technology by virtue of a license agreement between the University of Arkansas and WLT Capital. Equipment necessary for the production of WLT has been procured and installed at the Fay Jones School Build Lab for use in the Spring of 2023. Construction of the pilot project will allow for the analysis of the mass timber system for its constructability, cost effectiveness, material efficiency, passive design performance, environmental impact, and viability against regionally accepted technologies. Of equal significance is the testing of cultural dimensions and comfort in accepting the Design to Income (DtI) parameters. Community engagement fostered through the pilot project will establish a tangible understanding of marketability and cultural suitability in ways that drawings and other engagement tools cannot support.

STUDIO FRAMEWORK: The *STREET LEGAL* Studio will focus on final design refinement through the execution of construction documents, physical manipulation of material and project implementation. Students will begin the semester by analyzing the current design and developing coherent material production, assembly, and implementation plans for the home. Students will work with faculty, consultants, and AR HOME LAB allied partners in estimating, quantifying, and analyzing construction strategies and assemblies. The AR HOME LAB and this specific project have been funded by the US Forest Service, BANK OZK, and the Walton Family Foundation to facilitate the development of a sustaining network of professionals who can complement the assets represented in a Research 1 University. Resources needed for construction and mortgaging will be managed through conventional secured finance vehicles as a measure of market viability. The educational experiences of students will be complemented through travel and exposure to home pre-fabrication facilities and non-traditional development communities throughout the United States. The processing of all pre-fabricated elements required for the completion of this project will occur in the Fay Jones School Build Lab. The project schedule framework outlined below is tied to project milestones, but will be adjusted as the demands of construction demand:



UDBS Students working on large scale *Workforce16* models at the FJS Build Lab as part of the *Planet Waves* Studio, Fall 2022

MOBILIZING (3 Weeks): Focus of work will be design refinement, document development, coordination with consultants, and mobilization workflow identification. All staging and review will be completed with partnering Authorities Having Jurisdiction (AHJ's) and material orders completed.

MOVING: (1 Week) Students will travel with faculty to Dallas, TX, Austin, TX and other destinations in the near southwestern region of Arkansas to visit home manufacturing plants, mass timber manufacturing facilities, and innovative housing developed without subsidy.

MAKING WAVES (2 Weeks): Students will process all dimensional lumber required to construct the WLT building envelope system, quantifying waste and preparing boards for threaded rods and post tensioning. All processed materials will be transferred from the Build Lab to the project site.

PROTOTYPING (8 weeks): The UDBS *WORKFORCE 16* prototype WLT chassis will be constructed on site with monitoring equipment/sensors embedded.

ENGAGEMENT (2 weeks): Construction will be finalized and analysis of the process compiled. Preparation for extended stakeholder and community engagement to review viability of the prototype as a home for the Northwest Arkansas workforce.

A FUTURE/NEXT STEPS: Construction of the UDBS *WORKFORCE 16* prototype in the Spring of 2023 will advance partnerships with a local General Contractor, promote workforce training opportunities within the region, and validate cultural relevance. Practically it is poised to establish WLT as *STREET LEGAL*.

ORGANIZATIONAL BACKGROUND/FACULTY BIOS

Urban Design Build Studio (UDBS)

The Urban Design Build Studio (UDBS) is a university affiliated 501c3 non-profit organization that focuses on Public Interest Design (PID) and Community Empowerment. The UDBS is a collaborative of students, professors, and allied professionals who work with community residents on the implementation of appropriate, affordable, replicable design solutions. The design and construction processes employed by the UDBS value collective intelligence as the primary path to success in influencing positive futures for the greatest number of people through design. A fundamental belief that the scale of solutions must be calibrated to meet the scale of a problem informs an ethic in team building. The educational priority of the UDBS places value on teaching students to be thoughtful designers, makers, and citizens. Fundamental to that educational priority, the needs of underrepresented communities and residents that the UDBS serves drive scheduling and realization of work.

Founded in 2008 by John Folan, the UDBS has implemented a total of 87 projects with community residents. At present, the total value of that construction exceeds \$26,000,000.00. All projects are still in use by original clients/communities with many being replicated. 1,294 community residents/apprentices have graduated from job skill training programs that the UDBS supports through formalized partnerships. resulting in living wage employment through the construction industry, that the UDBS has supported through formalized partnerships. Over 600 students have been involved in the realization of work, benefitting from a constellation of consultant expertise represented by 102 formal partnerships. The UDBS actively pursues funding in collaboration with and on behalf of its partners as a means to community empowerment.

John Folan AIA, LEED AP BD+C is Head of the Architecture Department and Professor at the Fay Jones School of Architecture and Design (FJSoA+D), University of Arkansas. He is Director of the Urban Design Build Studio (UDBS) which he founded in 2008 while appointed as the T. David Fitz-Gibbon Chair in Architecture at Carnegie Mellon University. Through the UDBS and other collaborative ventures John has demonstrated a long-standing commitment to work with underrepresented communities in the development and implementation of catalytic projects informed by participatory design processes. His work prioritizes public interest, social justice and equity as a productive end. In 2011 John founded and assumed responsibility as the Executive Director of PROJECT RE_ to expand the capacity of the UDBS in Western Pennsylvania through strategic partnerships with other non-profit entities in addressing problems of regional significance at scale. His leadership in the realization of PROJECT RE_ has straddled transactional and physical dimensions of purpose in the promotion of entrepreneurial opportunities for under-represented populations, provision of job skill development, and demonstration of innovative design centered construction; supporting simultaneous aspirations of community restoration, resident empowerment, and material resource advocacy. John's work with the UDBS and community partners has been published widely and exhibited internationally with dedicated installations at the 2021 Venice Biennale, 2016 XX Pan American Bienal de Arquitectura Quito, Ecuador and the 2014 Hong Kong/Shenzhen (UABB) Biennale. The work of the UDBS under John's direction has been recognized with over thirty American Institute of Architect (AIA) Design Excellence Awards, numerous AIA/ACSA Collaborative Practice Awards, AIA/ACSA Housing Design Education Awards, ACSA Design Build Awards, the ACSA Practice+ Leadership Award, and four Design Corps SEED Awards for excellence in Public Interest Design. In 2018 the Urban Design Build Studio (UDBS) was named the American Institute of Architects (AIA) Impact Practice for sustained ability to span a wide range of design disciplines that are tied together by a common goal to design and create a better world through innovative, scale-able and measurable solutions. John's work in leading a group of students in formulating a Freedom By Design Chapter that created a pilot project focused on weatherization for low-income families was recognized with the first NAACP NOMAS SEED JEDI award of excellence in 2021.

Previous efforts in university affiliated, community-based design and construction initiated while he was a tenured faculty member at the University of Arizona, co-founder, and co-director, of the Drachman Design Build Coalition (DDBC); resulted in the construction of environmentally specific, energy efficient, affordable housing prototypes that privilege understanding of renewable material resources. Projects completed by under John's direction of the DDBC, implemented in Tucson's Urban Empowerment Zone have been recognized with three consecutive AIA Arizona Awards for *Residence of The Year*, the 2011 AIA/ACSA Collaborative Practice Award, and the 2016 Design Corps SEED Award for excellence in Public Interest Design. Urban strategies employed in the implementation of the DDBC work influenced the collaborative development of the Drachman Institute's legislative proposal for regionally specific sustainability guidelines. The work was

recognized with first place award in the 2008 National Urban Policy Initiative Competition (NUPIC). His efforts in academically affiliated design-build work are informed by extensive experience in professional practice which spans the realms of urban design to refined detail execution. In 2020 John was recognized by the AIAS as Educator of the Year in their international honor awards program. He is currently leading implementation focused research in wood and mass timber funded through two USFS Wood Innovations Program Grants totaling \$400,000.00 in value. In 2019 he initiated the formation of a housing innovation coalition at the University of Arkansas, the UDBS AR HOME LAB.

Candi Adams AIA, LEED AP BD+C is a Teaching Assistant Professor at Fay Jones School of Architecture + Design. Joining the faculty in 2020, she has been working with the UDBS AR HOME LAB to research and develop affordable housing prototypes that are designed to be regionally specific and culturally sensitive to the various ecoregions of Arkansas. Candi has an inherent interest in design innovation as a catalyst for community and economic development, specifically in relation to quality of life. Candi spent the previous 15 years practicing in architecture and community development throughout Arkansas, including the heavily forested Timberlands region of south Arkansas. With a Bachelor of Architecture from the Fay Jones School, and a Master of Science in Community Development, Candi's teaching pedagogy is centered in the empathetic and sociological impact of design. As a licensed professional, Candi has extensive experience in various scales of architecture from single family residential, to large scale healthcare and public education, to community master planning. Her most notable projects involve community and stakeholder engagement utilized in projects that catalyze community and economic development. She has also has extensive experience in construction administration, and full cycle project development from procurement to post occupancy evaluation.

Candi has worked with the Fay Jones School UDBS AR HOME LAB, and co-taught a series of Advanced Design studios with John Folan centered on affordable housing in Northwest Arkansas. The work has been funded by grants secured from the Walton Family Foundation, Bank OZK, Alice Walton Personal Philanthropy Group, the United States Forestry Service (USFS), and Weyerhaeuser Company. Candi has a long history of professional and community involvement, including work with the American Institute of Architects, Arkansas chapter, serving 16 years in some capacity of the state Board of Directors. She co-founded the AIA AR Diversity Committee, which she chaired for three years, and also co-founded Women in Architecture of Arkansas, a component of AIA AR that promotes equity in gender issues relative to Architecture. She has worked with the National Council of Architectural Registration Boards on various ARE Development Committees. Locally, Candi has served with a number of nonprofit organizations, and holds a personal interest in public education, having served with the local School Board and other education related organizations. She has focused efforts in working with the Fay Jones School Urban Design Build Studio (UDBS) AR Home Lab to develop affordable housing prototypes utilizing local resources that promote affordability, sustainability, and viability in current market forces. Developing a sensitivity for emerging designers to understand the relevance of local conditions, demographics, resources, networking capacities, and construction techniques is a primary objective as an educator.