Mid-Rise, Reimagined

AUAR's scalable solution for sustainable, affordable mid-rise housing

This project was supported by Innovate UK funding.

AUAR

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Industry Impact

AUAR
Mid-Rise System

45% Less embodied carbon than concrete

4% Lower cost than concrete

43% Faster than in-situ concrete construction

52% Less timber than CLT

AUAR’s approach

AUAR is redefining how housing is designed and delivered by combining robotic timber panel manufacture, decentralised micro-factories, and an integrated digital platform, MasterBuilder. Through a Hardware and Software as a Service model, developers and contractors can access automated fabrication, structural optimisation, and compliance-ready detailing with low capital expenditure and predictable delivery.

The AUAR system enables low-carbon, high-performance buildings that are cost-competitive, locally adaptable, and scalable. AUAR’s robotic micro-factory fits within a shipping container and can be deployed on or near site anywhere in the world, enabling fast, low-labour assembly. Digitally integrated design ensures material efficiency, early cost certainty and regulatory compliance from the outset.

The challenge

Mid-rise housing plays a critical role in delivering sustainable urban density. It offers far greater land efficiency than single-family housing while avoiding the cost, complexity and carbon intensity of high-rise construction.

The UK mid-rise housing market is still dominated by in-situ concrete. Its appeal lies in low cost, shallow structural zones and lower perceived risk, but this comes at the expense of high embodied carbon, limited reuse potential and slower construction programmes. CLT offers a lower-carbon alternative, but its high material intensity, cost, and reliance on specialist overseas supply chains have restricted its scalability.

AUAR asks the question: what if sustainable mid-rise construction could out-compete concrete and CLT on cost, speed and risk?

Image: The AUAR micro-factory in transportation

Image: The AUAR micro-factory delivery on site

Enabled by digital manufacturing

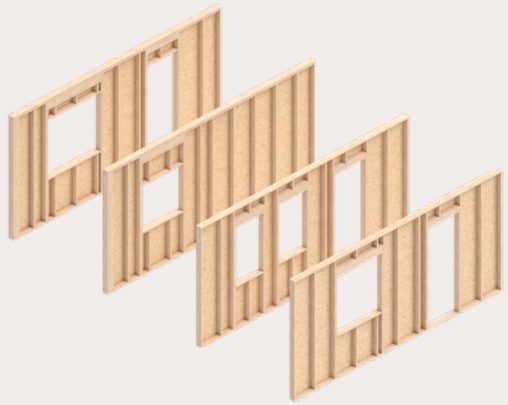
This level of optimisation has not previously been viable in mid-rise construction. Precisely controlling the position of every stud, joist and fastener across a multi-storey building would be prohibitively time-consuming and error-prone using conventional design and construction methods.

AUAR's MasterBuilder platform makes this possible. Architectural layouts are automatically translated into manufacturable components, with embedded structural analysis distributing material in line with actual loads. Predefined, compliance-tested fire and acoustic details are applied consistently, and instructions are sent directly to the robotic microfactory. A fully resolved digital twin down to the detail of individual fixings provides early-stage cost certainty, accurate carbon accounting, and guaranteed buildability.

This enables faster design iteration without compromising compliance or performance. The result is a repeatable, scalable delivery model for high-quality mid-rise housing.

MasterBuilder translates designs directly into optimised, compliance-tested components for robotic production. Digital manufacturing enables precise control of the position of every stud, joist, and fixing.

Image: The AUAR V3 Cell in operation



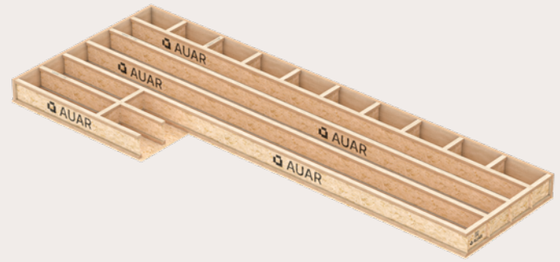


Image: AUAR wall and floor panels produced by robot

The AUAR mid-rise system

AUAR's mid-rise system overcomes the fundamental inefficiencies of existing solutions by rethinking timber construction at a structural level. It works with locally available solid timber, anywhere in the world, using entirely mechanical fixings and no adhesives. The system retains the programme advantages of panelised construction while competing directly with concrete on cost.

The real strength of Timber

In the United States, timber buildings of up to seven storeys are often delivered using traditional platform framing. In Europe, more stringent acoustic and vibration requirements lead to heavier floor build-ups, while stricter Eurocode provisions make it difficult to justify compression through floor zones beyond three to four storeys.

Timber's compressive strength is approximately ten times higher parallel to the grain than perpendicular to it. By maintaining vertical continuity of studs within light-frame timber walls, load capacity is dramatically increased, enabling taller buildings with significantly less material, and avoiding the compression limitations of platform-frame buildings.
Unlike conventional platform framing, AUAR's mid-rise system removes intermediate horizontal elements at floor levels, and studs are locally notched so floors can bear without interrupting continuity. Load is transferred directly from stud to stud in a continuous vertical load path, with tolerances tightly controlled through robotic fabrication.

> Keeping loads parallel to the timber grain enables taller and stronger buildings with less material. AUAR's system uses mechanical fixings, no adhesives, and is fully compatible with local C16 timber

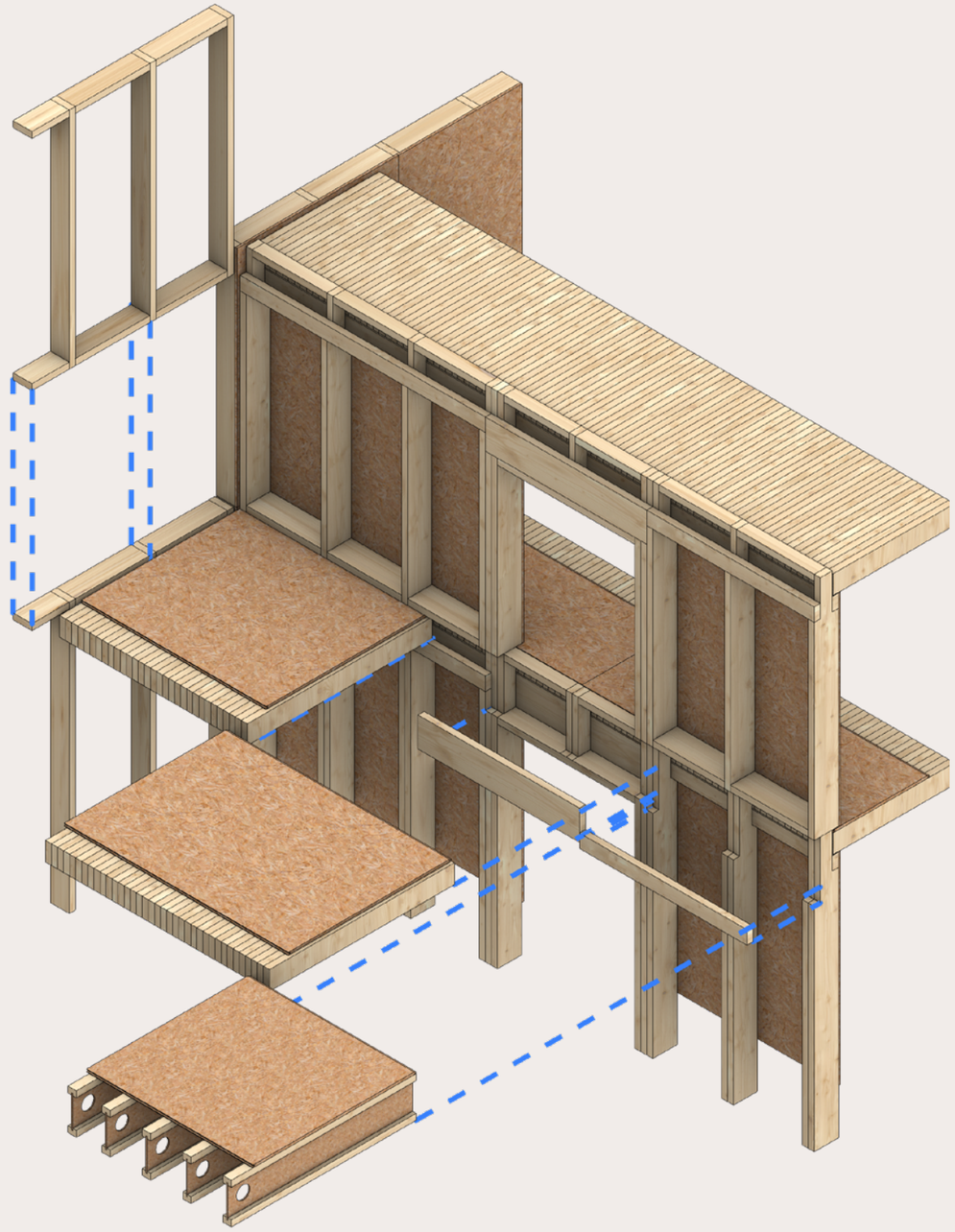


Diagram: AUAR mid-rise system

Material where you need it

Material efficiency is further improved by varying stud spacing in response to load: denser where forces are highest, and lighter towards the upper storeys where demands reduce.

The same principle applies to floors. Where spans are shorter, joists can be more widely spaced. For higher loads or longer spans, joists are placed closer together and, where necessary, transition to nail-laminated timber (NLT). NLT allows floors to be manufactured with the same supply chain and component materials as the walls (solid timber and mechanical fixings), and can achieve long spans with lower structural depth and better fire performance than CLT. Where the structure is hidden, or integrated services are preferred, the system is also compatible with I joists.

The result is the high strength and tight structural zone required to be competitive for midrise construction, using less than half the material than an equivalent CLT building.

Material efficiency is optimised by varying element spacing in response to load - denser where forces are highest, sparser where they reduce. The result: high strength, slim structural zones, using less than half the material of an equivalent CLT building.

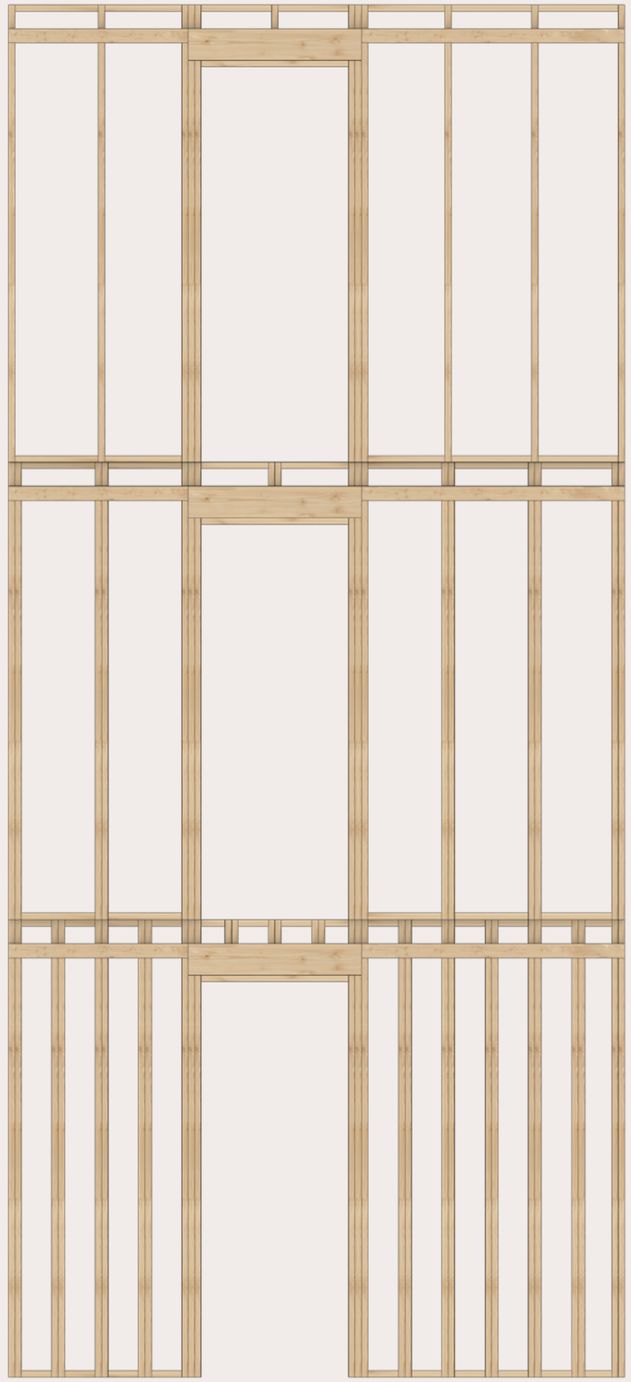


Diagram: Wall frame elevations showing varying stud spacing in response to load

Proven performance

Pilot Project

To validate the system, the AUAR mid-rise solution was applied to a six-storey UK residential pilot project adapted from a project designed by Waugh Thistleton Architects.
All key details were developed to meet or exceed regulatory requirements, with cost and carbon performance established and benchmarked against equivalent concrete and CLT designs to demonstrate market viability.

The pilot project design was developed and validated with leading industry partners:

- Architecture
  Waugh Thistleton Architects
  Validated layouts, head heights, spatial efficiency and usability.

- Structure & MEP
  Webb Yates
  Fully optimised walls and floors using C16 local timber, and verified stability, disproportionate collapse and robustness.

- Fire & Acoustics
  Jensen Hughes & RMP Acoustics
  Validated all key details against legislative fire and acoustic standards in the UK and beyond. Details verified using acoustic simulation.

Validated by leading industry partners, a fully detailed pilot project demonstrates compliance with all regulatory requirements. Cost and carbon performance benchmarking proves market viability.

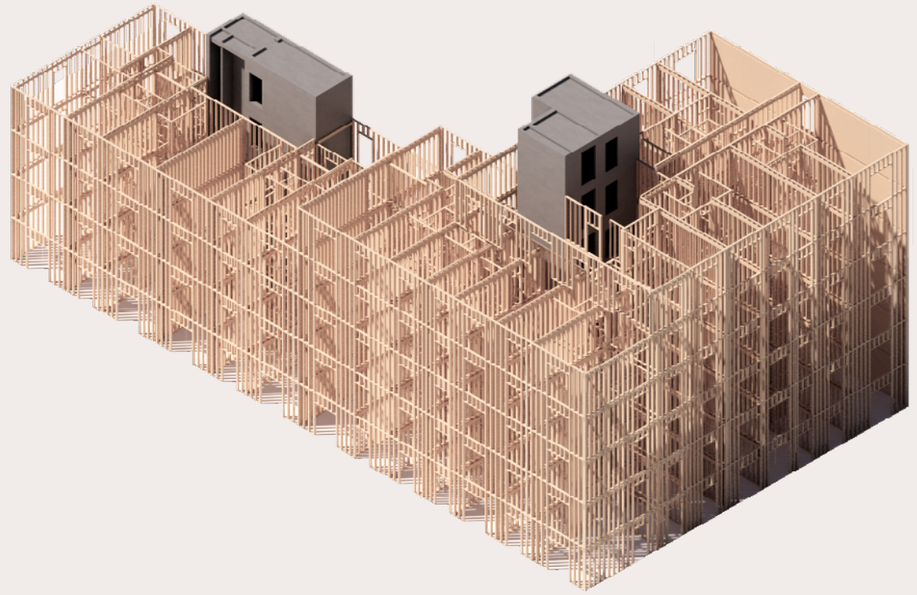
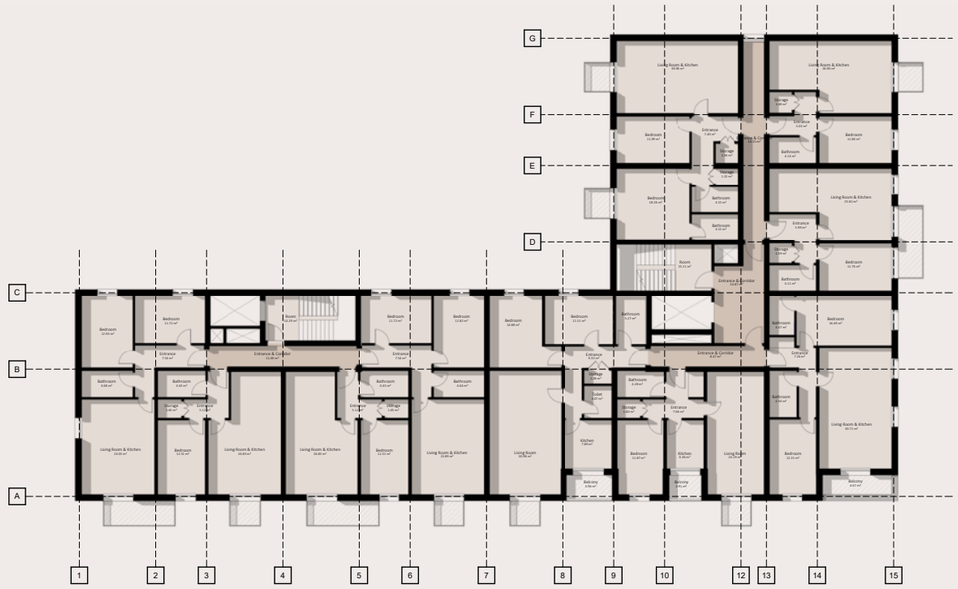


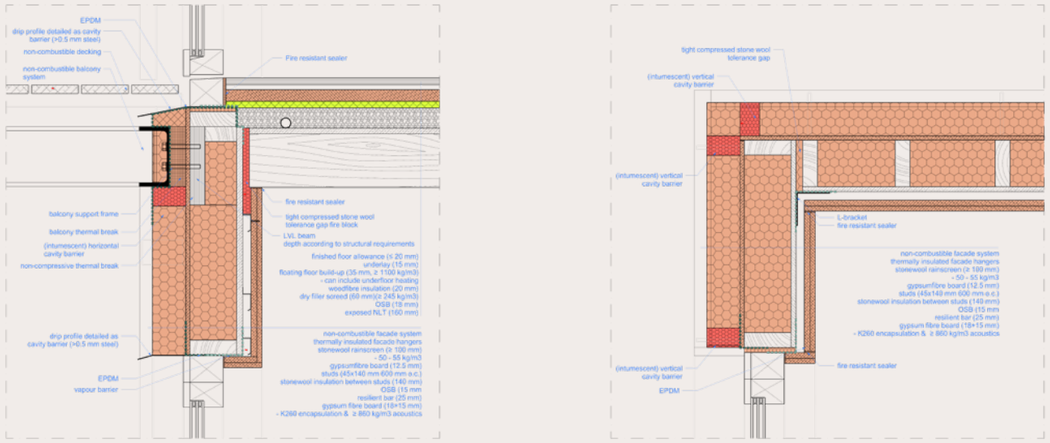
Image: Pilot project in construction



Plan: Pilot project typical floor plan

Build-up Design

Build-ups prioritise natural materials and avoid wet trades wherever possible, with connections designed for disassembly to maximise circularity at the end of the building's life. Details are developed to meet the stringent requirements of UK regulations, while remaining readily adaptable to other markets, including the option to expose NLT floors within apartments where permitted by fire regulations.



Drawing: Connection details

Build-ups prioritise natural materials, avoid wet trades, and use connections designed for disassembly. Details meet stringent UK regulations while remaining adaptable to other markets.

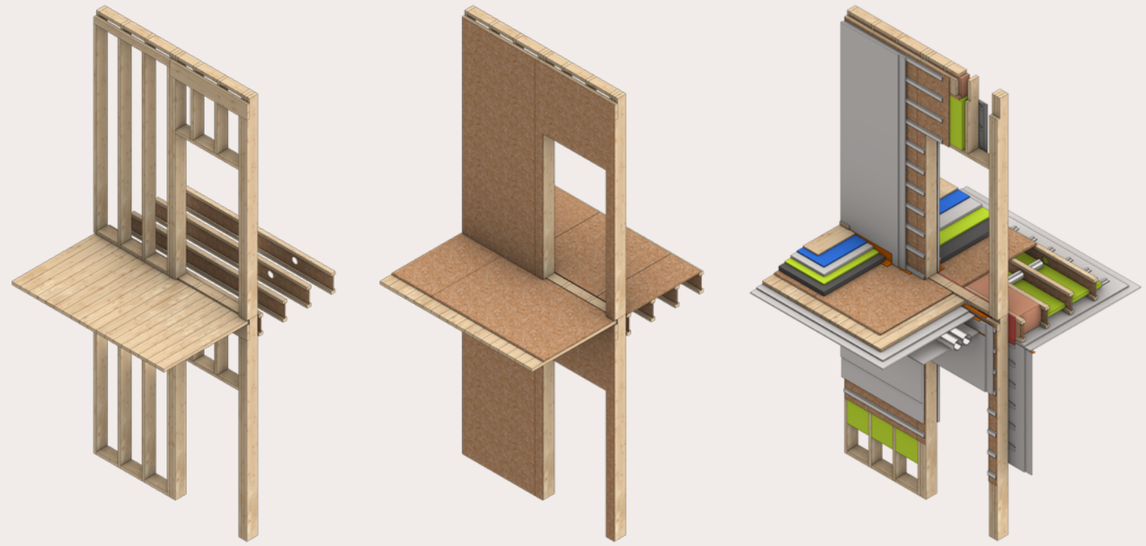


Image: I-joist and NLT floor with build-ups

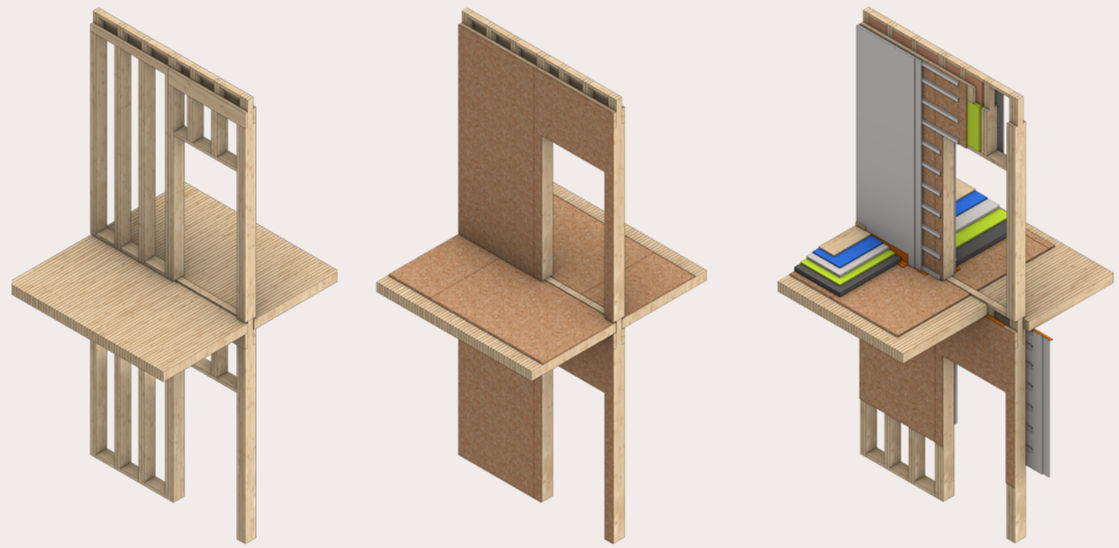


Image: NLT floor with build-ups

Image: Timber frame structure

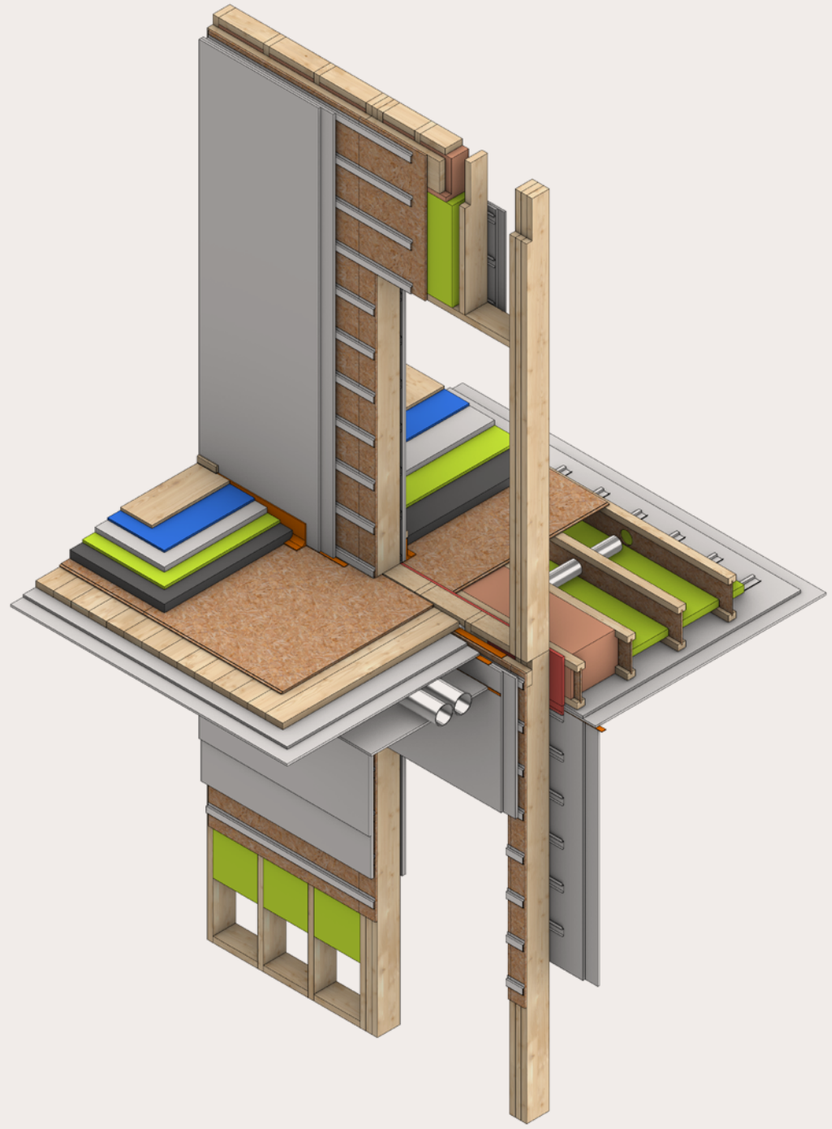
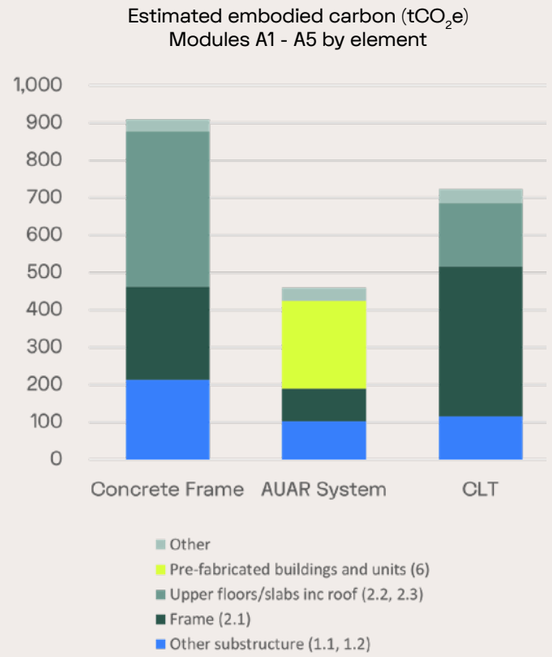


Image: Timber frame structure with build-ups

Sustainability impact

The AUAR system delivers substantial, measurable carbon reductions compared with equivalent buildings constructed in both

- A 45% reduction in embodied carbon compared to a concrete frame (UK concrete with 25% GGBS), including all additional layers required for fire protection of timber and acoustics.
- Over the building's lifetime, the AUAR mid-rise system stores more carbon than is emitted during construction, sequestering more than 600 tCO_2e.
- Less than half the volume of timber is required compared to an equivalent CLT building, with none of the end-of-life complications associated with adhesives.
- Unlike conventional prefabrication models that transport finished panels, AUAR ships only raw materials and manufactures panels on or near site, eliminating post-manufacture transport emissions and embedding production within local supply chains.



45% less carbon than concrete
52% less timber volume than CLT

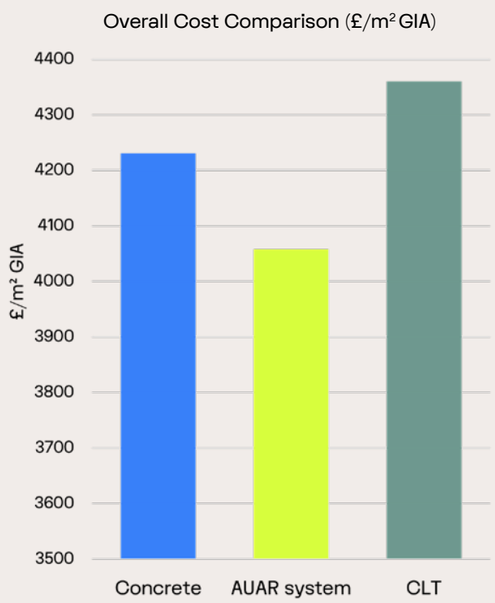
Image: The AUAR micro-factory in operation

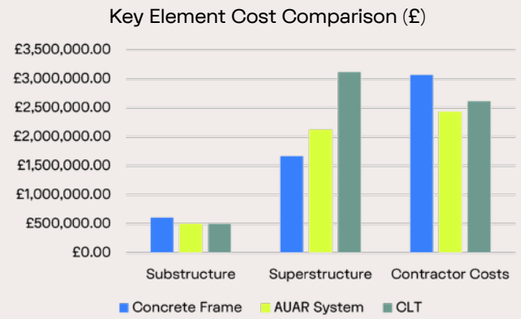
A scalable alternative for mid-rise housing

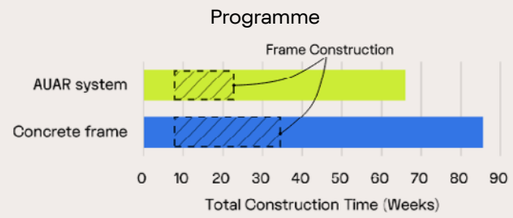
Cost & Programme – Gardiner & Theobald

A detailed cost plan was produced by Gardiner & Theobald for the pilot project fully designed and detailed in both the AUAR mid-rise system and an in-situ concrete equivalent.
The analysis demonstrated that:

- The AUAR system delivered the building at £172/m² GIA cheaper than the concrete alternative, including allowance for all additional layers required to meet fire and acoustic requirements.
- The AUAR system enabled a 66-week overall construction programme, compared to 85 weeks for in-situ concrete. This resulted in significantly reduced contractor preliminaries and overheads.
- The reduction in material volume in the AUAR system resulted in a 30% lower superstructure cost compared to CLT.







Graphs: Cost and programme comparisons, based on fully developed schemes for each material, and construction in greater London

Image: The AUAR micro-factories in operation on site

AUAR's mid-rise solution combines the efficiency of light timber, the speed of prefabrication, and the certainty of digital delivery, without the cost and material excess of mass timber or the carbon burden of concrete.

The AUAR mid-rise system is a commercially viable system for delivering sustainable mid-rise housing at scale.

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