TIMBER 2018

INDUSTRY YEARBOOK

TRADA

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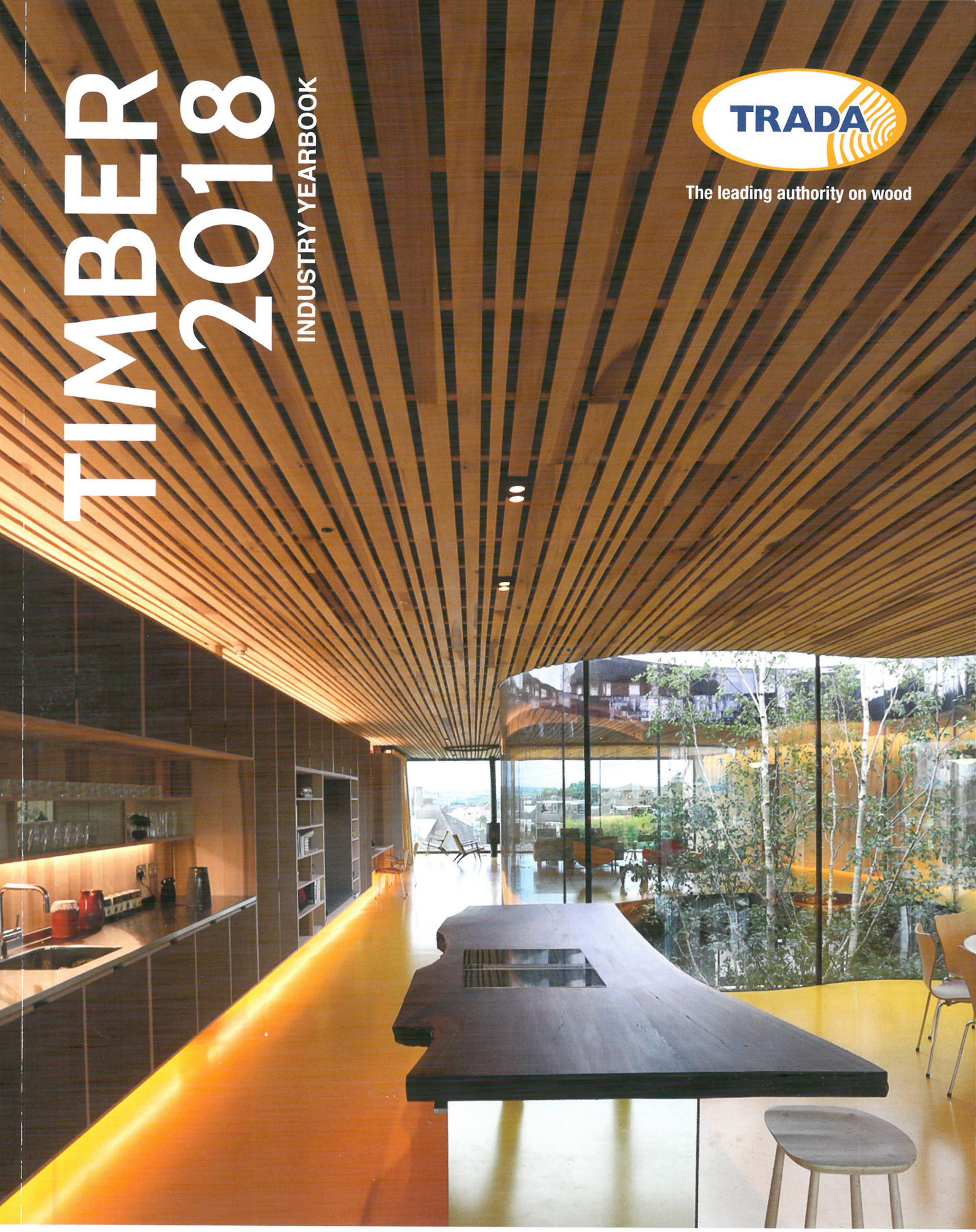


KEY TIMBER TOPICS

Tall timber's rising profile
Hybrid timber – the optimum solution?
CLT cost comparison

PROMINENT PROJECTS

GSK sustainable lab
Hastings Pier
Glulam and CLT case studies

TECHNICAL FEATURES

Sole plates and timber frame
Party wall thermal bypass
Cladding, decking and fencing

A TO Z OF TRADA MEMBERS BUYERS' GUIDE

Engineered timber
CLT

More for less

In this article **Kieran Walker** describes how using CLT resulted in more living space and better environmental credentials in a mixed-use development.

"The structure of Dalston Works consumes less than half the embodied carbon of an equivalent concrete frame."

CLT can help deliver high-quality, high-density housing, such as at Dalston Works
Photo: Daniel Shearing

Conceived as a cross-laminated timber building from the outset, Dalston Works, a mixed-use development, showcases how the innovative use of sustainable materials like CLT can help deliver high-quality, high-density housing without compromising the environment.

Located in east London, Dalston Works comprises 121 new affordable and private for rent apartments alongside 3500m^2 of commercial space. Situated on a former brownfield site, the building is divided into several discernible volumes and orientated to maximise daylight for courtyards and living spaces. The building's intricate brickwork references the surrounding Victorian and Edwardian housing and detailing of local warehouses, providing a contemporary addition to the local streetscape. The two courtyards bring quality external space to an otherwise hard landscaped local environment and are flanked by shops and restaurants. To the south of the site a flexible workspace hub caters to the growing creative community in Dalston.

Why CLT?

Truly sustainable design should consider the environmental impact of construction materials alongside the energy use of the building. However, convincing clients that this inherent sustainability adds value to their project is often a tougher sell, particularly given that one of the key benefits of timber – carbon sequestration – is not significantly acknowledged within common accreditation schemes or Building Regulations.

Using over 4,500m^3 of timber, the structure of Dalston Works consumes less than half the embodied carbon of an equivalent concrete frame. The carbon stored within the timber amounts to 3756 TCO_2e, so in building the scheme we have removed carbon from the atmosphere.

Environmental benefits aside, what appeals to developers is the speed at which CLT buildings can be constructed, as this contributes to reducing programme costs. There is also an acknowledgement that CLT improves both thermal performance and air tightness as a result of its low thermal conductivity, the off-site manufacturing process and the reduced reliance on third party components to complete the design respectively. >>

Interior of an apartment at Dalston Works. Photo: Daniel Shearing

While these benefits are attractive in their own right, it was predominantly the lightweight property of the material itself that led to CLT being adopted on Dalston Works. Weighing an estimated one-fifth of a comparable concrete structure, the use of timber enabled us to address specific site issues. Constrained by the proposed Crossrail 2 zone below, there was a limitation on the gross weight of the building, meaning piled foundations were not an option.

Due to the reduced weight of the building, a minimal raft foundation was possible and we were able to design 35 more homes than would have been achievable using traditional construction methods. The result: a more viable scheme for our client, more homes for Londoners and better re-use of a brownfield site.

Liberating space

The loadbearing timber structure, engineered by Ramboll, includes solid CLT walls, floors, lift shafts, stairs and parapets, initially supported at first floor level by a concrete transfer deck 500mm thick. The wall panels reduce in thickness as the building climbs, liberating additional floor space at upper storeys. Floor panels also reduce in thickness at higher levels increasing floor to ceiling heights; an efficient use of CLT. In order to transfer vertical load from the external walls and mitigate the risk of deformation at the edge of the floor slab, many of the CLT floor panels incorporate grout "plugs" at regular intervals along their length. These plugs, poured in-situ during erection, sit within pockets machined from the panels during the fabrication process, acting to reduce vertical movement and creep.

Internal walls forming the enclosure around the stair cores are the thickest within the building (typically 160mm) and are designed to resist shear forces. It is in these locations that the most substantial of the Rothoblaas brackets – in some cases reaching 620mm in length – are used to secure the CLT against uplift. Many of these were recessed in order to mitigate the loss of interior floor space and clashes with internal finishes.

As a building exceeding 18 metres in height, the structure is required to provide a minimum 90 minutes fire resistance, as governed by the provisions of Approved Document B. This requirement was achieved by lining the CLT with two layers of plasterboard, after first assessing well established data detailing CLT charring rates to determine suitable panel thicknesses. However, where permitted – namely the commercial block to the south which links the two residential portions of the scheme – we have been able to retain exposed soffits as a means to showcase the CLT within.

Façade

Dalston Works incorporates more than 500,000 Petersen-Tegl bricks, supported at each floor level with a masonry support bracket whose datum follows the line of the window heads. While the masonry support would traditionally be found at the slab edge (of a reinforced concrete frame), with high-rise CLT it is prudent to avoid this location where as noted above, any movement is most likely to occur. By adopting this strategy we were able to avoid the installation of individual lintels at window heads, resulting in a time saving on site. This approach also >>

mitigates differential movement and liberates the space at the slab edge, simplifying the installation of cavity barriers and balcony supports. As a consequence of this approach, the façade incorporates conventional 10mm horizontal and vertical movement joints across it.

Pre-clad panels

One of the more challenging technical aspects of the build involved installing pre-clad CLT panels along the wall at the boundary to the south. This was necessitated by the party wall condition, which restricted us from building against the neighbouring wall.

The solution, developed in conjunction with sub-contractor BKS, was to develop a pre-clad panel design that could be installed without the need for perimeter access. The CLT panels are lined with a breather membrane, insulation and a rain screen cladding system finished with a class 0 rated proprietary board. The large format wall panels include ventilation grilles at their base and head, and PPC flashings that direct water away from the facade. To allow for tolerance and ensure a good seal between component panels, compressible rubber gaskets were applied around the edges.

Completed panels were inspected by WTA and BKS for compliance with the design intent during construction at MHB's factory in Austria, before being exported for installation on site. This is an indication of the collaborative working environment this project fostered, and the versatility of pre-fabrication as a means to address tricky site constraints more efficiently.

'Modernise or die'

Over the last 12-18 months, off-site fabrication and modern methods of construction have gained significant traction, particularly as a potential solution to the UK's well documented housing crisis. The Farmer Review was significant in bringing this to Government attention, stating clearly the need for the construction industry to 'modernise or die'. In the London context, the recent "design, sealed and delivered" report commissioned by the London Assembly further emphasises the benefits of off-site construction as a means to address the homes shortage.

Of course, the housing crisis is complex and requires strategic thinking that examines the way in which housing is procured, maintained and delivered. Nonetheless, the benefits of off-site manufacture, including panelised and volumetric timber solutions, are difficult to ignore. Off-site manufacture speeds the delivery of new buildings and will help to mitigate the traditional skills shortage that is likely to be exacerbated post-Brexit. It reduces the traffic on our roads and the carbon in our atmosphere;

Off-site construction can help address the housing crisis. Photo: Daniel Shearing

it improves the health and safety of workers and improves quality; it helps unlock tricky sites and reduces disruption.

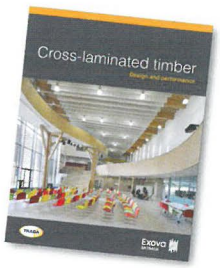
It will take time for the benefits to be felt more widely, but forward thinking architects, engineers, suppliers, and contractors continue to lead the charge, changing the construction industry from the inside out. Indeed, we are heartened to see CLT featuring prominently within half the buildings nominated for this year's RIBA Stirling Prize.

For our part, almost all of our current projects are CLT or timber based. We are also working with a number of housing providers to develop engineered timber modular housing.

Notwithstanding the positivity and momentum behind offsite timber technologies, more needs to be done at Government level to encourage this evolution. Changes in planning policy and legislation are required to ensure that low embodied carbon technologies – and not just low carbon emission buildings – are incentivised. Continued funding for research and development is central to furthering industry knowledge and promoting innovation. These measures are crucial to encouraging responsible ways of building and ensuring that sustainability is more than a point-scoring exercise. ■

Further reading

- *Cross-laminated timber: Design and performance*



About the author

Kieran Walker *is an associate at architects Waugh Thistleton, an east London based architectural practice and a leader in engineered timber and tall timber buildings.*