

FEBRUARY 2022

CROSS LAMINATED TIMBER

Construction is one of the main contributors to carbon emissions, raw material consumption and solid waste in the world. As a result, there is pressure for the real estate industry to address ways in which these contributions can be reduced and mitigated through more efficient construction methods and materials with lower embodied carbon.

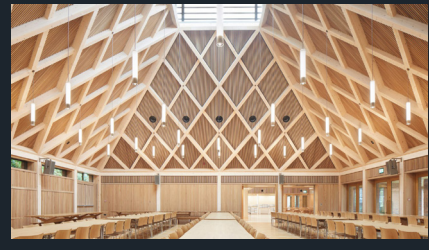
Traditional construction materials and methods are extremely carbon intensive, and with many companies committing to Net Zero, Cross Laminated Timber (CLT) presents an opportunity to address some of the inherent issues with traditionally constructed buildings. The use of CLT has gained momentum in recent years, and there are a whole host of major projects globally that have incorporated CLT into their building design and fabric.



Curtain Place ©Waugh Thistleton



Google KGX1 ©BIG/Heatherwick Studio



Ibstock Place School ©Dezeen

What it is

CLT consists of planks of timber that are perpendicularly layered and industrially glued to create structural rigidity and compressive strength. The thickness of each layer, the number of layers and the method of adhesion can be adapted to suit the structural requirements of the building. The panels are prefabricated off-site and hoisted and bolted together on-site, lessening the amount of waste and construction time and therefore lowering the carbon intensity of the construction process.



Brock Commons, British Columbia @csengineermag.com

The use of CLT dates back to the 1970s and was first introduced in Austria and Germany. In the early 2000s, the utilisation of CLT in construction accelerated due to increased environmental consciousness, and other countries have since followed suit. However, the UK's take-up has been more delayed due to scepticism surrounding fire safety and insurance.

A very similar product, called 'glulam', comprises timber layers laid parallel to one another. This provides greater strength than CLT (albeit only in one direction) and makes it particularly suitable for trusses and portal frames.

There are various other similar laminated timber products, including dowel laminated timber and laminated veneer lumber, which contribute in different ways to the building fabric and can be manufactured to various strength grades to suit appropriate stress requirements.



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Benefits of CLT

Sustainability

CLT's base material – spruce or other coniferous species – is a renewable resource that is relatively fast growing, unlike the conventional building materials of steel (iron ore) or concrete (sand). In particular, the type of sand used for concrete is being consumed by the construction industry at a faster rate than it is replenished, which in turn damages the natural environments from which it is mined. Conversely, the wood used in CLT is from managed forests that are regularly reforested. In Europe, which is the CLT industry's primary source of raw material and the UK's main source of timber, forest coverage has steadily increased over the past 30 years. Responsibly sourced timber is certified by organisations including [FSC](#), [PEFC](#) and [TTF](#).

The process of converting wood into CLT requires far less burning of fossil fuels than the manufacture of traditional construction materials, and recent research¹ points to an overall emissions reduction of 60% compared to reinforced concrete structures. Timber is also a much better store of carbon than concrete, steel and masonry. Once CLT panels have reached the end of their usable life, they can be recycled or reused for other purposes. The demolition process for CLT structures is therefore far less wasteful and less hazardous than conventional equivalents.

Green Premiums

Research points to timber buildings providing increased energy efficiency than buildings made of reinforced concrete². There are typically 'green premiums' associated with buildings that have attained high energy and sustainability credentials. For the landlord, this 'green premium' takes the form of higher rents and capital values for properties. Conversely, for properties that are energy inefficient, trends are showing negative impacts in capital and rental values, known as 'brown discounts'. From a tenant perspective, beyond the positive publicity and achievement of ESG targets whilst occupying a sustainable building, lower operational energy usage saves costs of the day-to-day running of the building.

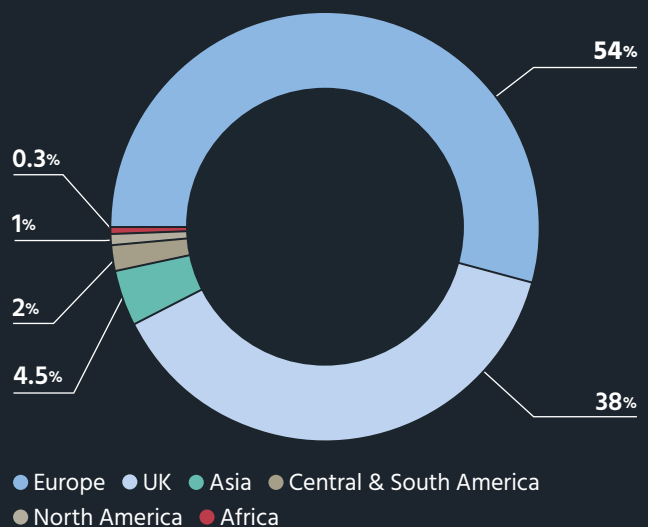
From June 2022, changes to building regulations will reduce the CO₂ emissions benchmark for new



Scottish Grown Stika Spruce @Forestry and Land Scotland

Sources of UK Timber Supply

Source: [Timber Trade Federation](#)



commercial developments by 27%. Furthermore, as part of the New London Plan, draft planning guidance has been released on whole life-cycle carbon emissions, showing the GLA's aspirational benchmarks which new developments would have to achieve in order to secure planning permission. These benchmarks are 40% below current levels, which will make CLT a far more attractive prospect for developers who are seeking to obtain permission³. Other local authorities are likely to follow the GLA's lead.

¹ www.mdpi.com/2071-1050/9/8/1426, www.thenbs.com/knowledge/timber-frame-design-low-energy-high-performance

² www.theccc.org.uk/Wood-in-Construction-in-the-UK-An-Analysis-of-Carbon-Abatement-Potential-BioComposites-Centre.pdf

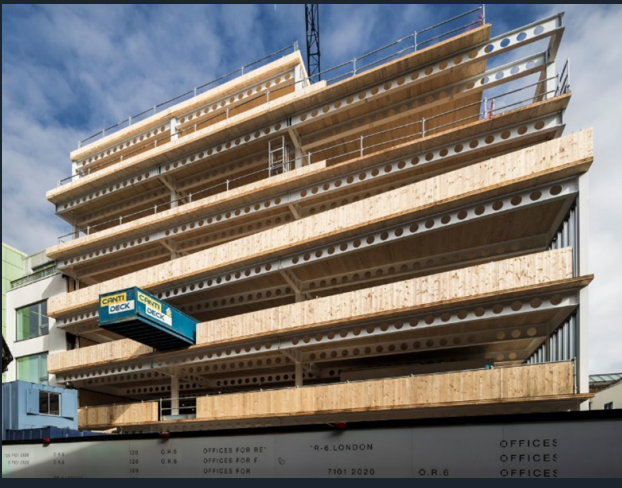
³ www.london.gov.uk/sites/default/files/wlc_guidance_consultation_version_oct_2020.pdf



Benefits of CLT

Wellbeing

The importance of wellbeing in commercial real estate has accelerated over the past decade, especially in the wake of the Covid-19 pandemic. Wooden interiors benefit occupants by regulating humidity levels and temperature, and there are numerous studies that point to wood having positive effects of individuals' physical and mental health, such as reducing blood pressure, stress levels, and fatigue⁴.



6 Orsman Road ©Waugh Thistleton Architects



6 Orsman Road ©Waugh Thistleton Architects

Efficiency and Durability

CLT panels are prefabricated off site and to a high level of precision, allowing for much quicker construction than conventional builds. This, alongside savings in embodied carbon, was a key reason cited by The Office Group for their use of a timber framed design at 74 Rivington Street, a new 51,000 sq ft office in Shoreditch. CLT panels have a lifespan of 50+ years⁵ and are highly versatile: they can be used for walls, floors, furniture, ceilings, and roofs albeit CLT and glulam panels exposed to the outside environment require additional surface treatment. CLT can also be integrated with conventional materials, as evidenced by recent developments such as 6 Orsman Road, a 34,000 sq ft office block in Haggerston completed in 2021 which is a hybrid of CLT, steel and concrete⁶. Further examples include timber extensions of 26 Underwood Street⁷ and Gordon House⁸, Greencoat Row.



74 Rivington Street ©Black&White

⁴ <https://link.springer.com/article>

⁵ www.researchgate.net/publication/330620007_Life_cycle_analysis_of_cross_laminated_timber_in_buildings_a_review

www.arup.com/perspectives/publications/research/section/rethinking-timber-buildings

⁶ waughthistleton.com/6-orsman-road

⁷ hts.uk.com/projects/26-underwood-street

⁸ www.urban.co.uk/industry-insights/clt-office-structures



Drawbacks

Track Record

So far, CLT's primary application in the UK has been in individual residential units and apartment blocks, as well as some educational and community buildings. There are a limited number of office and industrial buildings made of CLT, making it a relatively untrodden path for commercial developers to take.

However, there is clear growth in the number of larger commercial projects progressing in the UK and London particularly; recent examples include 247 Tottenham Court Road, an 80,000 sq ft joint venture between CO-RE and L&G which will incorporate CLT floors, and Astrea's 38 Berkeley Square, an 83,000 sq ft office building currently under construction incorporating a hybrid steel and exposed CLT frame.

CLT has a limited track record when it comes to larger scale projects: the tallest CLT building in the world is Mjøstårnet, a Norwegian 85-metre mixed-use tower totalling 122,000 sq ft⁹. The largest is Dalston Works, a 155,000 sq ft residential development in East London, completed in 2017¹⁰. Although Germany plans to exceed Dalston Works, pure timber buildings remain small-scale compared to reinforced concrete and steel equivalents. However, when used alongside these materials, hybrid CLT buildings are able to achieve much greater height and mass. Future developments exemplify this, such as EDGE London Bridge, a 255,000 sq ft hybrid scheme which is due to start construction in 2022 and is jointly funded by EDGE and Goldman Sachs; and The Dutch Mountains in Eindhoven, a proposed U-shaped building reaching 130m tall.

Supply of Materials and Contractors

As a newer construction material that requires precise engineering and modelling, currently there are relatively few manufacturers and contractors that have the expertise to cater for new CLT projects. Furthermore, both the sourcing of raw materials and manufacturing of CLT are conducted in other European countries, with the final product imported to the UK. Concerns surrounding transportation emissions are mollified to some extent by a shorter on-site construction lifecycle, as CLT construction is significantly faster than reinforced concrete.

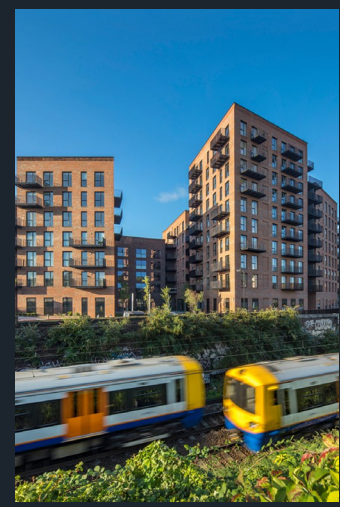
A more serious concern regards the supply of raw material for CLT, in that timber is a more costly material than its traditional counterparts. As the demand for timber grows, upward pressure continues to be placed on construction costs. Currently the UK relies mainly on EU-sourced timber, the import of which not only has an environmental impact but is also dependent on trade policy between the UK and EU. If export and import tariffs on timber from the EU were to increase, there is a risk that CLT use in the UK could become unviable. However, research on the feasibility of sourcing more wood from Scotland is currently underway which would help address this issue¹¹.



Mjøstårnet, Norway
©Mjøstårnet



EDGE, London Bridge, London ©EDGE



Dalston Works, London
©Waugh Thistleton Architects

⁹ www.moelven.com/mjostarnet

¹⁰ waughthistleton.com/dalston-works

¹¹ www.theconstructionindex.co.uk/news/view/construction-consortium-targets-greater-use-of-home-grown-timber



Drawbacks

Safety Concerns

Fire safety in buildings has become one of the country's most pressing concerns. The main focus has surrounded combustible cladding, in particular the aluminium composite material cladding used on Grenfell and numerous other large buildings in the UK, leading to changes in building and fire safety regulations. An obvious consequence of more stringent regulations is increased costs and timescales for delivering projects, but specifically, for any building with residential elements over 18m high, the use of CLT is now restricted to floors, internal walls and cores.

Beyond regulatory changes, press coverage of the Grenfell disaster has also incited greater public concern over combustible materials in buildings. CLT can resist fire for up to 90 minutes and remains structurally stable at high temperatures (unlike other construction materials such as steel). Despite this, it is important to isolate the fire and prevent it spreading between connecting CLT structures, which can be achieved by isolating floors from one another via fire retardant cladding. Safety concerns around CLT will likely take time to dissipate, however sentiment is clearly shifting as the increased number of UK projects shows.

The insurance market is often cautious about the construction and occupation of timber buildings, as there are no specific legislated national standards. As well as entering 'syndicates' in order to spread risk, insurers require more stringent and costly risk mitigation measures, such as enhanced sprinkler systems, during design and construction. If such measures are not designed in and implemented, insurance may be rendered invalid.

Ultimately, there remains a tension between promoting wider use of sustainable building materials and ensuring there are sufficient regulations around combustible materials. How this tension is resolved will depend on finding a regulatory balance between sustainability and safety concerns.



Case Study

In London, Gerald Eve is advising on a new 17-storey office-led development above Southwark station. The innovative building will enhance the public realm offering, provide affordable and flexible workspace, retail and leisure facilities, whilst also spearheading the borough's environmental agenda. The building aims to achieve BREEAM Outstanding, WELL Core Platinum, CO₂ savings through solar panels and air source heat pumps, recycling of demolition material and reduced construction emissions as a result of the hybrid CLT and steel superstructure. Additionally, the incorporation of CLT enables larger massing on the already existing foundations, reducing the project's embodied carbon emissions. Internally, the Southwark development will benefit from proptech offerings, such as control systems that provide occupants autonomy over their indoor climates.



Southwark Over Station Development (OSD) ©NLA

Gerald Eve has advised on a number of other projects incorporating CLT, including both new builds and redevelopments. For further information, please contact one of our team.

YOUR DEDICATED TEAM

If you have any questions or wish to know more about the incorporation of CLT, then please do contact one of our team members below.



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