Get on board

Jenny Sawyer looks at the growing use of cross laminated timber in the global construction market

Cross laminated timber (CLT) is making great inroads into the building structural frame market, providing a new competitor to reinforced concrete and steel. The engineered timber product has been used in Europe and North America for a number of years, and is now gaining recognition across the globe.

In Australia, for instance, Lend Lease has built the tallest CLT structure in the world, the Forte apartment block in Melbourne. Meanwhile, planning permission has recently been granted for more than 200 residential units using CLT in Elephant & Castle, London. As the material becomes more common place, more and more developers and occupiers of buildings are realising its benefits.

So what is CLT?
CLT comprises layers of wooden boards (lamellas) glued together perpendicularly under mechanical pressure. Between three and seven boards are used depending on the structural loading required for the building. The lamellas are formed from logs sourced from softwood forests preferably local to the factory. The more sustainable companies use formaldehyde-free adhesive to glue the boards together.

Once the CLT is formed into a master sheet, panels are cut out using a CNC machine. This will include all apertures for windows, doors and services, thereby reducing the amount of work required on site.

A key selling point is sustainability. With the increasing demand for housing and the extent of building work that is taking place in all major cities globally, it is a viable alternative to the concrete jungle that is found in many cities.

The manufacturing process also makes the wood very strong. The perpendicular nature of the lamellas means that the load is distributed in two directions, and therefore giving load-bearing properties.

CLT is used for walls, floors and ceilings and construction is much faster than traditional systems. There is also a minimal amount of shrinking and swelling due to the cross lamination and gluing process, meaning the frame remains in place and provides a solid structure.

The precise nature of the CNC cutting machine means follow on trades, such as lift engineers, M&E and window installers find their roles much easier. The manufacturing precision of the frame also helps to reduce air leakage and so energy costs for tenants.

The major downside is that timber is combustible. In the UK, a lot of work is being done with the Fire Brigade and local authorities in order to make them more comfortable with the material. The charring effect of timber means that often a fire will put itself out rather than continue to burn, and fire protective linings are used where the CLT is not exposed. Where aesthetics are paramount, fire protective coatings are then applied to ensure appropriate fire ratings are achieved.

Why is it used?
The biggest benefit for the use of CLT over conventional structural materials is the speed of construction. A project can be built between 25% and 40% more quickly than a reinforced concrete frame, generating programme savings. As the walls will already be in place, the follow on trades can get into the area quicker and enable projects to finish earlier.

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CLT also has excellent cost benefits for consumers due to its thermal qualities, in some instances reducing the amount of energy needed to heat buildings by approximately 40%, lowering costs for consumers and reducing CO₂ emissions.

It is also manufactured offsite, meaning the production and building process generates zero waste. The resulting benefits of reduced deliveries and therefore fewer trucks on the road makes for a safer solution for the wider community, while also helping to minimise on-site noise and air pollution.

Furthermore, CLT is very labour efficient. At Elephant & Castle, installing a floor of CLT needed only eight workers whereas reinforced concrete would have called for 25 to 30. The reduction in the labour requirements, exposure to less hazardous substances and the elimination of wet trades also makes for a much safer environment.

On sites that struggle with poor ground conditions, the lighter weight structure of CLT means that foundations can be reduced, and sites that would previously have been considered unviable can be resurrected. The reduction in noise, dust and deliveries also assists with any project’s good neighbour
policy. This is particularly evident in constrained sites in close proximity to other occupied buildings.

The sustainability story for CLT is also very compelling. Timber stores CO₂ and uses less carbon in construction. The demountable nature of CLT also means that at the end of a building's life, the CLT panels can be removed and used on another project. Finally, the prefabrication of CLT will maximise the use of timber and reduce waste on site.

Do the costs stack up?
CLT is currently more expensive than conventional structures. However, this is compensated for by the speed of delivery resulting in reduced costs from the preliminary stages of construction, and the lighter weight structure cutting foundation costs. For a client, a project finishing earlier means a more rapid income return and therefore a quicker return on investment. Schools in particular are finding that they can open their doors earlier to new intakes.

All these benefits mean that CLT can create a compelling value proposition for a project. With labour costs rising, the high productivity associated with CLT will also help to close the cost differential.

Quantity surveyors will be asked more and more by their clients to consider its appropriateness for their projects. By creating options that include the benefits from the speed of construction the client is able to compare appropriately conventional materials against CLT.

The material will not always be the best solution for the project, but it will start to create some interesting debates about structural design which until now has not been radically challenged.

Matti Mikkola, Head of Building Solutions at Stora Enso Building and Living, claims that CLT is gaining good foothold in various European markets and in the UK. “We are supplying many projects including one of the largest housing projects in London and CLT is also being used to build 12 buildings in the city of Graz in Austria,” she says. “In the near future we will also see the start of a whole urban block – Wood City – built with CLT in Helsinki, Finland. And in Melbourne, Australia, we have recently completed the new city library which opened its doors at the end of May 2014.”

The market’s drive for sustainable solutions and whole life cycle carbon accounting is creating greater demand for materials such as CLT. The Building and Construction Authority in Singapore has just mandated the use of CLT or volumetric construction on its suitable government land sale sites. This should kick-start the need for CLT in the Asian market, which has so far lagged behind the West. Countries such as New Zealand and Japan are also seriously considering using CLT as part of their rebuilding efforts due to the material’s ability to withstand the effects of earthquakes.

The more the material is used, the more innovation will occur and other material suppliers will work with the industry to create solutions to exceed the standards. Expect to see more projects using CLT and greater use of the material globally.

Jenny Sawyer is Senior Development Manager at Lend Lease in Singapore
jenny.sawyer@lendlease.com

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