

WHILE TIMBER BUILDINGS AREN'T COMING EVEN CLOSE TO THE HEIGHT OF THE SHARD AND OTHER SUPER-TALL STRUCTURES, WITH CROSS-LAMINATED TIMBER THERE IS THE POSSIBILITY THAT IT WILL ONLY BE A MATTER OF TIME, SAYS OLIVER LOWENSTEIN

TIMBER TOWERS



The nine-storey Murray Grove mixed-housing tower block in Hoxton, London by WaughThistleton is currently the world's tallest timber building

In 2010 the world's population crossed a fundamental threshold, before this tipping point the majority of this population lived in rural areas, afterwards more than half the planet's seven billion are found in megacities, cities, and other urban areas. The curve is set to grow, along with world population. UN-Habitat forecast a total global population of nine billion by 2030, of which 60 per cent will be urbanised, rising by mid-century to 70 per cent.

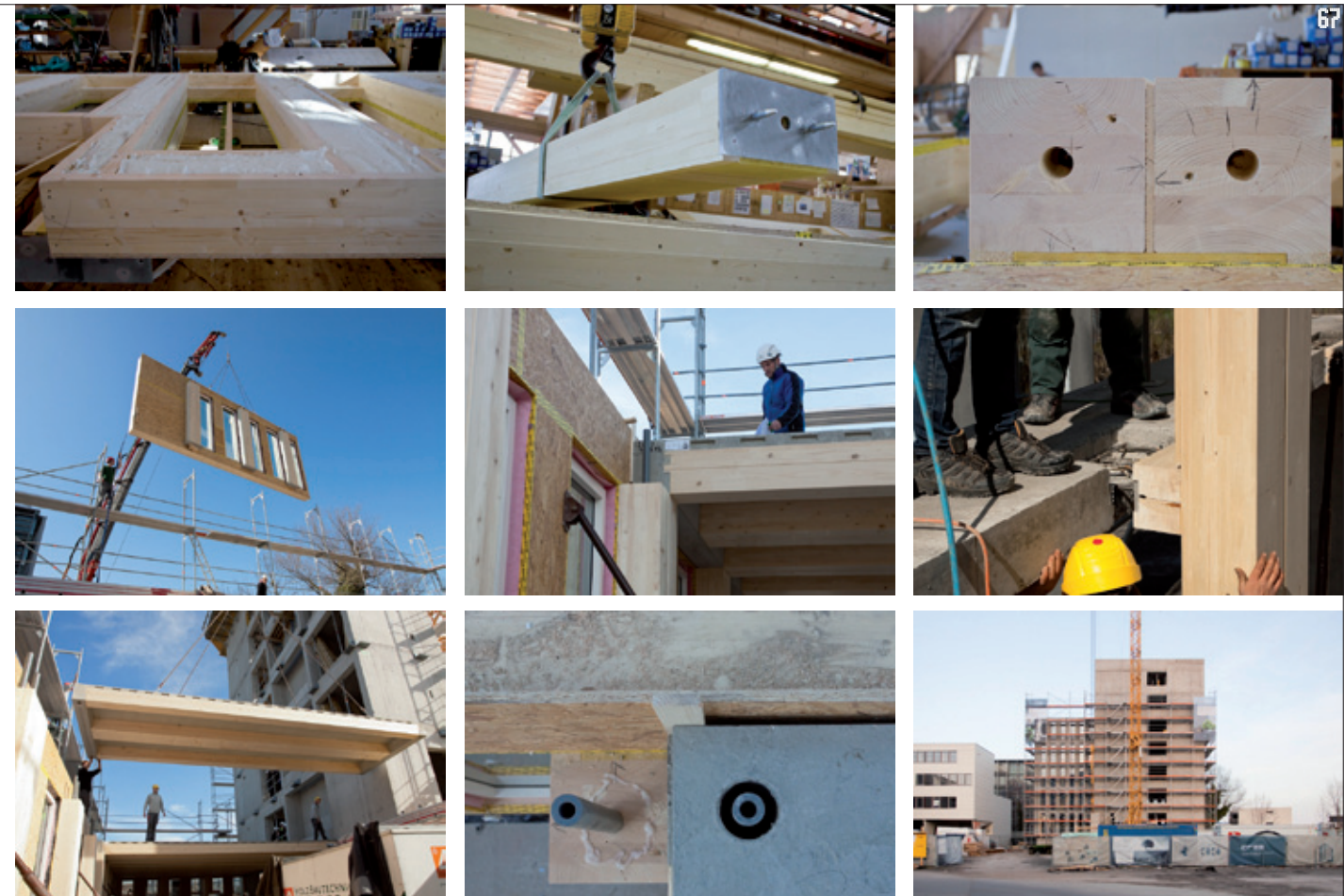
Alongside this there are the twin challenges of climate change and resource depletion. A consensus among urban planning experts has emphasised compact-city thinking, focused on building up in dense high-rise. But the need for far smarter energy use and footprint hits something of a brick wall when you realise that concrete is the fourth single largest carbon emitter, with between seven per cent and 11 per cent (depending on where you go looking for your figures,) of the planet's entire carbon emissions. Steel, too, isn't exactly carbon neutral. And where will the materials come from in both the developing and developed world for future urban housing, including high-rise?

Until recently future gazers envisaged renewable materials used in high-rise as the stuff of fantasy. Yet in the past half-dozen years the possibilities of wood being applied to high-rise has been emerging as a practical option. With this imaginative leap connecting the planet's oldest natural material, wood, and its potential application to high-rise has kick-started an excited, growing network around the world.

Joining the dots, after all, and making the material connection isn't exactly rocket science. It is, however, timber engineering science. It's in this branch of the engineering sciences, married to turn-of-the-millennium developments in engineered timber, particularly cross-laminated timber panels, (often termed as massive wood,) that a quiet revolution has been underway for the past six years.

The various technical challenges presented by fire risk, acoustics and insulation have benefited from research and are increasingly addressed. Across different forested parts of the planet that embrace Atlantic Norway and Pacific Vancouver, Canada, western Austria, Australia and

Right: The Life Cycle Tower One in Dornbirn, Austria and designed by Hermann Kaufmann, is one of the latest additions to the world's portfolio of timber towers. Adjoining the concrete core are eight floors of a structural timber-concrete hybrid building system



New Zealand, a race has been gathering pace to build the world's tallest timber building.

It was this race that a few weeks ago brought me to Dornbirn, the largest town in Austria's most western state of Vorarlberg, to climb the stairs of the Life Cycle Tower One (LCT One), the latest stage in this unfolding 21st-century engineering and architecture drama. The building is still very much an open shell, the staircase winding round the concrete core lift shaft, while adjoining the core are eight floors of a structural timber-concrete hybrid building system.

Designed by the respected Vorarlberg timber architect, Hermann Kaufmann, LCT One uses a new hybrid building system for its timber storeys, spanning open-plan office rooms and bringing, the promotional material states, a 90 per cent carbon footprint reduction. Although a hybrid, one astonishing point is that all the floors went up in the preceding two weeks, with the 2.7m-high

hybrid sections being craned into position.

Looking out at the Dornbirn suburbs from on-high isn't quite the experience you might get from Dubai's Burj Khalifa or London's Shard, but these are early days. First generation tall timbers – a phrase which encompasses longer, tall-timber blocks – are around eight to nine storeys, conventionally mid-rise or 'small' tall towers. This said, LCT One's research has successfully demonstrated that 30-storey timber towers are technically feasible. Kaufmann, a self-effacing and tireless promoter of the potential of 21st-century timber, acknowledges that LCT One is a first step to higher things, particularly through prefabrication: 'Prefabricated timber building systems can be used in different building applications. They have wider, new consequences; they can be faster, and easier, to work with on construction sites. But this is craft rather than industrial prefabrication, even if it's increasingly industrialised.'

Kaufmann anticipates that the next buildings will quickly adapt to becoming fully structural timber ones. It's a point echoed by one of the developers, Rhomberg, which states that its founder, Hubert Rhomberg, is obsessed with building the first 100m-high timber tower.

'There's continuous discussion about how high we can go,' noted Johan Vessby, who teaches in one of the engineering departments pushing the boundaries of this research at Linneaus University in Vaxjo, Sweden, when I visited a couple of years ago. 'Everyone's looking for the limits, of course.' Last year a research team led by Simon Smith, director of building and design at Ramboll UK presented a paper on 70-storey timber towers. 'At present there's absolutely no reason why you couldn't go to 30-35 storeys,' he states.

Above these heights the technical limits of cross-laminated timber begin to become evident, namely its liability to be crushed

by the sheer weight of the building and other forces. It's a problem to solve, Smith tells me on the phone, adding that while he acknowledges much of the research was speculative, the focus was on how the wood's grain could be chemically modified: 'We were looking at switching the grain around.' As with LCT One, despite real-enough research, one can't help sense a whiff of marketing with such 'highest-ever' claims.

'Twenty-five to 35 storeys seems like the realms of reality,' says Andrew Waugh, one half of London architecture practice WaughThistleton. Waugh has been at the receiving end of a blizzard of publicity and media attention over the past four years. For those new to timber high-rise it may come as something of a surprise that WaughThistleton's Murray Grove, currently the planet's tallest timber building, is in funky Hoxton, north London.

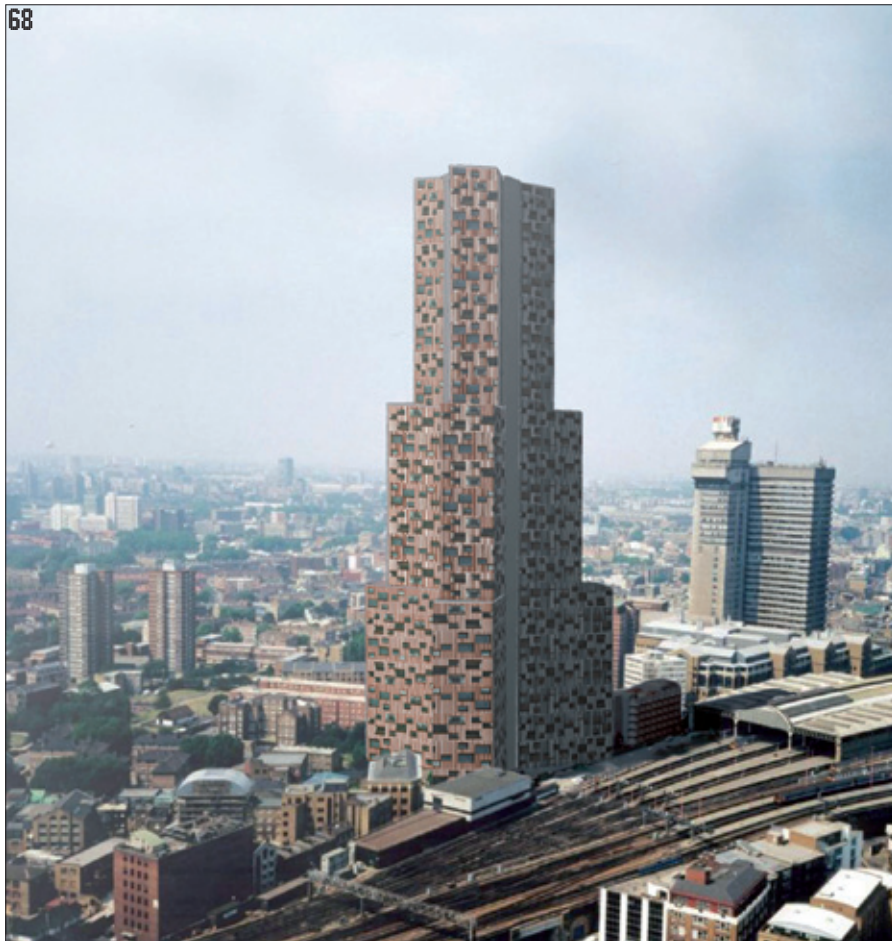
Different European countries operate

varying timber-regulation regimes and Britain's legally permitted nine-storey structures enabled WaughThistleton to persuade Hackney Council to give the go-ahead for the nine-storey, mixed-housing tower block. Begun in 2007 and opened in mid-2008, there's some irony that Murray Grove's cross-laminated timber system was conceived initially to reduce build time and costs. Using supplier KLH's cross-laminated timber system Murray Grove is an all-engineered timber structural frame saving 306 tonnes of carbon to a comparable steel and concrete tower, with 183 tonnes locked into the timber.

Murray Grove has turned Waugh's life from relative architectural normality – the practice hadn't previously completed a building – to globe-trotting timber-towers ambassador, talking at architecture schools, though also to the UN Environment Programme in Rome and in earthquake- >>

Below: The nine-storey Barenthus culture and innovation centre in Kirkenes, on Norway's border with Russia, was designed by Reulf Ramstad Arkitekter





ravaged Christchurch in New Zealand.

Now four years on from Murray Grove he is about to move into one of the apartments in a new five-storey block, in nearby Whitmore Road: 'Structurally it goes against everything we learned about cross-laminated timber at Murray Grove and since. We're using the material as a cellular structure, so the walls take much more of the load-bearing.' Although a five-storey building may seem like small beer, at this stage each new project provides an opportunity for valuable research.

Waugh has also teamed up with Michael Green of MGB Architects in Vancouver to give joint lectures. Green's practice has just published a study, Tall Wood: the Case for Tall Wood Buildings, for the Canadian Wood Council. This includes MGB Architect's own timber high-rise design with an open source licence for re-use and has generated much excitement in Canada and parts of the USA.

Apart from WaughThistleton, the other UK practice researching and developing timber high-rise early on was dRMM, which in 2006 developed a design for a 13-storey PCT health centre plus housing and vertical gardens. When this project folded dRMM joined forces with Norway's young practice Helen & Hard in Skadberg, persuading a local developer to build a 16-storey timber high-rise there, followed by 18 months of research with Norway's Treteknisk timber research centre. At a critical meeting in 2008, with the recession making experimental projects riskier, one of the developer's six members voted Skadberg

down. 'It was heart-breaking when we heard,' recalls Helen & Hard's Reinhard Knopf. Today the timber-concrete hybrid redesign remains modelled on a tree form.

dRMM's Alex de Rijke has pointedly remarked how, despite them being timber structures, you wouldn't necessarily know that these earliest designs were exploring timber's expressive potential. They echo 20th-century concrete and steel forms, rather than lighting out for a 21st-century timber aesthetic. De Rijke is optimistic that this will change: 'Inevitably people will be inventive, whether it's timber or timber-hybrids.' Recently appointed the dean of architecture at the Royal College of Arts, he also seems confident that Britain's minimal timber engineering research base will also change within a few years. As to dRMM itself, a 13-storey timber block in London's Elephant & Castle is due on site next year.

Waugh appears equally confident that changes are afoot, noting that one of London's local authorities is about to be the first in the country to commit to a Timber First policy, requiring a proportion of all – including taller – its public buildings to be constructed with wood.

So far London, with its small group of projects, is the exception among world cities. New projects are appearing across Europe, including in Munich, Berlin, Lyons and Vienna. The most unusual and exotic so far has been Reulf Ramstad Arkitekter's Barenthus, a nine-storey culture and innovation centre designed for the Arctic

Above left: A rendering of Ramboll's vision of a timber tower. Research by the firm last year led to it presenting a paper on 70-storey towers

Above right: MGB Architects in Vancouver has designed its own timber high-rise building, with an open-source licence for reuse that has created much interest in both Canada and the USA

Circle town of Kirkenes and looking out at the forbidding Barents sea.

Everything, at the moment, points to tall timber as a growing trend. One Canadian commentator wrote of 'a megabuzz about tall timber right now'. That's hyperbole, but there is definitely increasing interest, and increasing research. I'm personally ambivalent, impressed at the technical achievements, although also wondering whether technique can blind some to deeper environmental issues regarding the wider social principles of high-rise living.

Coming across a presentation by a member of Jan Gehl Architects, the respected Copenhagen urban design practice, particularly resonated. That underlined how children and others living above a high-rise's first three floors were much less likely to use the outdoors than those living at level three or lower. The consequence is less connection with daily urban life, and for the children, fewer friends.

But with a seven million-plus world population crowding into cities and other urban areas, with resource scarcity and carbon mitigation, the pragmatism of the head tends to trump the social poetry of the heart. Tall timber is here to stay. And even if it doesn't reach for the sky in quite the same way as the Shard's glass pinnacle, I wouldn't bet against a tall timber structure called the Splinter going up in the next decade or so. Wherever the next steps are, and who will reach 100m first, getting there is surely only a matter of time. ■