# VERTICAL URBANISM

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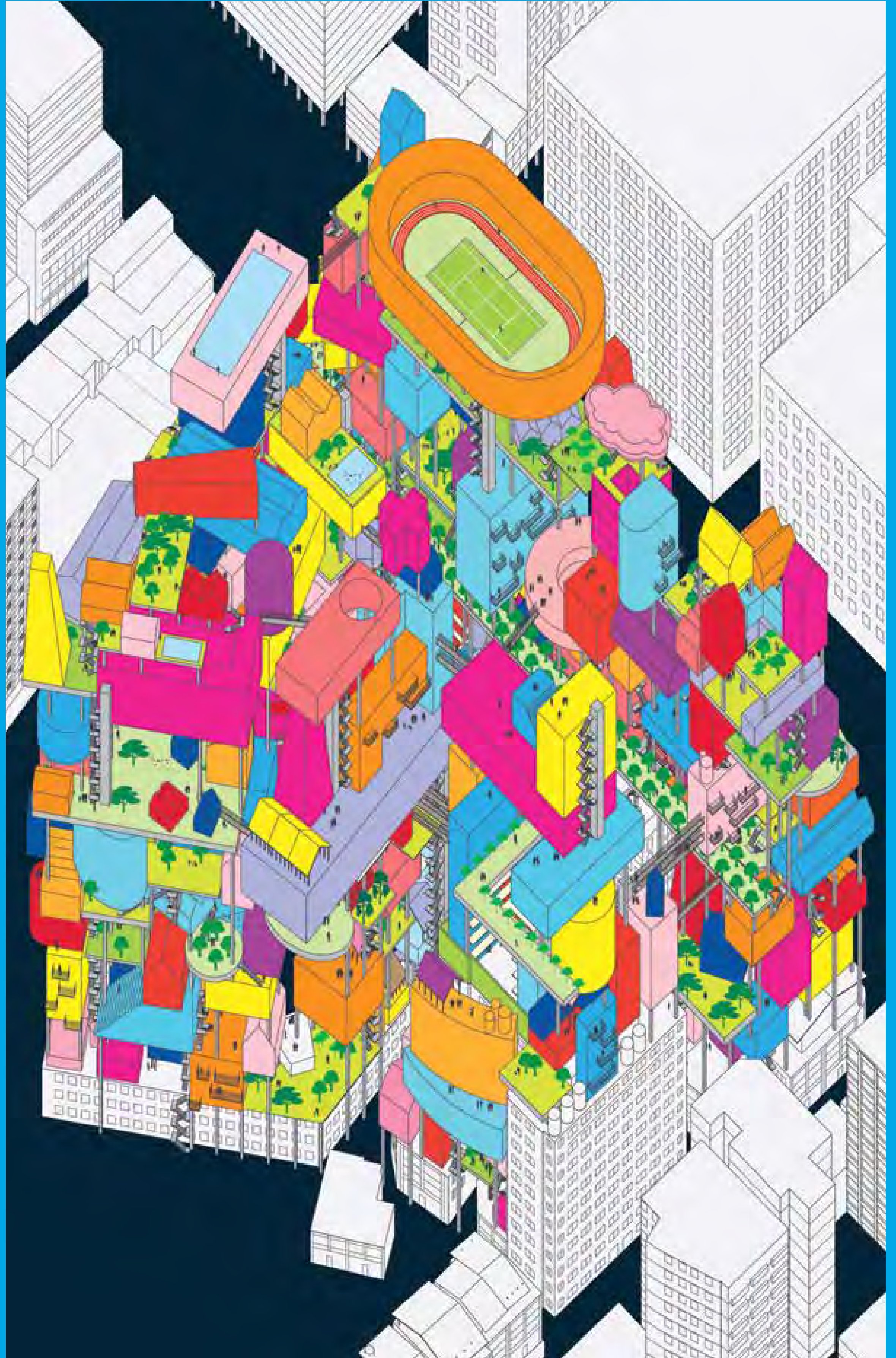
*NORMAN FOSTER CHARTS THE EVOLUTION OF HIS SKYSCRAPERS*

*MVRDV INTEGRATES NATURE AND PUBLIC SPACE INTO HIGH-RISE LIVING*

*PLUS VISHAAN CHAKRABARTI, RICHARD SENNETT, & TOSIN OSHINOWO*



INPLACE VISUAL

# HIGH HYBRID

C6 Perth is an elegant exemplar of high-rise timber construction, but prompts *Andrew Waugh* to reflect on the role of supertall towers in sustainable cities.

Historically a tall building was defined by London's City of Westminster as a building one-and-a-half times the height of its context. A cathedral or a mosque, a building of civic significance, a geolocator for our cities. A community-owned object that places us in our context. Since the emergence of the structural steel frame and then reinforced concrete 100 years or so ago, this notion has been supplanted. In most cities around the world, a massive increase in building height has become synonymous with densification, growth, and prowess.

Across the road from the zoo and just around the corner from the golf course on an inner suburban site in south Perth, Fraser & Partners is proposing a proper skyscraper—52 stories and 189 meters tall. The current scheme would see 236 apartments arranged within 45,000 square meters of real estate. It's a fine building of its class: simple and elegant in proportion, sleek façade, and meets the ground with gusto.

This isn't a takedown of the building—rather C6 Perth is a handy vehicle for a discussion on height, timber, and sustainability.

Fraser & Partners is a high-rise specialist. The upper 48 stories of C6 Perth are supported by an enlarged concrete core extending to the outer ring of apartments and encompassing each front door. The reinforced concrete columns support glulam timber beams which hold up solid cross-laminated timber (CLT) floor slabs. There are quite a few versions of tall hybrid structures around, some stuck on the drawing board and a couple built—HAUT in Amsterdam, for instance, is a smaller version.

Perth is an earthquake zone, so there are four floors of concrete outriggers to help overcome a potential seismic event. These are floors where the solid concrete core walls stretch out to the perimeter of the building to increase stability. And there is a proposal for a timber diagrid for the external façade to further dull any movement. The tower is designed to sway only 600 millimeters to either side at the top floor, managed by substantial dampers in the basements.

So, a few things that need hashing out here. Do we need supertall buildings? Do they really provide density? Can tall buildings ever be argued to be truly sustainable? And could claims of carbon neutrality really allow new buildings to be deemed sustainable?

Forty-two percent of C6 Perth's structure would be made of timber. The 7,400 cubic meters—6,000 metric tons—of timber will come from Austria (not a typo). Sadly, the cost of shipping the timber around the world was still less than buying it locally. Austria has a large, uber-efficient and profitable engineered timber industry—with little waste and low operational carbon emissions and has grown substantially over the last 30 years, so this does sound plausible. Sad that Australia has three times the area of forest and does so little with it. The beams and

Left—
C6, a 52-story skyscraper in Perth, designed by Fraser & Partners.

INPLACE VISUAL

floor slabs of this building would use more than 15 hectares of Austrian forest.

The developer, Grange, states on its website that C6 Perth would be a carbon-neutral building. The principle is that the amount of biogenic carbon stored within the timber portion of the structure is greater than the atmospheric carbon emitted through the manufacture and transportation of the steel and concrete of the core, columns, outriggers and basement, as well as the aluminum, glass and steel from the façade and the services—heating, cooling, fresh air—plus the carbon emitted through the production and transportation of the timber structure.

About half the mass of a European spruce is carbon. This carbon is stored within the tree through photosynthesis; as the carbon dioxide ($CO_2$) is soaked up from the atmosphere, the oxygen is then released. The tree is a beautiful carbon-processing machine and certainly a more efficient store than all those caves in Iceland.

The idea is that the carbon from constructing the building is canceled out by some of the carbon in the trees felled to make some of the building, on the basis that those trees are immediately replaced. I know these arguments; I have been whittling away at them for years. And this mostly makes sense, with important provisos. A mature European spruce inhales as much $CO_2$ as it sheds in branches etc.—a sapling soaks up and stores more carbon than it sheds.

If a forest area is sparse, then cutting down mature trees, storing them in buildings (as buildings), and planting carbon-hungry youngsters is the sensible move. However, protecting the below-ground timber and the complex forest ecosystems that allows this constant and consistent carbon storage cycle takes careful management and well controlled forestry. My experience is that Austria is pretty good at this—always room for improvement, of course.

If the choice is starkly between build it, or build it in

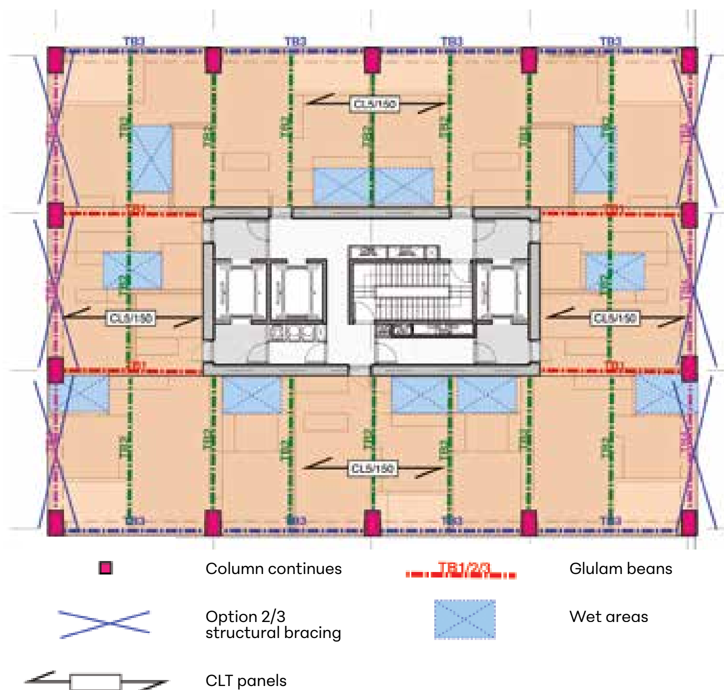
POINTILISM

some degree of timber, then my belief is that any inclusion of timber is a positive, if it avoids using carbon-hungry materials such as aluminum, concrete or steel. But, simply, tall buildings require more effort to achieve stability than shorter buildings—wind, gravity and seismic activity translate into greater structural complexity and therefore more material. More material, more carbon—more trees needed. Fewer trees for other timber buildings. And to be efficient carbon stores, they must last

**Top—** **C6's entrance meets the ground with "gusto."**

**Above—** **Apartment interior.**

**“With taller buildings, wind, gravity and seismic activity translates into greater structural complexity and therefore more material.”**




**Right—** Indicative floor plan by Fraser & Partners.

a long, long time. And to last, they need to be simple to maintain and readily adaptable. These are factors that need to contribute to our measurements of success in architecture.

How do they function over time? The operational carbon is that used to light, heat and cool our buildings. Tall, sleek buildings have a direct exposure to unadulterated sunlight and wind. A University College London study revealed that an office building above 20 stories—where you can’t rely on being able to open the windows—was on average 2.5 times more energy-hungry than a building half its height.[1] And that based on a London summer—not the summer C6 Perth will enjoy.

Globally, the energy consumption of our buildings accounts for around 28 percent of our GHG emissions.[2] I would imagine that this is less stark for residential buildings, but certainly shorter buildings are demonstrably more energy-efficient than taller ones.

Tall buildings were never traditionally about density; their relative tallness denoted significance as way-finders in our cities, objects that locate us in our context. The advent of the steel-framed American skyscraper, and its present global ubiquity, means that in cities full of tall buildings, this historical role is diminished. And with a typical skyscraper having double the carbon footprint of a 10-story building of the same floor area,[3] I’m beginning to question: when do we need them?

We need tall buildings for density, I hear you cry—and the more density, the more sustainable our cities. But, this really depends on context. European 10-story buildings will give around 150 homes a hectare with courtyard blocks and an overall higher density than taller buildings might with their increased footprint, services, elevators, escape stairs, and structure.

Density is usually tied to car density—or urban transport systems—and how much they can handle in concentrated areas of tall buildings; surely cities of focused mid-rise density are more pleasant, more livable and more sustainable. If C6 Perth were fully occupied, then several hundred people would be moving in and out of a smallish site daily. I like the idea of Lloyd Alter’s Goldilocks Principle: not too much, not too little, but just right for the context.

But would there even be several hundred people in C6 Perth? Tall buildings are so expensive to build, which means expensive apartments; so, are they financially sustainable without becoming just luxury vehicles for capital investment? Perhaps they never actually function to meet housing need?

But then do they provide seed funding for wider development? Are they bright shining symbols of economic success that encourage more investment into our cities through their prestige? But can we keep a lid on these sparkling individual essays in structure and accomplishment?

I worry that we’re building concrete buildings now with some timber in them—not timber buildings and not buildings worthy of meeting a climate emergency.

But perhaps by constructing supertall buildings with some timber we encourage others to explore building in timber—perhaps to a more modest height? Do these supertall timber buildings give us the encouragement needed to ween global society from this concrete obsession?

Vital questions for our time, but one thing I know—please don’t say they’re tall like trees.

**NOTES**


1 University College London (UCL). (2017). “High-rise Buildings Much More Energy-Intensive than Low-Rise.” https://www.ucl.ac.uk/news/2017/jun/high-rise-buildings-much-more-energy-intensive-low-rise.

2 World Green Building Council (WGBC). “Bringing Embodied Carbon Upfront.” https://worldgbc.org/article/bringing-embodied-carbon-upfront/.

3 Snelson, T. (2020). “Making Architecture - Rethinking Structure.” *Domus* N.1048.