COLLINS HOUSE

An essay by Bates Smart Director, Kristen Whittle

Collins House, heritage façade & lobby, circa 1910 – 1920

Collins House will be Australia's slimmest tower. Seamlessly stitched into the historic fabric of Melbourne's central business district, the project is a case study on the potential that can be unlocked when we challenge the way we develop our cities.

THE ARCHITECT'S BRIEF

Melbourne's CBD is a world renowned Victorian cityscape, featuring a diverse classical Palazzo, Neo-Gothic and Arts and Crafts building stock. Largely unified by a 40m height limit, the city has recently absorbed significant physical change through the construction innovations of the 20th century. Today, Melbourne is addressing the next generation of physical change, with increased urban density driving a quest for super tall buildings.

466 Collins Street, now Collins House, sits on a compact site between King and William Street, immediately adjacent to the CBD's legal, financial and business services sector. This vicinity has a rich architectural pedigree, which has in recent times lost some of its energy and cultural appeal. However, there is now a renewed interest within the city in making this a relevant and highly attractive place to live and work, completing the connection between the 'Paris end' and Docklands.

PROJECT DESCRIPTION

The site has an 11.5m Collins Street frontage and 480sqm footprint, with rear vehicle access from St. James Lane. The existing three storey Makers Mark building was built in 1908 to house a Victorian shipping company, Huddart Parker & Co, and is a well-liked heritage building loosely derived from Art Nouveau and Arts and Crafts precedents.

The development extends the lessons learned by Melbourne's first completed slender tower, Phoenix apartments, built by Equiset Construction in 2013. This experience sparked an interest in Equiset to develop another small footprint site with a much taller proposition. Bates Smart found such a site and presented this opportunity to Equiset in an off-market sale, leading to our engagement.

Before the project could progress, however, there were a number of structural, planning, heritage and buildability challenges to overcome.

The location presented an opportunity to deliver a highly contemporary and technologically innovative construction solution that would make inner city, small footprint sites viable for redevelopment.

THE PROPOSITION

The first design approach created an extruded form utilising an 'H'-frame vertical cantilever structural strategy using four shear walls and a mass damper to provide structural integrity. The gross floor area created, however, fell short of financial viability. Negotiations then began with the adjoining heritage property owner to purchase air rights, allowing the built form to both cantilever over this property and gain permanently unencumbered views. The cantilever off-set from the vertical structure by four metres, which increased the developable yield significantly.

An important element in achieving planning approval was our approach to the existing heritage building. Bates Smart proposed a comprehensive retention strategy to take advantage of the unique interior. Rather than distinguishing the natural junction between old and new, a blurring strategy was instead chosen. Details such as internal columns, encasements, cornices and coffered ceilings are to be retained or rebuilt.

The Arts and Crafts façade will be brought back to life, stripping off its black paint finish and returning it back to its original stone, clay tiled, masonry façade.

Visual separation of the tower form to the three storey heritage building below was established after extensive street level view cone analysis. The 'ziggurat' stepping outline that was introduced from levels four to ten worked to separate the forms whilst maximising floor area.

Collins House, Melbourne skyline

The building rises to a height of 195m, or 57 levels, from a base of just 11.5m across, widening to 14.5m as it cantilevers over the adjoining building.

THE FINAL DESIGN

The development consists of 263 luxury one, two and three bedroom apartments, including a 245sqm double storey penthouse on levels 56 and 57. The penthouse features inbuilt fireplaces and opulent materiality, with 180 degree views over Melbourne's CBD. Four half floor sub-penthouses make up levels 54 and 55. Resident amenities in the building reinforce the sense of a private club, including an executive lounge and roof terrace with views up and down Collins Street. Additional private dining and entertainment zones can also be booked at the level 27 Club.

The final façade design reflects its prominent and premium location on Collins Street. Three of the façades are almost entirely encased by a double glazed curtain wall system.

To the windowless western façade, a large scale fret in a herringbone pattern was selected as inferring the historic patination of the existing building. The fret pattern will be a highly polished aluminium fascia element sitting flush with the surface of the glass and concrete, emulating an embossed finish.

An important component of the planning strategy was to bring a unique visual activation quality to the laneway, verging on a public artwork. Here, the fret work evolves into an extruded form, pushing outward to form texture and grain.

THE STRUCTURAL ENGINEERING BRIEF

4D Workshop was introduced to the Collins House project to push the engineering of the prospective tower to its absolute engineering limit. A structural system was proposed that maximised the site footprint and building height, while being mindful of the limited site access and the construction constraints that necessarily entailed.

THE ORIGINAL SCHEME

The original scheme utilised concrete shear walls on each side boundary. The north and south elevations were column free and open to maximise available light and views. The side walls were connected by two transverse shear walls, creating a box for tensional rigidity and an overall 'H' section for maximum stiffness. A total building height of 225m above Collins Street ground level was deemed feasible, creating a slenderness ratio of 20.

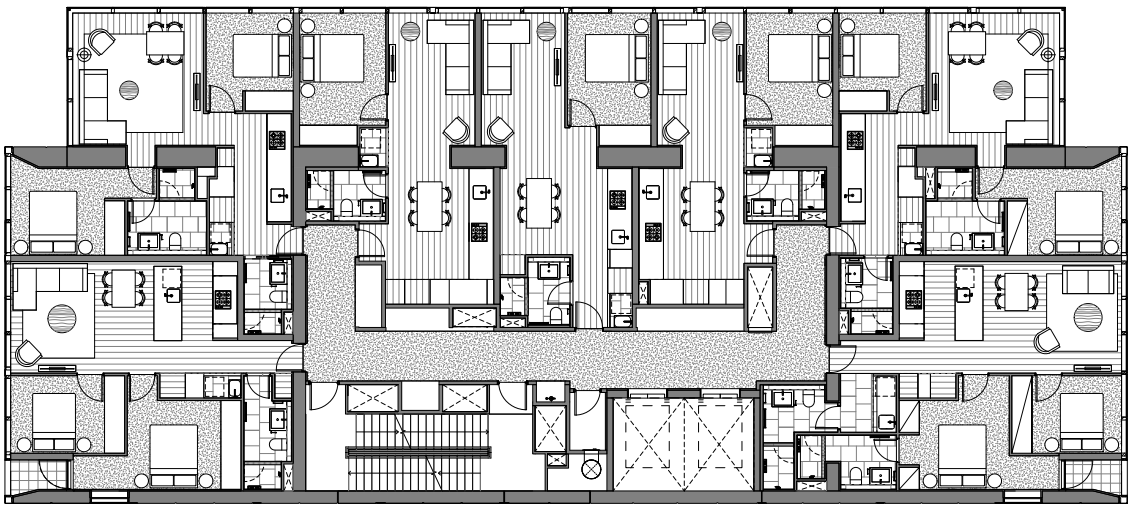
Inherent to tight building sites is a lack of access for construction activity, including deliveries and materials handling. The entire structure was therefore designed to be constructed as a jump form to enable the structure to be extruded from foundations to the top. Façade installation was to occur within the climbing screens below the jump system, in order to progressively close off the building.

DEVELOPMENT OF THE DESIGN

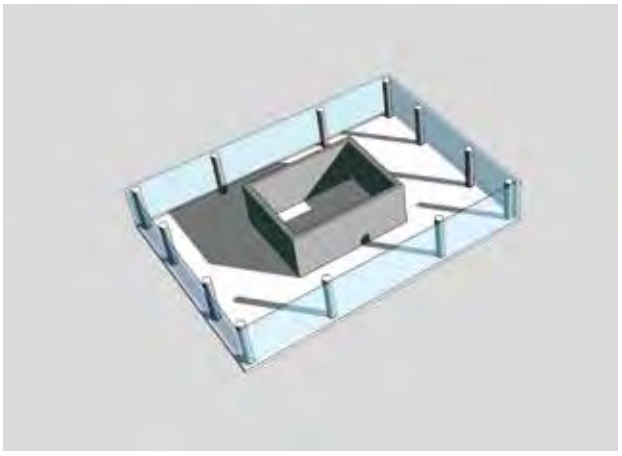
The purchasing of air rights created a development opportunity at the expense of structural efficiency. The floor system above level 14 now cantilevers beyond the eastern edge, shifting the building's centre of mass off-centre. Openings in the east wall caused a reduction in building stiffness and shifted the centre of rigidity in the opposite direction. These combined effects contributed to a magnification of accelerations due to torsional effects. In response, stiff floors with reduced openings in the east wall were introduced at levels 27 and 47 to improve torsional rigidity.

Planning restrictions subsequently limited the building height to 190m from the Collins Street level, resulting in a slenderness ratio of 16.5. With a reduction in floor to floor heights, the reconfigured scheme comprises 60 levels. The reduction in building height partly offset the structural compromises created by the introduction of cantilever floors over the east boundary.

Two large liquid-tuned damper tanks are required, one operating in each direction. A 400 tonne damper tank is required to control accelerations in the north-south direction and a smaller damper tank is required to control accelerations in the east-west direction. These tanks are located at the plant room levels to the top of the tower.

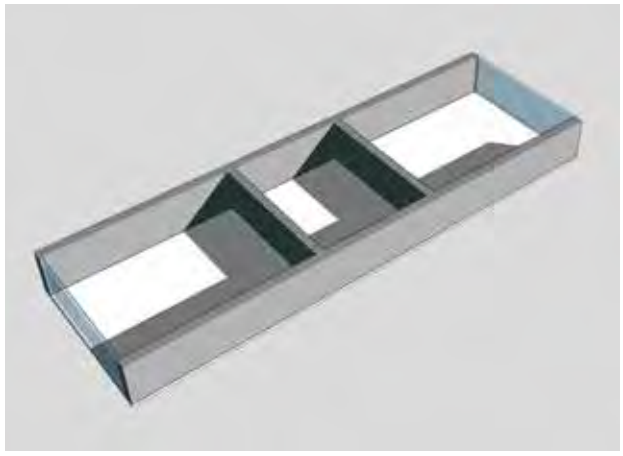


Collins House, typical floor plan



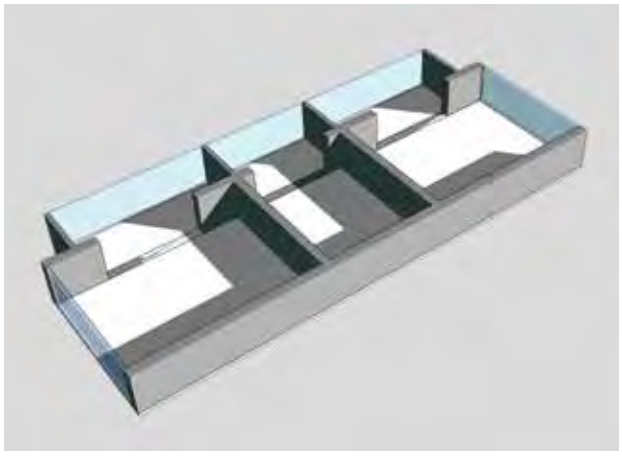
TRADITIONAL STRUCTURAL SYSTEM

Central core
Perimeter columns



COLLINS HOUSE – LOWER FLOORS

H structural 'backbone' to perimeter of building
Core centrally located (non-structural)



COLLINS HOUSE – TYPICAL RESIDENTIAL FLOORS

H shape structure
Introduction of cantilever to east over adjoining property
Floorplate opened up to light and views

Collins House, floorplates

The design team developed the floor and façade as prefabricated modules using advanced parametric BIM tools. This process lead to a unique design to fabrication approach for the Collins House project.

ECI STRATEGY AND DESIGN TO FABRICATION

The Bates Smart team proceeded to a 40% design development level prior to the project entering an ECI (Early Contractor Involvement) process. This procurement methodology was pursued due to the project's complexity, timeframe and constraints. Hickory Group was introduced to the project as the successful ECI contractor.

Hickory identified opportunities for a prefabrication strategy to deliver the floor and façade components. The design team developed the floor and façade as prefabricated modules with Hickory Group, making use of parametric BIM tools.

This process led to the generation of a unique design fabrication approach for the Collins House project, which now sets a precedent and exemplar for small footprint tower developments in Australia.

BIM WORKFLOW

The team designed, with Hickory Group, prefabricated floor components using a single parametric model (Revit family) capable of reflecting various design scenarios to a level of detail that directly translate into the fabrication process of the composite structure.

A critical aspect in the early stages was the crane/lifting capacity, which informed the size of prefabricated elements.

A clearly structured, phased review process allowed for the prefabricated floor components to be coordinated against architectural, structural and service requirements. The level of detail in the Revit families was increased following each coordination/sign-off gate. The Revit families are issued to the Hickory Group for the fabrication process following the coordination/sign-off process.

CONCLUSION

The success of the design and documentation stages of Collins House were achieved through seeking innovation across all aspects of project design and delivery. The unique circumstances of site size, innovative construction technology, economic viability, marketing strategy and town planning systems have efficiently synchronized to make this the most unique residential construction project being undertaken in Melbourne, if not Australia.

The ultimate success of this project however, has been in resolving all these elements in such a way that the effort required to achieve the leading-edge outcome is not evident.

Collins House will stand as a polished and sophisticated piece of architecture; a positive addition to the cityscape of Melbourne.

Collins House delivers a high quality enhancement to the urban fabric of Melbourne and an iconic addition to its skyline.

Collins House, design development