

Rising to the occasion

BlueScope Welded Beams and Columns
provide structural integrity for the ACU's
innovative vertical campus



Case Study

XLERPLATE® steel

Project Background

If ever there was a construction project that exemplifies the robustness, and design flexibility of steel as a contemporary and enduring building material, the Australian Catholic University's (ACU) Saint Teresa of Kolkata (STK) building in the inner-city Melbourne suburb of Fitzroy shines as a beacon of engineering, construction, and architectural excellence.

This project was first conceptualised in 2015 in response to the ever-increasing demands on the ACU's existing Saint Patrick's campus, which at the time was the fastest-growing University in the country and projected to grow its student and teaching staff by 30% over the next five years. Clearly the existing fragmented campus, which spanned multiple sites, intersected by busy city streets, and constrained by limited learning spaces, required a complete rethink, not only of its physical limitations but also of how best to deliver academic outcomes for its growing student population.

Following a lengthy concept, design and development process, the ACU's conundrum was resolved by incorporating the University's existing heritage-listed Mary Glowrey Building (MGB) and surrounding site into a new multi-storey vertical campus, driven by a desire to consolidate the University's footprint and its many faculties into a single, purpose-built facility. This visionary design brings people together in a pedestrian-friendly precinct, encouraging collaboration, promoting better learning, incorporating state-of-the-art technology and most importantly, helping to future-proof the University to grow, adapt, and evolve.

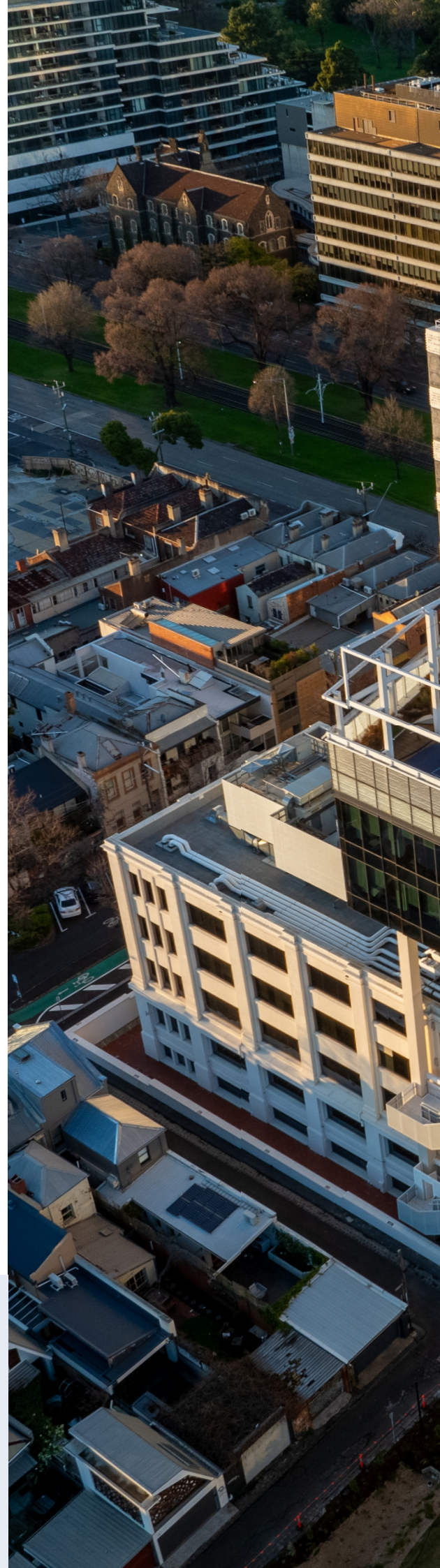
Achieving this objective, however, proved extremely challenging, given the site's heritage listing and its physical constraints, notwithstanding the ACU's key mandatory objective that the existing Mary Glowrey Building remain fully operational during construction.

Defining the brief

Lyons Architects was responsible for the design of the new facility, comprising approximately 18,500 square meters of gross floor area (GFA) that would incorporate a variety of learning and teaching spaces, lecture halls, offices, conference facilities, amenities, lounges, hubs, elevated gardens, personal and group study areas and a rooftop multi-sports court. Additionally, a 270-space car and bicycle parking station was constructed to meet both current and future demand.

Presented with such an ambitious client brief the team at Lyons would need to adopt an equally ambitious design methodology, and given the sites compact footprint and the ACU's desire to maximise the GFA, selected a multi-pronged approach that sympathetically integrated the existing heritage-listed MGB with a new 12-storey tower, a 3-storey overbuild and cantilever, a 7-level underground carpark and an extensive refurbishment of the L-shaped Mary Glowrey Building.

The use of a steel superstructure was determined to be the least disruptive option when considering the ACU's requirement that the MGB remain 'live' during the construction program.

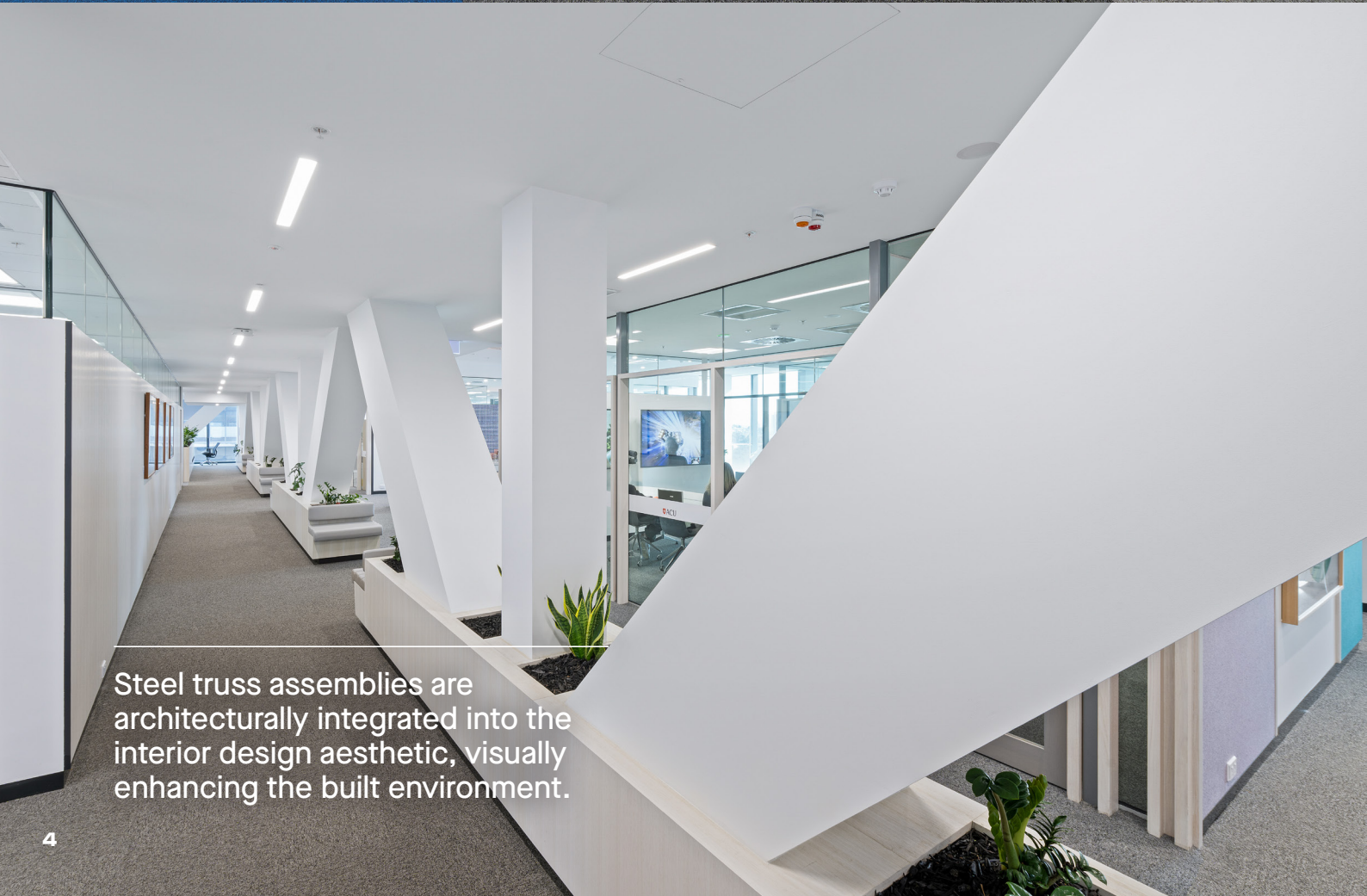




The strategic application of steel was paramount in the construction of the complex overbuild, cantilevered design elements and integration of the existing heritage-listed Mary Glowrey Building.



Steel's inherent ability to achieve greater clear spans provides flexible teaching and learning environments, allowing for easy reconfiguration of internal spaces, ensuring the building's long-term adaptability.



Steel truss assemblies are architecturally integrated into the interior design aesthetic, visually enhancing the built environment.

Rationale for steel

Having solidified the project from a conceptual design perspective, ensuring the client's functional and aesthetic expectations were completely satisfied, the next phase for the STK build was to focus on design development. It's at this juncture that the structural framework for the St Teresa of Kolkata Building was considered and finalised, with structural steel, specifically welded columns and beams, forming the backbone of its design.

The central 12-storey tower primarily utilises a steel composite structure, integrating steel beams and columns made from BlueScope XLERPLATE® steel with concrete slabs to leverage the optimal properties of both materials for strength, stiffness, and efficiency. This system was also extensively applied in the construction of the three additional levels built atop the existing 6-storey heritage-listed Mary Glowrey Building.

According to John Noel, Associate Engineer, ARUP, the selection of welded steel beams and columns for the superstructure was identified as the "most viable solution" for this project, driven by several compelling strategic advantages inherent to steel.

Firstly, steel possesses a superior strength-to-mass ratio. This property allows for significantly lighter structural elements compared to equivalent concrete structures, thereby reducing the overall dead load imposed on the foundations.

Secondly, a critical requirement from the ACU was the need for long, internal spans. Steel's inherent ability to achieve greater clear spans provided scope for flexible teaching and learning environments, allowing for easy reconfiguration of internal spaces, ensuring the building's long-term adaptability. The design of the ACU's built environment incorporates 'flexible teaching spaces' and 'multi-level terraces', which are directly facilitated by the use of structural steel.

Thirdly, from the design, engineering and construction teams' perspective, the use of a steel superstructure was determined to be the least disruptive option when considering the ACU's requirement that the MGB remain 'live' during the construction program.

And finally, the strategic application of steel was paramount in the construction of the complex overbuild, cantilevered design elements and heritage building integration. The construction of three new storeys, totally supported from ground level, utilising steel mega-columns over the existing MGB, was significant and specifically suited to steel, providing the base for the massive, multi-dimensional welded steel trusses that ensured the structural integrity of the heritage-listed building was not compromised. The use of welded steel beams and columns was also crucial in achieving seismic compliance for the MGB, as realised by transferring seismic loads from the existing building to the new building by stitching the new steel floor plates with the old floor plates, as John Noel suggested, creating one "super building".

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John Noel,
Associate Engineer, ARUP

Prefabricated efficiency

Over 2,500 square metres of XLERPLATE® steel was used on the project and according to Spiros Dallas, National Engineer Business Development, for BlueScope a significant proportion was used directly by BlueScope's welded products facility in Unanderra NSW to manufacture the massive code compliant welded beams and columns that formed a key part of the structural core and composite floor plates of the build.

These beams and columns would then be shipped to GVP Steel Fabricators and incorporated into their extensive scope of work. As the main steel contractor on the project, GVP were responsible for fabricating and installing all the structural steel components, including a series of geometrically complex, 3-dimensional nodes, column heads, inclined columns, bolted splices, double web plates, butt weld stiffeners, cantilevered trussed modules and T-bracing.

Importantly, all this complexity is handled in a controlled manufacturing environment, which, according to Spiros, ensures all the components are fabricated with exacting tolerances, essential during the installation process. Off-site fabrication also enables other elements of the building program to progress unimpeded, potentially expediting the project timeline.

Summary

The ACU St Teresa of Kolkata Building stands as a compelling example of contemporary high-rise construction, particularly in its innovative use of structural welded steel columns and beams. The project's success is a testament to the strategic application of steel's inherent properties, sophisticated engineering design provided by ARUP's multiple analysis models, GVP's extensive industry experience both as a fabricator and installer and the meticulous project management of builder BESIX Watpac.

The selection of a steel composite structure was a deliberate choice by the engineering and design teams, driven by the University's need for large internal spans to provide a flexible and engaging learning environment. Additionally, the challenge of overbuilding the heritage-listed Mary Glowrey Building was also a key driver and necessitated a performance-based design approach that preserves the existing structure's integrity and functionality.

Moreover, the project's foundational commitment to sustainability, evidenced by the ACU's funding via a Sustainability Bond and its 5-Star Green Star target, highlights steel's contribution to the building's environmental performance through its recyclability and the building's enhanced energy efficiency.







Project Details

Project: ACU Saint Teresa of Kolkata Building

Location: Fitzroy, Victoria, Australia

Client: Australian Catholic University

Builder: BESIX Watpac – Pierrick Versele, Senior Project Engineer

Architect: Lyons – Adrian Stanic, Director

Engineer: ARUP – John Noel, Associate Project Engineer

Steel Fabricators: GVP Fabricators

Steel Distributor: Surdex Steel

Manufacturer: BlueScope Port Kembla and BlueScope Welded Products Unanderra

Product/Application: 2,500 tonnes - Welded Beams & Columns made from XLERPLATE® steel

BlueScope: Spiros Dallas – National Engineer Business Development | Iman Erfanian – State Manager VIC Australian Steel Markets

Stuart Gibson – Hot Roll Product Owner | Joe Ciccone – Welded Products Factory Manager | Keith Hampton – Welded Products Factory Team Leader

Project Value: \$225M

Photography: Joel Strickland | Construction images: BESIX Watpac & ARUP

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For more information



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