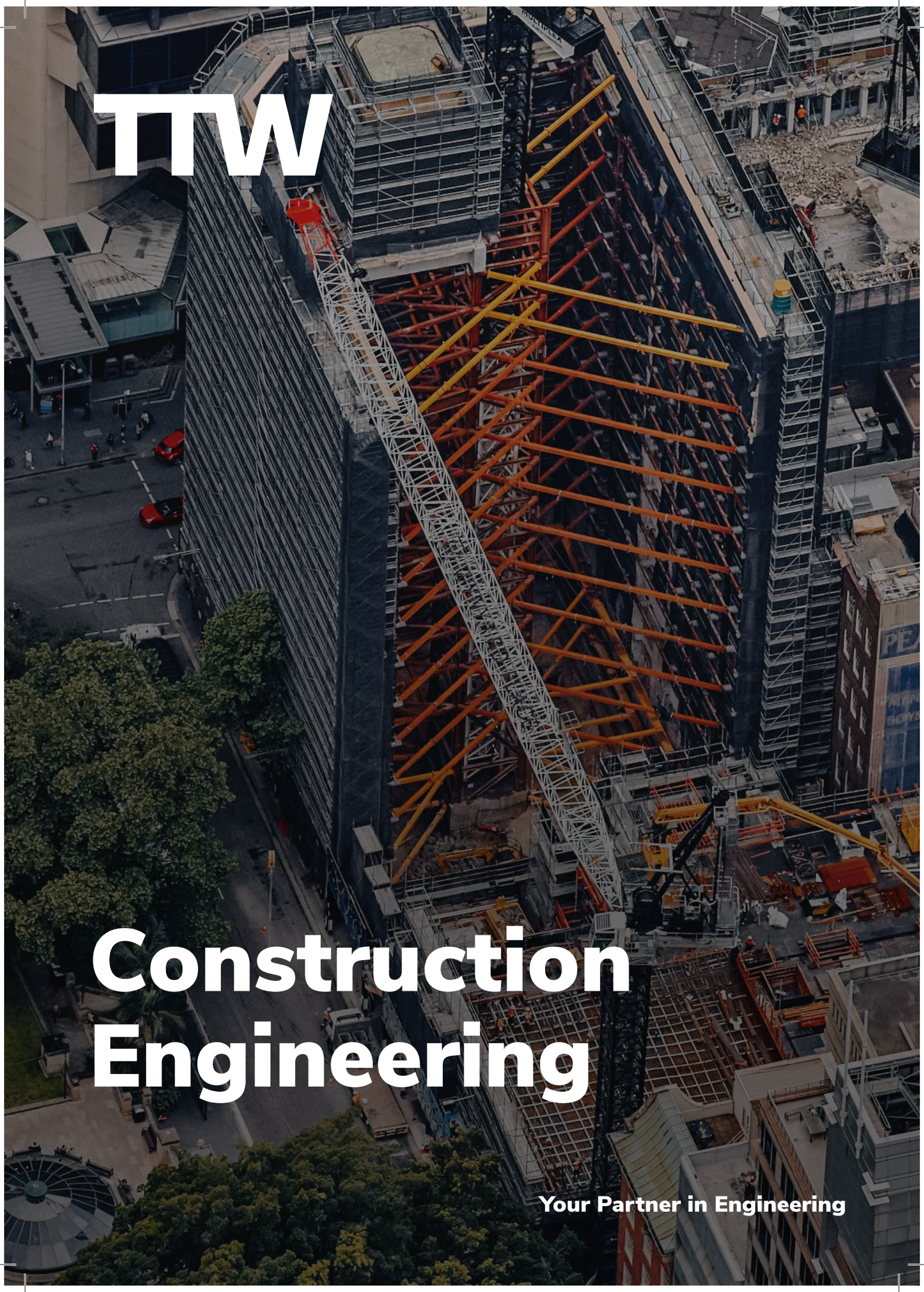


TTW

Construction Engineering

Your Partner in Engineering

Construction With Us

The best way to improve efficiency in your project is to be proactive. Statistics tell us that large-scale projects take up to 20 percent longer to complete than expected and are up to 80 percent over budget by completion as a result. It's a defining problem and one that TTW has become a forerunner in solving.

TTW's practical and customised Construction Engineering services have laid the foundation for success for landmark, high-profile and complex projects around the world.

We've pioneered solutions for our clients to help them build large scale retail and commercial precincts, high profile infrastructure and preserve the integrity of heritage structures through considered design and pragmatic construction methodologies.

Our Construction Engineering team's focus is on construction delivery. We are a **trusted, integral construction partner** that can deliver significant value to your project, no matter how complex. This comes in the form of improving efficiencies, increasing safety on site, and getting your site operational as smoothly and quickly as possible.

**Intelligent Solutions ** Located just beneath the surface of Sydney's Central Business District, Wynyard Walk's challenges encompassed design and construction within an operational major city hub, surrounded by critical services and heritage concerns.

We are **global experts** in Construction Engineering and have the ability to bring **intelligent solutions** to projects of any complexity.

Our Approach

We approach any project **collaboratively** and **intelligently** to offer optimal results with time and efficiencies front of mind.

Collaboration

We work with our clients through planning and delivery phases to refine processes to achieve cost reduction, enhance efficiency and ensure safe production.

Customised approach

Our Construction Engineering team creates solutions to complex problems - no two are the same. Your project is unique, your teams are unique and the environment you are working within is unique. As such, you can expect a personalised approach built in collaboration with the owner and delivery teams of the project to ensure work is synchronised and effective across all stages of the project life cycle. TTW has worked with numerous contractor delivery teams over the years, and through our continued successful project delivery, we have become a trusted, go-to Construction Engineering partner.

Award-winning project solutions

We plan strategically so you can build and operate more effectively. Our approach to construction methodologies has meant we have become a trusted provider globally on complex projects, with award-winning results for their ingenuity.

Reducing risk

Throughout the development of a project, the construction phase involves the highest risk. Our team strives to reduce risk and uncertainty in construction by producing practical solutions tailored to your needs.

Minimising costs

We provide pragmatic temporary designs which not only reduce risk but have also been proven to unlock opportunities through considered engineered solutions. An outcome of which is minimising overall construction costs and ensuring your site can become operational as quickly and smoothly as possible.

Access to additional capabilities

Importantly, our Construction Engineers are experienced Structural Engineers who have delivered major projects prior to specialising in Construction Engineering. This depth of experience enables project teams to efficiently query and unlock value from within the base structural design during construction planning and delivery. In an industry where time is often in short supply, having this capability on hand can be an invaluable benefit to the project.

**Award-winning design ** A unique subterranean 1500-seat auditorium with rooftop playground for Sydney Grammar School.

Infrastructure

CASE STUDY
Western Sydney Airport, Badgerys Creek, NSW

The new international terminal in Western Sydney is due for completion in 2026 and is a transformational infrastructure project that will generate economic activity, provide employment opportunities, and meet the growing needs for aviation in Sydney.

We provided a holistic approach to the project, incorporating Structural, Construction, Civil and Façade Engineering solutions.

Our Construction Engineering team provided temporary work solutions for the terminal structure and basements, including:

- Tower crane base reviews
- Jumpform construction reviews
- Construction methodology development
- Temporary support and propping for the 17 metre tall concrete ‘cigar’ columns
- Column reinforcement cage lifting methodology
- Shoring design
- Reinforced and precast concrete retaining wall back propping
- Structural steel install
- Structural peer review

“With 25-30% of the build cost being ‘temporary work’, getting the right advice is critical to the success of a project.

Glen Hetherington
Technical Director

Complex Temporary Works

CASE STUDY
West Gate Tunnel, Melbourne, VIC

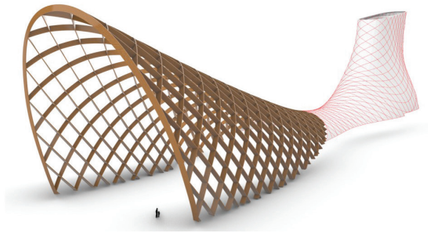
Our approach allowed quantitative analysis of hundreds of potential schemes and geometries enabling data driven decision making to guide the design and construction process. We used state-of-the-art parametric structural analysis and design techniques that ensured the build was structurally efficient and safe.

We worked collaboratively with the delivery team, stakeholders and government to deliver this project.

Our expertise was applied to:

- Safety audits and civil/structural condition assessments of the existing facilities
- Safe demolition methodologies of existing structures
- Temporary solutions to separate works, such as road realignments and draining diversions
- Inspections of existing buildings for adaptive reuse and retrofit
- Temporary safety construction works (crane footings, retaining walls and existing pavement/slab reviews) and decanting works

We provided specialist expertise relating to structural design, geometric optimisation and Construction Engineering to the challenging development of the West Gate Tunnel.



Construction Methodology

CASE STUDY

Crows Nest Metro Station Development, Crows Nest, NSW

Our Construction Engineering team provided installation methodology and third party review of the contractor's designs and inspected the construction of the station box to ensure it complied with the design intent of the permanent works structural drawings and specifications.

We also used the construction program to find cost and time saving opportunities to benefit our client. We found several buildability and practicality issues with the original designs and presented updated concepts for improved results whilst staying true to the design intent of the permanent works engineer.

We supported the team on site, delivering economical temporary works and represented the client from a technical standpoint where constructed elements deviated from the initial design documentation. We also assisted the delivery team in the structural assessment of the as-built condition for compliance with the relevant Australian Standards and design intent.

We unlocked cost and time-saving opportunities through considered engineering solutions on the Crows Nest Metro Station development with its complex and extremely high-risk elements.

Delivering Safety and Efficiency

CASE STUDY

New Academic Building (NAB), Murdoch University, Perth, WA

The NAB (New Academic Building) will be the largest mass timber construction in Western Australia, at over 130 metres long and four storeys tall. The project's mass timber structure comprises of glulam and cross laminated timber, sourced from both Australia and Europe, with in-situ concrete cores.

We collaborated with the delivery teams to provide construction methodologies and rationalised connection designs to facilitate minimising temporary works and reducing crane time. By defining hold points in the erection sequence, we were able to also reduce project and safety risks.

Using 3D sequencing animations, based on the timber manufacturers' modelling, we supported the client in scheduling the shipment of timber elements from Europe. This was also a powerful visual tool to communicate TTW's written installation sequence.

As a result, we were able to support the team in delivering a safer, more efficient project with minimised disruption to the university, its visitors and staff.

We use advanced analysis methods and innovative technologies to assess the temporary stability of structures throughout construction phases, defining critical hold-points to improve process management, delivery, safety and reduce the impact on surrounding assets and properties.

Hands-On Collaboration

CASE STUDY
Atlassian Central, Sydney, NSW

One of the main challenges presented by Atlassian Central involved managing the interface with the neighbouring properties and assets, including obtaining Sydney Water approvals, retaining adjacent owner's heritage assets, managing loadings on TFNSW services, and managing pedestrian and rail commuter access during the various stages of construction.

We leveraged the site and design experience of the permanent works and Construction Engineering team to develop a well-coordinated design. TTW has developed a strong rapport with the client, built on open communication and collaboration.

This collaboration has extended to the wider project design team, enabling us to produce fully coordinated documentation, from the early conceptual stages through to the detailed design phase.

Capturing the staging and sequencing of this project and the early identification and design of temporary works enabled the contractor to explore, challenge and communicate the construction challenges of the project from ECI (Early Contractor Involvement) through to engagement and delivery.

Atlassian Central is a multi-purposed 39-story sustainable tower on a very complex site. Our Construction Engineering team has utilised open communication and collaboration to deliver a coordinated approach to documentation and delivery.

Time and Cost Saving Solutions

CASE STUDY
Logos Metrolink Distribution Centre, Jakarta, Indonesia

Indonesia's first modern warehouse facility, Logos Metrolink, is a 170,000m² three storey ramp-up logistics centre in East Jakarta, carried out under design and construct responsibility of the contractor CNQC-Mitra Pemuda JO, and was practically completed in 2020.

We carried out the preliminary studies for the contractor to confirm the feasibility, then the detailed design including the sequencing of the work, the demolition, temporary works and the new-build details. We guided the main contractor and the specialist PT contractor (responsible for design and execution of the PT itself) throughout the process.

Our client (the D&C contractor) needed to modify the floor clearances for a near-complete six level truck ramp and was initially advised by industry specialists that the structure needed to be demolished and rebuilt. Once engaged, TTW provided a solution that was able to be carried out within months, for a fraction of the cost and time of the original advice to rebuild.

The work was complex with demolishing parts of continuous curved concrete slabs with curved tendons, and our detailed specification of design and methods controlled the associated risks.

This unique development will deliver a large-scale modern logistics warehouse facility that will cater to a variety of size requirements.

Award-Winning Innovation

Working alongside our heritage specialists, we ensure the preservation of heritage buildings through bespoke construction methodologies and our use of cutting-edge technology to deliver improved outcomes, manage temporary structures, and reduce risk.

Multi-award winning / Shell House wins National Trust Heritage Award.

CASE STUDY
Brookfield Place, Sydney, NSW

The Brookfield Place Sydney development includes Shell House, 285 George Street and Wynyard Tower projects. At 65.5m total height above ground level, Shell House is one of the tallest retained heritage façades in the world and certainly one of the most complex projects of its kind.

The major restoration and re-invention of this renowned Sydney landmark would not have been possible without the pioneering concept and subsequent construction of the Shell House temporary retention works. The project's challenges encompassed design, construction and heritage concerns within an area of constant activity.

Creative engineering, in conjunction with advanced analysis techniques, were employed to retain this complex heritage structure, which showcases the ingenuity of the team involved in its delivery. The heritage fabric of the façade and 400ft clock tower in the heart of the CBD has been retained and restored for future generations allowing the preservation of the heritage structures and adaptive reuse to create.

The engineering design was a result of the collaboration between TTW and Multiplex, working in close consultation with Brookfield Properties, Make Architects and Architectus to deliver optimal outcomes for this extremely complex project.

Heavy Façade Retention

CASE STUDY
Sandstone Precinct, Sydney, NSW

Our team's expertise in both Structural and Heritage Engineering was a critical consideration for the developers of an exciting new luxury hotel. The developments involved the adaptation of two prominent, Government-owned sandstone buildings in Sydney's 'Sandstone Precinct', the Lands and Education Department Buildings which are both located on Bridge Street.

Constructed between 1876-1892 and 1912-1930 respectively, both buildings are listed on the State Heritage Register. The project involved extensive renovations to deliver a 6-Star luxury hotel.

The complexity of the historical project meant there was critical input from our Construction Engineering teams, who provided full documentation for the conservation of external building fabric, including sandstone, trachyte and brick masonry, lead, slate and copper roofs, stuccowork, clinker concrete, seismic strengthening, cast iron, steel and timber windows, and glazed pavement lights.

Our Construction Engineers provided full support on both temporary and permanent works on site and were on-site to help the contractor with structural rectification requirements. We also provided significant changes to input on the design and construction sequences to better suit the project requirements.

Our team used **innovative analysis methodologies** to ensure the flow between stakeholders was clear to ensure the effective removal of the original structures, development of new structures and care and preservation of the façade.

TTW

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