

Rethinking Design Innovation

Expanding your design capabilities to deliver exceptional architectural features



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Industrial Design plays a critical role in expanding the design capabilities of architects, landscape architects and artists. Industrial Design is the process of designing products, devices, objects and services with a focus on physical appearance, functionality and manufacturability. This extends to the lasting value and user experience a product or service provides for end users.¹

Conventional design processes and thinking often constrict the architectural possibilities that can be achieved in modern building projects. Pushing creative boundaries to deliver unique and site-specific results requires new perspectives. As new technologies and materials emerge and clients become more demanding, it is becoming clear that the Industrial Design process can help architects unlock their creative vision.

Creating exceptional architectural features is often impossible within the scope of any single engineer, builder or tradesperson. By integrating Industrial Design into their process, architects can supplement their skills with specialised knowledge in the fields of product design, materials and manufacturing and benefit from the Industrial Designer's end-to-end view of their product. When design is at the front and centre of thinking, better design outcomes can be achieved.

In this whitepaper we look at how Industrial Designers can benefit the design and construction process and help architects design and construct unique, long-lasting features and products for commercial, residential, public art and landscape projects.





What limits your design as an architect?

Traditional construction methodology

In traditional construction, it is not common to work with Industrial Designers. The property owner will separately contract with an architect and a building contractor to complete the work. The architect will deliver ready-made plans, and the contractor is tasked to execute them.

Architects have the ability to conceptualise the solution, but conventional structural methodologies - that is, working with a construction engineer, builders and tradespersons - inhibit the ability to deliver challenging concepts. The divide between design and construction enables factors such as time, cost, product availability and capability to potentially negate the project's purpose and limit the architect's scope.

Industrial Design, by its nature, includes the process in which innovative solutions are constructed and fabricated. A construction project that integrates Industrial Design is more inclined to look at approaches that can help the architect realise their full vision, while also finding a solution that is cost-effective, easy-to-install and easy-to-maintain.

Builder capability and willingness

The builder's capability and willingness to pursue an inherently risky architectural idea constrains design freedom. If an idea cannot be executed within the scope of a specialist trade, the more likely it will be value-managed out of the project at a later stage. This may be because it would be too expensive to execute the idea, the builder does not have the requisite skills or resources, or the risk is too great for the builder to take on.

Industrial Design treats specialist components of a building as products, rather than a division of trade. This allows designers to support the architect, the builder and the client to deliver and install special components for the building. The Industrial Design process looks at installation and maintenance risks and provides a project solution that addresses all of them.

Materials and manufacturing knowledge

An architect is also limited by their personal experience with different materials and manufacturing processes. Industrial Designers offer a detailed understanding of materials and processes that enables architects to expand the scope of what can be achieved.

Consider the process of designing and building a metal building component. Collaboration with an Industrial Designer enables the architect to understand the range of possibilities based on the design intent by looking at the range of materials and manufacturing technologies available globally. If the architect engages with the fabricator directly, the fabricator's response is usually constrained by their own manufacturing and resource capabilities.

Budget maintenance and warranty concerns

Every client is concerned with budget. This covers not only the execution of the design, but also its ongoing maintenance and upkeep. Components that are highly complex with moving parts will usually raise concerns regarding repairs, the cost of maintenance and warranty. Industrial Designers can help clients address these issues early in the process through cost and risk management that is integrated within the design process.

Unlocking creative freedom in architecture

Incorporating Industrial Design into the construction process can unlock new opportunities and efficiencies. Ultimately, this creates outcomes that builds difference, inspire engagement and stand the test of time.

Projects featuring a high degree of integration between design and construction professionals have been proven to produce superior results. American studies have measured the project performance impacts of the “design and construct” project model.² The benefits include reduced costs, reduced maintenance delays, fewer change orders and a greater ability to meet the full requirements of the end user.

Below are some key aspects of the Industrial Design process adopted by Tilt Industrial Design (Tilt), a leading Australian Industrial Design company, in the context of building design and construction.

- **Discovery.** Independent thinking is critical to the process of getting the best possible architectural outcome. Industrial Designers are traditionally not manufacturers, giving them the opportunity to look at designing solutions without preconceptions -- they are able to analyse and recommend the best process, materials and design based on the project's stated objectives.
- **Design.** Industrial Designers will deliver detailed designs that are modelled with specialist software. They will look at the opportunities to manage the different tolerances of the components that make up the design through an iterative process that includes prototyping while at the same time managing stakeholder expectations.
- **Construct.** An Industrial Designer often takes on the responsibility for manufacturing a product – a “design and construct” model. This differs from the traditional construction approach where, if you are looking to design a building element (e.g. a large door), you may engage with a structural engineer who has no responsibility for managing costs, manufacturing and/or installing. By contrast, Industrial Designers are designing with cost, efficiency, installation, risks in manufacturing and long-term maintenance in mind.
- **Management.** Industrial Designers expect that the items designed, made and installed by them, they will have to look after. This responsibility ensures solutions that are designed to last.





Case Studies

Heliostat – One Central Park

The brief. Designed by French architects Ateliers Jean Nouvel and PTW Architects, One Central Park comprises two towers of 16 and 33 storeys, above a five-level retail and recreation podium. Jean Nouvel's design concept called for the use of reflected light to offset overshadowing and provide supplementary natural light around the site.

The use of heliostat systems – an array of motorised and fixed mirrors to reflect light towards a predetermined target – for architectural applications is an emerging technology. Tilt's brief was to integrate the mirrors into the building, making them an urban architectural feature rather than a standalone addition with a machine aesthetic. The heliostat would also fulfil a secondary purpose as a public art installation at night.

Tilt needed to develop a risk management strategy to ensure the installation would not reflect light onto unintended targets. There was also a restriction of only 320 mirrors on the cantilever after the installation of the steel work.

Making it exceptional. How did Tilt approach this problem? Below are some key highlights:

- During the discovery stage, Tilt identified existing technology in the concentrated thermal industry and determined how it could be repurposed for the urban environment to manage risk and cost.

- An iterative process involving multiple functional and aesthetic prototypes was followed during the design stage, enabling Tilt to assess the performance of the proposed solution.
- Multiple functional and aesthetic prototypes were developed throughout the design process to assess performance and inform further iterations.
- Tilt led the complex manufacturing and implementation stage, which involved a global procurement strategy from countries including China, India, America and Europe.

An iconic design outcome. Tilt's design process broadened the project's technical horizons, resulting in an iconic, cutting-edge architectural feature. One Central Park's heliostat system comprises 40 large motorised mirrors on the roof of the western tower. It tracks the sun during the day, reflecting it up to the 320 smaller fixed mirrors on the cantilever. The final arrangement results in reflections uniformly distributed around the site at an intensity that is 50-70% less than the available direct sunlight.

Tilt also worked alongside lighting artist Yann Kersalé to successfully integrate an LED public art installation into the structure.



Operable facade – Bunurong Memorial Park

Background. Architects BVN nominated Tilt to design, manufacture and install an operable glass facade for a chapel in Bunurong Memorial Park, Melbourne. The chapel itself is cantilevered over a lake, a unique configuration offering patrons open-air access to the environment as well as protection from the elements when appropriate.

BVN presented Tilt with a concept sketch for an operable facade early in the project. This is the best time to engage an Industrial Designer -- when there has been relatively little design investment, and feasibility and cost of implementing the design can be determined up front. After feasibility was established, Tilt's design process featured a significant focus on cross-referencing the interface between products and ensuring that weatherproofing and connection details were well resolved.

Elevating user experience. The final structure features a facade consisting of three large curved windows forming a floor-to-ceiling glass window in the "closed" position. In the "open" position, the windows slide down to waist height, creating a balustrade. Each curved window is approx 7m long x 2.5m high and weighs approximately two tonnes. Synchronised electric actuators are used to raise and lower the windows.

Product design – Phoenix Central Park

Infinite scope. The award-winning Phoenix Central Park project – featuring an art gallery designed by John Wardle Architects (JWA) and an intimate performance space designed by Durbach Block Jagers – showcases the range of possibilities Industrial Designers can offer you in a single build.

Tilt was initially approached by JWA to support them with design of a single bespoke element, but before long the scope expanded to delivering over 25 unique and challenging architectural features.

Managing risk, delivering exceptional quality. Tilt applied their unique Industrial Design process to protect the architect's original intent from design development through to fabrication. Tilt worked closely with the project team on designing all individual elements, then managed the fabrication process with the selected suppliers. Tilt also managed the assembly, testing and installation of each bespoke product item.

Each bespoke product item featured challenging geometry, proprietary hardware and a refined aesthetic. The project's exacting specifications called for combinations of materials and finishes that were almost impossible to achieve with a single trade. Tilt coordinated delivery of all of these elements.

In addition to delivering complex architectural features, the benefit of engaging an Industrial Designer lies in the management of risk. In this project, given the complexity of each bespoke item, multiple risks were identified by the builder. By packaging each item as a product, the risk is contractually shifted to the Industrial Designer, who is in the best position to address and mitigate each risk during the design process.

Bespoke features. Tilt delivered 25 custom architectural features ranging from components of the building exterior and the performance space to fixtures and amenities in the lower levels. Tilt employed advanced steelwork techniques, material technology, machining and 3D printing to deliver a wide scope, including large-format doors, complex brickwork, skylights, vanities, benches, hanging rails and mirror units.



Tilt Industrial Design

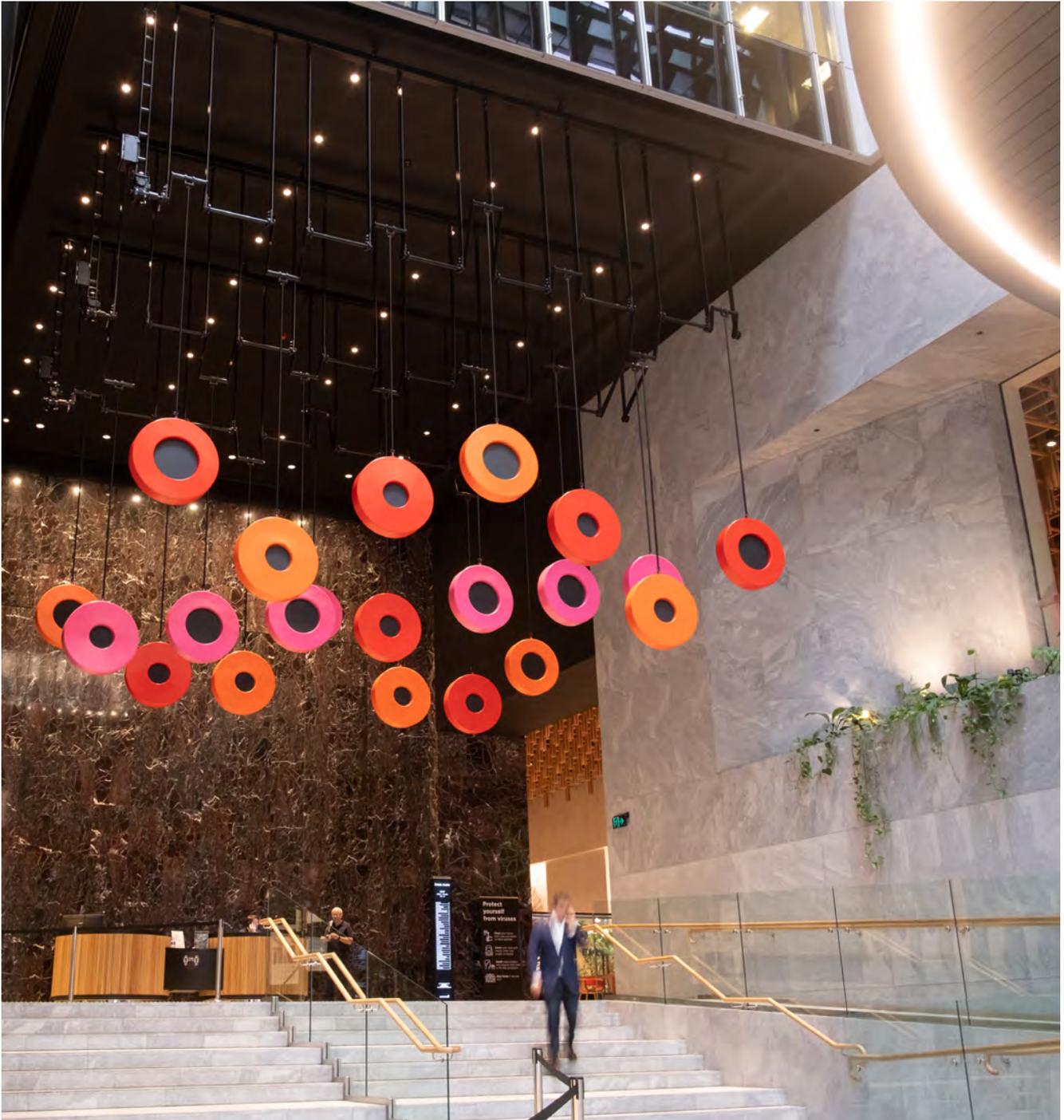
The Built Environment. Made Exceptional.

Tilt are a team of Industrial Designers working together with architects, artists and landscape architects to conceive and construct unique solutions to enhance the built environment.

Their difference stems from their unique perspective. They look at the built environment through the lens of Industrial Design, by applying a problem solving process to explore new ideas and achieve exceptional outcomes.

Tilt's multi-disciplinary team works collaboratively with clients throughout the project delivery, including concept feasibility, design development, supply and on-site installation to successfully deliver unique, award winning attractive projects. Their projects include revolutionary solutions such as heliostat systems, intricate sun shading systems, automated roofs, operable facades, bespoke product design, public art installation, custom play spaces and more.

For more information on Tilt, visit the website at www.tilt-industrialdesign.com



References

- ¹ Industrial Designers Society of America. “What Is Industrial Design?” IDSA. <https://www.idsa.org/what-industrial-design> (accessed 13 December 2020).
- ² For example, see Thomas, Stephen, Candace Macken, Tae Hwan Chung and Inho Kim. “Measuring the Impacts of the Delivery System on Project Performance – Design-Build and Design-Bid-Build.” Construction Industry Institute. <https://www.construction-institute.org/resources/knowledgebase/project-phases/procurement/topics/bmm2002-10> (accessed 13 December 2020).