



Australian Government
Department of Industry



MINIMISING INVESTMENT RISK

WHY PRECAST CONCRETE
DELIVERS ON INVESTMENT

MINIMISING INVESTMENT RISK USING PRECAST CONCRETE

The decision to build, buy or refurbish an existing structure is the first decision for building investors. The second decision is the choice of construction material.

Whether building or refurbishing, the inherent performance benefits of precast concrete during construction or over the life of a building can reduce investor risk.

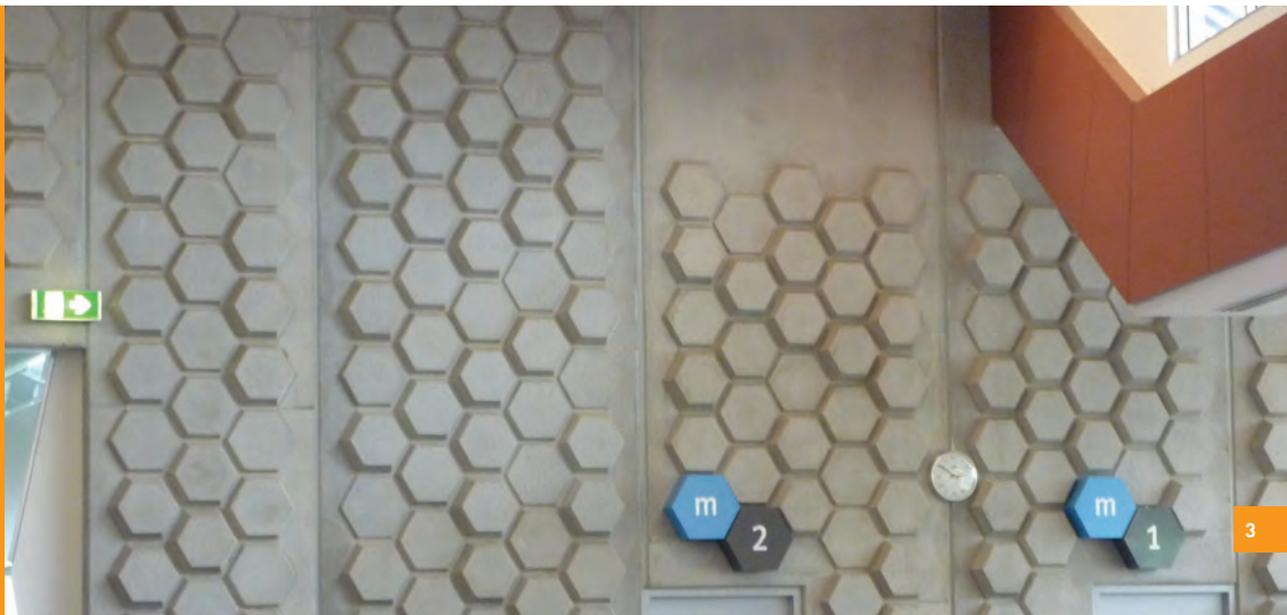
The investor should understand the inherent benefits that precast offers in the long term. The durability of precast structures is well known and maintenance of the product is minimal. With the increased focus on energy consumption over the service life of a building, good detailing on a project is a tool that can reduce the risk of ballooning and unexpected operational costs. Thorough detailing saves investors money.

Before construction commences, the buildability of a project should be assessed without guesswork. Of course, contingency should

always be made in project funding to deal with unexpected events or inevitable changes during construction.

The construction period is usually significantly shorter with precast which results in time and cost savings. While insitu construction can experience weather disruptions, manufacture of precast elements can continue in the factory and can often overlap the erection of precast elements on site. In addition, moving work off-site into a factory environment increases building site safety. Precast sites are cleaner and less cluttered, with less waste, noise and debris. Skilled workers in the factory are able to perform their duties in a controlled, safe environment while on site, small and experienced erection crews install precast safely.

Precast concrete is a stable manufacturing industry with hundreds of millions of dollars invested in Australian factories. It provides the construction industry with a reliable supply of consistently high quality precast elements.



SAVINGS CAN BE ACHIEVED WHEN STRUCTURES ARE WELL PLANNED



Precast is renowned for its time saving benefits during construction. These time savings reduce construction risk, benefitting the investor. Time means money and with good programming and well detailed working drawings and shop drawings, real savings can occur.

Well-detailed planning and documentation is possible with precast construction which then lowers the risk of late finishing projects and subsequent pressures on project finances.

Precast can deliver significant savings in construction time.

With a formal tender process and fair and equitable contract conditions, a project cost is established early in the planning cycle and can usually be achieved during construction. This process, usually associated with lump sum pricing, is often bypassed but can minimise the likelihood of significant project cost overruns and the financial pressures that follow.

Cost increases in precast projects generally only occur when the benefits of good planning are not well understood and planning is unsatisfactory. For example, when working drawings are inadequate, project managers can be tempted to proceed with precast simply to 'get the project going' while waiting for the complex elements of a site to be engineered. This can result in time delays and contract variations and can contribute to project difficulties.





CASE STUDY

FIONA STANLEY HOSPITAL WA

CHALLENGE

At \$2 billion, Perth's state-of-the-art Fiona Stanley Hospital is Western Australia's largest ever building infrastructure development. The 783 bed, 6,300 room development combines the latest in cutting edge technology with a design that blends seamlessly into the natural environment. With 150,000m² of floor space, the hospital occupies five main buildings, taking up the equivalent of four city blocks.

The design is based on principles of environmental sustainability, good accessibility and a healing health care environment. Essential to the project was the selection of building materials and a construction methodology to facilitate its on-time and on-budget completion.

SOLUTION

The first phase of construction included the main hospital building, a pathology/education centre, the central plant building, two multi-storey car parks and the service tunnel to the main hospital. Precast walling was selected for each of these structures as it offers elaborate architectural finishes of various colours and textures – finishes that cannot be achieved with conventional insitu construction.

Specifications for the precast wall panels on the project were highly complex, with strict quality controls and meticulous finish requirements.

At the same time, the rigorous project program called for a high rate of production, which was met by Delta Corporation. As well as precast walling, hollowcore precast flooring was used for sections of the main hospital and central plant building to further speed construction.

An innovative approach to storm water detention, filtration and harvesting is also a feature of the project. The stormwater system provided by Humes was supplied as a purpose-built detention and infiltration system, produced by connecting individual precast modules into a configuration that fulfilled the project's requirements. Given the tight building schedule and a requirement for early completion of civil drainage works, this system was an ideal fit for the project.

BENEFITS

Multiplex worked closely with Delta and Humes at the start of the project to produce the working drawings required. This facilitated all the precast elements to be delivered in a timely fashion. The unique approach to stormwater detention provided an extremely simple and flexible solution without compromising above ground land use during construction and beyond. This is a great example of a water sensitive solution for urban design.

ROBUST AND RESILIENT PRECAST STRUCTURES MINIMISE INVESTOR RISK



Photo: Australian War Memorial

The buildings and structures that people live in and use every day form the backbone of any community. These structures must resist the pressures of daily living and also increasingly withstand extreme conditions such as cyclone, fire or flood.

Precast concrete delivers robust, low maintenance, long life, rust-free, weatherproof structures that are fire-safe and boast excellent thermal and acoustic properties.

WEAR AND TEAR

The ability of buildings and structures to last is important to everyone - from the owner who must pay the maintenance bills, to the occupant who may visit, work or live in a structure, to even the admiring public. When everyday wear and tear is overlooked or ignored, the repair bill can be substantial. Precast structures offer impressive resilience that minimises this risk.

MAXIMUM SERVICE LIFE

The longevity of precast structures and their resistance to both every day and extreme events means institutional investors and other funding bodies tend to look favourably on precast concrete.

NO RUST

Intense compaction of concrete is critical to produce the protective and aesthetically pleasing outer skin that over the long term protects reinforcing steel from the ravages of time. Tight quality controls in precast factories enable this to occur.

WEATHERPROOF AND WATERPROOF

Concrete has been used in every climatic condition imaginable. It can withstand significant temperature variations, cyclones, storms and floods. With the effects of our changing climate, such conditions could become more frequent and widespread.

FIRE SAFE

Precast structures are fireproof which can be attractive for tenants. They are not combustible and therefore do not catch fire or burn.

EXCELLENT THERMAL AND ACOUSTIC PROPERTIES

The high density of precast concrete can act as a thermal sink to provide year-round comfort and reduced energy use. When insulation is combined into a precast concrete sandwich panel, the best of both worlds is achieved. This combination of high thermal mass and insulation results in significant energy savings.





CASE STUDY AAMI PARK VIC

CHALLENGE

An agreement between Melbourne Victory and the Football Federation of Victoria resulted in the building of a state-of-the-art 30,050 seat stadium and extensive refurbishments to the grounds of the historic Edwin Flack field.

The design of the seating and support structure was critical to ensure a safe working environment during construction. Careful selection of building materials eliminated the need for pillars, walls or other support structures, giving spectators an unobstructed view of the action. The project needed to create a robust structure which would withstand wear and tear from the millions of people expected to visit and would require minimal ongoing maintenance. The structure also had to withstand dynamic loads from crowds.

SOLUTION

Hollowcore precast flooring supplied by Hollow Core Concrete was extensively used. The manufacture of some 20,000m² of hollowcore flooring required strict attention to detail to ensure the integrity of each level of the stadium was retained.

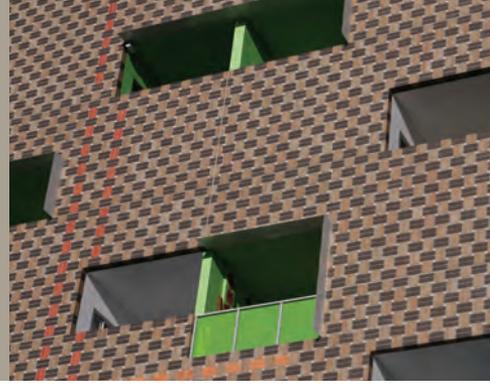
Also specified were precast seating plats from Westkon Precast. The standard pre-stressed seating plats for the project were manufactured using proprietary hydraulic self-stressing standalone moulds. Other specialised moulds were used by Westkon for the pre-stressed cantilevered plats, which were created to form both the upper back rows of the stadium and the foundation of the stadium's unique roof profile. This was a complex challenge as the plats themselves formed the curves that ran in line with the roof detail.

BENEFITS

Precast concrete is well suited to resist the wear and tear of millions of visitors. Able to absorb the dynamic loads of enthusiastic crowds, the precast structure requires minimal maintenance and is resistant to the vagaries of Melbourne weather.

Since completion, the project has received just under 20 awards, a testimony to the choice of building materials and construction method.

PRECAST OFFERS A FASTER RETURN ON INVESTMENT



Precast's rapid construction facilitates early use and occupancy of a structure, thereby minimising the cost of project funding.

EARLY USE

Structures such as bridges, roadways and buildings can be constructed more rapidly using precast, leading to earlier completion and earlier returns.

ATTRACT GOOD TENANTS FASTER

Precast buildings produce a faster, reliable return for investors as construction can be completed more rapidly and tenants can be housed quickly. They may also attract better tenants because they are robust, secure, fire safe, aesthetically pleasing and perform well acoustically and thermally.

MORE USEABLE AND LETTABLE SPACE

The flexibility and inherent strength of precast delivers the ability to create long clear spans without any additional structural support. This gives the designer flexibility to create maximum internal spaces that are column free. These spaces can be easily adapted to varying tenant layouts to maximise square metre returns.

BEST CHOICE FOR CARPARKS

Carparks that are constructed with precast create the ultimate in carpark spaces, by offering vast column-free spaces which maximise ease of use by cars. These benefits can realise an increased return on investment.





CASE STUDY **THE GREEN FOX** QLD

CHALLENGE

A tight site, a complex, multi-dimensional plan and strict environmental requirements were just three of the challenges to be overcome in the construction of this Queensland office building. The building is the Queensland headquarters of Kane Constructions, known affectionately as 'The Green Fox'. A three-storey building, it combines striking elevations with strong environmental specifications, including reduced water and electricity use, extensive use of recycled materials and passive design.

At a mere 10 metres by 40 metres, built to the side boundaries and with a council-required setback of three metres front and back, the tight site was a key driver for the choice of construction materials and methodology.

SOLUTION

The tight site, need for pleasing aesthetics and fast construction led both the client and architect to select precast as the predominant form for the project.

Even with the benefits of precast, installation of the panels required significant expertise which was provided by Austral Precast. The external walls weighed up to 18 tonnes each and required an extremely accurate set out, as they sat on

site boundaries. A 200 tonne crane was used to brace panels off each other and then onto the ground, to ensure braces from the two-storey panels did not penetrate through a visible part of the off-form concrete ceiling.

The building's northern façade is comprised of precast concrete columns over two levels in a random arrangement, separated by an insitu concrete beam on a different plane. Challenges arose as the columns could not be propped traditionally, due to a range of both aesthetics and formwork clashes. The solution required two parts: the first row of columns was held between the level one slab and the beam formwork, while the second row was constructed later between the then-poured beam and the roof slab formwork.

BENEFITS

Despite the site challenges and the complex slab rebates and penetrations, the end result was a smooth installation with no errors and a very happy client. "It is only through pushing the boundaries of good design and application of technology, together with the use of offsite manufactured materials, that innovation becomes mainstream practice," said David Rutter, Director of Kane Constructions. "It is this aspect of the project we are most proud of."

BETTER ONGOING RETURN ON INVESTMENT

It is not just the immediate return on investment that precast structures deliver, but also a better return over the structure's life.

Precast structures offer the investor lower insurance premiums, lower maintenance and refurbishment costs and reduced energy bills.

LOWER INSURANCE

Precast concrete structures will easily last a lifetime and can as a result, attract lower insurance premiums than those built from other construction materials. This is a reflection of the inherent and structural properties, as well as the functional benefits that precast structures offer.

LOWER MAINTENANCE

The maintenance of precast concrete structures is an easy task. An occasional high pressure water wash down if the building is located in a high traffic area and regular inspections of any element joint material are the main two tasks to undertake.

There are many precast buildings and structures around Australia that have not had any maintenance for generations and are still aesthetically pleasing and functioning well.

LOWER REFURBISHMENT COSTS

Buildings are often reinvented, reshaped or refreshed during their lifetime. When this conversion occurs, the framework and core of the building is important. Precast concrete construction offers a long lasting structure that

can easily be re-fitted internally and because of that it is a versatile material choice. Using the precast shop drawings that describe each element, the designer is able to explore a multitude of possibilities while knowing in minute detail how the building was originally constructed. This knowledge is powerful and gives the investor or building owner a structure that will generate maximum returns.

In the unfortunate event of a flood or fire, the fact precast does not erode, rot, catch fire or burn typically makes the restoration of a precast structure easier. In some cases, minor repairs may be all that is required to restore the building to its former glory.

REDUCED ENERGY COSTS

The energy associated with construction typically accounts for just 10% of a building's energy use over its lifetime or carbon footprint, so emphasis should be placed on the thermal performance of the structure and on the operational energy consumed within.

Over 60 years, a concrete home emits up to 15 tonnes less CO₂ than a lightweight alternative, so it provides a better long term solution.

Recent research on energy efficiency shows that making the best use of thermal mass in buildings (using sandwich panel construction) can save between 14-28% in heating and cooling demands compared to other building alternatives. This means on-going cost savings over the life of the building.





CASE STUDY

UNSW VILLAGE NSW

Photo: John Gollings

CHALLENGE

The University of New South Wales needed to provide various accommodation styles to house over 1,000 students on campus. The accommodation, which ranged from one to eight-bedroom apartments, had to be constructed quickly. All apartments included high quality facilities required for a 'study' lifestyle, adjustable air ventilation and generous levels of natural lighting. Thermal efficiency to reduce energy bills and minimum ongoing maintenance were also high on the project's priority list.

SOLUTION

The architect designed 19 buildings, ranging from one to nine storeys which used insulated precast sandwich panels, selected because of their higher thermal performance. The sandwich panels were manufactured by Hanson Precast with the internal structural layer poured first, a 50mm insulation placed next and then completed with a 60mm external concrete skin. The three layers were held together with non-conductive connectors enabling the concrete layers to move independently and allow for thermal expansion and contraction of the external skin without affecting structural integrity.

Precast hollowcore floor planks made by Hanson were also used and assisted with thermal performance. To provide free-flowing ventilation, an energy efficient hollowcore cooling system was devised. Permanently opened holes on the underside of the floor planks and the open external ends of the planks allowed for the automatic transfer of air. Fixed louvres were fitted at the plank ends to protect against rain ingress. This unique ventilation of the slab allows absorbed heat to be purged overnight, enabling the slab to absorb heat during the day and provide passive cooling to spaces. Cross ventilation to the bedrooms was created without compromising privacy.

BENEFITS

Integral to the project's success was the intelligent and innovative treatment of its extensive precast structural elements, which helped deliver a quickly constructed, low maintenance solution boasting excellent thermal efficiency. The use of total precast panel construction will also enable simple reconfiguration of the site, should that be required in the future.

