





www.australprecast.com.au Ph: 1300 778 668 Why precast concrete?

A guide to one hundred advantages

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National Precast is grateful to British Precast for the

If precast concrete were to be invented now it would be hailed as a miracle.

### Precast concrete: the sustainable choice

Concrete is the most commonly used building material in the world; yet we take what it does for granted and too often this means that much of what precast concrete can offer is overlooked.

Now it is time to take a fresh look at the world of precast concrete.

This booklet examines what factory-made precast concrete can offer the architect, the designer, the engineer, the builder, the client, the financier, the insurer and the environmentalist.

Precast concrete covers all factory-made concrete products both mass produced and custom - including walling, flooring, structural elements and civil products.

#### This amazing portfolio

of products serves the needs of society every day, and supports economic growth. Together they provide:

- Shelter and protection against the forces of nature
- Drinking water, drainage and sanitation systems
- Communication and transport infrastructures
- Energy supply systems
- Commercial, educational and healthcare facilities.

As well as these functions, precast concrete products also have very positive inbuilt sustainability advantages with environmental profiles. In use they help to combat some of the direct effects of climate changes such as hotter summers, high winds, flash flooding and urban heat islands.

We hope you enjoy reading about the 100 advantages of precast.

If you wish to know more contact us at: admin@npcaa.com.au



#### Any product...

From walling to flooring, from stairs to beams, from columns to bridges and even to one-off sculptures... the list is endless.



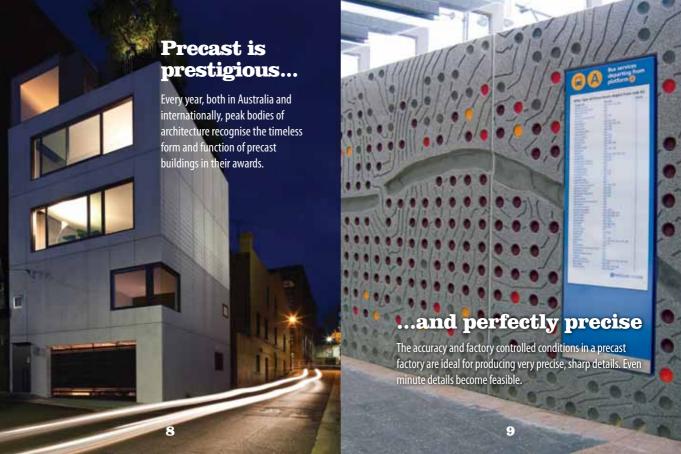
#### ...in any application

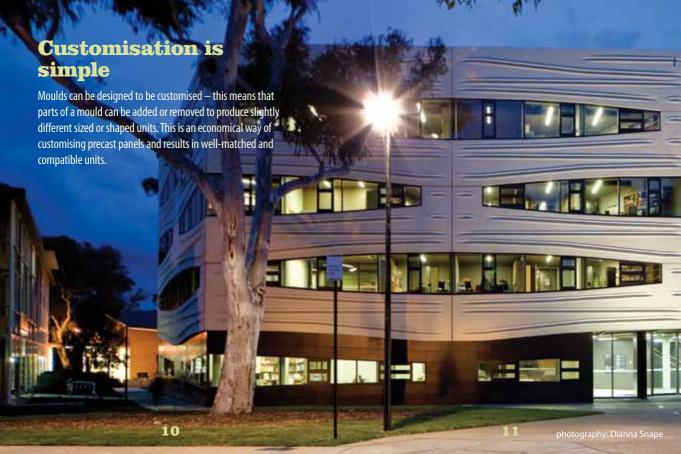
Evidence of precast is all around us... in our hospitals, our shops, our offices, our housing, our stadiums, our libraries, our museums, our prisons, our warehouses and our zoos. And it's everywhere on our roads, our rail and our waterways.

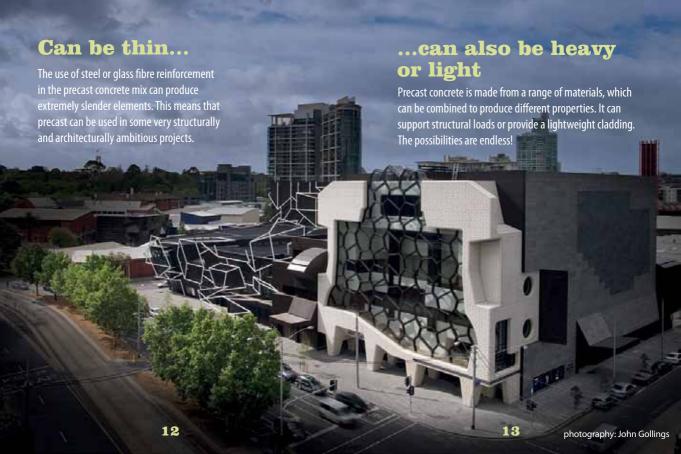
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# Inspiring and amazing architecture









achieve spectacular architectural forms using custom-made

moulds or form-liners.

The level of detail on a wall or façade is often referred to as articulation – this term is used to describe the level of complexity on a surface. Casting precast concrete in carefully constructed moulds means that very highly articulated panels can be made.

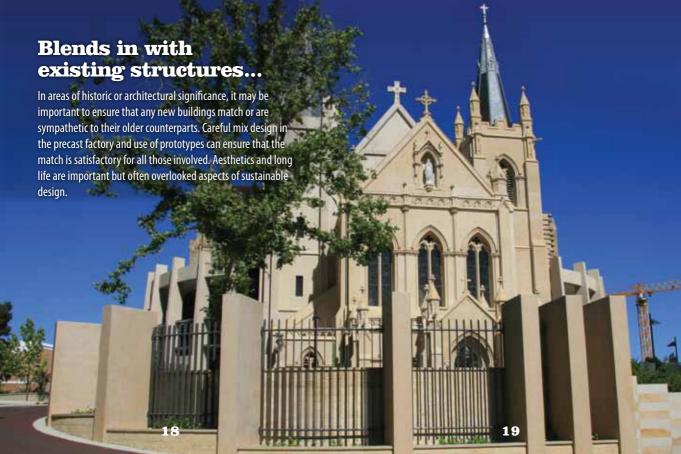
#### ...and keeps its form

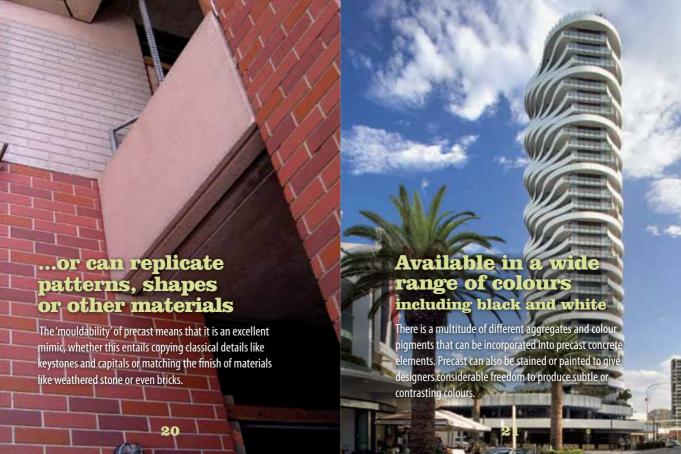
Keeping in shape is important and precast is no exception. Some materials'relax' over time, which can be difficult to account for in design; precast maintains its shape, size and properties.

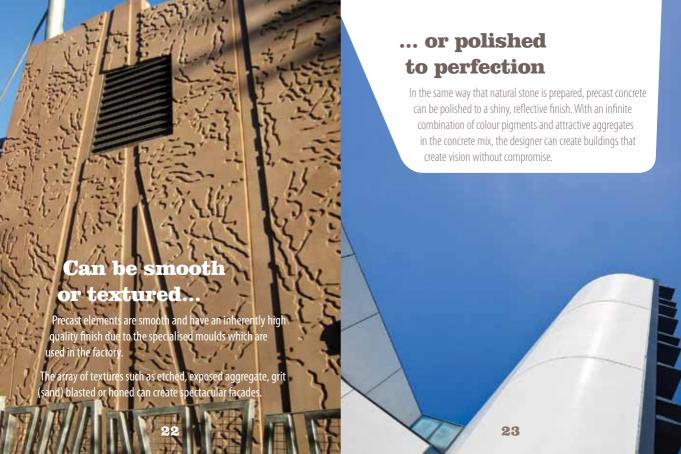


#### Can be straight or curved

Being able to produce a variety of different profiles is an area in which precast concrete excels because of the flexibility and accuracy in the production process.









# Mitigating construction risk

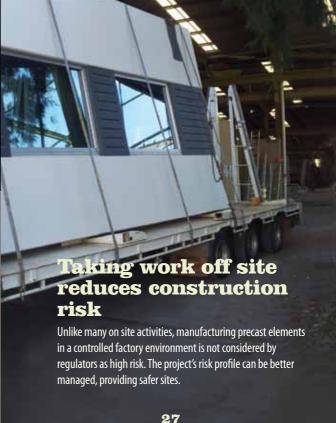
#### Safe design, manufacture and build

Precast structures offer the designer a safer way to construct buildings, making it easy to comply with health and safety regulations. In some cases, this benefit could be a life-saver.



#### Covered by Australian Standards

The precast industry is involved with the development and review of both Australian and international standards — this ensures that customers receive the best quality products which are compliant to all relevant standards. As well as specific product standards, many manufacturers also comply with ISO 9001 Quality Management Systems, ISO 14001 Environmental Management Systems and AS 4801 OH&S Management Systems.





Precast is produced in factories under strictly controlled conditions which means excellent resource efficiency for materials, labour, energy and processes. Today's precast factories are clean and productive, and many use computer controlled processes for moulding, concrete batching, casting and finishing.

Major efficiency programmes are also helping reduce factories energy consumption.

## ...which is getting better all the time

Innovations like the use of self-compacting concrete (SCC) in precast factories mean that vibration is no longer needed to ensure compaction. This makes the factory much quieter, safer and significantly reduces its electricity consumption.

## Great quality, over and over again

Having decided to specify precast, it's important to have confidence in the solution and this is where factory-controlled procedures are critical. Repetition of individual elements can be achieved with confidence whether 1, 10 or 100 are required. Re-using a mould makes both environmental and economic sense — every additional cast saves materials, energy and time, and prevents moulds going to recycling or to disposal prematurely.





## with long lasting moulds

Moulds for precast concrete can be stored to allow later replication, whether additional elements are required one day, one week or one year later.

## Less weather disruptions

With all precast production activities taking place within the factory, it is only erection that needs to be done on the construction site. This means that precast is significantly less vulnerable to disruption caused by wet, cold or very hot weather; whatever happens, precast can continue.

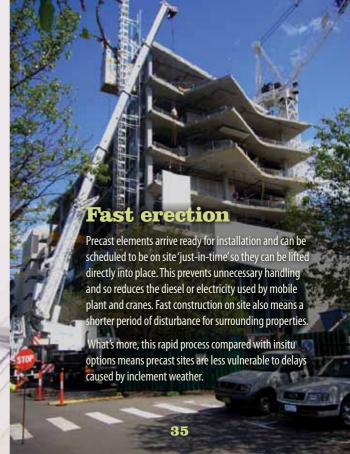


#### A reliable supply...

The combination of large weatherproof factories, dedicated workforces with regular shift patterns and good quality control... enables the production and delivery of quality product, day after day for any size project.

## ...means you can plan ahead

By building totally with precast elements, the specifier can improve efficiency, design out waste and work ahead of time.





## Provides an instant work platform above...

Precast structures and in particular floors and staircases provide an early, secure and broad platform from which subsequent site activities can be undertaken.

This solid footing helps speed up construction and gives managers confidence that trades can go about their work safely — allowing safe access and egress, even in an emergency.

#### ... and below

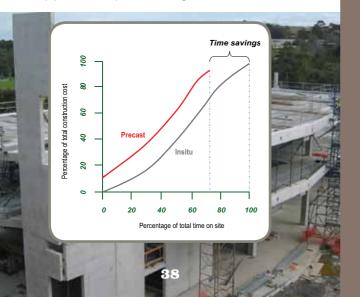
Precast construction requires minimal propping and bracing and reduces the need for scaffolding, to provide an immediate clear work area for following trades.



### Fast construction saves site costs

By maximising the use of precast elements in a structure, time savings of 35% can be easily realised.

Shorter durations for site facilities, supervision of trades and equipment hire all equate to cost savings.





## Improved safety on site...

As well as having established codes of practice for safe delivery and erection, delivery of exact precast elements to site reduces site clutter and improves safety.



## ...and lower site noise levels

No vibration, no sawing and no other noise-generating processes are needed to install most precast concrete products, whatever their size. This results in substantially quieter construction sites which has benefits for workers and neighbours alike.

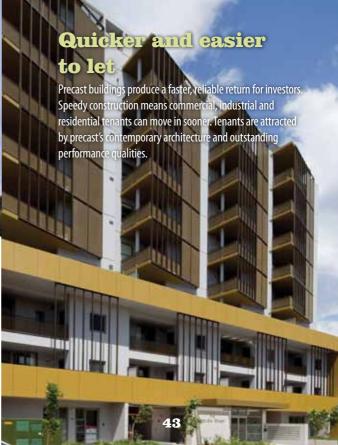
## Minimising investment risk



#### Appeals to investors

The longevity of precast structures and their resistance to both everyday and extreme events mean that institutional investors and other funding bodies tend to look favourably upon the precast option.

This is particularly well–matched in city locations where the solidity and sympathetic appearance of precast structures reflect the commercial businesses inside.





#### Withstands everyday use

All structures and buildings are subject to everyday wear and tear and this is where the use of precast concrete really makes sense. Its hard, tough surface is extremely resistant to everyday dents and punctures.

This might sound like a minor consideration, but the inherent benefit of concrete structures is that they are resilient and long-lasting from top to toe, offering an absolute maximum service life.

## Lower insurance costs

With amazing structural properties and functional benefits, precast concrete buildings can attract lower insurance premiums than those built from other construction materials.

This can become particularly apparent in high risk areas such as those at risk from floods, fire and burglary.



## Keeps buildings secure

Preventing the fear of crime and disorder is a major issue within social sustainability, but security also has a massive impact on people's livelihoods.

Whether for homes, businesses or increasingly for prisons, precast is secure against break-ins and break-outs; it can't easily be cut open and is extremely resistant to impact.



#### **Does not rust**

Precast concrete is corrosion-resistant and can therefore be used with confidence, even in very aggressive environments. For example, precast concrete piers are resistant to the inter-tidal anaerobic attack experienced in some marine environments.

Furthermore, tight quality controls in factory production mean that cover levels for reinforcement are guaranteed in any application, providing an aesthetically pleasing surface which is free from rust.

#### Rot proof, fungus proof and mildew resistant

Precast is dense, tough and does not shrink or warp. It simply will not fall prey to these common enemies of organic materials. Specifying precast means having confidence that a structure won't rot away — seen or unseen.

Damage is often done within or behind lightweight walls and on discovery, it is often too late to resolve easily; such repairs cost millions of dollars every year in Australia.

## Inedible to termites and rodents

Organic building materials make the best food for these pests that threaten our buildings.

Precast concrete is resistant to attack from termites and other infestations such as rats and mice, so buildings made with concrete will be less susceptible to such damage.



Precast is fireproof. It does not catch fire or burn. It protects against the spread of fire between rooms or properties fewer fire-related deaths are recorded proportionately in concrete buildings.

International studies have indicated that a major fire is more than 10 times less likely to develop in buildings which are built from concrete. Furthermore, there is a clear link between construction materials and fire safety.

#### Lower refurbishment costs after a fire...

Precast typically needs very little remedial treatment following exposure to the high temperatures of a fire. In many cases, some minor patching and a coat of paint may be all that is required to make good.

#### ...or a flood

The high quality of precast and the fact that it does not erode or rot make the task of cleaning up after a flood very straightforward.

This can be a difficult time for people struggling to come to terms with the devastation that floods can bring, so precast brings a welcome respite.



#### Weather-proof

Precast concrete stands up well to rain, storms, windblown debris and cyclones.

It can also withstand significant temperature variation, unlike other materials that can deteriorate quickly with such regular exposure to climatic changes. In damp, exposed or harsh environments, other materials struggle to match the performance of concrete.



## Resistant to the effects of a changing climate

Predictions of higher winds, more driving rain, tropical-style deluges and flash floods, and more incidences of localised severe weather events are of concern for homeowners and businesses.

Precast concrete offers better protection because it is robust, durable and has structural integrity.

#### Keeps water in...

Precast is an excellent material for containment, whether this is for mains water storage, domestic rainwater, stormwater or grey water collection.

The strength and resilience of precast concrete has been proven for these and other applications such as wastewater treatment works and desalination plants. Concrete pipeline systems play a key role in taking sewerage flows for treatment. Rigid pipes mean no leakage and centuries of performance.





#### ...and out

In other situations where we need to keep water out, precast can be used for flood protection, and river and coastal barriers to protect against inundation from high tides and storms.

Precast concrete flood mats and barriers can protect river banks and livelihoods — and with the effects of a changing climate, such flooding could become more frequent and widespread. The use of similar precast elements can also be used to create breakwaters and artificial reefs out to sea.

## **Absorbs impacts and offers protection**

Precast concrete can resist massive impacts. There is a growing need for built structures to be more resilient to threats from flood and fire. In extreme applications, blast protection from explosions may be a necessary design criteria. Sufficiently reinforced and thickened precast units can perform a critical role here.

Many high-profile infrastructure projects and government buildings in Australia and elsewhere feature precast concrete products because of their robustness and resilience.



Despite all the best intentions on a construction site, sometimes minor dents, damage or site grime can compromise the appearance of neatly installed concrete elements.

The excellent surface finish of precast makes cleaning and repairs easy — most manufacturers offer extensive quidance on how best to undertake these tasks.

## ...with lower maintenance costs

In exposed locations, some structures constructed with other materials will need regular painting to protect against corrosion and enhance their aesthetic appearance. This is not the case with precast concrete, which does not require such treatment. This advantage is particularly relevant for roads, bridges and overpasses that cannot be accessed easily.

## Structures for today and tomorrow

#### Guaranteed durability and built to precise specifications

Precast's lower water:cement ratio, combined with consistantly correct cover to reinforcement and use of admixtures ensure high strength, high quality and durable products. This guarantees precise, reliable workmanship ensuring that the quality of service from precast is maintained long after the products leave the factory.





Concrete buildings and structures from hundreds of years ago are still in use today. Some say concrete can last up to 2000 years. At least two recent European precast projects were built to a 1000-year minimum design life. Effective design detailing helps to lengthen the life of a concrete building; precast manufacturers can offer guidance on designing for durability.

#### ... and it gets stronger every day

Precast concrete goes on increasing its strength for hundreds of years after it is cast.

What's more, during that time it won't shrink, warp, move or creep excessively, so can be relied upon to perform consistently year after year.

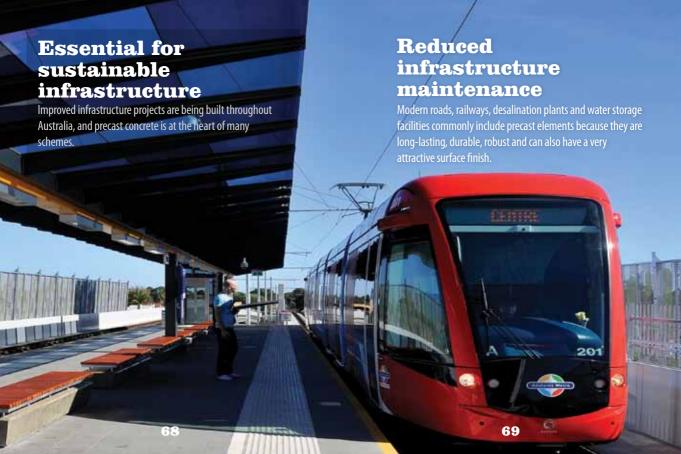




#### Long clear spans

Precast's inherent strength provides the ability to create long clear spans without any additional structural support. This provides the designer maximum flexibility to create spacious interiors and column free offices and car-parks.

### Can support heavy loads Where point loads or high bearing stresses are likely then the dense, high quality concrete in a precast element is absolutely critical. Civil structures, industrial applications, utilities and power generation all provide good examples. Can achieve high strengths In civil engineering applications high strength concrete is often desirable, and precast units can be cast to meet such demands. If high early strengths are needed, then this can be achieved through several means including accelerated curing and concrete additives.





# Fit for people

### **Built for generations**

Precast structures last for generations. Buildings can simply be refitted rather than demolished or even dismantled and reconstructed.

Precast structures can be designed for future generations by specifying them to withstand greater loads than are needed today.





#### Comfortable now

When combined with double glazing, the thermal mass properties of concrete help even out daily and seasonal temperature swings, making indoor spaces more comfortable without having to resort to air conditioning. With operational energy accounting for about 90% of the energy consumption over a 100 year life of a building, this ability to moderate extremes in temperature is important.



### ...and thermally versatile

Precast concrete can easily be used to create heating and cooling systems that use up to 50% less energy.

Ducting pipe systems can be cast into panels and slabs, or alternatively, the hollow cores in precast floors can be excellent conduits for circulating hot or cold air.

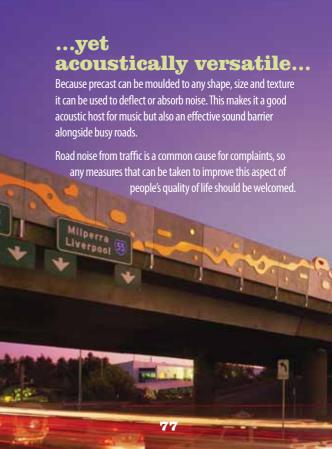
The concrete protects the heating or cooling system within and slowly absorbs the heat or cool, then releases it into the building's interior, further improving the effectiveness of the system. And the embedded ducting means that room spaces can be used more effectively.

#### Quiet...

As a dense material, precast elements in a building make for a peaceful lifestyle. It is the mass of concrete which helps to deaden noise, whether this arises from traffic, machinery, music or noisy neighbours.

Privacy and effective sound reduction are thus ensured, and with better acoustic separation between buildings, precast walls and floors are the ideal choice.

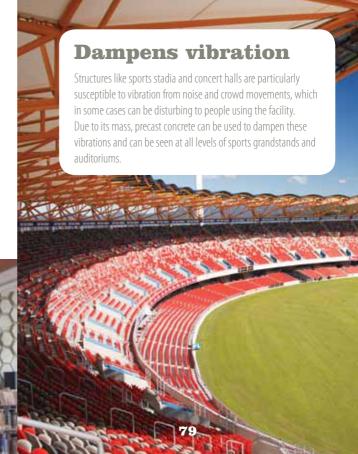




### ...and better for neighbours during construction

The easy installation of precast products makes for much less noise from the construction site and this is of great benefit to those inhabiting or working in adjoining properties. Life is quieter and therefore much more tolerable during the construction period.

In addition, a precast site will emit virtually no dust — lessening the likelihood of problems with dirt and poor air quality, the most common causes for complaint from neighbours during construction.



## Hidden services ... ready to roll

Precast concrete can carry pre-installed services and fixtures, whether these are communications, electrical, plumbing or even windows! Services can be cast within a precast element and can include connection plates ready to receive heating and lighting fittings on site. This makes both construction and maintenance easy.





### Wi-fi compatible

With homes and offices increasingly designed for information technology, it is good news that precast concrete buildings do not interfere with radio signals, local wi-fi or internet networks. This makes precast a technology friendly material for homes and places of work.

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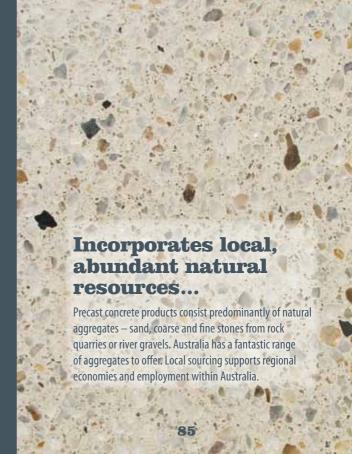
### Making better places

It is vital that we invest in buildings and infrastructure which are long-lasting and robust — but we must also consider the overall quality of the built environment so that it is a healthy world for people to enjoy.

Constantly changing world climatic conditions mean that the future pressure on structures could be much greater than today.

Precast concrete allows us to build sustainably and with confidence in the face of such adversity.

## Nurturing the environment



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## Using natural resources effectively

We have a responsibility to use our natural resources wisely by specifying building products carefully and ensuring that these have a high recycled content. The materials that are used to make precast concrete are available locally and are plentiful in Australia, but cannot be taken for granted.

Steps are being taken by the industry to encourage resource efficiency and to design out waste throughout the manufacturing and construction process. Specifiers can be confident that precast concrete products are sourced responsibly.

End-of-life destinies such as recycling for concrete aggregates or deconstruction for re-use in buildings or structures are increasingly being considered.





## Uses by-products from other industries

In many cases precast products incorporate waste materials such as blast furnace slag from the steel industry and fly ash from coal-fired powerstations. These materials can improve the performance of concrete and can be used as partial replacements for cement.

necific energy con

### Lower cementitious content using cement from a responsible industry...

The cement that goes into precast concrete is vital to both its durability and appearance.

The precast industry works hard to reduce cement use by the use of special mix designs including admixtures and to reduce water use by optimising water:cement ratios. The use of other cementitious materials such as ground granulated blastfurnace slag and pulverised fuel ash is also growing. Both these additions have much lower embodied CO, than cement.

In recent years, energy efficiency in Australian cement plants has improved under their Climate Change Agreements. Additionally, between 1998 and 2006 fossil fuel use per tonne of cement has reduced by 23%. This means that typical concrete now contains about 10% less embodied energy than it did just 10 years ago, purely on the basis of these improvements in cement manufacture.

Actual specific energy consum 92 on (kWh/t)

## ...which is reducing its carbon emissions

Making cement in a kiln requires a great deal of heat energy, but the amount of non-renewable fossil fuels used to produce this heat is being reduced.

The great majority of precast concrete mixes are made up of low carbon footprint sand, gravel or crushed rock meaning that the carbon content of cement is diluted many times over.





## Less cement reduces embodied energy...

Precast concrete flooring systems use less concrete than insitu concrete floors, due to the incorporation of void formers or hollow cores.

Less concrete means less cement, and less cement means savings in embodied energy. Precast flooring also delivers savings in operational energy for heating and cooling.





## Manufacture is not reliant on oil based products

Precast concrete is not as vulnerable as plastics and asphalt to increases in oil and gas prices and is well–positioned for the post–oil age.

A good quality precast finish relies on achieving a clean break between precast concrete and its casting mould or bed; vegetable-based release agents can be used as a substitute for oil-based chemicals, thereby reducing the overall environmental impact.



## The majority of factory waste is recycled...

The highly effective recycling systems used in precast factories enable virtually all process water, slurry, aggregates or cement to be safely re-captured and put back into production. This minimises any outgoing waste materials, thereby eliminating unnecessary disposal costs and energy use from transport miles.



## ...and site waste is minimal

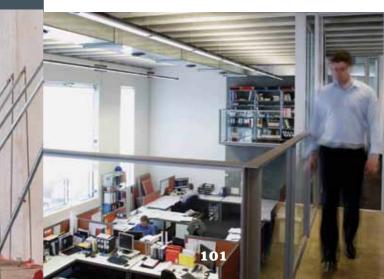
Every year, millions of tonnes of carbon emanate from waste on construction sites where traditional insitu concrete is used. Insitu concreting involves separate deliveries of concrete, steel and formwork which adds to the energy cost of the transport miles for a project. As well, carbon is produced from disposal of surplus wet concrete, formwork and steel waste.

Using precast is a highly effective strategy to reduce waste and energy. Executing all of the necessary finishing tasks in the factory allows any waste to be controlled, recycled and reused.

Using ready-made precast elements means no waste on site and prevents waste disposal costs being incurred.

## Precast is emission free...

In its daily use, precast concrete is an inert substance, so it doesn't emit or give off any gases, toxic compounds or volatile organic compounds. This all means allergy sufferers can breathe easy because precast does not contribute to the symptoms of 'sick building syndrome'—SBS costs Australian businesses every year in lost productivity.



### $\dots$ and reabsorbs $CO_2$

During its lifetime precast concrete elements will re-absorb the carbon dioxide that was used to create them in the first place, a process called carbonation. This process accelerates when products are crushed for recycling at end of life.





### **Does not melt**

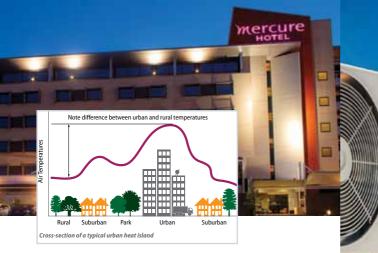
Just like many other concrete and masonry materials, precast concrete does not melt in high temperatures. This means that there is no need for protective paints or special insulation — and finishes can be viewed just as the designer intended. Concrete will not drip molten particles in a fire, and this helps protect human life by providing safe escape routes and preventing fire spread.



### **Energy efficient...**

Recent research on energy efficiency shows that using sandwich panels maximises thermal mass benefit. Savings between 14 — 28% in energy demand for heating and cooling (compared to other building methods) can be achieved. This means on-going cost savings over the life of the building.





## ...and saves energy in our cities

On a hot day, pale coloured concrete finishes reflect more sunlight and heat than dark surfaces, so keeping buildings cooler and mitigating the 'urban heat island' effect. This reduces urban energy use because people are less likely to use air conditioning, potentially saving many tonnes of carbon and millions of dollars every year.

### ...which minimises long term operational energy

The energy associated with construction typically accounts for just 10% of a building's energy use over its lifetime or carbon footprint, so emphasis is more often placed on operational energy consumed. Over 60 years, a concrete home emits up to 15 tonnes less CO<sub>2</sub> than a lightweight alternative, so providing a better-long term solution.

Research by Currie and Brown on commercial buildings shows that, over a 30-year period, concrete structures are more cost-efficient than steel and glass because they require less energy to heat and cool.

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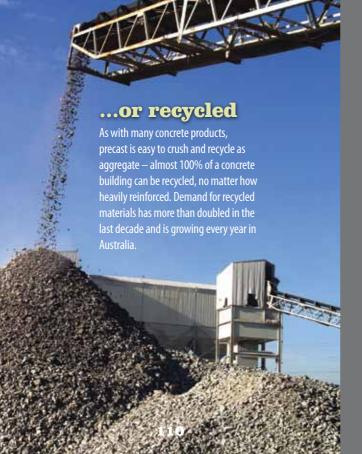
### ...and in the future thermal mass will ease summer overheating

The future effects of climate change are now dominating the way we build. Recent studies show that lightweight structures suffer significant overheating when summer temperatures are high. By contrast, precast concrete buildings with solar shading will be more comfortable to occupy and less likely to become reliant on air conditioning systems to maintain habitable temperatures inside.

Precast's thermal mass lowers the energy demands of a building at peak times, thereby reducing demands on energy infrastructure.

#### Can be re-used...

At the end of a structure's life, precast units can be re-used in their entirety, for example floor slabs can be reclaimed as whole elements. These could be re-installed in the same building or even transported a short distance and used in a comparable structure elsewhere.

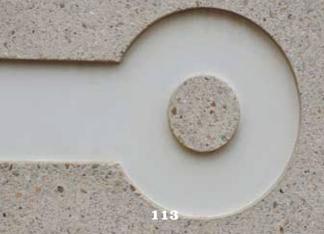


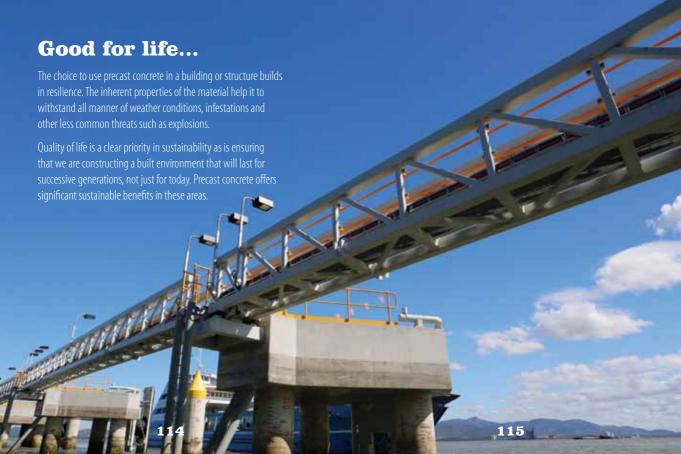
## Precast is proven



## Innovating for tomorrow

Manufacturers of precast concrete products invest heavily in research and development to make their products and services even better. New products, new information technology and new factory investments demonstrate this forward thinking attitude. Innovation is an everyday part of the precast world.





## ...with impressive whole of life value

There's no doubt that all 100 advantages of using precast concrete add up to a significant package — and it is exactly this idea that convinces people to use precast.

The argument is compelling. Precast offers value through stunning finishes, reduced risk and robust structures which are good for people and the environment.

