

UNDERSTANDING THE BENEFITS OF PRECAST CONCRETE PANEL CONSTRUCTION



INTRODUCTION

Across the country, the construction industry is booming. The findings of the 2017 Australian Constructors Association's Construction Outlook Survey indicate that the total value of major project work across Australia rose by 7.1% in 2017-18, and is set to rise by another 6.8% in 2018-19.ⁱ This growth is mirrored around the world: thanks to burgeoning populations and a massive, ongoing shift toward urban living, the global construction industry is projected to expand by an average 2.8% per year between 2017 and 2020, and is estimated to be worth more than \$US101.1 trillion by 2021.ⁱⁱ

The effects of this strong, sustained expansion are twofold. First, growth has prompted new levels of competition and innovation amongst designers and specifiers eager to keep up with rising industry demand. Second, it has led the industry to investigate construction materials and methodologies that align with – and enable – today's dynamic construction culture. Specifically, designers and specifiers are seeking construction materials that enable rapid, efficient construction without compromising on performance and aesthetics.

In this whitepaper, we explore how precast concrete can help designers and specifiers meet these goals, and present an innovative precast concrete solution that can enhance your next project and significantly streamline the construction process.

FAST, SAFE, EFFICIENT CONSTRUCTION

There are three main types of prefabrication.ⁱⁱⁱ

- **Simple elements** such as beams, columns, or other separate components that require assembly on site.
- **Panelised systems** including walls, cladding, insulation, and precast concrete panels. These are typically of a standard shape and size, allowing for rapid construction on site.
- **Volumetric systems**, namely self-contained three-dimensional modules that include the floor, ceiling, and walls of an entire room.

A major benefit of prefabrication is the expedited rate of construction that it allows. Prefabrication is particularly well suited to high-rise construction, which remains popular; for example, prefabricated construction allows upper floors to be cast in the factory before the foundations are even laid. Prefabrication also provides a crucial element of quality control, as all components and assemblies are carefully checked prior to delivery and installation on site.

Beyond this, prefabrication can help projects meet enhanced health outcomes. Prefabricated concrete significantly reduces on-site production levels of noise and dust, two major health and environmental risks posed by conventional construction. The issue of potentially harmful dust and gas emissions from construction sites is so critical that in January 2018, the NSW Office of Environment and Heritage issued an Air Quality Guidance Note for construction sites,^{iv} which in part provides instructions for controlling dust emissions.



FIRE PERFORMANCE

In the wake of a recent spate of high profile tower fires around the world, the fire performance of cladding and facades has been thrust into intense scrutiny. In Australia, the response to concerns surrounding fire performance has included a Senate Inquiry into Non-Conforming Building Products, which in late 2017 made four key recommendations including a total ban of aluminium composite panel (ACP) products with a polyethylene core.^v As they are inherently non-combustible, precast concrete panels are an excellent means of meeting fire performance requirements and filling the gap left in the market by ACP cladding.

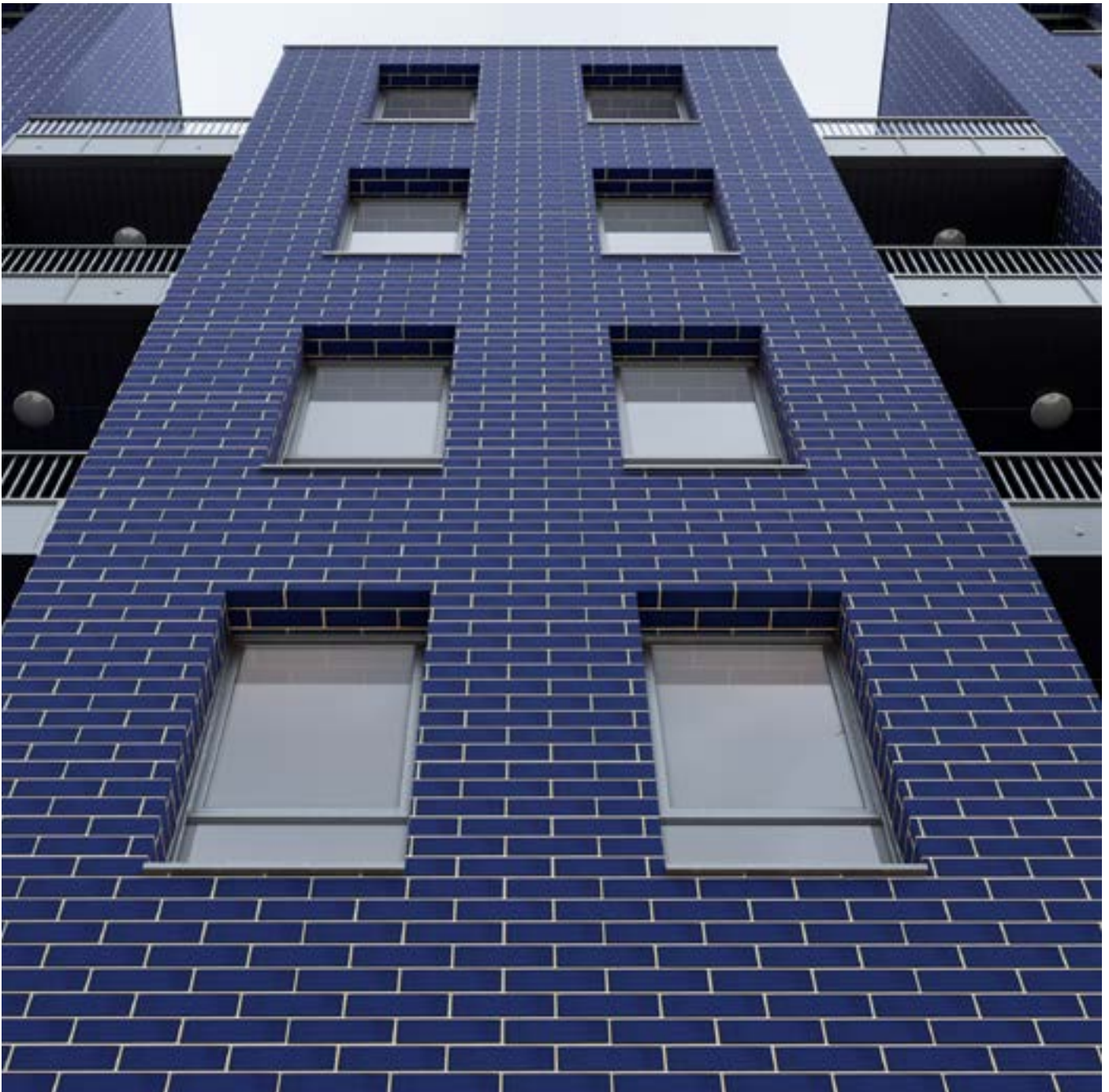
Precast concrete does not require additional fireproofing measures to resist ignition,^{vi} and excels at containing flames and preventing the spread of fire. Additionally, precast concrete does not emit toxic gases in the event of fire, and may limit the spread of smoke.

DURABILITY

The low water to cement ratio of precast concrete affords it a high degree of durability that extends to resistance to impact, blasts, and natural disasters, with minimal maintenance requirements.

Precast concrete is resistant to damage caused by exposure and weathering, and will not show wear in the face of prolonged exposure to UV and rain, two causes of damage that are prevalent in Australian climates.

Another major benefit of precast concrete panels is their ability to resist rot and potentially devastating attacks by termites and other pests. The latter is a particularly valuable characteristic in Australia, where termites cause an estimated \$100 million worth of damage each year and attack 1 in 5 homes.^{vii}





INSULATION

Precast concrete panels have a high thermal mass, which allows them to absorb and store radiant heat from the atmosphere and sun during the day before releasing it after sundown in an effective form of natural climate control.

The panels are a highly efficient addition to passive solar design systems, and can be incorporated into a broader passive design scheme to reduce reliance on air conditioning or other climate control mechanisms and offer operational cost savings of up to 25%.^{viii}

The insulation capabilities of precast concrete panels extend beyond thermal. Precast concrete panels also have a low acoustic transmission rate thanks to their dense composition, which absorbs sound and prevents the spread of noise in multi-residential or other high-density developments.

VERSATILITY

The virtually limitless range of design options that precast concrete offers architects and specifiers closely matches its high functionality. Available in a breadth of finishing options including a wide selection of colours, textures, and shapes, precast concrete provides a high degree of design flexibility that is unmatched by most other cladding materials.

Furthermore, its prefabricated nature and uniform panel size makes the material highly scalable, and ensures that it is well suited for small-scale projects and high rises alike.

SUSTAINABILITY AND HEALTH

The main sustainability benefits of precast concrete panels are rooted in their tightly controlled manufacturing process. Standard panel dimensions enable the use of standardised wood formwork, which can be reused on multiple projects and recycled following its useful life.

The large scale of precast concrete panel manufacturing allows for the fine-tuning of raw material quantities, ensuring minimal waste. These two factors are coupled with the fact that precast concrete can be ‘downcycled’ – broken down into separate components that can be reused – into aggregate that can be used in new concrete or as a base in roads, concrete slabs, or sidewalks.^{ix}

In contrast with synthetic construction materials that may off-gas harmful volatile organic compounds (VOCs) after installation, precast concrete panels do not emit any toxic substances into internal or external environments. As such, they can form an important part of holistic construction strategies for creating healthy interior spaces with a high indoor air quality.

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INBRICK™

InBrick™ is an innovative brick façade system developed by PGH™ Bricks to combine the high performance of precast concrete panels with the beauty and design flexibility of a 'real brick' look. As stylish as it is functional, InBrick™ provides architects and designers with the unprecedented opportunity to replicate the look and feel of brick without sacrificing the durability and convenience of precast panels.

InBrick™ combines the best qualities of brick and precast concrete panel construction. Genuine clay thin-brick facings are embedded into precast concrete panels using a NATA tested process for mechanical embedment that provides a durable, lasting finish. The precast panels are suitable for structural (including load bearing) and non-structural use, in addition to tilt-up and cast in place construction.

As they are prefabricated offsite, InBrick™ panels expedite the construction process, offering significant savings in labour and cost. Standard panel dimensions make integration into conventional construction methods and systems easy, and allow for rapid enclosure that far outstrips the speed of traditional brickwork. Additionally, installing the precast InBrick™ panels requires no additional specialist skill, meaning that designers, engineers, and builders can design and build exactly as they would for any other project.

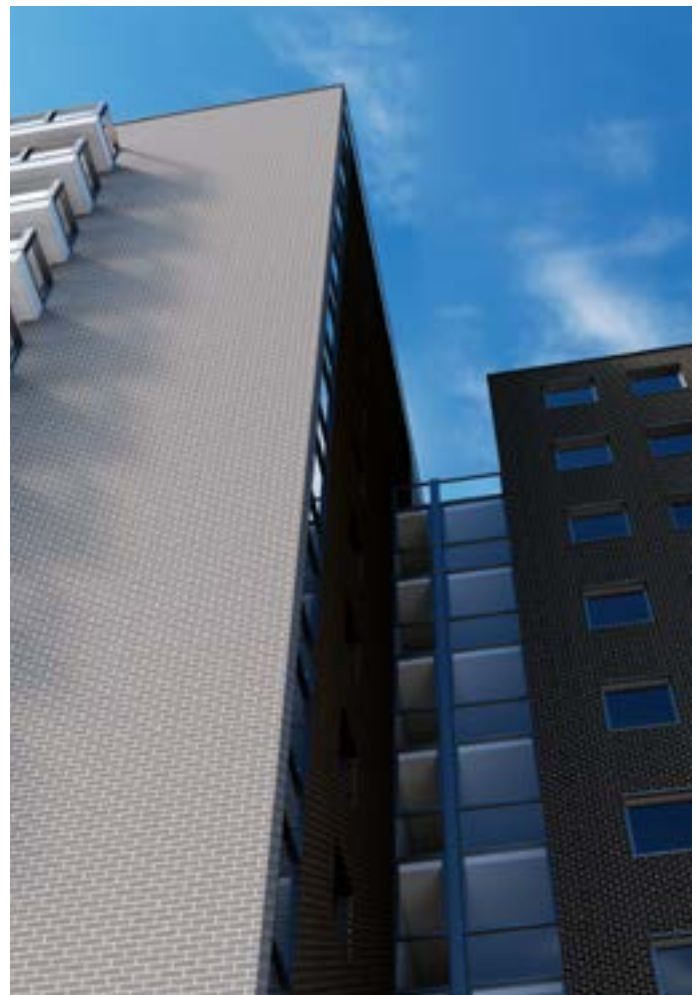
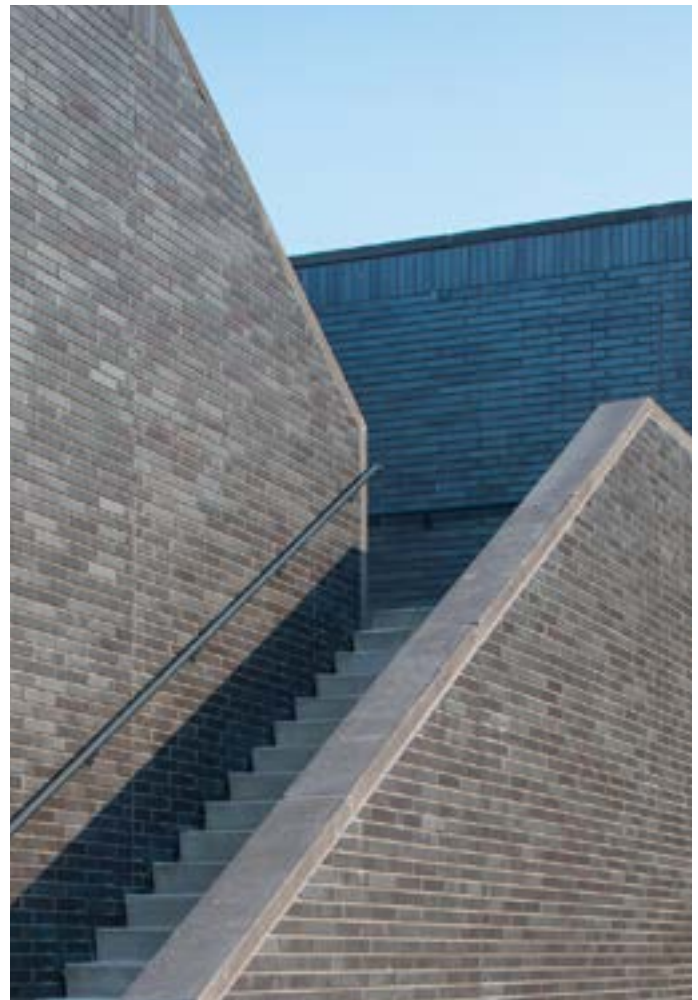
InBrick™ also offers major advantages in terms of outstanding design flexibility and versatile applications. The panel system grants designers freedom to use bricks at height – a particularly vital consideration given the ongoing popularity of high-rise construction – and is suitable for arches, headers, soffits, and multiple coursing patterns. InBrick's™ thin-brick facings are available in numerous sizes and an extensive selection of colours, and textures, making them ideal for use in repeat panels. A single facade constructed using InBrick™ panels can incorporate multiple brick styles and sizes, including cut-stone and masonry block.

In keeping with PGH™ Bricks ongoing commitment to sustainability, InBrick™ panels use a form-liner technology that incorporates recycled and reclaimed post-manufacturing PET and HIPS. The interlocking liners ensure that the installation process is as fast and easy as possible, and simplify the process of cutting panels down to shape. All InBrick™ panels are supported by PGH™ Brick's renowned comprehensive technical support and advice services both prior to and following installation.

PGH™ BRICKS

Since 1958, PGH™ Bricks has led the Australian market for high quality, innovative brick products. Drawing on years of experience at the forefront of the national construction industry, PGH™ Bricks has earned a reputation for delivering cutting-edge brick products that combine high performance and design flexibility with a striking, contemporary appearance.

Their wide range of brick solutions is backed by comprehensive customer service from the knowledgeable PGH™ team, and is designed and engineered to meet the unique demands of contemporary construction.



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