GROUTING & BRACING GUIDES TO IMPROVE PRECAST DESIGN AND CONSTRUCTION

Every architect, engineer and building professional who is involved with precast concrete construction should be familiar with the contents of two of National Precast's guides, Temporary Bracing and Propping of Precast Concrete Elements and Understanding Grouted Joints: A guide for engineers and building contractors, according to the organisation's CEO Sarah Bachmann.

Bachmann says that the two guides have been written by the industry's peak body to inform stakeholders, with the goal of improving the safety and quality of precast design and construction.

"Precast construction is a highly sustainable construction method, however, it is classified as a high-risk construction activity, so everyone needs to understand best practice and be aware of the consequences of neglecting critical stages in the design and construction process," Bachmann comments.

Grouting and bracing play a crucial role in ensuring the structural integrity and stability of precast concrete elements in construction.

CRITICALITY OF GROUTING

Grouting involves filling gaps and voids between precast elements with a cementitious material, providing additional strength and preventing the entry of water and other contaminants. This process enhances the overall load-bearing capacity and structural performance of the precast components, ensuring long-term resilience and durability.

According to Bachmann, "Loading bearing grouted joints play a critical but sometimes overlooked role in multistorey precast concrete structures."

"We've found that the three most common reasons for inadequate grouting are a lack of detailed documentation, rushed construction programmes and the assignment of grouting to untrained workers."

According to National Precast, inadequately detailed grouting - and in the worst-case scenarios an absence of grouting - can quickly lead to serious fatigue of precast joints and ultimately catastrophic structural failure of an entire building.

"This guide helps architects, engineers and building professionals to better understand the critical role that grouted joints play, and the procedures that ensure adequate design and implementation of grouted joints. Everyone should have a copy," Bachmann comments.

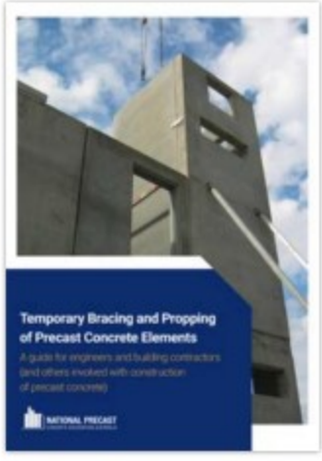
SAFE BRACING AND PROPPING

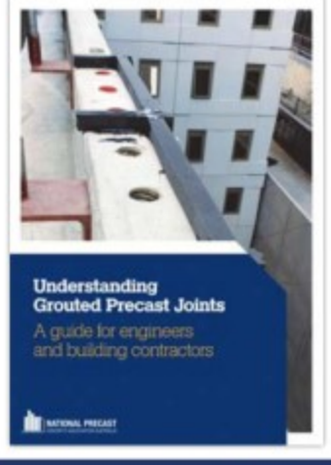
Also critical to the safety and durability of structures, are bracing and propping during construction. This process involves the use of temporary supports to hold precast elements in place during installation, and while the grout is curing. Proper bracing and propping ensures that the precast elements maintain their alignment and position, preventing any undesirable movements or deformations that could compromise safety, as well as the structural stability of the entire structure.

"We have developed the bracing and propping guide to detail the requirements, specifications and use of bracing and propping. Additionally, it explores the responsibilities for Erection Designers, In-service Designers, installers and head contractors," says Bachmann.

GUIDES AVAILABLE FOR PURCHASE

Both guides have been developed by professionals who are members of National Precast and come with extensive precast experience. They are available as a PDF or hard copy and can be purchased from National Precast's website: **https://nationalprecast.com.au/resources/publications**





THE DIFFERENCE BETWEEN BRACING AND PROPPING

Bracing is an engineering term for the structural components that resist and transfer lateral (horizontal) loads imposed on a structure. Typically, bracing applies to the securing of vertical elements, usually down to the footing system. Usual sources for these loads are wind, gravity-induced/out-of-plumb forces, seismic effects and construction loads. Resistance of such loads is required in the temporary and permanent stages, and in the temporary stage, this is typically achieved using inclined braces.

Propping – in contracts - is an engineering term for the structural components that resist and transfer vertical loads (usually self-weight and construction loads), typically for horizontal elements. The term is usually applied in the case of temporary supports only. Any lateral loads that exist with horizontal elements would usually be resisted by bracing.

GFRP-REINFORCED SLEEPERS FOR THE KOO WEE RUP BYPASS UPGRADE

The Koo Wee Rup Bypass Upgrade Project, nestled in the heart of Victoria, is rewriting the script for road infrastructure with a bold stroke of creativity and sustainability. Sunset Sleepers undertook the responsibility of crafting 1053 custom-designed concrete sleepers with the dual objectives of minimizing environmental impact and ensuring prolonged durability.

ECO-FRIENDLY FOUNDATIONS

Sunset Sleepers embarked on a groundbreaking path to promote environmental responsibility by adopting Glass Fibre Reinforced Polymer (GFRP) as a substitute for conventional steel reinforcement. GFRP presents numerous advantages, such as a remarkable strength-to-weight ratio, resistance to corrosion and extended lifespan. By reducing the dependance on steel, the production of GFRP-reinforced sleepers contributes to carbon emissions reduction, rendering them an eco-conscious choice. Additionally, the incorporation of a lower carbon concrete mix further and efficient, off-site manufacture and production methods further diminish the carbon footprint.

Sunset Sleepers' dedication to crafting exceptionally durable sleepers is exemplified by the choice to elevate concrete strength from 40MPa to 50MPa. The incorporation of a lower carbon concrete mix that incorporates waste materials equips these sleepers to withstand the challenges posed by tough environmental and adverse weather conditions.

QUALITY IS KING

To ensure that the sleepers adhered to the specified standards, comprehensive quality control procedures were meticulously enforced throughout the project. Each concrete delivery used in the manufacturing process underwent rigorous testing to verify the precise slump and strength. This exacting method ensures the uniformity and dependability of the sleepers.

Following a suitable curing period, the sleepers were cast and then carefully enveloped in plastic for a minimum of seven days, facilitating optimal hydration and the development of strength.

COMMITMENT TO MEETING STANDARDS

Sunset Sleepers adhered to a comprehensive Inspection and Test Plan (ITP) during the entire project. This ITP ensured that all manufacturing processes and materials met the specified standards and complied with regulatory requirements.

Regular inspections and tests were conducted to verify the quality of the sleepers, ensuring they met the stringent criteria for longevity and performance.

PIONEERING SUSTAINABILITY AND DURABILITY

The incorporation of GFRP-reinforced sleepers in the Koo Wee Rup bypass upgrade project establishes a groundbreaking standard for road infrastructure construction in Australia.

Anticipated to endure for a century, these sleepers exhibit extraordinary durability, leading to decreased maintenance expenses and a reduced environmental footprint. This achievement serves as a catalyst for the broader acceptance of sustainable construction methods and materials, motivating other infrastructure ventures to emphasize both longevity and environmental responsibility.