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Erection design engineering: Bracing

A high-value, high-risk and necessary task under the responsibility of the Erection Designer is the temporary bracing of precast elements after site erection, while awaiting incorporation into the finished structure.

Whilst lifting design is largely controlled by predictable and likely loads, a short design life (typically just a few minutes) and a greater likelihood for any failures to occur at the start of a lift, bracing design, deals with more unpredictable and longer term events. Events such as unlikely wind loads as per AS1170.2, an unpredictable design life that might be typically 2 weeks (but could extend for years - it has happened!), and the probability of high damage and possible injuries, necessitates a certified engineering approach for all bracing designs.

Other considerations for the Erection Designer are the design of the connections at both ends of the brace, the selection of the correct bracing and the specification of the anchor conditions (existing concrete structure or dedicated footings).

A further level of complexity which the Erection Designer must consider is if the designed bracing system includes secondary bracing. There is a common misconception that this simply refers to just a single knee brace on each main brace to increase allowable load. However, to avoid buckling in all directions, a complete bracing arrangement needs to include a single knee brace plus a lateral brace connecting groups of main braces, plus some diagonal bracing (typically at the end). Needless to say this requires competent engineering and, being a system, if any one element is inadequate, absent or removed for some reason the entire bracing solution is compromised.

It is common practice that as part of the lifting and bracing design process the Erection Designer may produce the required bracing design information or, alternatively, assess and sign-off that which has been provided by a certified engineered bracing system supplier.

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In this case it must be engineered by a competent person, approved by the Erection Designer, and co-ordinated with the precast manufacturer where cast-in bracing inserts are specified.

Critical to safe BRACING of elements is that:

- All specified bracing systems must be engineered and approved by the Erection Designer as part of the erection design.
- Rated and marked bracing systems must be correctly installed and verifiable - by the precast manufacturer for any cast-in items, and by the erector for completed bracing when erected.
- A complete bracing design is specific to each panel and nominates the type and location of braces, their support conditions and required connections. This is more extensive if secondary bracing has also been specified, which typically includes single knee braces, plus a lateral brace, plus diagonal end braces.
- Any changes to any of the above (including moving or removal of braces) must be approved by the Erection Designer.

Adopting these practices will minimise any potential for accidents.

Note – for more information about the role of the Erection Designer, refer to AS 3850:2015 Prefabricated Concrete Elements. Refer in particular to Part 2 - AS 3850.2 Building Construction.

Please note: The National Code of Practice for Precast, Tilt-up and Concrete Elements in Building Construction 2008 has become outdated and its content conflicts with requirements of the revised AS 3850.1 and 2:2015. National Precast does not support this Code, which is pending review and updating by Safe Work Australia.

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