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PRECAST AND TILT-UP

HYER STANDARD

PROCEDURE

CONTENTS

PURPOSE AND SCOPE

The purpose of this procedure is to ensure that Precast and Tilt up Work is conducted safely. The procedure applies to all HY projects where precast or tilt up concrete work is undertaken.

This procedure applies to concrete wall panels or other precast concrete elements made in either an onsite or off-site casting yard that is cast and then lifted into position to form part of a building but does not include concrete pipes, bridge beams or culverts.

RESPONSIBILITIES

HY PROJECT TEAM

- Ensure Lift Plans are developed as per Cranes and Lifting procedure
- Ensure Design documentation developed by competent persons has been obtained
- Ensure reports and verifications have been obtained from qualified geotechnical and structural engineers where required
- Ensure Plant and Equipment has been inspected and verified as safe for use prior to use on site
- Ensure applicable Work Permits are implemented prior to commencing work
- Ensure only trained and competent persons perform work on site
- Ensure worker competencies and qualifications are verified prior to commencing work
- Ensure that SWMS are provided for any work that involves tilt up or precast concrete

HAZARD IDENTIFICATION RISK ASSESSMENT AND CONTROL (HIRAC)

All risks associated with precast and tilt up work must be included in the project risk register. This includes risks associated with:

- Design
- Prefabrication
- Handling, storage and transport
- Erection and temporary bracing
- Fixing into final structure
- Brace removal
- Modification and/or demolition
- Lifting equipment failure/falling objects
- Persons falling from height
- Transportation and delivery

Consideration must be given to the risk of severe crush injuries resulting from:

- The uncontrolled collapse of concrete elements during handling and erection, including while temporarily braced or when elements are being modified or removed
- A person being caught between concrete elements, between elements and mobile plant or between elements and other structural components

DESIGN

There are two separate design stages as follows:

- In-service design – the performance of the element as part of the permanent structure
- Erection design – designing the element to resist all handling forces, including impact, arising out of stripping, storage, transport, lifting and temporary bracing and propping.

While in the braced position, an element is regarded as a temporary structure and the Temporary Works procedure applies.

Prior to manufacturing prefabricated concrete elements, HY, in association with the erection designer, manufacturer and subcontractors involved in erection, must have planned the complete construction and erection sequences.

DOCUMENTATION REQUIREMENTS PRIOR TO DELIVERY

A Design Plan consisting of proprietary design documentation prepared and certified by a qualified engineer must be available prior to delivery of concrete elements to site and must include the following:

- Design plans developed by the installer in consultation with the manufacturer/s and HY (including temporary works design for propping and lift design)
- Design and construction of panels including individual identifiers for each panel
- Adequate information to fully describe its intended use
- Instructions for use, storage and maintenance, including all precautions to be observed in its use
- Criteria for rejection and reworking of the component or system
- Lifting points and panel placement

- Lifting inserts must match the lifting clutches. They must also have a factor of safety of 2.5 to 1 against failure of the insert, the anchor the concrete and reinforcing on which the insert relies upon for its anchorage.
- Erection requirements and sequencing, including bracing and anchorage design
- Precast pour ITPs (which should include pre-pour photos, as-builts of panels and concrete test results showing over the MPa required for lifting)
- A certification letter from a qualified engineer to verify that the temporary support system for the concrete elements complies with AS 3850.1
- Regular inspection requirements for panels, lifting points, and bracing prior to, during, and after installation

Other documents required prior to commencing works are:

- SWMS
- Calibration records of equipment (e.g. torque wrench)
- A Lift Plan in accordance with the Cranes and Lifting procedure
- Plant Safety Verification, Plant Setup permit, Exclusion/Work Zone permits
- If traffic controls are impacted by the deliveries of panels, a temporary amendment to traffic permits may be required

The Precast Manufacturer Certificate of Compliance must be provided to the manufacturer for completion during casting of panels. The completed certificate shall be included with each panel delivery to identify every element to be erected.

TRANSPORT AND DELIVERY

Special consideration should be given to the transportation and delivery of precast elements, and traffic control requirements. If traffic control is in place at the site, HY is to communicate with the traffic control provider to identify any project specific requirements, alternative delivery routes, and temporary amendments to existing permits. If traffic control is not in place on site, consideration is to be given to the implementation of temporary traffic control during deliveries, and in such cases, this shall be managed in accordance with the Traffic Management procedure. Traffic control, transport, and delivery requirements shall be determined by the Project Risk Assessment.

Prefabricated elements must be transported in compliance with the Transport and Deliveries procedure. Transported elements must be:

- Secured using chains
- Loaded so that identification marks are visible during unloading
- Secured using 'ratchet type' dogs. "Over-centre lever binder" dogs should not be used.
- Stacked in such a way that:
    - Allows the rigger to access lifting points, and
    - Enables safe unloading to temporary storage or safe erection into the structure in the required sequence

Engineering details, specifications and inspection reports must be provided for support frames used for the transport of precast elements.

Elements must be unloaded as per the Cranes and Lifting procedure. The stability of the delivery vehicle must also be considered, and if necessary, blocked to prevent tipping when partially unloaded.

Where the unloading sequence could lead to the instability of the load:

- Elements must be individually restrained (Note – regardless of instability, elements must be restrained between each lift)
- Loading configuration must be checked to ensure that removing individual elements does not result in instability of the load or the vehicle

Elements must be inspected for damage by a competent person before lifting. Damaged elements must not be lifted without written approval from the designer.

If possible, elements should be lifted directly from the delivery vehicle into the final position. If this is not possible, they should be stored in a designated area in such a way that minimises multiple handling. Elements must be supported to ensure stable storage in a specified order to ensure safe access and removal. This includes ensuring that identification marks are visible during storage.

Delivery vehicles are to be managed in accordance with the Plant and Equipment procedure and the Mobile Plant procedure.

CRANES AND LIFTING

Elements must be lifted as per the Cranes and Lifting procedure. The rigging system to be used must be specified on certified shop drawings and erection documentation and inspected by a competent person prior to lifting. Any alterations to the specified rigging must be approved by the designer before implementation. Panels are to remain secured to transport vehicle until attached to crane.

When developing the lift plan, consideration must be given to ensuring that bracing cannot be struck by slewing crane. A lift plan including a Plant Setup Permit, Plant operating radius and SWL, primary and back-up lifting systems, weather conditions, exclusion zones and travel path is required for lifting of panels. Lift plans must be saved to the Precast Concrete Checklist.

Restricted work zones permitting only the workers releasing and bracing the precast elements into position must be established prior to lifting. All personnel must remain outside of the work zone while the element is being lifted into place. Elements must be held by crane if the brace is to be attached after positioning. Loads must not be released before the element is adequately braced or incorporated in the supporting structure.

Where reasonably practicable, loads must not be suspended over, or travel over, a person unless the plant lifting the load is specifically designed for that purpose.

Cranes are to be managed in accordance with the Plant and Equipment and Mobile Plant Procedures.

ERECTION

Prior to erection, the following must occur:

- Erection drawings, including details of the bracing and propping, must be available to the erection crew
- Verification that:
- Erection platform can carry the erection loads at the time of erection

- The concrete in the element has attained the specified strength for lifting, verified using the Manufacturer Certificate of Compliance
- The concrete in bracing support elements has attained the specified strength
- The supporting structure has sufficient strength to support the panel
- Ensuring that the lifting and bracing points on the elements are compatible with the lifting device to be used

A Precast Concrete Checklist must be opened in the project's HSE management software and used to verify the quality of the panels prior to erection and to verify the installation conforms with the planned design method.

Variations to the design must be approved by the designer, as well as verification of the installation to the design plan.

All elements including panels, bracing/propping, access platforms, plant/equipment used in the precast works must be protected from potential impact by mobile plant or other site activities.

Throughout the course of installation and securing, a competent person must verify that Tilt up/Precast panels are installed in accordance with the Design Plan and any relevant drawings/documents. Temporary support props must be locked off using padlocks or tamperproof devices.

During the erection sequence:

- Workers must not work on a concrete element that is leaning towards them or be placed between a concrete element being lifted and another wall or object, where movement of the concrete element could cause crushing
- Mobile plant should not be operated, or travel close to, erected concrete elements and braces unless there is a sound reason, such as the use of an EWP to assist in the installation or removal of braces

To reduce the need for working at heights, as many sections of the structure as possible should be assembled on the ground before being lifted into their final position. However, personnel are generally required to work at height to perform the following activities:

- Removal of braces from concrete elements

- Attaching the concrete elements to one another or to structural steelwork before removal of the braces
- Application of caulking to vertical joints between concrete elements

Work at heights must be done in compliance with the Work at Heights procedure.

TEMPORARY SUPPORTS

Bracing and propping must be installed in accordance with erection documentation. Written approval from the designer must be obtained before installation is varied. Written approval is also required before moving, removing, or modifying bracing and propping.

Inspections of temporary supports and their connections must be undertaken regularly, and after significant weather events, until temporary bracing is able to be removed. Damaged temporary supports must be reported to the Site Manager.

Records of inspections must be kept and uploaded to, or referenced in, the Precast Concrete Checklist. Acceptable methods of inspection are the HSE Site Inspection checklist using the Precast & Tilt Up work section and any structural engineer inspection reports.

Bolts in connections at both ends of a brace must be torqued in accordance with the insert supplier's specifications and verified. Torque wrenches must be calibrated. Bracing and fixings should be verified at least weekly and after major weather events to ensure they are secure.

Prior to removal of bracing, HY must ensure that a structural engineer has checked and verified that the precast elements are installed correctly in accordance with relevant documentation.

Bracing, props, frames and other items providing temporary support must not be removed before the element is incorporated into the structure and the structure can support the element for the applied loads. Prior to removal, the

structure must be inspected by the structural engineer or temporary works engineer to ensure all permanent structural elements affecting stability are in place and securely fixed in accordance with structural drawings

EMERGENCY RESPONSE

Where precast and tilt up is being undertaken, the procedures for the response to an emergency related to the work must be included in the Emergency Response Plan. When establishing emergency procedures, the following must be considered:

- Crush injury
- Collapse of elements during transport and erection
- Failure of temporary works (i.e. propping and bracing)

DEFINITIONS AND ABBREVIATIONS

ITP – Inspection and Test Plan

Concrete element – a concrete wall panel or other precast concrete element made in either an onsite or off-site casting yard that is cast and then lifted into position to form part of a building but does not include concrete pipes, bridge beams or culverts

Tilt up means –

- an essentially flat concrete panel
- cast in a horizontal position, usually on site; initially lifted by rotation about one edge until in a vertical or near vertical position, and
- transported and lifted into position if necessary; and then stabilised by bracing members until incorporated into the final structure

REFERENCES

- AS 3850.1: Prefabricated concrete elements Part 1: General requirements
- AS 3850.2: Prefabricated concrete elements Part 2: Building construction
- Federal Safety Commission (FSC) Audit Criteria – H14 Tilt up / Precast Concrete

ASSOCIATED DOCUMENTS

- HYer Standard – Precast and Tilt Up
- Quick Guide – Loading and Unloading (https://www.hyworkzone.com.au/loading-and-unloading-vehicles-quick-guide/)
- Transport and Deliveries procedure (https://www.hyworkzone.com.au/transport-and-deliveries-procedure/)
- Cranes and Lifting procedure (https://www.hyworkzone.com.au/cranes-and-lifting-procedure/)
- Temporary Works procedure (https://www.hyworkzone.com.au/temporary-works-procedure/)
- Work at Heights procedure (https://www.hyworkzone.com.au/work-at-height-procedure/)

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