

Precast and tilt-up concrete construction

Guidance for employers on the typical roles and responsibilities associated with the design and erection of precast and tilt-up concrete elements or panels.

May 2016

The construction of buildings and structures using precast or tilt-up concrete elements or panels can be a complicated process involving a range of employers and other persons.

Under the *Occupational Health and Safety Act 2004*, employers have a general duty to provide and maintain for employees a working environment that is safe and without risks to health.

An employer may fail to meet their general duty if they do not provide systems of work for the erection of precast or tilt-up concrete elements or panels that are, so far as is reasonably practicable, safe and without risks to health.

Risks associated with precast and tilt-up concrete construction include employees or the public being struck or crushed by falling concrete elements, for example:

- if elements fail while being lifted or erected
- if elements collapse once erected due to poorly designed, installed or maintained temporary bracing systems, or premature removal of temporary bracing systems.

A suitably competent person, such as an engineer with experience in such matters, should be engaged to develop a safe system of work for the erection of precast or tilt-up concrete elements or panels. This person is referred to as the erection design engineer (EDE).

Whilst the builder or principle contractor may not always directly engage the EDE, both the builder and erector should ensure that a suitably competent person(s) is engaged and has undertaken the relevant functions of the EDE before erection works commence.

The EDE should formulate a system of work (erection design) that includes ensuring that elements, panels, inserts, panel braces, and supporting structures are able to resist any potential static, dynamic and impact loads during:

- removal of the element from the form or casting bed (suction loads)
- handling and transportation (impact and dynamic loads)

- erection (lifting/rotating/bracing loads)
- temporary bracing (wind loads)
- subsequent construction works (any loading of the element, panel, or bracing system due to the construction sequence eg concrete floor construction, partial roof installation).

In the absence of an EDE, the builder or principal contractor should not assume that the project design engineer (PDE), precaster, or erection crew have formulated the erection design.

The builder or principal contractor should confirm who is responsible for the various aspects of the design and erection of precast or tilt-up concrete elements or panels.

The flow chart on the following page provides an example of typical roles and responsibilities associated with the design and erection of precast and tilt-up concrete elements and may assist builders and principal contractors.

Note that while contractual arrangements may vary from project to project, the responsibilities outlined should all be undertaken.

Precast and tilt-up concrete construction responsibility flow chart (typical)

This flow chart provides an example of typical roles and responsibilities associated with the design, manufacture and erection of precast and tilt-up concrete elements. Contractual arrangements will vary from project to project, and may result in changes to the structure of this process, however all roles and responsibilities should still be assigned to the relevant party.

Project name: _____ Site address: _____ Date: _____

| | |
|--|--|
| <p style="text-align: center;">Client</p> <p>name/contact number: _____</p> | <p style="text-align: center;">Building designer (architect/engineer)</p> <p>name/contact number: _____</p> |
|--|--|

Project design engineer (PDE)

Also known as the structural design engineer or in-service designer. Typically engaged by client / building designer.

- Produces the structural design of the building / structure and issues construction drawings.
- Designs and specifies any permanent structural connections (eg stitch plates [inc. weld/bolt specification], connections to permanent structures etc).
- Reviews the shop drawings produced by the shop detailer and forwarded by the EDE.
- Approves stability of structure during construction (when requested), especially prior to removing temporary supports.

name/contact number: _____ RBP number: _____

Builder / principal contractor

The builder typically has the overarching responsibility to ensure that, so far as is reasonably practicable, workers and the public are not exposed to health and safety risks arising from construction work.

- Project manages the construction of the building and has the management or control of the workplace.
- Ensures contractors develop and implement relevant safe work practices / safe work method statements (SWMS).
- Monitors and liaises with key parties at each stage (PDE, EDE, precaster, transporter, erector).
- Reviews the shop drawings and marking plan to confirm compliance with site dimensions.
- Ensures the following before erection begins:
 - concrete slabs and brace footings have reached the required concrete strength (20MPa minimum unless specified otherwise)
 - crane selection and crane standing has been checked by a suitably competent person
 - effective traffic management is in place in and around the delivery area
 - panel / element dowel bars are in place and set-out / erection sequence is planned.
- Checks the braces, bolts and pins at regular intervals to ensure that they are structurally sound and bolt torques are maintained – AS3850:2015 recommends weekly checks at a minimum (may be undertaken by the erector).
- Ensures a suitably certified and competent person(s) is engaged to perform welding of stitch / fish plates in accordance with the specification (may be engaged by the erector).
- Checks that all welded / bolted connections are completed and dowel bars are grouted before structural review by PDE.
- Requests PDE to review the structural stability as and when required during construction.
- Once written approval is provided by the PDE, removes the temporary braces.

name/contact number: _____ RBP number: _____

Erection design engineer (EDE)

The builder and erector should ensure that a suitably competent and qualified person(s) has been engaged and has performed the six critical functions of the EDE listed below. The role of the EDE may be undertaken by the PDE.

- Liaises with the PDE, builder, precaster and erector to agree on the erection procedure and sequence.
- Undertakes erection design to ensure element can resist all handling, transport, erection, wind, and construction loads.
- Provides the precaster with marked up structural drawings showing the necessary lifting and bracing insert locations, orientations and specifications and any additional reinforcement / strong-backs required.
- Produces rigging configuration, erection sequence and bracing layout drawings (including brace specifications).
- Reviews and signs-off completed shop drawings following review by PDE.
- Issues the EDE's certificate of compliance and supplies to the builder.

name/contact number: _____ RBP number: _____

Precaster / panel manufacturer

- Works with builder, EDE, and erector to agree on the erection sequence and advises transporter.
- Forwards shop drawings to the EDE for approval.
- Before casting, a suitably competent person ensures the dimensions, reinforcement and components comply with the approved shop drawings.
- Manufactures the precast panel / element.
- Ensures minimum concrete strength achieved before lifting.
- Issues birth certificate / manufacturer's certificate of compliance.

name/contact number: _____

Erector

- Works with builder, EDE and precast to agree erection sequence and safe work method.
- Produces and briefs erection crews on SWMS.
- Inspects precast element, reviews birth certificate, and erection plans / rigging drawings on delivery.
- Confirms clutches are compatible with inserts, and inspects all rigging gear prior to use.
- Erects panels / elements and installs temporary bracing.
- Checks torque on brace anchors.
- Ensures stability at all stages of construction as stipulated by EDE.
- Any variations / modifications to be approved by EDE.

name/contact number: _____

Transporter

- Plans delivery route for precast elements and obtains authorised planned routes and all necessary permits.
- Transports from precast yard to site.
- Hands over birth certificate and delivery docket to erector.

name/contact number: _____

Shop detailer

Typically engaged by precaster.

- Develops shop drawings and forwards to precaster / panel manufacturer.

Information about Precast and tilt-up concrete construction

Further information

Contact WorkSafe Victoria Advisory Service on **1800 136 089** or go to **worksafe.vic.gov.au**.

Occupational Health and Safety Act 2004

Occupational Health and Safety Regulations 2007

legislation.vic.gov.au

Publications

WorkSafe Victoria Industry Standard, *Precast and tilt-up concrete for buildings*

National Code of Practice, *For precast, tilt-up and concrete elements in building construction*

Australian Standard AS3850:2015 Part 1 & 2 – Prefabricated concrete elements

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