

## 16.2: Cast in Place Concrete

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### Cast-in-Place Concrete

#### General

Formwork shall be designed, fabricated, erected, supported, braced and maintained so that it will be capable of supporting without failure all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork.

#### Drawings or plans

Drawings or plans, including all revisions, for the jack layout, formwork (including shoring equipment), working decks, and scaffolds, shall be available at the jobsite.

### Shoring and Reshoring

#### General

All shoring equipment (including equipment used in reshoring operations) shall be inspected prior to erection to determine that the equipment meets the requirements specified in the formwork drawings. Shoring equipment found to be damaged, such that its strength is reduced to a point where it is not capable of supporting all vertical and lateral loads, which are reasonably expected to be present, shall not be used for shoring.

#### Shoring equipment

Erected shoring equipment shall be inspected immediately prior to, during, and immediately after concrete placement. Shoring equipment that is found to be damaged or weakened after erection, such that its strength is significantly reduced, shall be immediately reinforced.

#### Sills

The sills for shoring shall be sound, rigid, and capable of carrying the maximum intended load.

#### Single post shores

Whenever single post shores are used one on top of another (tiered), the employer shall comply with the following specific requirements in addition to the general requirements for formwork:

1. The design of the shoring shall be prepared by a qualified designer and the erected shoring shall be inspected by an engineer qualified in structural design.
2. The single post shores shall be vertically aligned.
3. The single post shores shall be spliced to prevent misalignment.
4. The single post shores shall be adequately braced in two mutually perpendicular directions at the splice level. Each tier shall also be diagonally braced in the same two directions.

#### Reshoring

Reshoring shall be erected, as the original forms and shores are removed whenever the concrete is required to support loads in excess of its capacity.

#### Vertical Slip Forms

The steel rods or pipes on which jacks climb, or by which vertical slip forms are lifted shall be:

1. Specifically designed for that purpose; and
2. Adequately braced where not encased in concrete.

#### Design

Forms shall be designed to prevent excessive distortion of the structure during the jacking operation.

#### Scaffold and work platforms

All vertical slip forms shall be provided with scaffolds or work platforms where employees are required to work or pass.

### Jack ratings

Jacks and vertical supports shall be positioned in such a manner that the loads do not exceed the rated capacity of the jacks. The jacks or other lifting devices shall be provided with mechanical dogs or other automatic holding devices to support the slip forms whenever failure of the power supply or lifting mechanism occurs.

### Form structure

The form structure shall be maintained within all design tolerances specified for plumbness during the jacking operation. The predetermined safe rate of lift shall not be exceeded.

## Reinforcing Steel

### Support

Reinforcing steel for walls, piers, columns, and similar vertical structures shall be adequately supported to prevent overturning and to prevent collapse.

### Wire mesh

Employers shall take measures to prevent unrolled wire mesh from recoiling. Such measures may include, but are not limited to, securing each end of the roll or turning over the roll.

## Removal of Formwork

### General

Forms and shores (except those used for slabs on grade and slip forms) shall not be removed until the employer determines that the concrete has gained sufficient strength to support its weight and superimposed loads. Such determination shall be based on compliance with one of the following:

1. The plans and specifications stipulate conditions for removal of forms and shores, and such conditions have been followed.
2. The concrete has been properly tested with an appropriate ASTM standard test method designed to indicate the concrete compressive strength, and the test results indicate that the concrete has gained sufficient strength to support its weight and superimposed loads.

### Removing reshoring

Reshoring shall not be removed until the concrete being supported has attained adequate strength to support its weight and all loads in place upon it.

## Precast Concrete

### Supporting

Precast concrete wall units, structural framing, and tilt-up wall panels shall be adequately supported to prevent overturning and to prevent collapse until permanent connections are completed.

### Lifting inserts

Lifting inserts which are embedded or otherwise attached to tilt-up precast concrete members shall be capable of supporting at least two times the maximum intended load applied or transmitted to them.

Lifting inserts which are embedded or otherwise attached to precast concrete members, other than the tilt-up members, shall be capable of supporting at least four times the maximum intended load applied or transmitted to them.

### Lifting hardware

Lifting hardware shall be capable of supporting at least five times the maximum intended load applied transmitted to the lifting hardware.

### Employee positioning

No employee shall be permitted under precast concrete members being lifted or tilted into position, except those employees required for the erection of those members.

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