

Concrete and Masonry

Short description

This section outlines the safety requirements and practices associated with concrete and masonry work in construction.

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1 Objective and area of application

The objective of this section of the HSEQ Manual is to inform Centennial employees and subcontractors of their obligations to develop the appropriate hazard prevention and control methodologies designed to prevent workplace injuries, illnesses and property damage occurring from concrete and masonry activities.

All personnel who may be involved in concrete or masonry activities on Centennial project sites shall be able to recognize the hazards associated with the different types of equipment and the safety precautions necessary to prevent incidents and injuries.

Areas covered by this section include, but are not limited to the following:

- Construction Loads
- Reinforcing Steel
- Post-Tensioning Operations
- Concrete Buckets
- Working Under Loads
- Personal Protective Equipment
- Equipment and Tools
- Cast-in-Place Concrete
- Drawings or Plans
- Shoring and reshoring
- Vertical Slip Forms
- Removal of Formwork
- Precast Concrete
- Lift-Slab Operations
- Masonry Construction

2 Superior and additional applicable documents

1000_GP_11_01_en_6.0 Global Policy on Health, Safety, Environment and Quality (HSEQ)

EM 385-1-1 (2014)

ANSI A10.9 – 1983 Safety Requirements for Concrete and Masonry Work

This section of the HSEQ Manual applies to all Centennial employees and subcontractors who are performing work in Centennial facilities and / or on project sites. There may be more stringent requirements than this section as defined by specific State, local or contact specific HSEQ requirements. If there is a conflict between this section and other applicable regulations, the more stringent will apply.

3 Definitions

The following definitions of terms are important for an understanding of this procedure.

Term	Definition
Bull Float	A tool used to spread out and smooth concrete.
Cast-in-Place	Also known as poured-in-place, cast-in-place is a technology of the construction of buildings where walls and slabs of the building are cast at the site using formwork. The concrete is deposited in the place where it will harden and become an integral part of the structure.
Centennial	All Centennial employees, joint venture employees, subcontractors and business partners.
Competent person	Person who can identify existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees and has authority to take prompt corrective measures to eliminate or protect against those hazards.
Formwork	A total system of support for freshly placed or partially cured concrete, including the mold or sheeting (form) that is in contact with the concrete as well as all supporting members including shores, re-shores, hardware, braces, and related hardware.
HSEQ	Health, Safety, Environment and Quality
HSEQ Director	Leads the HSEQ Team
Jacking Operation	The task of lifting a slab (or group of slabs vertically from one location to another (e.g., from the casting location to a temporary (parked) location, or to its final location in the structure), during the construction of a structure where the lift-slab is being used.
Lift-Slab	A method of concrete construction in which floor and roof slabs are cast on or at ground level and, using jacks, lifted into position.
Limited Access Zone	An area alongside a masonry wall which is under construction and which is clearly demarcated to limit access by employees.
Post-Tensioning	A method of reinforcing (strengthening) concrete or other materials using high-strength steel strands or bars, typically referred to as tendons.

Precast Concrete	Concrete members (such as walls, panels, slabs, columns, and beams) which have been formed, cast, and cured prior to final placement in a structure.
Reinforcing Steel	A material used to strengthen concrete. Woven into a maze and placed inside of forms or suspended to allow the reinforcing steel to lie in the center of a poured slab, the iron rod gives added strength to the already strong cement; commonly called re-bar.
Reshoring	Construction operation in which shoring equipment (also called re-shores or reshoring equipment) is placed as the original forms and shores are removed in order to support partially cured concrete and construction loads.
RPE	Registered Professional Engineer
Shore	A supporting member that resists a compressive force imposed by a load.
Tremies	A tremie is a watertight pipe, usually of about 250mm inside diameter, with a conical hopper at its upper end above the water level. It may have a loose plug or a valve at the bottom end.
Vertical Slip Forms	Forms which are jacked vertically during the placement of concrete.

4 General requirements

All Centennial employees and subcontractors shall take precautions to safeguard employees, subcontractors, owners and the general public during concrete installation, alteration, demolition and repair.

Wet cement is damaging to the skin and can create skin problems for workers. The most common types of skin problems include:

- Dry skin or irritation
- Irritant contact dermatitis
- Allergic contact dermatitis
- Caustic burns (alkaline burns)

Precautions shall be taken to prevent accidental contact to exposed skin. Best protective practices for working with wet cement include:

- Keep concrete from contacting your skin
- Wash with clean water & ph-neutral or mild acidic soap
- Do not wear jewelry
- Wear long sleeves
- Use rubber boots with pants taped inside
- Never let cement remain on skin or clothing
- Avoid barrier creams
- Report any persistent skin problems to your supervisor immediately

Wet cement is also a conductor for electricity. Special precautions should be taken to ensure live wires never come into contact with wet cement.

Crystalline Silica (“Silica”) is known to cause silicosis, a serious lung disease, as well as increase the risk of lung cancer. Due to the risk posed by respirable silica, it is critical that all Centennial employees and subcontractor personnel, who are exposed to or involve in activities that could potentially create silica dust that is above the action level (25ug/m³), take specific actions to ensure that the hazards created by respirable silica dust are eliminated or minimized.

Note: Please refer to HSEQ Manual Section 25 Health Hazards in Construction

4.1 Construction Loads

No construction loads shall be placed on a concrete structure or portion of a concrete structure unless the employer determines, based on information received from a person who is qualified in structural design, that the structure or portion of the structure can support the load.

4.2 Reinforcing Steel

All protruding reinforcing steel, either vertical or horizontal, that presents the potential for harm shall be guarded to eliminate the hazard of impalement, cuts, abrasions or other minor injuries by being bent over, capped with steel reinforced rebar caps, or other approved methods.

The mushroom style rebar caps **DO NOT** provide sufficient protection to eliminate the hazard of impalement and are not approved for impalement protection on Centennial project sites.

4.3 Post-tensioning Operations

No employee (except those essential to the post-tensioning operation) shall be permitted to be behind the jack during tensioning operations.

4.4 Signs and Barriers

Signs and barriers shall be erected to limit employee access to the post-tensioning area during tensioning operations.

Note: Please refer to HSEQ Manual Section 15 Protective Barriers, Warning Signs and Tags

4.5 Hoisting Concrete Loads

Under no circumstances shall an employee be allowed to ride a concrete bucket. When concrete, either wet or pre-cast, is to be hoisted for installation, no employee shall be permitted to work under the load while being elevated or lowered into position. To the extent practical, elevated concrete buckets shall be routed so that no employee is exposed to the hazards associated with falling material.

Note: Please refer to HSEQ Manual Section 23 Material Handling Equipment and Operations

4.6 Personal Protective Equipment

No employee shall be permitted to apply a cement, sand, and water mixture through a pneumatic hose unless the employee is wearing protective head and face equipment.

Note: Please refer to HSEQ Manual Section 11 Personal Protective Equipment

5 Equipment and Tools

This section describes the requirements for safe work practices when Centennial and subcontractors are utilizing the equipment and tools associated with concrete and masonry construction.

5.1 Bulk Cement Storage

Bulk storage bins, containers and silos shall be equipped with the following:

- Conical or tapered bottoms
- Mechanical or pneumatic means of starting the flow of material

No employee shall be permitted to enter storage facilities unless the ejection system has been shut down, locked out and tagged to indicate that the ejection system is not to be operated.

Note: Please refer to HSEQ Manual Section 13 Hazardous Energy Control

5.2 Concrete Mixers

Concrete mixers with one cubic yard (0.765 cubic meter) or larger loading skips shall be equipped with the following:

- A mechanical device to clear the skip of materials
- Guardrails installed on each side of the skip

5.3 Power Concrete Trowels

Powered and rotating type concrete troweling machines that are manually guided shall be equipped with a control switch that will automatically shut off the power whenever the hands of the operator are removed from the equipment handles. Safety switches shall never be modified or disabled at any time.

5.4 Concrete Buggies

Concrete buggy handles shall not extend beyond the wheels on either side of the buggy.

5.5 Concrete Pumping Systems

Concrete pumping systems using discharge pipes shall be provided with pipe supports designed for 100 percent overload. Compressed air hoses used with concrete pumping systems shall be

provided with positive fail-safe joint connectors to prevent separation of sections when pressurized.

5.6 Concrete Buckets

Concrete buckets equipped with hydraulic or pneumatic gates shall have positive safety latches or similar safety devices installed to prevent premature or accidental dumping. Concrete buckets shall be designed to prevent concrete from hanging up on top and the sides.

5.7 Tremies

Sections of tremies and similar concrete conveyances shall be secured with wire rope (or equivalent materials) in addition to the regular couplings or connections.

5.8 Bull Floats

Bull float handles that might contact energized electrical conductors shall be constructed of nonconductive material or insulated with a nonconductive sheath that has electrical and mechanical characteristics to provide the equivalent protection of a handle constructed of nonconductive material.

5.9 Masonry Saws

Masonry saws shall be guarded with a semicircular enclosure of the blade.

5.10 Lockout/Tagout Procedures

No employee shall be permitted to perform maintenance or repair activity on equipment where the accidental operation of the equipment could occur and cause injury, unless all potentially hazardous energy sources have been locked out and tagged.

Note: Please refer to HSEQ Manual Section 13 Hazardous Energy Control

6 Cast-in-Place Concrete

This section describes the requirements for safe work practices when Centennial and subcontractors are engaged in work entailing the use of Cast-in-Place Concrete.

6.1 General Requirements for Formwork

Formwork shall be designed, fabricated, erected, supported, braced and maintained so that it will be capable of supporting all vertical and lateral loads that may be applied to the formwork until such loads can be supported by the structure.

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

6.2 Shoring and Reshoring

All shoring equipment (including reshoring equipment) 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 shall not be used. Once shoring equipment is erected it shall be inspected prior to, during, and immediately after concrete placement. If installed shoring is found to be damaged, it is to remain in place and shall be immediately reinforced or re-shored.

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

6.3 Removal of Formwork

Forms and shores (except those on slab or grade and slip forms) shall not be removed until the individual responsible for forming and/or shoring determines that the concrete has gained sufficient strength to support its weight and all superimposed loads.

Re-shoring shall not be removed until the concrete being supported has attained adequate strength to support its weight and all loads placed on it.

6.4 Concrete Mix Design and Testing

Concrete supplied and used for construction shall be in accordance with requirements of ACI 301-16 / ACI 301M-16, except as modified or supplemented by owner specifications or contract documents. Federal, state or local AHJ requirements for where concrete is to be placed shall apply. Any conflicts or inconsistencies between this section, design drawings, or other contract documents must be brought to attention for resolution.

Samples for testing shall be obtained per the design drawings, owner specifications or contract documents, and in accordance with ACI 301 / ACI 301M. If no testing is specified, a slump flow test in accordance with ASTM C1611 / C1611M shall be conducted and the results recorded.

7 Precast Concrete

This section describes the requirements for safe work practices when Centennial and subcontractors are engaged in work entailing the use of Precast Concrete.

7.1 Support

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. The temporary bracing used to support tilt-up walls can **only be removed after** a pour-back strip is installed, the panels are grouted, and the steel trusses are welded, which connects the panel to the roof. Workers not directly involved in the tilt-wall installation shall not

be allowed to work in the area in front or behind of a temporarily braced tilt-up panel that has not been permanently secured in place.

7.2 Lifting Inserts and Hardware

7.2.1 Tilt-up

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

7.2.2 Pre-cast

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

7.2.3 Hardware

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

At no time shall any person be allowed under any precast concrete member being lifted or tilted into position except those employees required for the erection of those members.

Note: Please refer to HSEQ Manual Section 23 Material Handling Equipment and Operations

8 Lift-Slab Operations

Lift slab operations shall be designed and planned by a registered engineer with experience in lift slab construction. Such plans and designs shall include detailed instructions and sketches indicating the prescribed method of erection.

8.1 Jacking Equipment

Manufacturer's rated capacity shall be clearly marked and legible. The jacks shall not be loaded beyond their intended capacity.

Jacks and any equipment that may transmit loads to the jacks shall have a minimum safety factor of two and one-half times (2.5x). The equipment includes, but is not limited to:

- Threaded rods
- Lifting attachments
- Lifting nuts
- Hook-up collars
- T-caps
- Shearheads
- Columns

- Footings

Jacks shall be designed and installed so that they will not continue to lift when overloaded. Jacks/lifting units used in lift slab construction shall have a safety device installed which will cause the jacks to support the load in any position if the jack malfunctions or loses its lifting ability.

8.2 Jacking Operations

The maximum number of manually controlled jacks on one slab shall be limited to 14, and in no event shall the number be too great, which may prevent the operator from maintaining a level slab within specific tolerances.

During lifting, jacks shall be synchronized to ensure even and uniform lifting of the slab. All lifting points shall be kept within one half inch (1/2" or 1.2 cm) of that needed to maintain the slab in a level position.

If leveling is automatically controlled, a device shall be installed that will stop the operation when the 1/2 inch tolerance is exceeded or where there is a malfunction in the jacking system.

Under no circumstances shall any employee who is not essential to the jacking operation be permitted beneath a slab while it is being lifted. Furthermore, no employee, except those essential to the jacking operation, shall be permitted in the building/structure while any jacking operation is taking place unless it has been reinforced sufficiently to ensure its integrity during erection, as determined by a RPE, who must be independent of the lifting operation RPE.

When making temporary connections to support slabs, wedges shall be tack welded into place to prevent them from falling out of position. Lifting rods may not be released until the wedges at that column have been secured.

Load transfer from jacks to building columns shall not be executed until the welds on the column shear plates are cooled to air temperature.

9 Masonry Construction

This section describes the requirements for safe work practices when Centennial and subcontractors are engaged in work entailing the use of Masonry.

9.1 Limited Access Zone

A limited access zone shall be established whenever a masonry wall is being constructed. The limited access zone shall meet the following criteria:

- Be established prior to the start of construction of the wall
- Be equal to the height of the wall to be constructed plus four feet (4 ft.) and run the entire length of the wall
- Placed on the side of the wall which will be un-scaffolded
- Restrict entry by employees actively engaged in the construction of the wall. No other employees shall be permitted to enter the zone.

- Remain in place until the wall is adequately supported to prevent overturning and collapse unless the height of the wall is over eight feet (2.4 m), in which case the limited access zone shall remain in place until permanent supporting elements of the structure are in place.

9.2 Scaffolds and Fall Protection

Scaffolds for masonry construction workers shall not be used to provide temporary lateral support of masonry walls.

Note: Please refer to HSEQ Manual Section 14 Scaffolding and Work Platforms

Fall protection shall be provided to masonry workers exposed to falls of 6 feet (1.8 m) or more.

Note: Please refer to HSEQ Manual Section 20 Fall Protection

10 Amendment history

Date	Version	Revised content
06.01.2020	1.0	Initial Preparation

11 Appendix

There are no appendices to this section.