CHAPTER 5-
J.A. Rosa Construction, LLC
CONCRETE AND MASONRY CONSTRUCTION

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1.1 Scope, application, and definitions.

Concrete and masonry are at the heart of every construction environment, from high-rise buildings to roads and bridges. Although concrete is a strong and reliable resource, working with it is anything but risk-free.

Forming, mixing, placing, and finishing concrete present distinct hazards for workers, and understanding these risks is the first step toward mitigating and preventing their unfortunate outcomes.

This subpart sets forth requirements to protect our employees from the hazards associated with concrete and masonry construction operations performed in workplaces covered under 29 CFR Part 1926 Subpart Q - 1926. 700 through 1926.706

1.1.a Definitions

Bull float - A tool used to spread out and smooth concrete.

Formwork - The 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, reshores, hardware, braces, and related hardware.

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.

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.

Reshoring - The construction operation in which shoring equipment (also called reshores or reshoring equipment) is placed, as the original forms and shores are removed, to support partially cured concrete and construction loads.

Shore - A supporting member that resists a compressive force imposed by a load.

Vertical slip forms - Forms that are jacked vertically during the placement of concrete.

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 building/structure where the lift-slab process is being used.

1.2 Hazards Associated with Concrete work

Safety hazards for concrete construction workers include:

- Skin, eye and respiratory irritation from cement dust and chemical exposure
- Formwork collapses or falling materials
- Slips, trips and falls on wet or uneven surfaces
- Chemical burns from direct contact with wet concrete
- Overexertion injuries from heavy lifting and awkward postures
- Noise exposure from machinery and power tools
- Confined space dangers in enclosed pouring areas
- Impacts or crush injuries from equipment and vehicles

Forming Risks

Creating strong, stable formwork, or forms, to hold the mix in place as it sets after pouring is a crucial initial step of working with concrete. However, the forms themselves can be dangerous if set up incorrectly. Injuries during this stage often result from structural failures or falls.

Preparing concrete forms requires carpentry skills, and hand and power tools. Inspect your tools to ensure they are in good working order. Saws should be properly guarded to protect your hands and fingers. Use power tools that are double insulated or grounded with a three-prong plug and connected to ground fault circuit interrupters (GFCI) to prevent electric shock in case the tool comes into contact with moisture.

Hazards can include:

- Falls during rebar tying or formwork erection
- Collapse of poorly braced forms
- Falling materials during formwork striking
- Silica dust exposure when cutting forms
- Manual handling strain from heavy materials
- Skin irritation from wet materials or debris

Mixing Hazards

Mixing may seem routine, but airborne cement dust and caustic reactions with moisture can create serious health risks, like:

- Cement dust exposure from bag dumping, cutting, or grinding
- Skin contact with wet cement reacting with sweat
- Irritated eyes, nose, and throat
- Progressive lung damage, such as silicosis

Placement Risks

Pouring concrete is a physically demanding task with multiple dynamic hazards, many of which increase when surfaces are unstable or wet. These can include:

- Slips on surfaces with a slick, wet mixture
- Falls from unstable formwork or improperly supported rebar
- Pinch points and crush zones near machinery or hoses
- Vehicle and equipment strike hazards
- Caustic skin burns from wet cement
- Uncapped rebar impalement

All protruding reinforcing steel, onto and into which employees could fall, shall be guarded by an impalement protection cap to eliminate the hazard. (29 CFR 1926.701 Subpart Q)

Finishing Risks

Timing and coordination are critical when finishing concrete. At this stage, workers often operate under time pressure and in close proximity to hazardous materials and tools.

Dangers in this step can include:

- Electrocution risks from long-handle floats near power lines
- Silica dust exposure from dry cutting or sweeping
- Chemical hazards from curing compounds or sealants
- Inhalation risks from compressed air cleaning methods
- Extended kneeling or crouching, leading to ergonomic strain

1.3 Personal Protection – Head & Eyes

Concrete jobs are full of airborne debris, fast-moving equipment and unsteady footing. Protecting your head and eyes is always essential.

- Always wear a hard hat on active construction sites.
- Use protective eyewear with side shields or goggles rated for dust and impact.
- If exposed to cement or debris, flush eyes immediately at an eye wash station.

Never remove eye protection while working with wet concrete or during grinding/cutting tasks.

1.4 Skin Protection

Concrete and skin don't mix. The chemicals in cement can cause everything from mild irritation to third-degree burns.

- Wear long sleeves, full-length pants, and alkali-resistant gloves when working with concrete.
- Use waterproof boots that extend above the ankle.
- Avoid direct contact with wet or dry cement; never kneel or sit on damp concrete.
- Wash any exposed skin immediately with clean water and mild soap.
- Never allow cement to remain in contact with skin.

1.5 Respiratory Protection

Silica dust is invisible, deadly and present at nearly every stage of concrete work. Inhaling it can lead to permanent lung damage.

- Wear a properly fitted respirator when cutting, grinding or mixing.
- Avoid dry sweeping; use wet methods or HEPA vacuums to control dust.
- Never eat, drink or smoke in dusty areas.
- Schedule regular air monitoring to assess dust levels on site.
- Stay upwind of cutting or mixing operations whenever possible.
- Requirements for Equipment and Tools.

Concrete mixers.

Concrete mixers with one cubic yard (-8 m(3)) or larger loading skips shall be equipped with the following:

- A mechanical device to clear the skip of materials; and
- Guardrails are installed on each side of the skip.

Power concrete trowels.

Power trowels are vital for finishing concrete, helping operators create smooth, even surfaces quickly and efficiently. One of the most frequent errors is using the power trowel before the concrete has reached the correct set. Operators may feel pressure to finish the slab quickly, especially under tight deadlines, but premature troweling can damage the surface.

- The Consequences
- Gouging or tearing the concrete surface
- Embedding aggregate unintentionally
- Creating an uneven or porous finish

Conversely, delaying the start for too long can also lead to issues. As concrete cures, it becomes more difficult to manipulate. Troweling late can lead to insufficient smoothing or a burnished finish that traps moisture.

- The Consequences
- Surface crazing or cracking
- Difficulty achieving proper finish
- Wasted labor and fuel

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.

Maintain a clear, dry path for walking. Train all operators on safety procedures before use. Always wear:

- Gloves
- Eye and ear protection
- Slip-resistant boots

Concrete buggies.

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

Concrete pumping systems.

Concrete pumping systems pose several significant dangers that require careful management.

Hazards

- Hose Whipping: A sudden release of pressure can cause hoses to whip violently, posing a risk to nearby workers.
- Blockages and Bursting: Blockages in the line can lead to bursts, which can injure operators and bystanders.
- Electrical Hazards: Malfunctions in electrical systems can lead to shocks or equipment failures.
- Hydraulic Leaks: Leaks from hoses or fittings can cause equipment to malfunction, leading to accidents

Implementing proper safety protocols can significantly reduce risks associated with concrete pumping. Compressed air hoses used on the concrete pumping system shall be provided with positive fail-safe joint connectors to prevent separation of sections when pressurized.

Fail-Safe joint connector

Post-tensioning operations.

Post tension concrete slabs are a type of prestressed concrete, wherein high-strength steel cables or wires are used to apply tension to the concrete slab. This prestressing force helps to counteract the forces of compression that would otherwise act on the concrete.

Post-tension slabs are typically used in the construction of bridges, parking structures, high-rise buildings and other structures where enhanced durability and strength are required.

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

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

Concrete buckets.

Concrete placement with a crane and bucket is one of the most common picks in commercial construction. It looks routine: the crane lifts the loaded bucket from the truck or pump position, swings to the placement location, the operator holds while the placement crew releases the concrete, swings back, and repeats. The picks are short, the radius is short, and the cycle time is fast, the weight is heavy.

The unit weight of normal-weight concrete is approximately 150 pounds per cubic foot, a long-standing engineering reference value documented by the American Concrete Institute and used in standard structural calculations. A one cubic yard bucket carries 27 cubic feet, or approximately 4,050 pounds of concrete,[1]

No employee shall be permitted to work under concrete buckets while buckets are being elevated or lowered into position.

To the extent practical, elevated concrete buckets shall be routed so that the fewest number of employees are exposed to the hazards associated with falling concrete buckets.

[1] https://www.craneop.net/blog/concrete-placement-crane-operations

Common Bucket Mistakes

Overloaded bucket. The bucket holds more cubic feet than the chart cell at the placement radius can support.

Two-block from inattention. The operator hoisted past the anti-two-block warning by reflex on the routine cycle.

Ground condition change. The setup was fine at the start of the pour and degraded during the pour. The lift director did not monitor the ground.

Pump-to-crane interference.

The two booms moved into each other's airspace because the communication protocol was informal.

Signal person fatigue. The signal person worked the full pour without relief, lost focus, and missed a signal.

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.

Tremies.

A tremie is a vertical pipe system that delivers concrete to specific locations with minimal segregation and optimal flowing conditions[2]. The tremie method operates on the principle of gravity and controlled concrete flow. Fresh concrete is transported from the surface through the tremie pipe to underwater placement locations. The process begins by positioning the tremie pipe at the placement site with its lower end sealed by a plug or closure device.

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

Bull floats.

Employees should be aware of any low-hanging electrical cables or energized electrical conductors that could contact a bull float handle while in use.

[2] https://drillingbucket.com/what-is-a-tremie/

Masonry saws.

Masonry saw shall be guarded with a semicircular enclosure over the blade.

A method for retaining blade fragments shall be incorporated in the design of the semicircular enclosure.

Misting or wetting the surface while cutting is mandatory to keep dust levels low.

Lockout/Tagout procedures.

No employee shall be permitted to perform maintenance or repair activity on equipment (such as compressors mixers, screens or pumps used for concrete and masonry construction activities) where the inadvertent operation of the equipment could occur and cause injury, unless all potentially hazardous energy sources have been locked out and tagged (see JA Rosa's Lock Out Tag Out safety section in the Procedure Manual).

Tags should read Do Not Start or similar language to indicate that the equipment is not to be operated.

1.6 Requirements for Cast-in-place Concrete.

General requirements for formwork.

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

Shoring and Reshoring.

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.

A Shoring Drawing prepared by a person qualified to analyze the intended loading and consistent with the manufacturer's recommended safe work loads, shall be always used on the job.

B. Inspect All Equipment Before Using. Never use any equipment that is structurally defective in any way. Mark it or tag it as defective, then remove it from the jobsite.

C. Survey The Job Site. A survey by a qualified person shall be made of the job site for

hazards, such as untamped earth fills, ditches, debris, high tension wires, unguarded openings and other hazardous conditions. These conditions should be corrected or avoided as noted in the following sections.

D. Plan Shoring Erection Sequence In advance and obtain necessary access equipment to accomplish the work safely.

E. Erect, Dismantle Or Alter Shoring only under the supervision of a qualified person.
F. DO NOT ABUSE OR MISUSE THE SHORING EQUIPMENT.

G. Inspect Erected Shoring: (a) immediately prior to concrete placement; (b) during concrete placement and while vibrating concrete, and (c) after concrete placement until concrete is set.

H. Use Shoring Equipment only for the purposes or in ways for which it was intended. Use proper tools when installing equipment.

I. requires good physical condition. Do not work on shoring if you feel dizzy, unsteady in any way or are impaired in any way by drugs or any other substances.

J. DO NOT USE SHORING SYSTEMS for fall protection.

Shoring equipment found to be damaged such that its strength is reduced to less than that required shall not be used for shoring.

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 reduced to less than that required by General requirements for formwork, shall be immediately reinforced.

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

All base plates, shore heads, extension devices, and adjustment screws shall be in firm contact, and secured, when necessary, with the foundation and the form.

Eccentric loads on shore heads and similar members shall be prohibited unless these members have been designed for such loading.

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

- 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.

- The single post shores shall be vertically aligned.

Single Post Shoring

- The single post shores shall be spliced to prevent misalignment.

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.

Adjustment of single post shores to raise formwork shall not be made after the placement of concrete.

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.

GUIDELINES FOR ERECTION AND USE OF SHORING

A. Provide And Maintain A Solid Footing. The sills or cribbing for shoring shall be sound, rigid and capable of carrying the maximum design load without settling or moving.
B. Always Use Base Plates. When sills or cribbing are used, base plates must be centered on them.
C. Adjusting Screws Shall Be Used to adjust to uneven grade conditions. Maintain all screw adjustments within the recommended height for the design load.
D. Plumb And Level All Shoring Frames as the erection proceeds. DO NOT force braces on frames - level the shoring towers until proper fit can be made. Maintain all shoring towers plumb and level.

E. Maintain The Shore Frame Spacings Or Tower Heights as shown on the shoring drawing. Where job site conditions require deviations from the shoring drawing, consult a qualified person.

F. If Motorized Concrete Equipment is to be used, be sure that the shoring layout has been designed for use with this equipment and such fact is noted on the layout.

G. Use Caution When Erecting Free-Standing Towers. Prevent tipping by guying or bracing when height exceeds 4 times the minimum base dimension.

H. Give Special Consideration To Temporary Loading. Areas where re-bar, material or equipment is to be stored temporarily may need to be strengthened to meet those loads.

I. DO NOT CLIMB CROSS BRACES. Use proper access equipment.

J. Use Special Precautions when shoring from or to sloped surfaces.

K. Use adjustment device on top of leg to position the falsework - not the bottom adjusting screw.

L. Shoring loads are intended to be carried by vertical legs. Horizontal loading may require special consideration. Consult your shoring supplier for allowable loads on

horizontal members.

M. AVOID ECCENTRIC LOADS on U-Heads, top plates and similar members by centering stringer loads on those members.

III. GUIDELINES FOR DISMANTLING SHORING

A. Do Not Remove Braces Or Back Off On Adjustment Screws until proper authority is given.

B. Dismantled equipment should be stockpiled in a planned manner and distributed to avoid concentrated loads on the partially cured concrete.

C. Use Proper Access Equipment In the dismantling process.

D. LOWER SHORING COMPONENTS in a safe manner. Do not drop or throw components, as this could result in injury to personnel or damage to equipment. I

IV. RESHORING −−−−Reshoring is one of the most critical operations in formwork; consequently, reshoring procedure must be designed by a qualified person and approved by the architect/engineer of record.

V. WINDLOAD – Erector must analyze the forming/shoring system for additional loads imposed from wind loading and provide adequate anchorage to resist these forces, including uplifting wind forces.

Reinforcing steel.

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

Rosa employees 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.

Forms and shores (except those used for slabs on grade and slip forms) shall not be removed until the competent person 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:

The plans and specifications stipulate conditions for removal of forms and shores, and such conditions have been followed, or

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.

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.

1.7 Requirements for Pre-cast Concrete.

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 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 shall be capable of supporting at least five times the maximum intended load applied and transmitted to the lifting hardware (See J A Rosa's safety Chapter on Rigging).

No employee shall be permitted under precast concrete members being lifted or tilted into position, except those employees required load transferred to them because of the loss of support at the lifting jack considered.

1.8 Requirements for Masonry Construction.

A limited access zone shall be established whenever a masonry wall is being constructed. The limited access zone shall conform to the following.

The limited access zone should be established prior to the start of wall construction.

The limited access zone shall be equal to the height of the wall to be reconstructed plus four feet and shall run the entire length of the wall.

The limited access zone shall be established on the side of the wall which will be free of scaffolding.

The limited access zone shall be restricted to entry by employees actively engaged in constructing the wall. No other employees shall be permitted to enter the zone.

The limited access zone shall remain in place until the wall is adequately supported to prevent overturning and to prevent collapse unless the height of wall is over eight feet,

in which case, the limited access zone shall remain in place until the requirements of paragraph (b) of this section have been met.

All masonry walls over eight feet in height shall be adequately braced to prevent overturning and to prevent collapse unless the wall is adequately supported so that it will not overturn or collapse. The bracing shall remain in place until permanent supporting elements of the structure are in place.

1.9 References to Concrete and Masonry Construction

The following non-mandatory references provide information that can be helpful in understanding and complying with the requirements for this chapter.

- Accident Prevention Manual for Industrial Operations; Eighth Edition; National Safety Council.

- Building Code Requirements for Reinforced Concrete (ACI 318-83).

- Formwork for Concrete (ACI SP-4).

- Recommended Practice for Concrete Formwork (ACI 347-78).

- Safety Requirements for Concrete and Masonry Work (ANSI A10.9-1983).

- Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens (ASTM C39-86).

- Standard Test Method for Making and Curing Concrete Test Specimens in the Field (ASTM C31-85).

- Standard Test Method for Penetration Resistance of Hardened Concrete (ASTM C803-82).

- Standard Test Method for Compressive Strength of Concrete Cylinders Cast In-Place in Cylindrical Molds (ASTM C873-85).

- Standard Method for Developing Early Age Compressive Test Values and Projecting Later Age Strengths (ASTM C918-80).

- Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction (ASTM E329-77).

- Method of Making and Curing Concrete Test Specimens in the Laboratory (ASTM C192-88).

- Methods of Obtaining and Testing Drilled Cores and Sawed Beams of

Concrete (ASTM C42-87).

- Methods of Securing, Preparing and Testing Specimens from Hardened Lightweight Insulating Concrete for Compressive Strength (ASTM C513-86).

- Test Method for Comprehensive Strength of Lightweight Insulating Concrete (ASTM C495-86).

- Method of Making, Accelerating Curing, and Testing of Concrete Compression Test Specimens (ASTM C684-81).

- Test Method for Compressive Strength of Concrete Using Portions of Beams Broken in Flexure (ASTM C116-68 (1980)).