



Concrete and Masonry in Construction

- *Subpart Q*

Objectives

In this course, we will discuss the following:

- OSHA's minimum requirements for concrete and masonry work in construction
- General requirements, equipment, tools, formwork, shoring, precast concrete, and lift-slab operations
- Hazards associated with concrete and masonry construction operations
- Abatement methods



Subpart Q – Concrete and Masonry Construction

- **1926.700** – Scope, application, and definitions
 - **1926.701** – General requirements
 - **1926.702** – Requirements for equipment and tools
 - **1926.703** – Requirements for cast-in-place concrete
 - **1926.704** – Requirements for precast concrete
 - **1926.705** – Requirements for lift-slab operations
 - **1926.706** – Requirements for masonry construction
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- **Bull float**

- A tool used to spread out and smooth concrete.

- **Formwork**

- The total system of support for freshly placed or partially cured concrete.

- **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.
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- **Limited access zone**

- An area alongside a masonry wall, which is under construction, and is clearly demarcated to limit access by employees.

- **Precast concrete**

- Concrete members which have been formed, cast, and cured prior to final placement in a structure.

- **Reshoring**

- The construction operation in which shoring equipment is placed, as original forms and shores are removed, to support partially cured concrete and construction loads.
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- **Shore**

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

- **Vertical slipforms**

- These forms are jacked vertically during placement of concrete.

- **Jacking operation**

- The task of lifting a slab during the construction of a building where the lift-slab process is being used.
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Does Subpart Q Apply?





Construction Loads

1926.701(a)

- Structures must be capable of supporting loads.



Reinforcing Steel

1926.701(b)

- Guard protruding, reinforcing steel
 - Letter of interpretation: 05/29/1997
 - » [Addresses use of small plastic rebar caps]
 - Letter of interpretation: 03/10/2006
 - » [Horizontal protection from impalement]





Rebar Protection

- The following images are from video shot during an investigation of an actual rebar accident.

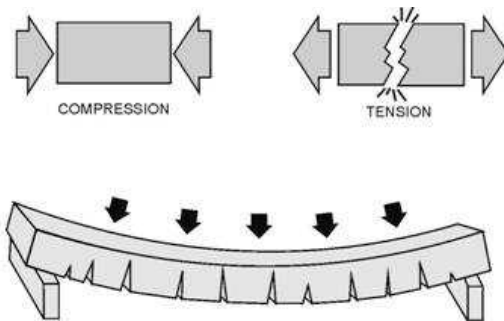
Courtesy of Utah Occupational Safety and Health Division



Post-Tensioning Operations

1926.701(c)

- Method of reinforcing concrete, masonry, and other structural elements
- Strands $\frac{1}{2}$ " diameter are stressed to a force of 33,000 lbs. using a hydraulic jack

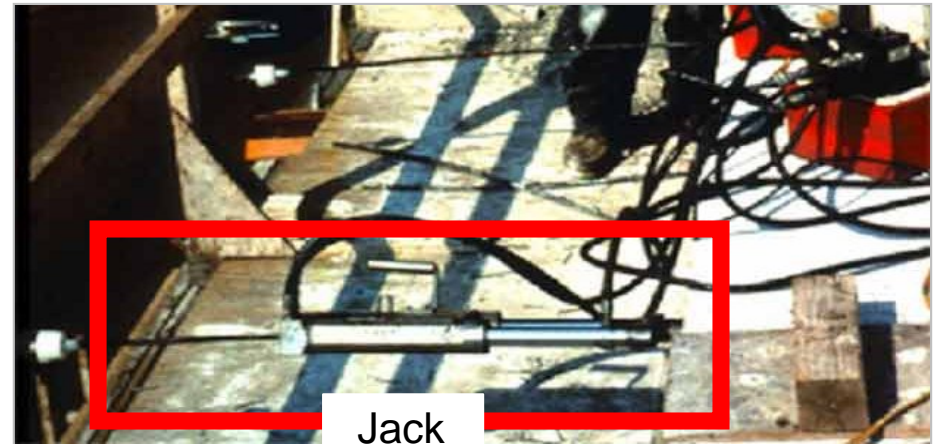




Post-Tensioning Operations

1926.701(c)(1)-(2)

- No non-essential employees allowed in hazard zone.
- Use signs and barriers to limit employees access to work zone.



Jack



Riding Concrete Buckets

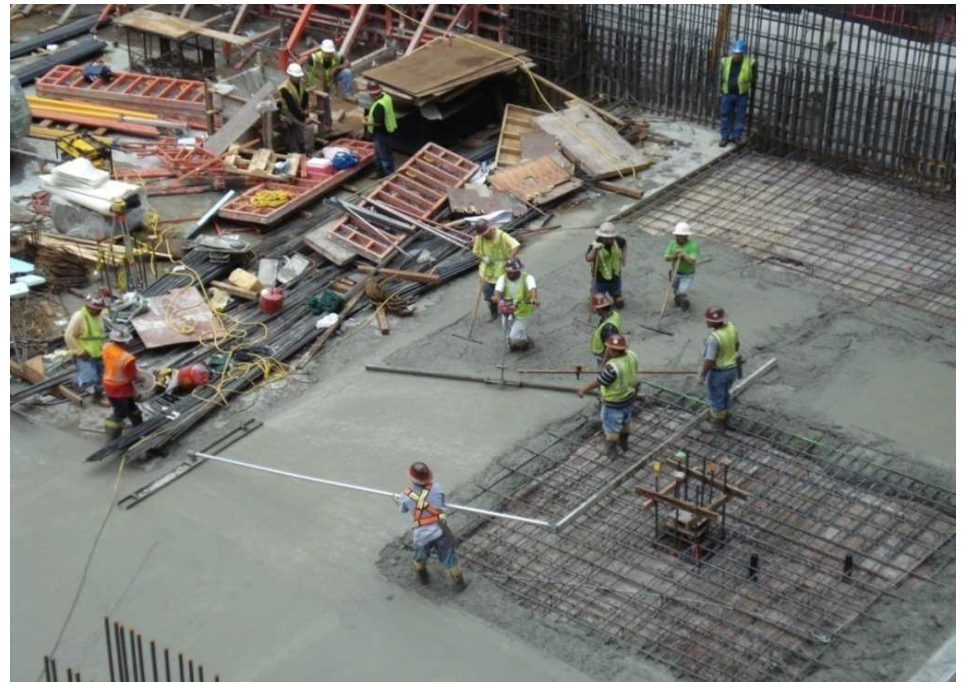
1926.701(d)



Working Under Loads

1926.701(e)(1)

- Employees must not be permitted under concrete buckets while they are being elevated or lowered into position.





Working Under Loads

1926.701(e)(2)

- Elevated concrete bucket routes



Personal Protective Equipment

1926.701(f)

- Employees must wear protective head and face equipment when applying cement, sand, and water mixture through a pneumatic hose.



Bulk Cement Storage

1926.702(a)(1)-(2)

- Bins, containers, and silos must be equipped with:
 - Conical or tapered bottoms
 - Mechanical or pneumatic means to start flow of material.

- Ejection system must be shut down, locked and tagged out prior to entry.



Concrete Mixers

1926.702(b)(1)-(2)

- Concrete mixers with one cubic yard or larger loading skips must be equipped with:
 - Mechanical device to clear skip of materials
 - Guardrails installed on each side of the skip



Power Concrete Trowels

1926.702(c)

- Manually guided concrete troweling machine must be equipped with:
 - Automatic control switches shut off power when hands are removed.



Power Concrete Trowels



Concrete Buggies

1926.702(d)

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



Concrete Pumping System

1926.702(e)(1)-(2)

- Discharge pipes must be provided with pipe supports designed for 100 percent overload.
- Compressed air hoses must be provided with positive fail-safe joint connectors.



Concrete Buckets

1926.702(f)(1)-(2)

- Concrete buckets equipped with hydraulic or pneumatic gates:
 - Must have positive safety latches or similar devices to prevent accidental dumping
 - Designed to prevent concrete from hanging up on top and sides





Tremie Sections

1926.702(g)

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





Bull Floats

1926.702(h)

- Bull float handles must be constructed of nonconductive material or insulated.
 - When used where they may contact energized electrical conductors

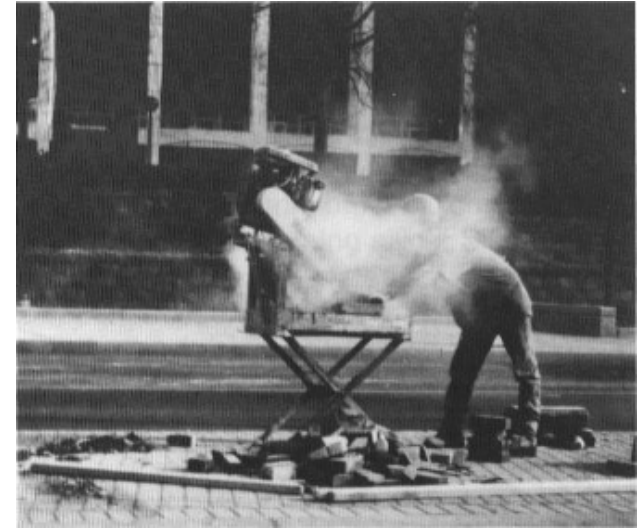




Masonry Saws

1926.702(i)(1)-(2)

- Masonry saws must be guarded with a semicircular enclosure over the blade.
- Method for retaining blade fragments must be incorporated in the design of the enclosure.



Lockout/Tagout Procedures

1926.702(j)(1)

- Employees must not be allowed to perform maintenance or repair activity on equipment.
 - Unless hazardous energy sources have locked out or tagged out.



General Requirements

1926.703(a)(1)

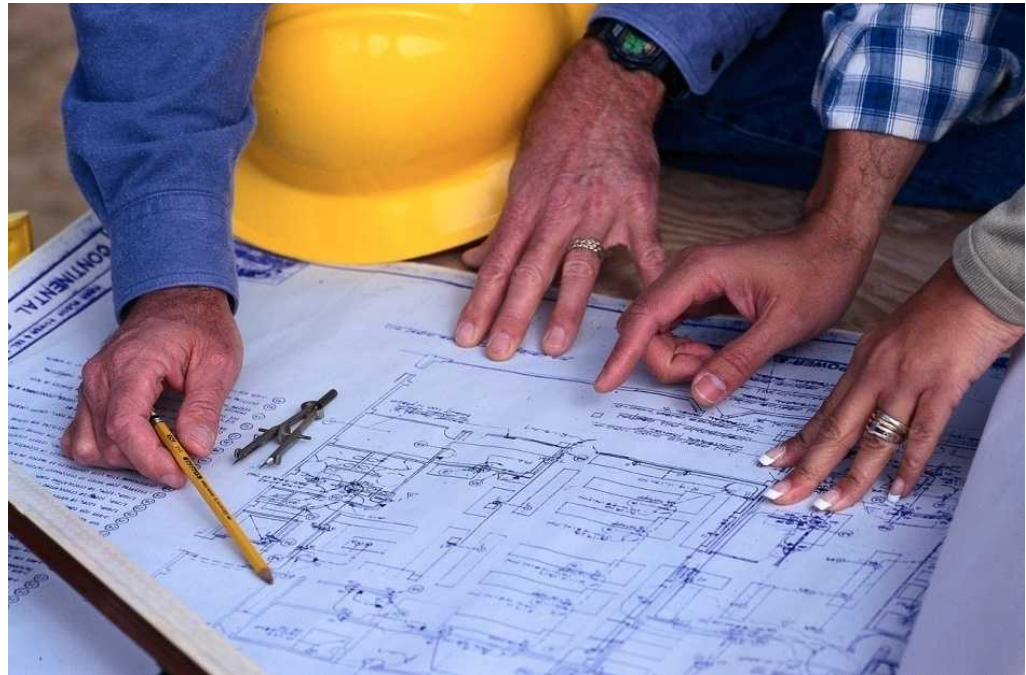
- Formwork must be designed, fabricated, erected, supported, braced, and maintained.
 - Must support without failure all vertical and lateral loads applied to it



General Requirements

1926.703(a)(2)

- Drawings or plans for the jack layout, formwork, working decks, and scaffolds must be available at the jobsite.



Shoring and Reshoring

1926.703(b)(1)-(3)

- Inspected prior to erection.
- Damaged equipment shall not be used.
- Inspected immediately prior to, during, and immediately after concrete placement.



Shoring and Reshoring

1926.703(b)(4)-(5)

- Equipment found to be damaged or weakened must be immediately reinforced.
- Sills must be sound, rigid, and capable of carrying maximum intended load.



Shoring and Reshoring

1926.703(b)(6)

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



Shoring and Reshoring

1926.703(b)(9)

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



Shoring and Reshoring

1926.703(b)(10)

- Reshoring must be erected:
 - As the original forms and shores are removed.
 - Whenever the concrete is required to support loads in excess of its capacity.



Vertical Slipforms

1926.703(c)(1)-(3)

- Form steel rods or pipes on which jacks climb must be:
 - Designed for that purpose and adequately braced when not encased in concrete.
 - Provided with scaffolds or work platform where employees required to pass.





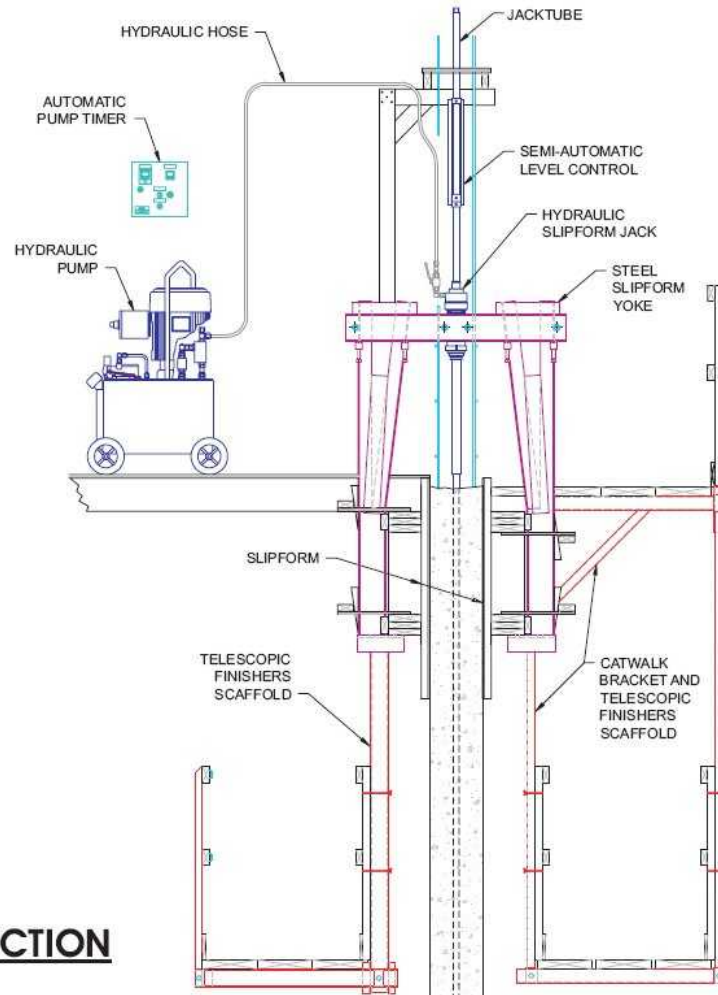
Vertical Slipforms

1926.703(c)(5)

- Jacks and lifting devices must be provided with mechanical dogs or other automatic holding devices.



Vertical Slipforms



SLIPFORM SECTION

Removal of Formwork

1926.703(e)(1)

- Forms and shores must not be removed until employer determines concrete has gained sufficient strength.



Precast Concrete

1926.704(a)

- Wall units, structural framing, and tilt-up wall panels must be adequately supported to prevent overturning.





Precast Concrete

1926.704(b)

- Tilt-up precast concrete members
 - Lifting inserts embedded or otherwise attached must be capable of supporting at least two times the maximum intended load.



Precast Concrete

1926.704(c)

- Precast concrete members
 - Other than tilt-up members.
 - » Lifting inserts capable of supporting at least four times maximum intended load.



Precast Concrete

1926.704(d)

- Lifting hardware must be capable of supporting at least five times maximum intended load.



Precast Concrete

1926.704(e)

- No employees permitted under precast concrete members being lifted or tilted into position.
 - Except employees required for the erection of those members.



Fall Protection

1926.501(b)(12)

- Each employee engaged in the erection of precast concrete members and related operations who is 6 feet or more above lower levels shall be protected from falling.



Precast Concrete

- Precast walls can be installed quickly.
- Foundations can be backfilled as soon as the slab is in place, enhancing jobsite safety.



Lift-Slab Operations

1926.705(a)

- Designed by a registered professional engineer
- Plans and designs implemented by employer must include:
 - Detailed instructions
 - Sketches indicating method of erection





Jack/Lifting Unit

1926.705(b), (c), (g), (i)

- Marked to indicate rated capacity
- Not loaded beyond capacity
- Synchronized lifting to ensure uniform lifting
- Manual controls located in central location—attended by competent person (must be experienced)





Lift-Slab Operations

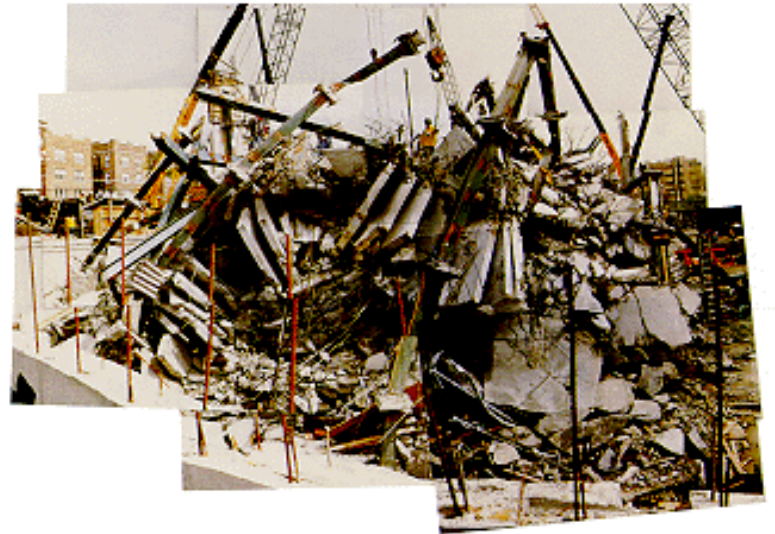
1926.705(k)(1)

- No employees permitted in the building or structure while any jacking operation is taking place.
 - Except essential personnel



L'Ambiance Plaza, Bridgeport, Conn.

- Lift slab construction project
- 28 workers killed
- Multiple failures in design system and construction practices





Limited Access Zone

1926.706(a)(1)-(5)

- Established prior to the start of construction
- Equal to the height of the wall plus four feet
- Unscaffolded side of wall
- Restricted to entry by employees constructing the wall
- Remain until adequately supported



Limited Access Zone

1926.706(b)

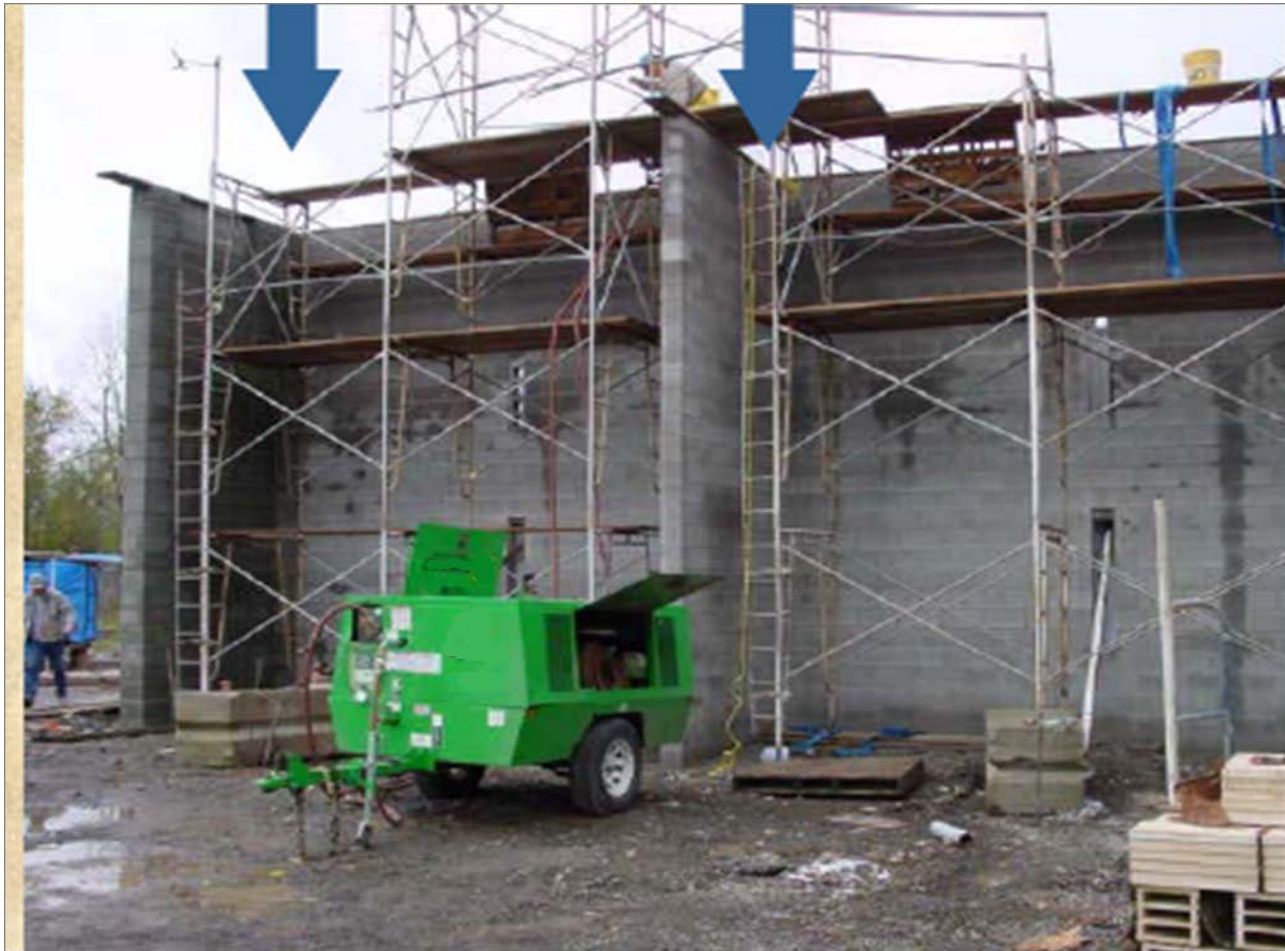
- Masonry walls over 8 feet in height must be adequately braced.
- Bracing must remain in place until permanent supporting elements of the structure are in place.



Limited Access Zone



Limited Access Zone



Limited Access Zone



Summary

We covered the following information during this presentation:

- OSHA's minimum requirements for concrete and masonry work in construction
- General requirements for equipment, tools, formwork, shoring, precast concrete, and lift-slab operations
- Hazards associated with concrete and masonry construction operations
- Abatement methods



Thank You For Attending!

Final Questions?
