Concrete and Masonry Operations

Preparation

1. Read Applicable Background information and related Company Policy Chapter.
2. Make _____ Copies of this Lesson Plan for Personnel
3. Make Transparency, procure transparency pens, etc.
4. Coffee, tea, snacks

Other:

Material

1. Personal Protective Equipment
2.

Objective

By the end of this session, personnel shall be able to describe:

- Hazards Associated with Concrete
- Employee and Supervisor Responsibilities
- Operational Safety, to include:
  - Shoring and Reshoring
  - Concrete Rebar and Steel Handling
  - Forms
  - Formwork Removal
- Concrete and Masonry Construction
- Supervisor Oversight Responsibilities

Background

Concrete is composed of cement, sand, aggregate (sized stones), and water. When mixed in the correct amounts, concrete is a stable and versatile building medium which can be used in a variety of applications ranging from roads, bridges and buildings, to septic tanks and even countertops for household use. The versatility in building application is accomplished by altering the proportions of air and other variables in the mixture. Strengthening materials such as re-bar, fiberglass strands, and plastic rods are then added.

Notes

Lesson

Hazards Associated with Concrete

- Engulfment
- Skin irritant and Eye Hazards
- Form Blowout and collapse
- Noise exposure
- Falling from the form structure
- Impact & pinch points
- Earth cave-in

Employee and Supervisor Responsibilities

Supervisors

- Provide continuous operation safety observation and control
- Provide immediate corrective training for all unsafe acts
- Conduct pre-pour inspections

Employees

- Follow all safety and operational procedures
- Wear all Personal Protective Equipment during the concrete operation to include,
  - Rubber gloves and boots
  - Face Shields or goggles
  - Hard Hats
- Immediately notify supervisor of all unsafe condition

Notes

Operational Safety

Form work 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 form work.

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 re-shoring:

All Shoring equipment (including equipment used in re-shoring operations) shall be inspected prior to erection to determine that the equipment meets the requirements specified in the form work drawings.

Shoring equipment found to be damaged such that its strength is reduced 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, 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 comply with the following specific requirements in addition to the general requirements for form work:

Notes

A qualified designer shall prepare the design of the shoring and an engineer qualified in structural design shall inspect the erected shoring.

The single post shores shall be vertically aligned.

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.

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

Concrete Reinforcing Bar (Rebar) and Reinforcing Steel Handling

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

Measures shall be taken 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.

In addition, the following procedures shall be practiced:

- Anyone working around or with concrete should be aware of the hazards and safety precautions related to this operation.
- Employees working more than 6 feet above any adjacent working surface, placing and tying reinforcing steel in walls, piers, columns, etc., must use a safety belt, harness or equivalent device.
- Employees will not be permitted to work above vertically protruding REBAR unless it has been protected to eliminate the hazard of impalement. The top of the Rebar must be covered with a Rebar cap, wood board or similar device.

Notes

- Handles on bull floats must be of non-conductive materials or insulated with a non- conductive sheath when used around energized electrical conductors to prevent electrical shock.
- When using a powered or rotating type troweling machine, the control switch will automatically shut off the power when the operator removes his hands from the handle - DO NOT USE "TIE-DOWNS" on the control switches.
- Riding concrete buckets for any purposes is prohibited.
- Vibrator crews must not work under concrete buckets suspended from cranes or cableways.
- When discharging concrete on a slope, make sure the ready-mix truck wheels are blocked and the brakes set to prevent movement.
- Gloves, eye protection and personal protective equipment should be used when needed.
- All equipment, hand and power, should be checked and in safe working condition before use. Replace or repair all defective equipment.
- If concrete splatters on the skin, wash off as soon as possible.

Forms and Formwork

Vertical slip forms - steel rods or pipes on which jacks climb or by which the forms are lifted shall be:

Specifically designed for that purpose; and

Adequately braced where not encased in concrete.

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

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

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.

Notes

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.

Removal of form work:

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:

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.

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

Concrete and Masonry Construction

All construction workers should be alert to the potential hazards associated with concrete and masonry operations. Among the most critical *unsafe* practices are:

- premature removal of formwork;
- failure to brace masonry walls;
- failure to adequately support precast panels;
- inappropriate operation of equipment;
- failure to guard the end of reinforcing steel;
- inadequate shoring, which can lead to formwork collapse.

General safety requirements should always be followed on construction, demolition, alteration or repair worksites-not just because of OSHA standards, but because serious accidents and injuries may happen if they are not.

Notes

☐ ***Construction Loads:*** Construction loads must not be placed on a concrete structure unless it has been determined that the structure is capable of supporting the intended loads, based on information received from a person who is qualified in structural design.

☐ ***Reinforcing Steel:*** All protruding reinforcing steel, onto which an individual could fall, must be guarded to eliminate the hazard of impalement.

☐ ***Post-Tensioning Operations:*** No one (except those essential to post-tensioning operations) should be permitted behind the jack during tensioning operations. Signs and barriers must be erected to limit worker access to the post-tensioning area during tensioning operations.

☐ ***Concrete Buckets:*** Under no condition may employees ride concrete buckets.

☐ ***Working Under Loads:*** *Never* work under concrete buckets while the buckets are traveling, being elevated or lowered into position. Elevated concrete buckets must be routed so that no employee is exposed to the hazards associated with falling concrete buckets.

☐ ***Personal Protective Equipment:*** Protective head and face equipment must always be worn when applying cementous grout through a pneumatic hose. A safety harness must be worn or equivalent fall protection provided while placing or tying vertical reinforcing steel and working more than 6 feet above any adjacent working surface.

☐ ***Masonry Construction:*** Whenever a masonry wall is being constructed, a limited access zone must be established prior to the start of construction. The limited access zone must be as follows:

- Equal to the height of the wall to be constructed, plus 4 feet, and running the entire length of the wall;
- On the side of the wall that will be unscaffolded;
- Restricted to entry only by employees actively engaged in constructing the wall;
- Kept in place until the wall is adequately supported to prevent overturning and collapse. If the height of the wall is more than 8 feet and unsupported, bracing must remain in place until permanent supporting elements of the structure are in place.

Notes

Supervisor Oversight Responsibilities

Conduct a safety meeting with the workers at the beginning of each shift to review that hazards that each person may encounter and give instructions for hazard elimination and/or protection.

Inspect all tools and equipment at least daily before use.

Workers mixing dry contents of concrete, or making saw cuts or other dust raising actions with concrete, may be exposed to dust inhalation. Workers should use approved respiratory protection when exposed to silica dust above the threshold limits. Implement dust control measures during sawing, grinding and mixing operations.

Ensure backup alarms work on all equipment and/or require all equipment to be escorted into position. Keep workers out of the backing-up path of mixing trucks.

Be aware of the swing radius of the concrete chutes, pinch points and the handling of chutes. Fingers caught in chute pinch points may be amputated.

Permit one person trained with standard crane hand signals to signal the crane operator swinging the cement bucket. Ensure the swing path of the cement bucket is NOT over any personnel.

Check for overhead power lines and avoid contact with float handles, pump booms and other tools and equipment.

If electrical lines are too close for safe float and finish work, the concrete pour should be reconfigured to avoid potential contact hazards.

Protect all moving parts of batch plants, mixers, portable mixers and other equipment with the appropriate safety guards or barriers. Keep fingers, hands, loose clothing and hair away from pinch and catch points.

Prior to workers entering mixing drums, batch plants, excavations, storage bins or other similar spaces:

> Determine the confined space requirements. If the space is considered to be a confined space by OSHA definition, then follow approved confined space procedures.

Notes

Prior to workers entering mixing drums, batch plants, excavations, storage bins or other similar spaces (continued)

Use proper Lockout-Tagout (LOTO) procedures when cleaning, performing maintenance and repairing batch plants, mixers and other equipment.

Inspect all hand-held electrically powered tools and cords before use and keep them Circuit Interrupters (GFCIs).

Provide and require the use of approved fall protection when workers are exposed to a fall greater than six(6) feet or more.

Use approved tied-off ladders and stairs to access all excavations and elevated heights.

Review Material Safety Data Sheets (MSDS) with the employees concerning the ingredients of the concrete, both the basic and additive ingredients, and other items such as curing compounds and sealants.

Secure the work area to keep the curious members of the public and other untrained personnel out. The risk of injury increases dramatically when your workers are distracted by outside hazards.

Closure

Be aware of the hazards of concrete and masonry operations and pre-plan your work!

Short cuts and haste can lead to painful accidents!

What questions do you have?

Notes

29 CFR part 1926.700 subpart Q, Concrete and Masonry Construction

Concrete and Masonry Operations-Assessment

Name: _____ Date: _____

1) Check all that apply

Hazards Associated with Concrete:

____ Engulfment ____ Skin irritant and Eye Hazards ____ Noise exposure
____ Impact and pinch points ____ Form Blowout and collapse ____ Earth Cave-in
____ Carpal Tunnel Syndrome

2) True or False

Employees must wear all Personal Protective Equipment during the concrete operation to include,

- Rubber gloves and boots
- Face Shields or goggles
- Hard Hats

Circle the correct phrase/words

3) All Shoring equipment (including equipment used in re-shoring operations) shall be inspected **prior to erection** **during erection** to determine that the equipment meets the requirements specified in the form work drawings.

4) A(n) **experienced foreman** **qualified designer** shall prepare the design of the shoring and an engineer qualified in structural design shall inspect the erected shoring.

5) Shoring equipment that is found to be damaged or weakened after erection, such that its strength is reduced, shall be immediately **reinforced** **replaced**.

6) Employees will not be permitted to work **above** **below** vertically protruding REBAR unless it has been protected to eliminate the hazard of impalement. The top of the Rebar must be covered with a Rebar cap, wood board or similar device.

7) Re-shoring shall not be removed until the concrete being supported has attained adequate **strength** **curing time** to support its weight and all loads in place upon it.

8) Supervisors shall conduct a safety meeting with the workers at the **beginning of during** each shift to review that hazards that each person may encounter and give instructions for hazard elimination and/or protection.

9) **<u>Supervisors</u>** **<u>All employees</u>** shall check for overhead power lines and avoid contact with float handles, pump booms and other tools and equipment.

10) True or False

Prior to workers entering mixing drums, batch plants, excavations, storage bins or other similar spaces they shall observe **Confined Space** requirements and use proper **Lockout-Tagout (LOTO)** procedures when cleaning, performing maintenance and repairing batch plants, mixers and other equipment.

29 CFR part 1926.700 subpart Q, Concrete and Masonry Construction

Key-Concrete and Masonry Operations-Assessment

1) Check all that apply

Hazards Associated with Concrete:

____ Engulfment **____ Skin irritant and Eye Hazards** **____ Noise exposure**
____ Impact and pinch points____ Form Blowout and collapse **____ Earth Cave-in**
____ Carpal Tunnel Syndrome

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