



# Lusail Real Estate Development Company

## Health, Safety, Security, Environment, Logistics & Quality Department

### Lusail Construction Safety Management Procedure – Concrete & Masonry Construction

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## 1. Description

This element of the LCSMP provides Contractors with guidance on basic health and safety requirements for concrete and masonry construction work. This Procedure applies to all Lusail personnel, Supervising Consultants, Developers, Contractors, and Subcontractors working on the Lusail Real Estate Development Project. It shall also apply to all phases of the particular activity per specifications described herein.

## 2. Definitions

Term	Description
Job Hazards Analysis (JHA)	A process used to identify the hazards or potential hazards associated with each step of a job or work plan to uncover hazards and then eliminate, control, or remove them before the work is started.
Bull Float	A tool used to spread 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.
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.
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 that is under construction, and that is clearly demarcated to limit access by employees.
Precast Concrete	Concrete members (e.g., walls, panels, slabs, columns, and beams) that have been formed, cast, and cured before 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 in order 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.

## 3. Responsibilities

The Contractor is fully responsible for the pre-planning, development of Method Statements, Job Hazard Analysis, overall safe work planning and implementation. The Contractor's Project Management is responsible for the assurance that all work is planned and conducted according to the pre-planning document, Contractor and Lusail Health Safety & Environment (HSE) procedures and the Qatar Construction Specifications 2010. Should a conflict occur between procedures/standards or requirements the more stringent will apply.

## 4. General Requirements

Vertically standing reinforcement bars 6' (1.8 m) or less in height shall be safeguarded with controls intended to minimize or eliminate the potential for worker impalement on exposed bars.

During tensioning operations, only authorized employees are permitted behind the jack. Signs and barriers limit access to the post-tensioning area during tensioning operations, in accordance with [LUS-HSE-WG3-446-016](#), Signs, Barricades, and Traffic Control.

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Employees are not permitted to ride in concrete buckets or work under concrete buckets while the buckets are being elevated or lowered into position. Elevated concrete buckets are routed so that no employee or the fewest employees possible are exposed to the hazards associated with falling concrete buckets, or debris falling from the bucket.

The project engineer determines whether concrete and/or masonry structures can support the proposed construction loads. The project engineer designs supports and/or guys to prevent overturning or collapse of structural and reinforcing steel for walls, piers, columns, and similar vertical structures. Connections of equipment used in plumbing-up must be secured.

## 5. Personal Protective Equipment Requirements

PPE follows the minimum requirements of [LUS-HSE-WG3-446-006](#), Personal Protective Equipment.

Employees are not permitted to apply a cement, sand, and water mixture through a pneumatic hose unless they are wearing protective head and face equipment.

Fall protection shall be provided to trained workers who are or may be exposed to falls of 6 feet (1.8 m) or more, in accordance with [LUS-HSE-WG3-446-022](#), Fall Protection.

## 6. Silica Exposure

The HSE Representative ensures that JHAs are conducted when activities may result in crystalline silica exposure. Such activities include jack hammering, concrete mixing, concrete drilling, and brick and concrete block cutting and sawing. The HSE Representative determines the necessary provisions for compliance in accordance with international best practices and QCS 2010, which may include the following:

- Until engineering controls are implemented, include affected employees in the project respiratory protection plan in accordance with [LUS-HSE-WG3-446-008](#), Respiratory Protection Program.
- Where feasible, provide engineering or administrative controls, such as local exhaust ventilation and blasting cabinets. Use all available work practices to (e.g., water sprays) control dust exposures.
- Provide disposable or washable work clothes, washing facilities, and/or showers.
- To monitor any adverse health effects caused by crystalline silica exposures, provide training and exposure monitoring in accordance with [LUS-HSE-WG3-446-009](#), Exposure Identification & Controls; and health screening and surveillance programs in accordance with [LUS-HSE-WG3-446-001](#), Medical Qualification and Surveillance.

## 7. Equipment & Tools

Bulk storage bins, containers, or silos must have conical or tapered bottoms with mechanical or pneumatic means of starting the flow of material.

Concrete mixers equipped with one (1) yard or larger loading skips must be equipped with a mechanical device to clear the skip of material and have standard guardrails installed on each exposed side of the skip.

Handles on bull floats that are used where they may contact energized electrical conductors must be constructed of nonconductive material or insulated with a nonconductive sheath whose electrical and mechanical characteristics provide equivalent protection.

Powered and rotating concrete troweling machines that are manually guided must be equipped with a control switch that automatically shuts off the power when the operator removes his/her hands from the equipment handles.

Concrete pumping systems using discharge pipes must be equipped with pipe supports designed for 100% overload.

Handles of concrete buggies must not extend beyond the footprint of the wheels on either side of the buggy.

Concrete buckets equipped with hydraulic or pneumatically operated gates must have positive safety latches or similar safety devices installed to prevent premature or accidental dumping. The buckets must be designed to prevent material from accumulating on the top and sides of the bucket.

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

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## 8. Cast in Place Concrete Requirements

The project engineer and project manager ensure that formwork is designed, fabricated, erected, supported, braced, and maintained in conformance with ANSI/ASSE A10.9-1997 (R2004) and publication ACI 347.

### 8.1 Shoring & Re-Shoring

- If single-post shores are used one on top of another (tiered), then additional shoring requirements must be met. The shores must be:
  - Vertically aligned
  - Spliced to prevent misalignment
  - Adequately braced in two mutually perpendicular directions at the splice level. Each tier also is diagonally braced in the same two directions.
- Single-post shores to raise formwork are not adjusted after the concrete is placed.
- As the original forms and shores are removed, reshoring is erected when the concrete is required to support loads in excess of its capacity.

### 8.2 Vertical Slip Forms

- The steel rods or pipes on which jacks climb or by which the forms are lifted must be:
  - Specifically designed for that purpose.
  - Adequately braced where not encased in concrete.
- Forms are designed to prevent excessive distortion of the structure during the jacking operation. Jacks and vertical supports are positioned so that the loads do not exceed the rated capacity of the jacks.
- The jacks or other lifting devices are equipped with mechanical dogs or other automatic holding devices to support the slip forms if the power supply or lifting mechanism fails.
- The form structure is maintained within all design tolerances specified for plumpness during the jacking operation.
- Do not exceed the predetermined safe rate of lift.
- Provide scaffolds or work platforms where employees are required to work or pass, in accordance with [LUS-HSE-WG3-446-020](#), Scaffolding Systems.
- Should work platforms exceed 6' (1.8 m) in height above lower levels, an approved means of fall protection shall be provided to workers using work platforms.

### 8.3 Removal of Formwork

Forms and shores (except those on slab or grade and slip forms) are not to be removed until the project engineer determines that the concrete has gained sufficient strength to support its weight and all superimposed loads. Such determination is based on one of the following criteria:

- Satisfaction of conditions stipulated in the plans and specifications for removal of forms and shores.
- Concrete testing in accordance with American Society for Testing and Materials (ASTM) standard test methods indicates that the concrete has achieved sufficient strength to support its weight and superimposed loads.

## 9. Precast Concrete & Lift Slab Operations

Lift-slab operations are planned and designed by the Project Engineer and include detailed instructions and sketches indicating the prescribed method of erection. The plans and designs also include provisions for ensuring lateral stability of the building/structure during construction.

No employees, except those essential to the jacking operation, are permitted in the building/structure while any jacking operation is taking place unless a registered professional engineer (independent of the project engineer who designed and planned the lifting operation) has determined from the plans that if there is a loss of support at any jack location, that loss is confined to that location and the structure as a whole will remain stable.

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Under no circumstances will any employee who is not essential to the jacking operation be permitted immediately beneath a slab while it is being lifted.

### 9.1 Lifting Inserts & Hardware

Lifting inserts that are embedded or otherwise attached to tilt-up precast concrete members must be able to support at least two (2) times the maximum intended load applied or transmitted to them.

Lifting inserts that are embedded or otherwise attached to precast concrete members (other than tilt-up members) must be able to support at least four (4) times the maximum intended load applied or transmitted to them.

Lifting hardware must be able to support at least five (5) times the maximum intended load applied or transmitted to the lifting device.

Jacking equipment must be able to support at least 2½ times the load being lifted during jacking operations, and the equipment is not to be overloaded. For this provision, jacking equipment includes any load-bearing component that is used to perform the lifting operation(s). Such equipment includes threaded rods, lifting attachments, lifting nuts, hook-up collars, T-caps, shearheads, columns, and footings.

### 9.2 Jacking Operations

- When a firm foundation must be provided, block or crib the base of the jack. If the metal cap of the jack might slip, place a wood block between the cap and the load.
- The maximum number of manually controlled jacks on one slab is limited to fourteen (14), and in no event will the number be too great to permit the operator to maintain the slab level within specific tolerances.
- Synchronize jacking operations to ensure even and uniform lifting of the slab.
- During lifting, keep all points of the slab support within 0.5 inch (1.2 cm) of that needed to maintain the slab in a level position.
  - If leveling is automatically controlled, install a device to stop the operation when the 0.5-inch (1.2-cm) leveling tolerance is exceeded.
  - If leveling is manually controlled, locate such controls in a central location and ensure that they are attended by a trained operator while lifting is in progress.

## 10. Masonry

The designated person establishes a limited access zone whenever a masonry wall is being constructed. The limited access zone:

- Is established before the start of construction on the wall.
- Is equal to the height of the wall to be constructed plus four (4) feet (1.2 m) and runs the entire length of the wall.
- Is established on the side of the wall that is un-scaffolded.
- Is restricted to entry by employees actively engaged in constructing the wall; no other employees are permitted to enter the zone.
- Remains in place until the wall is adequately supported to prevent overturning and to prevent collapse unless the height of the wall is greater than eight (8) feet (2.4 m), in which case the limited access zone remains in place until the requirements of EM-385-1-1, Section 27.G.02, have been met.

Masonry walls over eight (8) feet (2.4 m) high must 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 remains in place until permanent supporting elements of the structure are in place.

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

Cleanouts are on the side of the masonry wall opposite to the scaffolding.

## 11. Periodic Inspection

The designated person inspects shoring equipment prior to erection to determine that it is as specified in the shoring design. If equipment is damaged, it shall be properly tagged and removed from service immediately.

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The designated person inspects the erected shoring equipment immediately before, during, and immediately after the placement of concrete. If shoring equipment is damaged, displaced, or weakened, reinforce or reshore it immediately.

## **12. Training**

Contractors are required to train their employees in the requirements to be followed during concrete and masonry work.

The HSE Representative arranges employee training at the time of initial assignment. Supervisors are responsible for identifying additional employee training needs during risk mitigation planning (2-week look-ahead). Training can be organized and presented to groups or on a work area by work area basis, depending on the operation.

Re-training is provided for employees when their job assignments change or when a change in equipment or processes presents a new hazard.

Additional re-training shall be conducted when there are deviations from, or inadequacies in, the employee's knowledge or use of proper procedures. The re-training re-establishes the employee's proficiency and introduces new or revised control methods and procedures, as necessary.

## **13. Documentation**

The HSE Representative documents all instruction and training provided. Records verifying completion of training are kept in the employee's individual training files located in the Contractor site office.

Drawings and plans for cast-in-place concrete and lift-slab operations, including revisions for the jack layout, formwork, working decks and scaffolds, and manufacturer's specifications for fabricated shoring systems are available at the jobsite during job planning and execution.

The HSE Representative maintains project records at the site for the duration of the project and archives them for a minimum retention time of 10 years from creation date.

## **14. References**

Qatar Construction Specifications 2010

ACI 347, Guide to Formwork for Concrete

ANSI/ASSE A10.9-1997 (R2004) – Concrete and Masonry Work Safety Requirements

ASTM, Concrete Test Methods

EM 385-1-1, Safety – Safety and Health Requirements, Section 27.G.02, Masonry Construction