



Lusail Real Estate Development Company

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

Lusail Construction Safety Management Procedure – Cranes, Hoists, and Lifts

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1. Description

Proper procedures must be followed to ensure that cranes, hoists, and lifting devices handle loads properly, safely, and with maximum efficiency. Each appropriate Contractor / Developer must review this element of the LCSMP and provide assurance to the Lusail HSE Department that all aspects of this Procedure are followed.

This element of the LCSMP details Lusail Construction HSE requirements for lifting equipment, including cranes, hoists, cableways, and high lines. This element applies to all Lusail personnel, Contractors, Developers, Consultants and subcontractors working on the Lusail project.

This element is not all inclusive of applicable regulations and specifications for material handling equipment. This element does not include conveyors, fork trucks, motor vehicles, or pile drivers. Fork trucks and motor vehicles are covered in [LUS-HSE-WG3-446-025](#), Motor Vehicles and Equipment.

2. Definitions

Term	Description
Job Hazard Analysis (JHA)	A process used to identify the hazards or potential hazards associated with each step of a particular job or work plan to uncover hazards and eliminate, control or remove them before work is started.
Crane	A machine that lifts, lowers, and moves a load horizontally. The hoisting mechanism is an integral part of the machine. Cranes (fixed or mobile) are driven manually or by power.
Critical Crane Lift	Any crane lift that requires a Critical Lift Plan
Crane Operator	A person certified by Third Party and Licensed by the State of Qatar as being qualified to operate a specific model and capacity of crane.
Critical Lift Plan	A Critical Lift Plan is a document that identifies a specific load and the operating restrictions. Pertinent information includes all weights on hook blocks and attachments.
Drum	The cylindrical member around which the ropes are wound to raise or lower a load.
Gantry crane	A crane similar to an overhead crane except that the bridge for carrying the trolley or trolleys is rigidly supported on two or more legs running on fixed rails or other runway.
Hoist	An apparatus that may be a part of a crane, exerting a force to lift or lower a load.
Load	The total superimposed weight on the load block or hook.
Overhead crane	A crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure.
Rigger	A person Third Party certified to prepare a load for lifting
Standard Crane Lift	A standard crane lift is any lift not classified as a critical lift. Crane configuration shall be with main boom only.

Term	Description
Tailing	The placement of a load resting on the ground from the horizontal position to the vertical position or the vertical position to the horizontal position. Tailing lifts shall be classified as Critical Lifts and handled accordingly.
Tandem Lift (Multi Crane Lift)	Any crane lift involving two (2) or more cranes lifting or tailing the same load at the same time. Tandem lifts shall be classified as Critical Lifts and handled accordingly.

3. Responsibilities

ALL CRANE OPERATIONS ARE SUSPENDED WHEN WIND SPEEDS REACH 35 KPH

The Contractor is fully responsible for the pre-planning, development of Method Statements, Job Hazard Analysis, Critical Lift Plans, and 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. Pre-Lift Plan/ Method Statement

The qualified person in charge of the work develops and implements a project pre-lift plan/method statement in accordance with local regulations and this LCSMP section. The project manager and HSE Representative facilitate implementation and compliance with the plan, and the qualified person is responsible for overseeing the plan.

Prior to conducting crane lifts and other materials hoisting on Lusail project sites, Contractors must develop and implement a written Pre-lift Plan, which shall be submitted to the Supervising Consultant and/or Lusail for review and approval.

The qualified person may use the Pre-lift Checklist (Attachment [LUS-HSE-FM4-446-053](#)) to complete the Plan. At a minimum, the Pre-lift Plan includes the following information:

- Name of the person responsible for maintaining the program, and communicating program requirements to employees and other employers
- Name of qualified operator for each machine
- Name of competent person(s)
- JHAs and daily huddles
- Provisions for inspections
- Preventive maintenance program
- Provisions for training
- Provisions for signs and barriers
- Weights to be lifted
- Crane capacity
- Lifting operations
- Tailing load
- Lifting hardware
- Stresses
- Signal system
- Allowable line speed for various loads
- Set-up and set-down procedures (mobilization, assembly or erection, dismantling, and demobilization)

- Ground conditions, outrigger or crawler track requirements
- Critical lift provisions

Supervisors ensure that all employees are trained in the recognition and avoidance of hazards identified in JHAs. All parties must completely understand the activities to be performed and maintain communication during lifting activities.

All planned lifting activities are coordinated by one designated qualified person in conjunction with the any subcontractor representatives, the project manager, and/or the HSE Representative.

Hoisting equipment, cableways, high lines, cranes, and other lifting equipment must be installed, inspected, tested, and operated in strict conformance with the manufacturer’s or engineer’s specifications, ratings, limitations, and operation and maintenance requirements. Modifications, additions, or repairs that affect the structural competence, capacity, or safe operation of the crane or hoisting equipment will not be made without the manufacturer’s written approval.

When information is not available from a manufacturer, it will be developed and/or determined by a professional engineer qualified in the field.

Loads must be safely rigged by a competent person.

During the 2-week look-ahead, Foremen and Construction Managers notify the project manager of any planned/scheduled crane lifts, and the project manager adds the work to the schedule. The HSE Representative then works with Construction teams to develop the Pre-lift Plan.

5. Critical Crane Lift Provisions

A lift is designated “Critical: and requires a “Critical Lift Plan” if any of the following conditions are met:

- Any part of a crane whose boom or boom attachment is working within ten (10) meters (33’) of any hydrocarbon and / or pressurized piping areas. This includes cranes having to suspend a load over vessels, piping, and/ or equipment containing hydrocarbons, steam, or pressurized liquids
- Any part of a crane whose boom or boom attachment is working within ten (10) meters (33 feet) of any populated/ traffic areas. This includes cranes having to suspend a load over pedestrians, vehicle traffic, occupied construction equipment, and/ or occupied buildings
- Any crane lift that requires an attachment(s) to the main boom
- Any load forty (40) tons or greater
- Any load that exceeds seventy-five percent (75%) of the crane’s rated load capacity of manufacturer’s specifications at that specific configuration and set-up
- Any crane lifts with explosion/fire/high heat hazards
- Any crane lifts occurring within three (3) meters (10’) of overhead energized power- lines
- Any tandem lift (lifts involving two (2) or more cranes/ hoists
- Any tailing lift
- Any part of a crane whose boom or boom attachment is working within 10 meters (33 feet) of a railway line. A copy of the railway trail schedule will be attached to the Critical Lift Plan.
- Lifts involving items which are unique and, if damaged, would be irreplaceable or not repairable and which is critical to a system, facility, or project operation.
- A lift not meeting the above criteria is also designated “critical” if mishandling or dropping of the load would result in any of the above-noted consequences to nearby installations or facilities.

Further site-specific criteria may be developed to supplement those cited above and may include loads that require exceptional care in handling because of size, weight, close-tolerance installation or high susceptibility to damage.

6. Critical Crane Lift Plans

ALL Critical Lifts require an approved Critical Lift Plan to Include the Following:

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- The Critical Lift Plan shall be properly completed, signed and approved prior to the lift. It shall be signed by the originator, the crane operator, rigger, supervisor, and Project Manager.
 - The originator, crane operator, rigger, and supervisor shall physically examine the jobsite prior to giving signature approval to the Critical Lift Plan. The supervisor shall be present during the critical lift operation.
 - The Plan shall include identification of the items to be moved; the weight, dimensions, and center of gravity of the load; and any hazardous or toxic materials that are present.
 - Plan shall identification of operating equipment to be used by type and rated capacity.
 - The Plan shall include rigging sketches that containing (as applicable):
 - Identification and rated capacity of slings, lifting bars, rigging accessories, and below-the-hook lifting devices
 - Load-indicating devices
 - Load vectors
 - Lifting points
 - Sling angles
 - Boom and swing angles
 - Methods of attachment
 - Crane orientations
 - Other factors affecting equipment capacity
 - The project manager (or designee) and the HSE Representative review and approve the Critical Lift Plan, containing rigging configurations, before submittal to the Supervising Consultant for approval.
 - Prior to starting the critical lift, a pre-lift meeting involving participating personnel is conducted at the specific lift work area. The Critical Lift Pre-lift Plan is reviewed with all parties involved in the lifting operation.
 - Upon verification by the participants that all controls are in place, the Supervising Consultant authorizes the lift plan and the Critical Lift may commence.
 - If required by the specific Critical Lift Plan, a practice lift will be performed before the Critical Lift. Conditions for a practice lift will closely simulate actual conditions including weight, rigging selection and configuration, load movement path, and other relevant factors. Both the practice lift and the Critical Lift are performed by the same crew, using the same lifting equipment, set up in the same configuration.

7. Specifications

Equipment operators must adhere to relevant Qatar and Lusail requirements and specifications for hoisting activities. Requirements for specific material handling equipment are detailed in the following attachments:

- [LUS-HSE-FM4-446-054](#), Crane Specifications
- [LUS-HSE-FM4-446-055](#), Hoist Specifications
- [LUS-HSE-FM4-446-056](#), Cableway and Highline Specifications
- [LUS-HSE-FM4-446-057](#), Rigging Specifications
- Personnel Hoists: The use of a crane to hoist employees on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, (e.g., a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold), would be more hazardous or is not possible because of structural design or worksite conditions. Refer to the applicable regulatory standard for the design, construction, testing, use and maintenance of personnel platforms and the hoisting of personnel platforms on the load lines of cranes. In which case, personnel platform operations will comply with all federal and state regulations, and manufacturer specifications.

Tag lines shall be used on **ALL LOADS** regardless of size or weight.

The safe working load, recommended operating speeds, special hazard warnings, and other essential information, as determined by the manufacturer or project engineer, must be indicated in or on all lifting equipment and must not be exceeded.

When using cranes or hoists to lift any object or load over active work areas, systems or equipment, the crane or hoist must not be loaded to greater than client requirements or 75% of their calculated rated load limits, based on boom angle and radius, or Max lift weight = Rated capacity – 25%.

For example, if a manufacturer rates its crane at 100 tons, at a Lusail project site it becomes in essence a 75 ton crane or hoist.

Cranes or other hoisting equipment operated within (10') of energized electrical transmission or distribution lines shall be designated as Critical Lifts, in accordance with [LUS-HSE-WG3-446-024](#), Electrical.

A braking system capable of stopping, lowering and holding a load of at least 110% of the rated maximum capacity must be provided on all hoisting equipment.

No person is permitted to ride loads, blocks, buckets, hooks or other type devices attached to hoist lines, booms, or attachments of any crane or material hoist. The following exceptions may apply:

- Authorized designated personnel may ride in enclosed cages on approved man skips rigged to cableways or high lines.
- Designated maintenance personnel may ride the carriage service platform of a cableway to perform inspection testing or maintenance operations.

A boom angle indicator must be installed on all machines having booms capable of moving on the vertical plane.

Hoisting equipment with telescopic or extendible booms must have an indicator that shows the boom length from minimum to maximum and is visible to the operator from his position at the controls.

When outriggers are used, outriggers must be fully extended to the appropriate setting indicated by the manufacturer's load chart.

All controls must be of the "deadman" type that automatically return to neutral when released. Each control must be plainly marked to indicate its function. A main power switch capable of being locked in the open position must be within reach of the operator.

All brakes must be designed so that the brake is automatically applied when power is lost and cannot be released until power has been restored.

Power must be off and all controls locked before an operator leaves the cab of a crane or hoist. Where practicable, booms will be lowered to the ground before machinery is left overnight.

Safe access to the cab and/or bridge walkway is provided by a fixed ladder, stairs or platform with no step over gaps exceeding 12 inches.

A fire extinguisher must be mounted in the cab or near the operator's position in accordance with [LUS-HSE-WG3-446-012](#), Fire Protection.

8. Communication

Using (Attachment [LUS-HSE-FM4-446-061](#)) all Contractors shall notify a Lusail Representative a minimum of seventy-two (72) hours prior to mobilizing a crane to the Lusail Project site or erecting a tower crane. No tower crane shall be erected on site without prior Approval of the location(s) by Lusail Representative.

Only designated, qualified signalers or riggers may give signals to the crane operator. However, the operator must obey a STOP signal at all times, no matter who gives the signal.

A uniform signal system is used in the operation of cranes and hoists. All signalmen or riggers shall be fluent in crane hand signals. Hand signals shall be used in concert with an audible electrically operated communication system consisting of a 2-way radio or direct-connect telephone.

Where crane operators do not have a full range of view of the lift, transport, and delivery locations, multiple qualified signalmen/ riggers should be used to ensure the crane operator receives both visual and voice instructions at all times throughout the operation.

The Contractor shall ensure that adequate numbers of radio frequencies are available for the number of cranes/ hoists. Crane operators and signalmen shall have a dedicated channel(s) for hoisting activities which is (are) not combined with channels serving any other purpose.

Personnel hoists must be controlled by a radio or a visual and audible electrically operated signal system installed between the operator and each cage access point.

9. Barricades

In accordance with [LUS-HSE-WG3-446-016](#), Signs, Barricades, and Traffic Controls, the competent person erects barricades around the accessible areas within the swing radius of each crane to prevent employees from being crushed by the crane counterweight.

Any special deviation from the following requirements must have joint written approval of the foreman/supervisor, HSE Representative, and Construction Manager.

- Unless the crane is barricaded, adequate clearance must be maintained between moving and rotating parts of a crane and other fixed objects in order to allow safe passage of personnel.
- Equipment oilers, signalpersons, and supervisors must not stand, talk, or perform maintenance work inside the equipment barricaded area while the operator is running the machine.
- To gain entrance to the equipment barricaded area, the machine oiler, signalperson, and supervisor must first be acknowledged by the equipment operator, who, in turn, is responsible for securing all rotating movement of the equipment until the area is safely vacated.
- In some situations, the oiler may sit in back of the equipment operator; but at no time will the oiler leave this position without notifying the operator, who must comply with the above requirements.
- Individual employees cannot be assigned the responsibility (in lieu of barricades) of warning others who may venture into the rotating structure hazard area of cranes, excavators, and pile driving rigs.
- The equipment oiler assists in keeping unauthorized personnel outside the barricaded swing area.
- No one is allowed to enter a barricaded area while the equipment is operating. Also, no employee is allowed to take a short cut through a barricaded area regardless of whether the equipment is operating.

10. Inspection

10.1 Crane Inspection

All cranes and hoisting devices shall be professionally inspected and certified on an annual basis. Annual inspections shall be performed by a third party test and certification agency that has been pre-approved by Lusail.

Record of annual testing and certification must be received and reviewed by the Construction Manager and a copy of the inspection/ test certificate retained on site in the Contractors site office. A copy should also be provided inside the cab of the equipment.

Annual inspections must be performed in accordance with the manufacturer's recommendations and as mandated by Qatar laws and Lusail policies and procedures.

Third party test and certification inspections shall occur on the following schedule:

- Upon mobilization onto the project
- After initial set up/ erection (tower or component crane)
- Prior to initial lift
- After any mechanical malfunction in hoisting components
- After any crane incident
- Following repair or re-configuration

Contractors shall conduct a thorough mobilization crane inspection upon mobilizing a new crane onto the Lusail project site. No crane/ hoist shall be operated until the mobilization inspection has been completed and the HSE Representative approves the crane for site use.

Contractor shall conduct daily crane/ hoist inspections prior to each day's use. A qualified operator or inspector completes the Daily Crane Inspection Form (Attachment [LUS-HSE-FM4-446-059](#)) or a form having equivalent information. Refer to the manufacturer's guidelines for more specific inspection criteria.

Daily inspections should checks for the following, at a minimum:

- All control mechanisms for improper adjustment interfering with proper operation
- All control mechanisms for excessive wear of components and contamination from lubricants or other foreign matter
- All safety devices for malfunction or defect
- Deterioration or leakage in air or hydraulic systems
- Crane hooks with deformation or cracks
- Sling and choker for broken strands, fraying, or kinking
- Electrical apparatus for malfunction, defect, signs of excessive wear, dirt, and moisture accumulation

A qualified operator or inspector must inspect all cranes/ hoists in use on the project on a monthly basis and record the inspection results on the Monthly Crane Inspection Form (Attachment [LUS-HSE-FM4-446-060](#)), or equivalent form.

Contractors shall track and document all cranes/ hoists which are on the project site at any given time. Inventory shall be kept and maintained weekly.

Any deficiencies identified during crane/ hoist inspection shall be communicated to the Construction Manager. Evaluation of the condition of the crane/ hoist shall be made by the qualified person. Cranes/ hoists determined to be unsafe shall be placed out of service, or de-mobilized, until proper repairs or corrective actions are made.

10.2 Rigging Inspection

All rigging hardware shall arrive from the manufacturer with test certificates attached. Manufacturer's data for rigging hardware shall be retained on file by the Contractor and copies of records furnished to the HSE Representative before such equipment is used.

Rigging equipment and hardware shall be third party certified by an approved testing and certification agency on an annual basis with records provided to the Contractor HSE Representative.

Ropes, slings, and rigging hardware must be inspected daily before each use, using the Rigging Equipment Inspection Form (Attachment [LUS-HSE-FM4-446-058](#)). Remove defective rigging equipment from service immediately:

- Inspect guy lines and load lines each time they are rigged and taken down, and cut any defective or damaged rope or cable to prevent further use.
- Nylon slings showing red fibers, or being excessively frayed, torn, burnt, worn or damaged in any other way shall be removed from service.
- Chains shall be inspected for bent, twisted, cracked, or deformed links; stretched links, excessive wear and broken welds.
- Inspect wire rope at least monthly for any of the following conditions:
 - In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay.
 - Wear of one-third of the original diameter of outside individual wires, or kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure.
 - Evidence of any heat damage from any cause.
 - Reductions from nominal diameter of more than $\frac{3}{64}$ inch for diameters up to and including $\frac{3}{4}$ inch, $\frac{1}{16}$ inch for diameters $\frac{3}{8}$ to $1\frac{1}{2}$ inches, and $\frac{3}{32}$ inch for diameters $1\frac{1}{4}$ to $1\frac{1}{2}$ inches.

Contractors shall also conduct inventory-wide inspections of rigging equipment and hardware. Equipment should be color coded to reflect this month's inspection and results documented.

11. Maintenance

Only qualified crane manufacturer representatives, or designees, shall perform crane or hoist maintenance. Contractors shall not appoint their mechanics to perform maintenance unless approved in writing by the manufacturer or manufacturer's designee.

Cranes identified to be deficient or mechanically defective shall be properly tagged and taken out of service immediately. If mechanically possible, mobile cranes shall be relocated to designated maintenance areas away from active construction activities.

Cranes shall be properly locked/ tagged out prior to commencing maintenance activities:

- Ensure that all controllers are in the OFF position.
- Ensure that the main or emergency switch is open, locked, and tagged in the open position.
- Place warning "Do Not Operate" or "Out of Order" signs on the equipment, where visible from all locations, in accordance with [LUS-HSE-WG3-446-016](#), Signs, Barricades, and Traffic Control.
- If other equipment is in operation in the same area, provide rail stops or other suitable means to prevent interference with the idle equipment.

Install maintenance platforms and walkways, protected by standard guardrails and toe boards, on the crane trolley and bridge. Where it is impractical to install platforms and walkways, install safety lines with runners for attachment of personal fall arrest equipment to afford safe inspection and maintenance, in accordance with [LUS-HSE-WG3-446-022](#), Fall Protection.

After making adjustments and repairs, do not operate the equipment until all guards have been reinstalled, safety devices have been re-activated, and maintenance equipment has been removed.

Per Section 10, when modifications, additions, or repairs affect the structural competence, capacity, or safe operation of the equipment, the crane/ hoist shall be subjected to re-testing and certification by a third party agency.

The maintenance department keeps all maintenance records, provides a copy in the crane or hoist, and forwards a copy to the HSE Representative.

12. Training

Contractors shall be required to train employees in the requirements for operation of cranes and hoists. Only properly trained, certified, and designated personnel shall be permitted to operate cranes, hoists or lifts at any time.

The HSE Representative arranges employee training at the time of initial assignment based upon direction from management. Crane operators shall possess current certification from an approved third party testing and certifying agency. Operators shall be trained and certified on the specific type and configuration of crane that they plan to operate.

Proof of qualification must be in writing as evidenced by the following:

- Annual Examination: Operators must have an annual physical examination and obtain a physician's certificate of physical fitness, in accordance with (Attachment [LUS-HSE-FM4-446-001](#)) Employee Health Assessment & Historic health Exposure Questionnaire.
- New Hires: Every newly hired crane or hoist operator shall be first paired with an experienced operator to determine if he is knowledgeable of and capable of operating the equipment safely.
- Operators shall be capable of reading and understanding the signs, signals, and operating instructions in use on site, and as posted in/on the crane.

In addition to fully qualified crane operators, the following personnel may be designated to operate cranes under limited conditions:

- Maintenance personnel who have completed all operator trainee qualification requirements. Operation is limited only to those functions necessary to perform maintenance or verify performance of a crane.
- Inspectors who have completed all operator trainee qualification requirements. Operation is limited only to functions necessary to accomplish inspection.

Re-training is provided for employees when there is a change in job assignment or a change in equipment or processes that present a new hazard.

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

13. Documentation

The HSE Representative documents all instruction, training, and re-training records for crane/ hoist operators. Records verifying completion of training are kept in the individual employee's training files.

The following documents shall be in the cab of the crane at all times while on site:

- Operating manual developed by the manufacturer for the specific make and model of the crane
- Operating manual for any crane operator aids with which the crane is equipped.
- Load-rating chart(s) for the crane/hoist in use (separate or included in the operating manual), which includes the following information:
 - Crane make and model, serial number, and year of manufacture
 - Load ratings for all crane operating configurations, including optional equipment
 - Recommended reeving for the hoist line
 - Operating limits in windy or cold weather conditions.
- A durable load chart with legible letters and figures must be fixed at a location visible to the operator while seated at the control station. Load chart shall be in the English language.
- The crane's log book, which is used to record operating hours and all crane inspections, tests, maintenance, and repair.
- A copy of the hand signals in use on the project site.

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 Section 1 Part 10.3.8 "Lifting Operation" & 10.3.9 "Lifting Gear"

Qatar Construction Specifications 2010 Section 1 Part 14.4 "Test Certificates For Cranes And Lifting Tackle"

Qatar Construction Specifications 2010 Section 11 Part 1.4.3 "Lifting Operations, Equipment and Accessories"

Qatar Construction Specifications 2010 Section 11 Part 2.3.10 "The Safe Use Of Cranes & Other Lifting Appliances (Excavators, Tele Handlers And Lorry Loaders"

15. Attachments

LUS-HSE-FM4-446-053	Pre-lift Checklist
LUS-HSE-FM4-446-054	Crane Specifications
LUS-HSE-FM4-446-055	Hoist Specifications
LUS-HSE-FM4-446-056	Cableway and Highline Specifications
LUS-HSE-FM4-446-057	Rigging Specifications
LUS-HSE-FM4-446-058	Rigging Equipment Inspection Form

<u>LUS-HSE-FM4-446-059.00</u>	Daily Crane Inspection Form
<u>LUS-HSE-FM4-446-060.00</u>	Monthly Crane Inspection Form
<u>LUS-HSE-FM4-446-061.00</u>	Mobile and Tower Crane Notification Form