

EXPRO National Manual for Projects Management

Volume 11 ,Chapter 2

Project Crane and Lifting Operation Procedure

Document No. EPM-KSS-PR-000018 Rev 003



Project Crane and Lifting Operation Procedure

Document Submittal History:

Revision:	Date:	Reason For Issue
000	21/09/2017	For Use
001	03/12/2017	For Use
002	29/11/2018	For Use
003	09/08/2021	For Use



Project Crane and Lifting Operation Procedure

THIS NOTICE MUST ACCOMPANY EVERY COPY OF THIS DOCUMENT

IMPORTANT NOTICE

This document, ("Document") is the exclusive property of Government Expenditure & Projects Efficiency Authority.

This Document should be read in its entirety including the terms of this Important Notice. The government entities may disclose this Document or extracts of this Document to their respective consultants and/or contractors, provided that such disclosure includes this Important Notice.

Any use or reliance on this Document, or extracts thereof, by any party, including government entities and their respective consultants and/or contractors, is at that third party's sole risk and responsibility. Government Expenditure and Projects Efficiency Authority, to the maximum extent permitted by law, disclaim all liability (including for losses or damages of whatsoever nature claimed on whatsoever basis including negligence or otherwise) to any third party howsoever arising with respect to or in connection with the use of this Document including any liability caused by negligent acts or omissions.

This Document and its contents are valid only for the conditions reported in it and as of the date of this Document.



Project Crane and Lifting Operation Procedure

Table of Contents

1.0	PURPOSE	5
2.0	SCOPE	5
3.0	DEFINITIONS	5
4.0	REFERENCES	6
5.0	RESPONSIBILITIES	6
5.1	Certified Competent Person Rigger (CPR)	6
5.2	Crane Operators	6
5.3	Person in Charge (PIC)	7
5.4	Certified Rigger Engineer (CRE)	7
5.5	Project Rigging Engineer (PRE)	8
6.0	RISK ASSESSMENTS	8
7.0	GENERAL REQUIREMENTS	9
7.1	Crane Operators	9
7.2	Riggers	9
7.3	Mobile Phone Restrictions	9
7.4	Testing and Examination	10
7.4.1	Minimum Requirements for Maintenance and Inspection	10
7.4.2	Pre-lift Checks	10
7.5	Ground Conditions	11
7.6	Mobile Crane Outriggers	11
7.7	Automatic Safe Load Indicators	11
7.8	Load Radius Indicator	11
7.9	Fly Jib	11
7.10	Safety and Operational Aids	11
7.11	Crane Operation	12
8.0	PLANNING	12
8.1	Lift Requirements by Risk Category	13
8.1.1	Low Risk Lifts	13
8.1.2	Medium Risks	14
8.1.3	Critical Risk Lifts	14
8.1.4	Super Critical Risk Lifts	14
9.0	SPECIAL OPERATING CONSIDERATIONS	14
9.1	Effects of Wind Speeds on Crane Operations	14
9.2	Overhead Power Lines	15
9.2.1	Encroachment Prevention Precautions	15
9.3	Piling Operations	15
9.4	Excavators	16
9.5	Loader Cranes (HIAB)	16
9.6	Tower Cranes	16
9.7	Working Over Water	16
10.0	WORKBOX USE AND REQUIREMENTS	17
10.1	Workbox Risk Assessment	17
11.0	SAFETY SIGNS AND MARKINGS	18
11.1	Road Closures	18
12.0	TRAINING	18
13.0	ATTACHMENTS	18
	Attachment 1 - Rigging Equipment/Cranes	19
	Attachment 2 - EPM-KSS-TP-000004 - Rigging Work Operations Checklist	20
	Attachment 3 - EPM-KSS-TP-000005 - "Low Risk" Crane Lift Summary Template	21



Project Crane and Lifting Operation Procedure

1.0 PURPOSE

This Procedure establishes the minimum requirements for contractors to develop and implement the necessary plans and procedures to ensure the safe and efficient execution of lifting and construction operations. It outlines the minimum requirements relating to the safe operations of crawler cranes, wheel mounted cranes of both truck and self-propelled wheel type and other variations that retain the same characteristics.

The aim of this procedure is to:

- Ensure compliance with Project specific requirements, and statutory legislation.
- Specify the guidelines for contractors to develop and implement a lifting procedure; including required training for personnel involved in the execution of these operations.
- Assist in the elimination of workplace injuries
- Provide a guideline to ensure consistency in the operation and maintenance of cranes, lifting and transportation equipment and rigging gear.

2.0 SCOPE

The scope of this procedure applies to all works performed under the National Project Management Organization throughout the Kingdom of Saudi Arabia.

3.0 DEFINITIONS

Definitions	Description
Anti-two Block	A system installed to crane winches that warns and/or prevents two-blocking. Two-blocking is defined as, " <i>the condition in which the lower load block (or hook assembly) comes in contact with the upper load block (or boom point sheave assembly), seriously interfering with the safe operation of the crane.</i> "
CPR	Competent Person Rigger
Crane	For the purposes of this procedure, the term "Crane" is considered to be any lifting device having capacity over 3 tons.
Crane Chart/ Rated Capacity	A tabular sheet collating all the essential parameters of the lifting operation; it is the primary record that contains, but is not limited to, details of the configuration of the crane(s), capacity deductions to be taken, load weight and center of gravity (C.G.) details, rigging to be used, operating radii, crane capacities, etc.
CRE	Certified Rigging Engineer
Hauling	The process of loading, transferring, relocating and/or moving of equipment, components, vessels, or other materials from one point to another.
Hoist	An appliance intended for raising and lowering a load or people, vertically and without slewing which includes a mast climbing work platform, personnel and materials hoist, scaffolding hoist and serial hoist but does not include a lift or building maintenance equipment
HSSE	Health, Safety, Security and Environment
JHA	Job Hazard Analysis
Lifting	The process of changing the elevation and/or location of a payload using a lifting device. Lifting operations include not only the actual process of lifting but all necessary pre-lift preparations and post-lift demobilization
Lifting Equipment	Any manual or powered machine used to lift a load; such devices include, but are not limited to, the following: crane, hoists, winch, chain hoist, hydraulic or mechanical jack, levers, pulley system, beam trolley etc.
Lifting Gear/Rigging Gear	Lifting Gear / Rigging Gear is approved equipment used to provide connection between lifting equipment and a load, and includes: chains, slings, shackles, hooks, spreader beams, lifting frames, etc.
Lift Plan	A collection of documents containing the information necessary to convey the full intent of the planner of the specific operation to others and defining the steps necessary to execute it safely and efficiently. Documents include, but are not limited to, details of the configuration of the crane(s) capacity deductions, load weight and center of gravity details, rigging to be used, operating radius and crane capacities.
LMI	Load Moment Indicator



Project Crane and Lifting Operation Procedure

Definitions	Description
Mobile Crane	A crane capable of moving over a supporting surface without the need for fixed runways and/or rails and relying only on gravity for stability.
OSHA	Occupational Health and Safety Administration
Payload Weight	The weight of the item to be handled, including the weight of attachments, saddles, temporary supports, insulation, content, etc. as applicable
PIC	Person in Charge
Plant	Any machine that is self-propelled and controlled by an operator
PPE	Personal Protective Equipment
PRE	Project Rigging Engineer
Rigging	Work involving the use of mechanical load shifting equipment and associated gear to move, place and/or secure a load including plant, equipment or members of a building or structure and to ensure the stability of those members and for the setting up and dismantling of cranes and hoists
SWL	Safe Working Load (Max load capacity due to configuration)
VOC	Verification of Competency
Weight	Weight is the gravitational force of an object mass, or the heaviness of the object.
WLL	Working Load Limit (Max load designed by manufacturer)
WMS	Work Method Statement
Workbox	A personnel-carrying device, designed to be suspended from a crane, which provides a working area for persons elevated by and working from the box. Also referred to as a Workbasket, Manbox or Manbasket

4.0 REFERENCES

- OSHA 29 CFR Subpart CC – 1926 – Cranes and Derricks in Construction.
- OSHA 29 CFR Subpart N – 1910 -179 Overhead and Gantry Cranes
- OSHA 29 CFR Subpart N – 1910 - 180 Crawler locomotive and Truck Cranes.
- OSHA 29 CFR Subpart N – 1910 - 181 Derricks

5.0 RESPONSIBILITIES

5.1 Certified Competent Person Rigger (CPR)

The CPR is responsible for the following:

- Planning and controlling lifting operations.
- Selection of suitable equipment and rigging hardware.
- Completing the Pre-Lift Safety Checklist and conducting rigging in accordance with this procedure and applicable regulations, and job site-specific requirements.
- Identifying existing and predictable unsafe/hazards in the surroundings or working conditions and taking prompt corrective measures to eliminate the unsafe/hazardous condition
- Ensuring that rigging hardware and materials are inspected before use, configured correctly, and properly attached to the lifting equipment
- Ensuring the availability of information, procedures, and equipment necessary to move loads without injury to personnel and without damage either to the site or the equipment.

5.2 Crane Operators

Only certified operators are authorized to operate cranes. Equipment operators are responsible for the following:

- Meeting all requirements for the type and class of equipment being operated and maintain valid qualification documents.
- Performing and documenting a daily thorough inspection to ensure equipment is in good working condition and does not require repair, adjustment, or lubrication prior to use.



Project Crane and Lifting Operation Procedure

- Performing a repair, adjustment, or lubrication of equipment will then require the equipment inspection to be repeated prior to use. If the equipment is due for monthly or annual inspections, as defined by the equipment manufacturer, ensure that required inspections are performed.
- Determining if the equipment is safe to perform its function and addressing any concerns with the equipment that need to be resolved (and/or repaired, as necessary) with their supervisor prior to performing a lift.
- Verifying the equipment readiness by completing a daily checklist once the repairs are complete.
- Performing a final check to ensure all applicable lift criteria are met and determining if lift is safe to perform upon satisfactory completion of the pre-lift checklist.
- Securing the lifting equipment upon successful completion of the lift and preparing for demobilization and, when necessary, transport.
- Complying with all applicable standards, and regulations including customer restrictions and job site-specific requirements.
- Operating assigned lift equipment within the specifications provided by the manufacturer's operator manuals, load charts, and operation notes.
- Utilizing crane information and monitoring systems (on-board computers) when they are installed on the crane.
- Operating the lift equipment without tampering or disabling systems as this is prohibited.

5.3 Person in Charge (PIC)

For every lifting / hauling operation, contractor shall designate the PIC to have overall control on behalf of the organization conducting the operation to ensure implementation of a safe system of work. The PIC must be available on-site during operations they control. The PIC must have adequate training and experience to carry out these duties competently; a person qualified as a Certified Competent Person Rigger (CPR) would meet the criteria to function as the PIC for "low risk" operations. For medium, heavy, or critical operations the PIC shall be an employee who meets the minimum qualifications for a PRE as defined in Section 5.5 of this procedure. The PIC may have other duties but shall not be the Crane Operator for that operation.

The PIC is responsible for:

- Planning and controlling lifting operations.
- Selecting suitable lifting equipment and rigging hardware where not specified by a written plan.
- Verifying the condition of equipment before use and ensuring that adequate inspection and maintenance of the equipment has been performed.
- Ensuring that rigging is configured correctly and properly attached to the lifting equipment.
- Identifying defects and incidents and ensuring that necessary corrective action is taken.
- Coordinating, directing and controlling lifting and/or hauling operations.
- Actively participate in the preparation of Job Hazard Analysis (JHA) for lifting and transportation activities.
- Ensure assigned personnel are properly trained for their task and aware of their responsibilities; and are complying with all applicable standards, regulations, client requirements and safe practices.
- Stopping the operation whenever an unsafe condition is identified or suspected, or if the operation is inconsistent with the plan.

5.4 Certified Rigger Engineer (CRE)

The project will have a nominated Certified Rigging Engineer (CRE) to support rigging activities. For many projects this will be office support; the Project Rigging Engineer (PRE), or other person preparing rigging plans, will send them electronically for review and approval. The CRE is responsible for the following:

- Reviewing and approving all lifting and abnormal transportation operations are categorized as "critical risk."
- Planning for the safe execution of complex rigging operations.
- Identifying and performing lifting device feasibility studies to determine the optimum set-up of lift equipment.
- Advising and participating in Constructability reviews to establish construction equipment and rigging philosophy (i.e., modularization versus stick built, plant layout, dressing of vessels, etc.).



Project Crane and Lifting Operation Procedure

- Working with the design team on items to optimize the benefits of plant layout versus lifting equipment set-up versus construction equipment cost.
- Maximizing lifts within capacity of lift equipment readily available in the market to meet the needs of equipment/material placement.
- Evaluating lifting and specialized transport requirements and establishing most appropriate solutions.
- Participating in the development of the construction equipment schedule regarding rigging operations.
- Sharing knowledge and expertise to develop innovative construction techniques that enhance safety and provide economic benefits and commercial advantage.
- Preparing or vetting Risk Assessments, Method Statements and procedures for lifting operations as required.
- Reviewing work interfacing with lifting and activities such as road/culvert protection/reinforcement, soil preparation works and lifting attachment design.
- Providing guidance and assistance in rigging matters to those requiring support.

5.5 Project Rigging Engineer (PRE)

Where medium and critical risk lifting and transport operations are involved the designated Project Rigging Engineer (PRE) is responsible for:

- Providing technical guidance and support by developing safe work methods and plans for rigging operations and heavy haul operations.
- Preparing rigging and heavy haul plans and calculations, specifying rigging materials, lifting and transport equipment.
- Preparing Lift Data sheets for medium, and critical lifts.
- Liaising with Contractor regarding the preparation and Contractor approval of plans for heavy and critical lifts, and heavy hauls.
- Performing the duties of the "Person in Charge (PIC)" for medium and critical lifts, ensuring compliance with the developed safe system of work.
- Monitoring general project rigging operations, especially medium and critical risk lifts and transports, to ensure that all are performed in accordance with the approved rigging plans and procedures.

The PRE shall have following minimum qualifications:

- A minimum of two (2) years of construction or engineering rigging related experience.
- Knowledge of codes and regulations regarding lifting and rigging operations.
- Knowledge of crane types & ability to interpret crane load charts.
- Knowledge of rigging hardware and its safe usage.
- Possess drawing skills to prepare rigging drawings.
- Possess understanding of soil type and soil bearing capacity.

6.0 RISK ASSESSMENTS

Before any Project/Work Activity/ commences it is important that Risk Assessments are completed prior to beginning any work.

Risk assessments must be conducted at the Planning Stage:

- Project Risk Assessment.
- Work Method Statements (WMS)
- Job Hazard Analysis (JHA).

It is imperative that prior to beginning of any work activity, a pre-start briefing occurs to discuss the contents of the WMS/JHA which includes mitigations of for other hazards noted by the crew at the jobsite. The discussion shall also include job steps, expected hazards associated with the activity, and the mitigation and protection methods that shall be implemented to prevent incidents.

The Hierarchy of control shall be used to reduce the likelihood of an incident occurring.

- **Elimination** (Remove the Hazard)



Project Crane and Lifting Operation Procedure

- **Substitution/Isolation** (Replacing material, process or hazard with a lower risk one/ separate people from the hazard (such as through guarding, distance, etc.)
- **Engineering Controls** (Redesign or replacement of plant and equipment)
- **Administration Controls** (Procedures, training, signage)
- **PPE**

No work is to commence until the above has been implemented and signed by the relevant Supervisor in charge.

7.0 GENERAL REQUIREMENTS

7.1 Crane Operators

Contractor shall provide evidence of valid certification from an approved and internationally recognized source, that all operators meet minimum job qualifications including specific physical requirements.

Operators must demonstrate the knowledge and practical skills required to safely and proficiently operate the crane(s) and lift equipment to which they are assigned. Persons operating mobile cranes are required to hold the appropriate class of license for the specified crane. Additionally, the following shall apply:

- All personnel involved in crane operations must ensure that workers are kept clear of loads about to be lifted and that no person is ever located under a suspended load.
- Crane owners and operators shall comply with the manufacturer's specifications and operational restrictions, the crane must be maintained and serviced as per the operator's manual instructions.
- Crane rotating or other moving parts such as belts; pulleys drums etc. must be guarded.
- No person will use or operate any crane unless they have the required certificates of competency and have valid authority to operate issued in accordance with project requirements. In general crane operators, will:
 - o Be over 21 years of age and certified by 3rd party safety agencies as competent to operate the crane.
 - o Physically fit and physically capable of operating the crane safely.
 - o Understand the duties of the Rigger with full understanding of the signals used.
 - o Adequately trained on the crane they are assigned to operate.
 - o Able to judge distances, height and clearances, and not be color-blind
 - o Aware of the means of escape and safe use of fire extinguishers
 - o Competent to operate the crane by examination and hold a current certificate from an approved accreditation body

7.2 Riggers

Riggers must be trained and certified competent for the task; in general, they will:

- Be trained, certificated by 3rd party safety agencies and experienced.
- Can determine the weight, center of gravity and characteristics of a load.
- Inspect and determine whether a wire rope sling or other piece of lifting equipment is damaged or not fit for purpose.
- Be familiar with the different and correct slinging techniques.
- Know the correct hand signals.
- Be authorized to perform the work.

7.3 Mobile Phone Restrictions

During crane operations, the use of cell phones (or any other type of mobile phone by anyone considered essential to the operation (e.g., operator, riggers, etc.) shall not be permitted. Due to the potential for distraction, using the "hands-free" mode is not permitted while operating the crane.



7.4 Testing and Examination

- All Cranes brought to the site will be accompanied by a valid insurance and 3rd party testing certificate.
- Cranes brought to the site will be load-tested and thoroughly examined before use.
- Crane operators shall check their cranes daily for oil, hydraulic oil, leaks, water etc. (Document in daily check log)
- Cranes having their configuration changed, dismantled and re-erected will also be tested.
- The crane manufacturer's manual will be adhered to for on-going maintenance.
- The Operator's Manual and Load Charts will be inside the crane at all times.

NOTE: No part of any lift equipment, which is subject to stresses during its operation, shall be altered, welded or changed in any way without the written approval from the equipment manufacturer.

7.4.1 Minimum Requirements for Maintenance and Inspection

Contractor shall maintain equipment specific maintenance and inspection files for each piece of lifting and transportation equipment. These files shall include initial inspections, daily inspections, load tests, periodic monthly inspections as a minimum requirement. Maintenance records and any other documentation are to be made available upon request.

Contractor operators shall perform a daily inspection of the cranes and transport equipment and record the results on applicable Inspection forms.

Contractor operators shall perform periodic (recorded) crane & transport equipment inspections in accordance with applicable manufacturer's specifications and all legislation, standards and best industry practices, irrespective of jurisdictional requirements. In no case shall the period of inspection exceed one year from the last recorded inspection.

7.4.2 Pre-lift Checks

The following questions form the basis for a standard Lifting Operations Checklist and shall be used before commencing any lifts:

- Have the personnel responsible been adequately trained?
- Has the weight, Centre of gravity and nature of the article been determined?
- Where is the article to be lifted from?
- Where is the article to be moved to?
- Has the length of slings etc. and the clearance between the load and crane jib been properly considered?
- What is the maximum load that can be lifted?
- What is the maximum radius that the crane can operate when lifting the load?
- What is the maximum (including slings/spreader beams etc.) that the crane will be lifting?
- Is there enough space to erect and operate the crane and maintain a safe distance between the counterweight and any fencing, building etc. to enable pedestrian access?
- Are there any slew limitations on the machine, when under load?
- Has the route been checked for positioning the crane about any overhead obstructions?
- Are there any overhead power lines or other elevated obstructions that the crane is likely to contact?
- Has the crane site been determined and is it in the best location?

7.4.2.1 Inspections

Lifting gear is any piece of equipment below the hook used to attach the load and includes:

- Chains.
- Slings (wire rope slings, synthetic webbing slings, etc.).
- Shackles.
- Hooks.
- Chain sling adjusters.
- Spreader beams.



Project Crane and Lifting Operation Procedure

- Lifting frames.

All lifting gear must be:

- Designed and fabricated in accordance with jurisdictional rules, regulations, and recognized international standards.
- Inspected by the certified competent person/rigger before being put to use.
- Stored in a safe manner when not in use, away from chemicals and adverse weather conditions.
- Inspected periodically, inspection records should be maintained, projects and entities must develop a color coding system for the periodic inspection process.

7.5 Ground Conditions

When planning lifts, the following shall apply:

- Consideration must be given to the ground conditions.
- Outrigger and track loading should be established before positioning the crane; the competent person shall also consider the added weight when lifting operations take place.
- When positioning a crane in live operational areas and on concrete ground, the safe load limits should be identified against the specification of the concrete, foundations etc. of the area involved. For other areas, the density and compaction qualities should be assessed.

7.6 Mobile Crane Outriggers

- Outriggers must be used as specified by the manufacturer of the crane.
- Sound timber packing, steel plates and/or crane mats shall be provided under crane outrigger pads to distribute the load.
- When multiple layers of packing are used, they should be stacked at right angles. Each layer should be packed tightly together.
- Outriggers must be properly set and locked where locking devices are provided.
- The operator must ensure that the pad of each outrigger is positioned correctly before lifting a load.
- Outriggers must be extended on both sides when performing lifting operations.
- Outriggers must be fully extended; any other outrigger configuration will require the preparation/approval of a lift plan.
- Check the condition of the jacks and packing regularly during crane operation.

7.7 Automatic Safe Load Indicators

- **Automatic safe load indicators:** Must be tested and thoroughly examined after erection and/or installation of the crane before use.
- **Anti-Two blocks:** Will be fitted to prevent the head and sheaves blocks coming into contact with one another.

7.8 Load Radius Indicator

Every crane brought to the site shall be fitted with an appropriate load radius indicator.

7.9 Fly Jib

Fly jibs on telescopic cranes shall only be erected or dismantled by a competent person, normally the crane operator and the equipment superintendent or designee.

7.10 Safety and Operational Aids

- All mobile and locomotive cranes with a capacity over three tons are required to have fitted, as a minimum, a working LMI (Load Moment Indicator).
- Safety and operational aids originally fitted by a manufacturer shall be fitted and in full working order. They should not be removed except to upgrade.



Project Crane and Lifting Operation Procedure

- Operations shall not begin unless the required safety devices are in proper working order. If a device stops working properly during operations, the operator shall safely stop operations and operations shall not resume until the device is again working properly. Alternative measures are not permitted to be used.
- Operations shall not begin unless all operational aids are in proper working order, except where the specified temporary alternative measures are implemented. More protective alternative measures specified by the crane/derrick manufacturer, if any, shall be followed.
- If a listed “operational aid” stops working properly during operations, the operator shall safely stop operations until the temporary alternative measures are implemented, or the device is working properly. If a replacement part is no longer available, the use of a manufacturer approved substitute device that performs the same type of function is permitted.
- The operator shall be familiar with the equipment and its proper operation. If adjustments or repairs are necessary, the operator shall promptly inform the person designated by the employer to receive such information and, where there are successive shifts, to the next operator.
- Safety devices and operational aids shall not be used as a substitute for the execution of professional judgment by the operator.

7.11 Crane Operation

- The weight of the load shall be determined from a reliable source (such as the manufacturer provided information), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known weight per meter), or by other equally reliable means.
- Compliance with rated capacity.
 - o The equipment shall not be operated in excess of its rated capacity.
 - o The operator shall not be required to operate the equipment in a manner that would violate the above.
 - o The operator shall consider the effect of wind on equipment stability and rated capacity.
- The operator shall test the brakes each time a load that is 90 percent or more of the maximum line pull by lifting the load 100mm, and applying the brakes. In duty cycle and repetitive lifts where each lift is 90 percent or more of the maximum line pull, this requirement applies to the first lift but not to successive lifts.
- Neither the load nor the boom shall be lowered below the point where less than three full wraps of rope remain on their respective drums.
- The operator shall obey a stop (or emergency stop) signal, regardless of who gives it.
- Booms are not very strong laterally, thus side loads such as those resulting from inertia of the load during movement must be limited. Crane manufacturers publish guidance on the maximum swing (slew) at which a crane may be operated in a specific configuration. This guidance is not to be exceeded without approval from the crane manufacturer.
- When a local storm warning has been issued, the competent person shall refer to the site requirements.
- Whenever there is a concern as to safety, the operator shall have the authority to stop and refuse to handle loads until a qualified person has determined that safety has been assured.

8.0 PLANNING

Projects should ensure that executing parties develop a rigging plan which defines the general strategy to be adopted to execute load handling activities. As a minimum, the plan should include:

- A list of all critical lifts and critical transportation activities.
- A summary of anticipated contractor or subcontractor participation.
- A list of planned heavy haul equipment and cranes (large and small).
- A list of applicable codes and standards.
- A summary of anticipated personnel training requirements.
- To plan for safe lifting and handling operations, certain information regarding the item and its safe handling is required from the Vendor (equipment supplier or contractor). This information shall be identified and shall be included as a deliverable in the purchase order or subcontract.



Project Crane and Lifting Operation Procedure

- Projects and entities must ensure that a formal lift plan is prepared for all lifting operations, the required details on the lifting plan varies based on the classification of the lift, higher risk operations should have more stringent requirements. The below table is an example of Lift Operations Risk Categorization:

Table 1: Lifting Operations Risk Categorization

Lifting Operations Risk Categorization		Risk Category		
Criteria		Low	Medium	Critical
Payload Weight	0 t to less than 10 t	*		
	10 t to less than 50 t		*	
	50t and above			*
Chart Capacity	lifts at less than 75% of chart	*		
	75% to less than 90%		*	
	90% and above			*
	if 360° chart not used or short outrigger duties planned		*	
Hoist Line Pull	lifts using less than 75% of available hoist line pull	*		
	75% to less than 90%		*	
	90% and above			*
Tandem Lifts	any 2-crane tandem lift (as a min)		*	
	either crane over 75% of chart			*
	where either crane travels carrying load		*	
	possibility of load transfer taking either crane over 75%			*
	significant possibility of boom or jib side loading			*
	any lift using more than 2 cranes			*
	"flipping" a load over 180° using 2 cranes			*
"Special" Lift Devices	cranes where Superlift tray is required for the lift		*	
	"tugger" lifts		*	
	gin poles / stiftleg & guy derricks			*
	hydraulic gantries			*
	strand jacks or climbing jacks			*
	"alternative" custom or specialized rigs			*
Specialized Rigging	complex rigging arrangements (including 'xmas-treeing')		*	
	custom below-the-hook hardware		*	
Specialized Crane Use	Use of a land-based crane on a barge		*	
	lifts using short outrigger spreads or narrow track center's		*	
	lifts not using 360° charts		*	
Electrical Hazards	"topping" and "tailing" with a single crane using two hoists			*
	lifting over any power line (regardless of clearance)			*
	lifts breaching Safe Limit of Approach			*
	lifts over Motor Control Center's or Switch Gear Buildings			*
Buildings /Structures Live Plant	lifts requiring the assistance of a utility company			*
	lifting over occupied buildings or operating facilities			*
	where live pipe racks or essential plant are in the fall zone			*
	when set up over critical underground services			*
"Design-Criteria"	any item on the Engineering Support Required Item List	See Note 2		*

* Mandatory requirement. Higher risk category may be applied on highlighted terms

Note 1: No person shall be allowed, either in whole or in part, under any portion of any suspended load. Personnel assigned to rigging (i.e., attaching and/or detaching rigging hardware to an intended load) are permitted under the lifting/rigging hardware only, and to the extent required to attach or detach the hardware from the intended load prior to or after it has been lifted.

Note 2: Large flimsy loads with little integral strength; forming larger/heavier lifts by assembly of components where such preassembly was not originally envisaged by the designer; lifts inducing out-of-place lifting loads or stress reversals as a result of lifting from points other than the permanent supports, when engineering assists with design of special handling frames, lift beams and custom structural rigging tackle; where review of permanent structures to withstand temporary construction loads is required or where temporary structure additions to permanent structures are needed.

Note 3: A lift is categorized per the highest risk category it meets in the table above.

Note 4: any lift may be classified to a higher risk category due to the sensitivity, risk, or cost of the payload being lifted.

Note 5: Any lift whose failure would pose exceptional risk to persons, property, schedule and/or finances, and/or whose methodology is sufficiently unusual as to be outside the skill sets required of the responsible Certified Rigging Engineer is to be defined as being "Super-Critical" and additionally requires review and approval by a "Chief Rigging Engineer."

Note 6: "t" is a metric ton (MT) or TE of 1000 KG

8.1 Lift Requirements by Risk Category

8.1.1 Low Risk Lifts

Planned and executed using best rigging practice.

Prior to lifting, the characteristics of every "low" risk lift should be entered into a "low-risk" Crane Lift Summary Sheet to be maintained by the responsible supervisor. An example is in Attachment 1.



Project Crane and Lifting Operation Procedure

PIC to be a CPR that the Supervisor determines is qualified to be in charge of “low-risk” lifts by virtue of experience and technical knowledge.

8.1.2 Medium Risks

Lift plan requirements are a Lift Data Sheet supplemented by crane chart extracts and other information as required to adequately explain the intent (e.g., rigging hook-up sketches).

Contractors may use their own formats for Lift Data Sheets upon approval from the PRE.

8.1.3 Critical Risk Lifts

A full lift plan, including lift plan drawings and procedures (including special instructions for complex lifts), crane charts extracts and similar supporting data with completed Lift Data sheets is required.

Where a Critical Lift Plan drawing includes the required content of a Critical Lift Data sheet in similar format, the drawing effectively includes the Lift Data Sheet. If completion of a Lift Data Sheet would serve no other useful function, then it is an unnecessary duplication and project policy shall allow the drawing to substitute. Critical Plans shall be prepared by the PRE-or a qualified representative.

Technical review of all rigging plans and “approval to proceed” will be performed by an approved, qualified Rigging Engineer.

8.1.4 Super Critical Risk Lifts

Any lifting operation whose failure would pose exceptional risk to persons, property, schedule and/or finances, and/or whose methodology is sufficiently unusual as to be outside the skill sets required of the CRE is defined as being “Super-Critical”.

Handled as a “critical” lift, but additionally requires review and approval by the Senior Rigging Manager.

9.0 SPECIAL OPERATING CONSIDERATIONS

Depending upon the scope of work, location of the operation, and other task-specific elements, the following additional requirements shall be considered:

9.1 Effects of Wind Speeds on Crane Operations

- When wind velocities equal or above 32 km/h (20 mph), all lifting operations must be suspended.
- Only operations that have been assessed by a competent person and where the rated load and boom lengths were reduced according to manufactures specifications.
- Wind forces are greater at height by as much as 35% or more. All lifts above ground level must account for wind forces (e.g., side loads, down drafts, etc.), as applied to the load and the boom.

The following table lists speed in the major units, relative to Beaufort Wind Scale Numbers, the internationally accepted reference for wind force.

Beaufort Numbers	Description	Knots	M/Sec	KM/H	Miles/H
0	Calm	0-1	0-0.51	0-1.84	0-1.15
1	Light Air	1-3	0.51 - 1.53	1.84 - 5.52	1.15 - 3.45
2	Light Breeze	4 -6	2.04 - 3.07	7.36 - 11.04	4.6 - 6.9
3	Gentle Breeze	7 - 10	3.58 - 5.11	12.88 - 18.4	8.15 - 11.5
4	Moderate Breeze	11 -16	5.62 - 8.18	20.24 - 29.44	12.65 - 18.4
5	Fresh Breeze	17 - 21	8.69 - 10.73	31.38 - 38.64	19.55 -24.15
6	Strong Breeze	22 - 27	11.24 - 13.80	40.48 - 49.68	25.3 - 31.05
7	Near Gale	28 - 33	14.31 - 16.87	51.52 - 60.72	32.2 - 37.95
8	Gale	34 - 40	17.38 - 20.44	62.56 - 73.6	39.1 - 46
9	Strong Gale	41 - 47	20.96 - 24.02	75.44 - 86.48	47.15 -54.05



Project Crane and Lifting Operation Procedure

10	Storm	48 - 55	24.53 - 28.11	88.32 - 101.2	55.2 - 63.25
11	Violent Storm	56 - 63	28.62 - 32.20	103.04.-115.92	64.4 - 72.45
12	Hurricane	64+	32.71+	117.76+	73.6

9.2 Overhead Power Lines

There is an area surrounding every power line that is referred to as the absolute limit of approach. It is strictly forbidden to move any crane boom or load line into this area unless the line has been de-energized or insulated.

NO EXEPTIONS

9.2.1 Encroachment Prevention Precautions

Any lifting operations that are within the below distances, power lines require an encroachment permit issued and approved by the Saudi Electric Co.

In the event a safe boundary needs to be established, the following encroachment measures must be followed:

- Conduct a planning meeting with the crane operator and the other workers who will be in the area of the equipment or load to review the location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution. When tag lines are used, they must be non-conductive and made of 16mm Dry Natural Fibre Rope.
- Erect and maintain an elevated warning line, barricade, or line of signs equipped with flags or similar high-visibility markings at the minimum clearance distance. If the operator cannot see the elevated warning line, a dedicated spotter must be used to signal the operator that the crane is passing the marked line.
- Additionally, you must use at least one of the following precautions: A proximity alarm, a dedicated spotter, warning device, range limiter, or insulating link.

The absolute limit of approach varies according to the following:

Line Voltage (nominal, kV, alternating current)	Minimum clearance distance (feet)
Up to 50	10
Over 50 to 200	15
Over 200 to 350	20
Over 350 to 500	25
Over 500 to 750	35
Over 750 to 1000	45
Over 1000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

NOTE: Once voltages have been identified, height restrictors (goal posts) must be erected at both sides of the overhead lines to indicate the safe working distance.

9.3 Piling Operations

When cranes are used for piling operations, a determination should be made to ensure that the jib and hoist ropes are not overloaded.

The removal of friction and sheet piles may also place additional stresses on the crane and a calculation is required to ensure that the safe operational limits are not exceeded.

The following general requirements shall be followed:

- The length of the jib shall be kept to a minimum.
- The crane manufacturer's manual shall be checked to ensure that piling operations are permitted.



Project Crane and Lifting Operation Procedure

- Extraction of piles shall be carried out with a smooth pull and steady tension.
- Consideration shall be given for the fitting of a buffer spring/shock absorber between the crane hook and extraction hammer.

9.4 Excavators

Excavators will only be used for lifting subject to the following:

- Shall have a thorough inspection before use.
- Periodic (at least monthly) inspections.
- Examined after alteration or repair.
- Weekly inspections.
- Have a safe load indicator, and load chart.
- Have the SWL (safe working load) displayed on the boom.
- Properly designed, installed and certificated lifting point and check valves.
- Shall only travel with a load if the arm is retracted as far as practicable.

9.5 Loader Cranes (HIAB)

Loader cranes may only be used for loading and unloading of vehicles, any deviations must be pre-authorized by the project management and assessed by a competent person and under the following guidelines:

- The driver / operator holds a valid and in-date Saudi Government driving license, and is trained to operate the specific Hiab by examination, holding a current approved certificate / license from an approved and internationally recognized source.
- The safe working load (SWL) of the Hiab is clearly displayed
- The Hiab has a 3rd party inspection certificate.
- All other requirements for lifting operation equipment and mobile cranes are met.

HIABs used on public roads for lifting operations shall comply with Saudi Arabian Ministry of Communications Standards for Road Safety Features.

9.6 Tower Cranes

Specific design drawings must be in place and all necessary approvals granted for the erection of any Tower Crane. Design drawings may be required and may include but not limited to the following:

- Foundation design.
- Lift plans for the average lifts being conducted/proposed.
- Crane jib zone coverage approvals (areas where crane will be lifting over that are not a part of the construction site)
- Inspection Certificates by third party prior to operation.
- Emergency procedures for extraction of injured operator.
- Design drawing of the crane.

9.7 Working Over Water

When personnel lifts are conducted over water, personnel flotation devices must be used. Personal fall protection devices with quick release features shall be used, attached when personnel are lifted over land and detached while personnel are over water.

A safety rescue boat with appropriate rescue personnel shall be present and available when personnel are lifted over water.



10.0 WORKBOX USE AND REQUIREMENTS

This section establishes the requirements for the use of Workboxes, the equipment requirements, and operating procedures for the safe hoisting of personnel in platforms suspended on load lines from cranes or derricks.

In addition to the requirements specified in this procedure, all workbox operations shall comply with the requirements specified by local Legislation and Codes and all workboxes shall meet the design, construction, inspection and testing requirements from the manufacturer.

For the purpose of this procedure, a workbox also referred to synonymously as a manbox, shall meet the following criteria:

- Consist of a single-level platform/basket to be used to carry/transport personnel to an elevated work site.
- Platforms used for lifting personnel must be designed with a minimum safety factor of five by a qualified engineer or a qualified person competent in structural design (i.e., capable of supporting its own weight and at least five times the maximum intended load).
- The suspension system must be designed to minimize tipping due to personnel movement on the platform or due to other effects such as wind loading/gusts.
- Load lines shall be capable of supporting, without failure, at least ten times the maximum intended load.
- All bridles and associated rigging for attaching the personnel platform/basket to the hoist line must not be used for any other purpose.
- Workbox suspension sling sets shall be made out of flexible wire ropes or chains. They shall be securely attached and dedicated to the workbox by moused shackles, hammer lock shackles or other means. In the case of multiple leg slings, the static loading on each shall be estimated on the basis that only two carry the load. In no case, shall the factor of safety of each suspension sling be less than 8mm for chains or 10mm for wire rope, based on the guaranteed breaking force of the slings.
- Each workbox must be provided with a standard guardrail system that is enclosed from the toe-board to the mid-rail to keep tools, materials, and equipment from falling on employees below.
- The workbox must have an inside grab rail in addition to the protection provided on each side top edge and adequate headroom for employees.
- The workbox shall be stamped or provided with a stamped metal data-plate secured and permanently attached that clearly indicates the platform's Maximum Hoisted Load (kg), Safe Working Load (kg), Tare Mass (kg), Minimum Allowable Crane Capacity (kg) & Identification Reference.
- Access gates should be at least 500mm in width and shall open inwards (except emergency man baskets), be self-closing and self-locking & be permanently attached to the workbox.
- All edges on the workbox must be smooth to prevent injuries to employees.
- Workboxes shall be of solid construction with only welded joints and seams. Assembled construction using clips, bolts, pins, or any other form of semi-permanent construction is prohibited.
- All welded joints and seams on the workbox and its components must be performed by a qualified welder who is familiar with weld grades, types, and materials specified in the platform design.
- As may be required by workbox manufacturers, annual inspections shall be performed and documented by personnel qualified to do so.
- Personnel suspended from a crane shall wear a fall-arrest harness. with the lanyard attached to a fall-arrest anchorage point.
- Workboxes should not be used in winds in excess of 7 m/s (25 km/hr), electrical storms or any other condition that could affect the safety of personnel.
- Mobile cranes shall not travel while people are in the workbox.
- The maximum number of workers in the workbox is restricted to three.

10.1 Workbox Risk Assessment

Hoisting employees in a workbox is prohibited except when the use of conventional means of reaching the work-site, such as personal hoist, ladder, stairway, mobile elevated work platform, or scaffold, would be more hazardous or would not be possible because of structural design or work-site conditions.

The originator of the Personnel Lift Plan must determine if an alternative means of reaching the worksite location is available.



Project Crane and Lifting Operation Procedure

The decision to use a workbox over other conventional means must be reviewed and approved by the following individuals prior to first use of the workbox:

- Construction Site Manager.
- Project Health, Safety, Security and Environment HSSE Manager.
- Project Field Engineer.

The Hazard Identification and Control tools shall be used to evaluate and control risks associated with utilizing a workbox to perform work.

11.0 SAFETY SIGNS AND MARKINGS

All warning signs shall be posted in Arabic and English.

Boom length, size and safe working load capacities at the appropriate radius and recommended operating conditions shall be identified on an instructions plaque which shall be permanently affixed to the cab of the crane in a location readily visible to the operator while seated at the control station.

A sign warning of the danger of overhead power lines shall be mounted in each crane.

Operator instruction labels/plates mounted on the crane shall have an equivalent plate in the operators first language.

All exclusion zones should be established by way of a physical barrier, nominated personnel to control the area or by signage and flagging. Exclusion zones shall be identified prior to the commencement of the lift and maintained throughout the lift. Once the heavy lift is positioned and is undergoing consolidation the exclusion zone will be the immediate area of the lift crane and all other work fronts previously affected can then re-open.

During lifting or lowering of the associated rigging gear all traffic, pedestrian and vehicular shall be diverted from the immediate area.

11.1 Road Closures

Road closure to accommodate lifting operations must be coordinated with the governing authorities and applicable third parties including emergency services must be advised in advance of the road closure.

12.0 TRAINING

License, training & Verification of Competency VOC process requirements shall adhere to the regulatory requirements, or applicable approved local standard, pertaining to crane operator competency/certification requirements.

Subcontractor should make available on an ongoing basis refresher courses to maintain the competencies originally achieved and verified. Evidence of refresher training records must be made available for Contractor review.

Documentation of training, copies of individual certifications, and documentation regarding verification of competency shall be kept onsite by the employer and made available to Contractor and Company upon request.

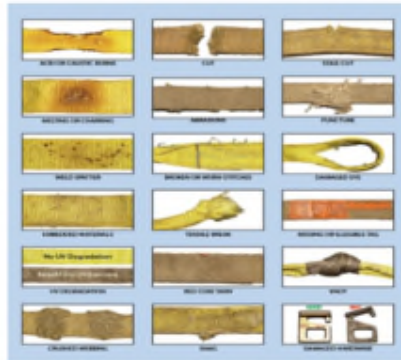
13.0 ATTACHMENTS

1. Rigging Equipment/Cranes
2. EPM-KSS-TP-000004 - Rigging Work Operations Checklist
3. EPM-KSS-TP-000005 - "Low Risk" Crane Lift Summary Template

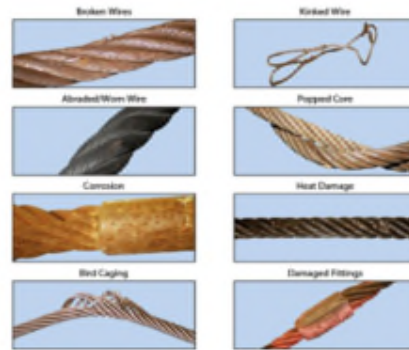


Project Crane and Lifting Operation Procedure

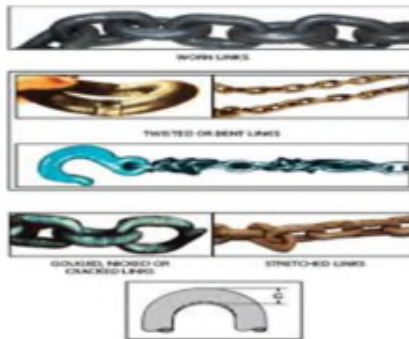
Attachment 1 - Rigging Equipment/Cranes



Damaged Soft Slings



Damaged Steel Wire Rope



Damaged Chains



Tower Crane



Hydraulic Crane



Crawler Crane

Attachment 2 - EPM-KSS-TP-000004 - Rigging Work Operations Checklist

RIGGING HARDWARE/SPECIALTY RIGGING PRE-LIFT CHECKLIST			Will rigging be used today? Yes/No		
RIGGING INSPECTION CHECK	Yes	N/A			
☐ Rigging Hardware will be inspected before use?					
☐ Rigging Hardware Quarterly Inspected:					
First Quarter - Red					
Second Quarter - Green					
Third Quarter - Blue					
Fourth Quarter - Yellow					
Foreman/General Foreman VERIFIED!					
			Yes	N/A	
WIRE ROPE SLINGS (All used today)					
☐ Does the slings have identification tag?					
☐ Is diameter of item to lift > the diameter of rope?					
☐ Does the Rigger understand the D/d Ratio?					
☐ No more than 3 broken wires in 1 strand/1 lay?					
☐ No more than 6 random broken wires in 1 lay?					
☐ Checked for severe kinks, abrasion or scrapes?					
☐ Is Rope over stretched, deformed or corroded?					
☐ Instructed all users that there shall be no more than 2 eyes of sling in a single hook?					
Foreman/General Foreman VERIFIED!					
			Yes	N/A	
ROUNDSLING & SYNTHETIC SLINGS					
☐ Does the slings have identification tag?					
☐ Is the rated for the load that is being picked?					
☐ Does the Rigger understand the D/d Ratio?					
☐ Inspect for tears, cuts, holes, excessive wear?					
☐ Is sling discolored? Ultraviolet/Sunlight damage?					
☐ Sling soiled and/or sour/musty smell?					
☐ Is sling protected from sharp objects or edges?					
☐ Will sling be constantly exposed to weather?					
If yes, explain why:					
			Yes	N/A	
WIRE ROPE CLIPS					
☐ U-bolt clips did not "saddle a dead horse"?					
☐ Is the correct number of clips being used?					
☐ Have the clip bolts been torque with a torque wrench to the proper torque value?					
☐ Have the properly torque clip bolts been clearly marked (orange paint) and identified as verified?					
Foreman/General Foreman VERIFIED!					
			Yes	N/A	
"CHAINFALLS AND COME-A-LONGS"					
☐ Is it clearly marked with manufacturer name, model, serial number, "Safe Working Load Limit"?					
☐ Verified it has an annual inspection?					
☐ Performed the daily "before use inspection?"					
☐ Will the chainfall be used to "pull a load"?					
☐ Will the come-a-long be used to lift personnel?					
☐ No more than one person will operate the chainfall or come-a-long at any time?					
☐ Will the area beneath the chainfall/come-a-long be barricaded to prevent people from walking below a suspended load?					
☐ The chainfall or come-a-long will be attend at all times? Attended means access no farther than 26' horizontal					
☐ The chainfall or come-a-long will be removed and stored properly at end of shift?					
If No, How long will it remain in service/place?					
NOTE: IF THE CHAINFALL/COME-A-LONG IS LEFT IN PLACE UNATTENDED THEN A BARRICADE MUST BE ERRECTED TO PREVENT PERSONNEL FROM ENTERING THE AREA BENEATH THE LOAD.					
Foreman/General Foreman VERIFIED!					



Project Crane and Lifting Operation Procedure

Attachment 3 - EPM-KSS-TP-000005 - "Low Risk" Crane Lift Summary Template

CRANE LIFT CARD (planned lifts for the day)									
Crane Operator Log-In the Qualified Riggers :	Qualified Rigger Name / Qualification Number:				Qualified Rigger Name / Qualification Number:				
Payload Description/Crane Location	Weights		Radius	√	Crane Chart Capacity	Chart %	Rigging Inspected (Yes/No)	Approved	
	Payload Rigging	Deductions							

Operator to keep STARRT in the cab of the crane. Payload items add during the day must be added to the list above prior to picking up the payload.

I/WE ACCEPT RESPONSIBILITY FOR MY SAFE BEHAVIOR AND ENVIRONMENTAL ISSUES. I WILL PROMPTLY REPORT ALL INCIDENTS TO MY SUPERVISOR AND SAFETY REPRESENTATIVE.

RIGGING PERSONNEL PRINT/SIGN	RIGGING PERSONNEL PRINT/SIGN

Signature: _____ Signature: _____ Signature: _____
Person-in-Charge Crane Operator(s) Supervisor/Supintendent

Did we leave the work area clean and organized, and all equipment Yes ☐ N/A ☐ turned off?