

Lifting and hoisting recommended practice



Acknowledgements

This report was prepared by the Lifting and Hoisting Task Force, reporting to the IOGP Safety Committee.

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About

This Report hopes to enable a significant reduction in lifting incidents among IOGP Member Companies and our contractors by highlighting the essential principles of safe lifting and encouraging their strict application to lifting and hoisting operations.

Secondly, this report aims to assist those responsible in planning, managing, and controlling lifting and hoisting operations by providing high level principles and operative questions to check safety and technical compliance at working sites.

Feedback

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Contents

Introduction	6
1. Ten principles for lifting	8
2. Lift categorization	10
3. Roles and Responsibilities	13
3.1 Lifting crew, roles, and associated competence	13
3.2 Site manager	14
3.3 Site lifting competent person	14
3.4 Approved Competent Person	15
3.5 Person in Charge (PIC)	15
3.6 Appliance Operator	16
3.7 Rigger/Slinger	16
3.8 Banksman/Signaller	17
3.9 Lifting Equipment Inspector	17
3.10 Rigging Loft Controller	17
4. Lift planning	18
5. Specific high-risk lifting considerations	20
5.1 Lifting personnel for work activities	20
5.2 Personnel transfer by lifting	21
5.3 Lifting over live plant (hydrocarbons)	21
5.4 Tandem lifts	21
5.5 Hands free lifting	22
5.6 Operating/ground conditions	22
5.7 Marine or offshore conditions	22
5.8 Effects of wind on suspended loads	23
5.9 Lifting in close proximity to hazards including overhead power lines	23
5.10 Technological innovations	23
5.11 Dropped objects	23

6. Equipment	24
6.1 Definition and marking	24
6.2 Design and certification	25
6.3 Maintenance	25
6.4 Inspection	26
6.5 Thorough examination	26
6.6 Colour coding	27
7. Leading lifting operations	28
Further Reading	30
Glossary	31
Appendix A: Lifting Operations Risk Management	33
Appendix B: Example roles and competence matrix	37

Introduction

In 2006, IOGP published a Recommended Practice for lifting and hoisting operations. Fatal and serious accidents continued to occur in lifting and hoisting operations, and it is clear that more effort is required to eliminate accidents from this activity. The first phase of this renewed effort was to revise the existing document to consider the required competence of people involved in all phases of lift planning and execution, new technologies, new processes, and feedback that IOGP had received from its Member Companies.

This recommended practice applies equally to onshore and offshore lifting and hoisting operations, including associated transport and handling. This Report's recommendations are relevant throughout the entire lifecycle of an oil and gas operation, and can be applied to all offshore and onshore mechanical lifting and hoisting activities in the exploration and production industry, with the exception of:

- Drilling crown block, travelling block, and top drive operations
- Goods and personnel elevators
- Ship anchor handling, marine towing, and routine ship operations not directly associated with Upstream activities (e.g., ship maintenance)
- Tree cutting and associated movement of lumber
- Mining and earth moving
- Helicopter lifting operations
- Fall protection and rope access equipment
- Manual handling
- Jacking
- Diving operations
- Vehicle maintenance lifts
- Piling machines

IOGP strongly recommends that all companies conducting lifting activities have a management system that includes specific procedures based on a full assessment of the risks and control measures required. Further guidance on the development and implementation of such systems can be found in IOGP Report 510 - *Operating Management System Framework*.

IOGP recommends that organizations performing marine lifting operations refer to the International Marine Contractors Association (IMCA) Guidelines for Lifting Operations as well. This IMCA guideline provides detailed technical and health and safety information on all matters pertaining to marine and subsea lifting and hoisting operations, much of which can equally be applied in other situations.

The IOGP Life-Saving Rules and the supporting Start-Work Checks are consistent with the recommendations in this report. For more on the Rules, see IOGP Report 459 – *Life-Saving Rules*.

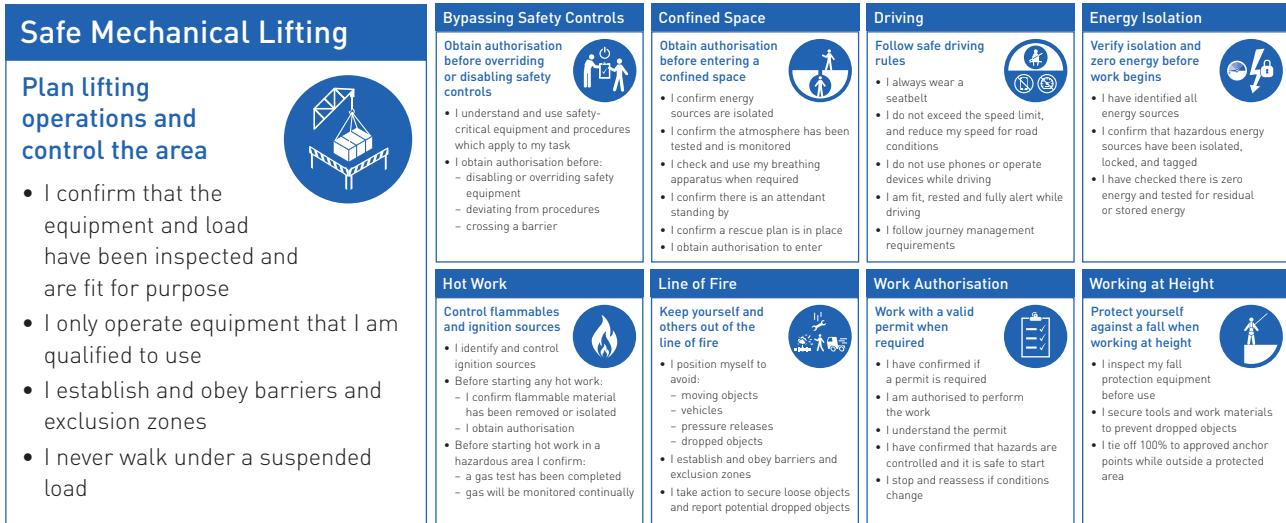


Figure 1: Safe Mechanical Lifting and the other Life-Saving Rules

Start-Work Check			
Mechanical Lifting			
WHEN TO COMPLETE – Before the start of any MECHANICAL LIFTING activities			
Confirm each control/safeguard below before starting work	Guidance for confirming each control/safeguard	Personal Performing Work	Start-Work Verifier
I HAVE CONFIRMED:			
1 The lift has been planned	<ul style="list-style-type: none"> The lift method, equipment, and number of people required has been assessed and determined When required, an approved lift plan or procedure is in place and has been evaluated by a competent person The lift has been assessed for: <ul style="list-style-type: none"> - load size - centre of gravity (e.g., lifting point) The lifting equipment's current capacity and condition has been assessed Equipment operator and lifting crew have discussed the written lift plan prior to lifting 		
2 The hazards are identified and controlled	<ul style="list-style-type: none"> Completed a task risk assessment specific to the scope of work and the lift method, equipment, and number of people required Identified overhead hazards and/or other obstructions (e.g., overhead power lines), making sure to check: <ul style="list-style-type: none"> - load path - overhead cables - overhead hazards - overhead equipment Checked for simultaneous operations that may introduce any additional hazards Completed stop work and re-assessed if work, weather changes including change of weather Note: Considerations may apply "Hazard free lifting" (e.g., use of push poles under load) 		
3 Workers involved with the lift are qualified to perform their task	<ul style="list-style-type: none"> Equipment operator and lifting crew are qualified to perform their task Note: To be "qualified" may require certification and/or assessment to meet company or applicable legal requirements 		
4 The lift equipment is set up and potential for unplanned movement has been assessed	<ul style="list-style-type: none"> The lift equipment is set up and potential for unplanned movement has been assessed Communication plan and responsibilities are agreed to by the lift crew The load has been inspected prior to lift Barriers and exclusion zones are in place 		
5 The lifting and rigging equipment is: <ul style="list-style-type: none"> * certified * inspected * rated for the lift 	<ul style="list-style-type: none"> Pre-use crane inspection has been completed Safety and monitoring devices are in place and functioning Manufacturer's load chart is available The lift equipment has been assessed prior to lift The rigging equipment is rated for the lift Note: If load chart does not exist, assume equipment is not rated for the lift; stop work and identify equipment and verify rating per OEM requirements (e.g., weather, sea state and temperature) 		
6 A communication plan and responsibilities are agreed to by the lift crew	<ul style="list-style-type: none"> Communication methods (e.g., hand signals, radio) have been agreed to and tested Equipment operator and lifting crew discussed the emergency response, including what emergency stop signals to use 		
7 The load has been inspected prior to lift	<ul style="list-style-type: none"> Every load has been inspected for integrity and stability (e.g., center of gravity) The load and its packaging are whitelisted for the lift These objects have been secured or removed prior to lift Load has been secured using appropriate type of Power lifting basket 		
8 Barriers and exclusion zones are in place	<ul style="list-style-type: none"> Exclusion zones have been identified and controls are in place to protect people from line of fire hazards, including: <ul style="list-style-type: none"> - working under suspended loads - dropped objects - access to exclusion zones is controlled (e.g., attendant or physical barriers) - exclusion zones are communicated and known by the work crew 		
Confirm these controls/safeguards are in place and verified prior to starting work. Stop and seek help if anything changes.			
Printed Name & Role	Signature	Date	
Start-Work Verifier			

The diagram shows a mechanical lift (crane) lifting a purple rectangular load. Several workers are present around the site, some wearing hard hats and safety vests. Numbered callouts point to specific parts of the operation:

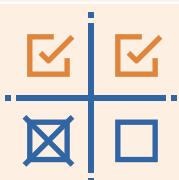
- Callout 1: Points to a worker near the base of the lift.
- Callout 2: Points to a clipboard with a checklist.
- Callout 3: Points to a worker near the load.
- Callout 4: Points to the lift's mechanical arm.
- Callout 5: Points to the load being lifted.
- Callout 6: Points to a worker near the base of the lift.
- Callout 7: Points to a worker near the base of the lift.
- Callout 8: Points to a worker near the base of the lift.

Figure 2: Mechanical Lifting Start-Work Check

1. Ten principles for lifting

Table 1: Ten principles for lifting

Principle 1		All lifting operations are categorised by the Person in Charge to reflect the risk of the lift. This then defines the required controlling documents and the competence of the people involved.
Principle 2		All persons involved in planning, performing, lifting and maintaining lifting equipment are trained and assessed as competent for their role. Competence is assured through relevant experience, initial and refresher training, and periodic assessments.
Principle 3		One person in the lift crew is designated as the Person In Charge of the lifting operation. All personnel involved in the lifting operation have their individual responsibilities clearly defined and communicated prior to commencement of the lifting operation.
Principle 4		<p>A risk assessment is required for every lift, regardless of category. A lift plan is required for every lift, with the level of detail required defined by the category of lift. A Permit to Work may also be required subject to lift complexity and company policy.</p> <p><i>NOTE: Category 1 lifts may be addressed through a generic lift plan, while Category 2 and 3 lifts require a specific lift plan. All Category 3 lifts require a Permit To Work.</i></p>
Principle 5		An approved competent person (Lifting Technical Authority, Advisor, Engineer or Subject Matter Expert) is engaged in assuring that all lifting operations are correctly planned and managed.

Principle 6		A Red Zone is established. All non-authorised personnel are restricted from entering the Red Zone ¹ , and all personnel are kept clear of suspended/travelling loads and lifting equipment or between the load and any heavy immovable object.
Principle 7		Lifting Equipment is thoroughly examined on a regular basis by an inspector who is sufficiently independent ² from the on-site lifting crew, and who may be external or an in-house appointee. The examination refers to an acknowledged Standard for scope, methodology and acceptance/rejection criteria. All safety and monitoring devices installed on lifting equipment are operational and not by-passed or disabled. <i>NOTE: Periods of inspections can be influenced by the nature and robustness of use and application as well as the environments of use.</i>
Principle 8		All lifting equipment is visually inspected by a competent person before and after use. Equipment integrity is maintained and faulty equipment is removed from service and tagged as such. Inspection and maintenance activities are recorded in an equipment register.
Principle 9		Periodic audits and inspections are conducted by an Approved Competent Person.
Principle 10		Any Lifting of personnel is classified to the category requiring the highest level of controls (IOPG Category 3) and a rescue plan is included as part of the Lift Plan. Any equipment used for lifting personnel is certified for the specific activity and used according to recognised international standards.

¹ Red Zones, sometimes also known as Exclusion Zones or No-Go Zones, are areas where access is controlled and no one can enter unless authorized to do so. They should be clearly marked, ideally with physical barriers, so that a person cannot accidentally enter one.

² A sufficiently independent inspector is someone not influenced or controlled in any way by the company or organization executing or responsible for the task.

2. Lift categorization

To ensure adequate planning and safe execution of lifting operations, all lifting operations need to be categorised according to their degree of complexity and associated risks. This section provides a lift categorization example to help organizations apply Lifting Principle 1.

Principle 1		<p>All lifting operations are categorised by the Person in Charge to reflect the risk of the lift. This then defines the required controlling documents and the competence of the people involved.</p>
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Different naming conventions for categorizing are used globally. This document categorizes lifts as a category 1, 2, or 3 lift. If your organization or partners use a different nomenclature, ensure that the controls are appropriate for the complexity and risk of any lift being performed. Some organizations use more or less than three categories; what is most important is that the categorization leads to the definition of controls appropriate for the complexity and risk of the lift being performed.

Table 2 provides an example of a simple methodology for categorizing a lift, alternatives may include:

- Critical, non-critical
- Routine, non-routine simple, non-routine complex
- Simple, complicated, critical, complicated/critical

Table 2: Example methodology for categorizing a lift

Companies can modify the specific criteria listed to reflect their operations and equipment.		
CATEGORY 3	Y	N
Is the gross load weight over 90% of the certified load radius curve of the crane?		
Does the operation involve the lifting or lowering of personnel?		
Will the lift involve tandem lifting using powered lifting appliances?		
Could the lift be affected by any proximity hazards, i.e., restricted area, power line, confined space etc.		
Will the load be lifted over or in close proximity to live plant?		
Will the lift take more than one shift to complete?		
Will the lift plan require technical input or calculations from a technical expert (i.e., load distribution in rigging and appliances)?		
Will the load be transferred from one powered lifting appliance to another?		
Will the load be lifted from one marine vessel to another?		

During the lift, will the crane operator's visibility of the load be restricted/limited (i.e., 'blind lift')?		
Is the load to be rotated, up-ended/up-righted (roll-up, tailing or special lifting operations) or transferred from one appliance to another during operation?		
Will the lift be subsea?		
Will the lift involve proof load testing of appliances or lifting equipment?		
If you've answered YES to ANY of the above, the lift is CATEGORY 3. If you've answered NO to ALL of the above, check the next set of questions		
CATEGORY 2	Y	N
Is the gross load weight over 80% of the certified load radius curve of a mobile crane?		
Is the lift outside normal operating conditions for the equipment or the asset?		
Is the weight distribution uneven, or does it have the potential to shift?		
Will environmental conditions place restrictions on lifting operations?		
Is the load of an unusual shape?		
Is the weight of the load estimated (i.e., not known)?		
Does the load have any hazards such as sharp edges?		
Is the load subject to permanent deformation?		
Absence of designed and tested lifting points?		
Does the load have excessive dimension (limited clearance from crane structures, surroundings)?		
Is the operation taking place during SIMOPS or interfering with other concurrent activities?		
If you've answered YES to any of the above, the Lift is CATEGORY 2. If you've answered NO to ALL of the above, the lift is likely Category 1.		
CATEGORY 1	Y	N
Are all these three conditions present?		
1. You have you answered "No" to all questions in Category 3 and Category 2		
AND		
2. The personnel involved in the lift are trained, assessed as competent and authorised to perform their specific role		
AND		
3. The lifting equipment and the load are simple to use and lift		
Only if ALL the 3 conditions for Category 1 are present, is the lift classified as CATEGORY 1.		

Tables 3 and 4 provide examples of the different control measures and the personnel required depending on the category of lift. For example a lifting operation during 'SIMOPS' (Simultaneous Operations) would be categorized as a Category 2 at minimum (see Table 1 categorization questions), and therefore have a specific lift plan approved by the Site Lifting Competent Person, a permit to work for the entire SIMOPS scope, a specific risk assessment, and so on.

Table 3: Example of documentation and control measures for each category of lift

Type of measure	Category 3	Category 2	Category 1
Lift Plan	Specific	Specific	Generic for the type of lift
Permit to Work	Required	Might be required by procedures or operating instructions (e.g., required where SIMOPS involved)	Might be required by procedures or operating instructions
Risk Assessment	Specific	Specific	Generic for the type of lift
Toolbox Talk ¹	Required pre-lift	Required pre-lift	Recommended pre-shift
Start Work Checks ²	Mechanical Lifting Work around mobile equipment (if relevant) Man-riding (if relevant) Work at height (if relevant)	Mechanical Lifting Work around mobile equipment (if relevant) Work at height (if relevant)	Mechanical Lifting Work around mobile equipment (if relevant) Work at height (if relevant)

Note 1 – a second talk may be conducted post operation to collect lessons learned – e.g. 'After action review'

Note 2 – more Start Work Checks may apply depending on activity/operation

Table 4: Example of personnel involved for lifts of different category
(See next section for more details on personnel)

Type of role	Category 3	Category 2	Category 1
Person In Charge ⁺	✓	✓	✓
Appliance operator [#]	✓	✓	✓
Slinger/Rigger	✓	✓	As required by operating instructions
Banksman	✓	✓	As required by operating instructions
Site lifting competent person	✓ (Site approval of lift plan)	✓ (Site approval of lift plan)	✓ (Site approval of lift plan)
Approved Competent Person*	✓ (Technical approval of specific lift plan)	If required by operating instructions	✓* (Periodic review approval of generic lift plans)

⁺ Please note that most organizations have different names and different categorizations for who is considered the Person in Charge of a lifting and hoisting operation.

[#] An appliance operator can also be the Person in Charge in some Category 1 operations, for example a forklift truck operator or winch operator.

* An Approved Competent Person (e.g., lifting technical authority, advisor, engineer or subject matter expert) is usually involved in the review process of Category 2 and 3 Lift Plans in line with their tasks as described in section 3.3. For Category 1 lifts, an Approved Competent Person vets the generic lift plans and/or operating procedures, usually this is a one-off exercise with a scheduled review frequency.

3. Roles and Responsibilities

This section describes the roles and responsibilities of personnel involved in lifting and hoisting operations, reflecting Lifting Principles 2, 3, and 6.

Principle 2		<p>All persons involved in planning, performing, lifting and maintaining lifting equipment are trained and assessed as competent for their role. Competence is assured through relevant experience, initial and refresher training, and periodic assessments.</p>
Principle 3		<p>One person in the lift crew is designated as the Person In Charge of the lifting operation. All personnel involved in the lifting operation have their individual responsibilities clearly defined and communicated prior to commencement of the lifting operation.</p>
Principle 6		<p>A Red Zone is established. All non-authorised personnel are restricted from entering the Red Zone, and all personnel are kept clear of suspended/travelling loads and lifting equipment or between the load and any heavy immovable object.</p>

3.1 Lifting crew, roles, and associated competence

A lifting crew typically comprises a minimum of three individuals: a Person in Charge (PIC), a banksman/signaller/rigger/slinger, and an appliance operator. However, the number of people required in a lifting crew will vary with the complexity and scale of lifting operations performed. For example, a routine lift involving a mobile or pedestal crane would normally involve a three-person lifting crew, a routine lifting operation in a factory or warehouse environment using an overhead gantry crane may be safe to conduct with a lifting crew of 2 people. The size of the crew must be determined as a result of a detailed risk assessment. IOGP Category 3 lifts would normally require a larger crew to conduct operations safely.

Job titles change frequently around the world and depending on the type of site or operation. Table 5 shows examples of this to help illustrate who performs these roles. It is the competence of any individual that matters when deciding if they can perform a certain role, not their job title. IOGP recommends that companies develop a lifting roles and associated competence matrix, an example is given in Appendix C.

Table 5: Lifting crew roles and example of job titles associated with the role

Role	Example of job titles
Person In Charge	Crane supervisor, site supervisor, lifting supervisor
Appliance operator	Equipment operator, powered lift appliance operator, crane operator
Slinger/Rigger	Roustabout, roughneck
Banksman	Signaller, roustabout, roughneck
Site lifting competent person	Deck foreman, deck pusher
Approved Competent Person	Lifting engineer, lifting authority, lifting SME

3.2 Site manager

The Site Manager has accountability for the site and for applying the Lifting Management System requirements including the execution of safe lifting and hoisting operations at the site. Their responsibilities include:

- Appointing a Person in Charge of the lift and lifting crew
- Ensuring personnel are trained and competent for the task
- Ensuring lifts are properly studied, assessed, planned, and conducted safely, ensuring that only suitable, certified, and sound equipment and machinery are provided

3.3 Site lifting competent person

The Site Lifting Competent Person (SLCP) is generally the person who approves lift plans.

SLCP (e.g., deck foreman, site lifting or rigging supervisor) has knowledge and experience to verify that lifting operations are planned and executed safely in conformance with legislation, standards, codes, and company requirements and that the lifting equipment used is in a safe to operate condition and suitable for the task.

The SLCP's responsibilities include the following:

- providing lift plan(s) and risk assessment(s) that meet, legal or regulatory requirements and company requirements
- confirming that the lifting equipment is only operated within its safe operating limits and OEM operating instructions
- advising others on preparation of the lift plan
- confirming that the categorization and technical content of the lift plan is correct
- approving the lift plan prior to submission for authorisation
- confirming that the lifting operations are undertaken safely and in conformance the approved lift plan
- participating in and deliver toolbox talks
- confirming that all personnel involved in a lifting operation are protected at work from the risk to their health or safety by having sufficient training, experience, and appropriate supervision to perform the task competently relative to the categorization of the lift

3.4 Approved Competent Person

An Approved Competent Person (Lifting Technical Authority, Advisor, Engineer or Subject Matter Expert) assists and supports all the stakeholders in the definition of any aspect related to the lifting process. The Approved Competent Person provides technical advice and guidance for the following:

- Internal auditing services required for the correct lifting management system implementation
- Design and selection of lifting appliances
- Developing and/or approving the generic lift plan for Category 1 lifting operations
- Developing and/or approving the specific lift plan for Category 2 and 3 lifting operations
- Developing and reviewing documented thorough examination schemes for lifting appliances
- Developing and reviewing guidelines for the engineering and planning of the operations
- Investigating lifting related HSE events and sharing of the lifting operations lessons learnt
- Reviewing lifting processes
- Conducting capability assessments of contractors and subcontractors for lifting operations
- Determining requirements for management of change and deviations in lifting operations
- Competence assessment, assurance, and training of lifting personnel

3.5 Person in Charge (PIC)

The PIC is the only person who has operational control of the lift and has the authorization to give instructions to the lifting crew during the operations. The PIC has the required level of competence to plan and supervise the specific lifting and hoisting operation. Their responsibilities include:

- Categorizing, risk assessing, and planning Category 1 lifting operations
- Creating and approving Category 1 lift plans and ensuring that the required controls are in place. As the PIC is the individual who ensures the lift plan is suitable for the task, they must be competent to make that assessment. For Category 2 and 3 lifts, an approved competent person is required to approve the lift plan, and may also be involved in its development.



Figure 3: Red Zones Save Lives poster

- Defining the lifting appliance set-up/configuration, ensuring the correct equipment is available and safety devices are installed and operational
- Ensuring a Red Zone is established.
- Ensuring the travel route of the lifting operation is clear and free from hazards and obstructions (e.g., overhead obstacles such as powerlines) to enable the lifting equipment and load to safely travel from the lifting to landing point without being impeded by any obstacles
- Ensuring there are good access and egress routes for the lifting team, including putting in place safe alternative routes if walkways are obstructed

3.6 Appliance Operator

The appliance operator is a person trained and competent to operate the lifting appliance to be used, and the only one allowed to manoeuvre it during the activity, unless a change of planning and control documentation is made. Their responsibilities include:

- Carrying out pre- and post-use inspections
- Ensuring cranes are properly secured on firm and level foundation on outriggers and set up in accordance with the manufacturer's instructions
- Checking the suitability of the routes for the forklift or mobile appliance to be used (e.g., ground conditions, slope, space)
- Not leaving a load unattended or suspended above people
- Not leaving a lifting appliance with ignition key in place
- Operating the appliance properly, verifying weight of load does not exceed the safe working load (SWL) or Working Load Limit (WLL) of lifting appliances
- Communicating with banksman before operation start to establish common understanding, signs, and instructions that will be used
- Contributing and participating in Toolbox Talks
- Not starting the operation if barriers are not in place

3.7 Rigger/Slinger

The rigger/slinger is a person trained and competent in attaching slings, lifting appliances, accessories, and shackles onto the load to ensure that it can be lifted and moved safely. Responsibilities include:

- Inspecting and selecting lifting equipment correctly, ensuring certification is in place
- Inspecting the load and ensuring that any required certification is in place e.g., integral lifting points
- Securely connecting and disconnecting lifting accessories to loads and accessories to lifting appliances
- Establishing a Red Zone, ensuring task areas are kept clear of non-essential Personnel, and including the deployment of physical barriers where required
- Maintaining a safe position during lifting
- Contributing and participating in Toolbox Talks

3.8 Banksman/Signaller

The banksman is the only one authorised to give signals to the lifting operator and their responsibilities includes:

- Control of the lift area, ensuring all personnel are positioned safely and using physical barriers to prevent access to Red Zones
 - Members of the team may have their attention focused elsewhere and may react instinctively by moving into a hazardous area when something goes wrong. It is the responsibility of the Banksman to watch for anyone moving towards the ‘line of fire’ during the lift, but all team members can help each other by calling a halt if anything unexpected happens, or if anybody begins to move towards the ‘line of fire’.
- Checking for potential dropped objects
- Maintaining direct sight of the load and clear communications with the appliance operator and making use of 2-way radios with designated channels
- Maintaining an awareness of other ongoing operations that may affect lifting activities
- Directing the movement and placing of loads
- Not performing any other job while the lift is in progress
- Contributing and participating in Toolbox Talks

3.9 Lifting Equipment Inspector

- Person can be either in-house or external, but must be independent³
- Competent to assess the condition and compliance of lifting equipment

3.10 Rigging Loft Controller

A designated individual who is responsible for managing all lifting accessories and loose lifting gear at a given site. They are responsible for managing the Rigging Loft where these accessories are stored, and in particular, they keep a record, track and verify the accessories in order to determine the correct flow, disposal, certification availability and proper condition of all the accessories.

³ A sufficiently independent inspector is someone not influenced or controlled in any way by the company or organization executing or responsible for the task.

4. Lift planning

This section describes how to plan a lift and provides guidance to complement the lifting principles related to Lift Plan (Principles 4 and 5).

Principle 4		<p>A risk assessment is required for every lift, regardless of category. A lift plan is required for every lift, with the level of detail required defined by the category of lift. A Permit to Work may also be required subject to lift complexity and company policy.</p> <p><i>NOTE: Category 1 lifts may be addressed through a generic lift plan, while Category 2 and 3 lifts require a specific lift plan. All Category 3 lifts require a Permit To Work.</i></p>
Principle 5		<p>An approved competent person (Lifting Technical Authority, Advisor, Engineer or Subject Matter Expert) is engaged in assuring that all lifting operations are correctly planned and managed.</p>

When planning the lift, perform a hazard identification and a risk assessment to determine the lift method, equipment to use, and the number and competence of personnel required.

As per Principle 4, the detail required in the Lift Plan is related to the complexity of the lift and associated risk:

- Category 1 lifts may only require a generic Lift Plan supported by an onsite risk assessment and team briefing. Generic lift plans may be appropriate for multiple occurrences of similar routine lifts within specified limits but must be formally reviewed and re-issued periodically.
- Category 2 lift plans are specific to the lift and include technical details and drawings
- Category 3 lift plans are specific to the lift, include technical details and drawings, and may also require additional engineering input (e.g., Site Factors and Load Factors) to define load integrity and stability

The technical competence of the reviewer of a Lift Plan is determined by the complexity of the lift. Plans for IOGP Category 2 and 3 lifts are reviewed by an Approved Competent Person (Lifting Technical Authority or Subject Matter Expert).

Any change to a prepared lift plan is considered and adequately reassessed through a Management of Change/deviation process and modifications approved by a person with the same, or higher, competence level as for the original lift plan.

All lift plans includes the following:

- Lift category
- The type and number of personnel required, their specific roles and competences, and how they will be briefed
- The nature, the weight, and the Centre of Gravity (CoG) position of the load and lifting points specifications
- Pick up and set down points, and constraints such as space and stacking
- Application of the correct rigging methods and lifting appliance positioning
- Equipment required and certification checks
- Requirements to erect/dismantle the Lifting equipment
- Step-by-step instructions
- Communication methods to be used
- Responsibility for pre-lift visual inspection of the lifting equipment and load, including checks for dropped objects
- Emergency and rescue plans
- Restrictions on the lift such as weather, light, sea state, ground bearing pressure.
- Access and egress for slinging and unslinging the load
- Simultaneous, conflicting, or nearby operations or work
- Whether Permit to Work procedures are applicable
- Load integrity check
- Load charts for generic lift plans and for heavy or complex lifts
- Establishing a Red Zone and identified line of fire hazards

In addition, Category 2 and 3 lift plans may also include:

- A drawing or sketch with lateral view and top view. Category 3 lifts may also require additional supporting detailed drawings (e.g., 2D or 3D computed aided drawings for complex lifting operations) including crane(s) and load position, operational steps (phases).
- Rigging arrangement including a rigging table detailing all lifting accessories (ID, description, type, quantities, expected loads, unity checks and safety factor based on rigging calculation for the worst-case scenario).
- IOGP recommends that organizations performing mechanical handling operations carry out risk-based analysis to highlight the type and level of required/additional engineering analysis, technical evaluation or control measures that would be required. The output of such an exercise could, for example, include the need for determining ground bearing capacity, soil analysis, geotechnical study, engineering design, load stability calculations, swept path analysis, sea and weather state or dynamic amplification factors.

5. Specific high-risk lifting considerations

This section describes particular considerations for different types of operations, including the lifting of personnel which is also addressed by Lifting Principle 10.

Principle 4		<p>A risk assessment is required for every lift, regardless of category. A lift plan is required for every lift, with the level of detail required defined by the category of lift. A Permit to Work may also be required subject to lift complexity and company policy.</p> <p><i>NOTE: Category 1 lifts may be addressed through a generic lift plan, while Category 2 and 3 lifts require a specific lift plan. All Category 3 lifts require a Permit To Work.</i></p>
Principle 10		<p>Any Lifting of personnel is classified to the category requiring the highest level of controls (IOGP Category 3) and a rescue plan is included as part of the Lift Plan. Any equipment used for lifting personnel is certified for the specific activity and used according to recognised international standards.</p>

5.1 Lifting personnel for work activities

Lifting personnel in a suspended basket or elevated forklift basket is avoided in preference to dedicated lifting devices such as Mobile Elevated Work Platforms, cherry pickers, and scissor lifts.

When personnel lifts, including Man-Riding, are unavoidable, these lifts are subject to stringent planning and controls including regular inspection requirements, risk assessment, and an approved Permit to Work. For Man-Riding, IOGP has produced a Start-Work Check (see IOGP Report 459-1 *Start-Work Checks*).

Start-Work Check		
Man-riding		
WHEN TO COMPLETE - Before the start of any MAN-RIDING activities		
Confirm safe control of personnel and equipment	Reason for confirming safe control/required action	Preventing Errors/Incidents
THREE CHECKS:		
<ul style="list-style-type: none"> 1 Personnel involved with the man-riding activity have been trained and can describe their responsibilities: <ul style="list-style-type: none"> Rider, Winch operator and Spotters have all been trained and can describe their responsibilities. 2 The man-riding equipment is certified and suitable for the task: <ul style="list-style-type: none"> Motors are certified as suitable for man-riding Brakes are certified as suitable for man-riding Hoist system is certified as suitable for man-riding Load limit is certified as suitable for man-riding Fall arrest gear, if using, is certified as suitable for man-riding 3 All training or training refresher for the man-riding activities and relevant equipment has been completed and signed off: <ul style="list-style-type: none"> Hoisting and riding equipment in the immediate area and at alternate spots, are not moving (e.g., set the brake for the training track, tick our tag out) 	<ul style="list-style-type: none"> • Rider, Winch operator and Spotters have all been trained and can describe their responsibilities. • Motors are certified as suitable for man-riding • Brakes are certified as suitable for man-riding • Hoist system is certified as suitable for man-riding • Load limit is certified as suitable for man-riding • Fall arrest gear, if using, is certified as suitable for man-riding 	<ul style="list-style-type: none"> • Rider, Winch operator and Spotters have all been trained and can describe their responsibilities. • Motors are certified as suitable for man-riding • Brakes are certified as suitable for man-riding • Hoist system is certified as suitable for man-riding • Load limit is certified as suitable for man-riding • Fall arrest gear, if using, is certified as suitable for man-riding
<ul style="list-style-type: none"> 4 Barriers and other elevation devices are in place and ready to be used: <ul style="list-style-type: none"> Elevation equipment, e.g. lorry, truck or crane, is secured to a fixed point for movement of rider and other passengers, safety harnesses are being used by the rider and used by the work crew 5 The instructions and safety briefings for the lift are executed: <ul style="list-style-type: none"> Tool used at height have secure working devices such as lanyards, fall arrest gear, etc. Cover opening to lower levels by grilles, gates, etc. or use access mats or other measures to prevent falls from height (e.g., work at height tag register) 6 Rescue plan is in place and ready to be used: <ul style="list-style-type: none"> Establish de-escalation plans e.g., evacuation routes, emergency stops, etc. Rescue plan is available Location of rescue equipment and resources is available specific hazards related to this task can measure the rescue plan 	<ul style="list-style-type: none"> • Elevation equipment, e.g. lorry, truck or crane, is secured to a fixed point for movement of rider and other passengers, safety harnesses are being used by the rider and used by the work crew 	<ul style="list-style-type: none"> • Elevation equipment, e.g. lorry, truck or crane, is secured to a fixed point for movement of rider and other passengers, safety harnesses are being used by the rider and used by the work crew
Confirm these controls/requirements are in place and verified prior to starting work: Stop and seek help if anything changes.		
Start-Work Verifier	Project Name & No.	Date

Start-Work Check

Man-riding



Figure 4: Man-Riding Start-Work Check

5.2 Personnel transfer by lifting

Transfer of personnel by lifting is avoided where possible and is subject to strict risk assessment criteria.

Lifting of personnel is done according to a specific personnel lift plan, or a dedicated lift plan with a rescue plan incorporated.

Lifted personnel are secured.

Planned personnel transfer by lifting should not be performed in darkness.

5.3 Lifting over live plant (hydrocarbons)

Live plant is defined as equipment containing a hazardous, pressurised, energised or strategic resource. Lifting over or in close proximity to live plant is defined as any lifting operation where there is a process safety risk of the load, lifting appliances and/or lifting accessories impacting, damaging, and/or rupturing a live plant.

Lifting over or in close proximity to live plant is not undertaken unless:

- No other feasible alternative exists
- An operational contingency plan and risk assessment are in place

Operational contingency plans define the potential worst-case consequences in the event of a dropped object or catastrophic failure of the lifting equipment, documenting the mitigation measures to be taken prior to the lift and the emergency response actions required. The Red Zone used during the lift is extended to match the requirements of the operational contingency plan.

5.4 Tandem lifts

Lifts involving two or more cranes (including top and tail, load transfer, multiple hooks) are complex operations requiring considerable planning. The Approved Competent Person must be engaged in the process of developing a detailed lift plan. See Appendix B.1 for further information on this.

5.5 Hands free lifting

Hands free lifting is preferred though subject to thorough risk assessment and planning.

Push/Pull sticks

Injuries to hands and fingers are a leading cause of injuries during lifting activities.

Therefore, in order to avoid and/or reduce direct contact of workers with lifted loads while executing lifting operations, push pull sticks can be used to guide loads (creating a buffer zone of safety) and retrieve slings.

Tag lines

Tag lines are only used in normal operating conditions to adjust the position of a load that is stable and under full control of the crane or powered equipment operator. Please consult Appendix B for more information.

5.6 Operating/ground conditions

A system should be in place that allows the PIC (or approved competent person, such as a lifting engineer) to effectively manage:

- Site maximum ground bearing capacity/permissible ground loading factor
- Identification of underground services
- Identification of underground voids
- Effects of environmental/weather conditions where applicable ice, permafrost, rain, lightning
- Proximity to excavations
- Proximity to other operational equipment including other crane operations with overlapping boom radius
- Restricted visibility due to environmental conditions (fog, snow)
- Blind lifts, where it is not possible to ensure line of sight communication

5.7 Marine or offshore conditions

A system should be in place that allows the PIC (or approved competent person, such as a lifting engineer) to effectively manage:

- Crane operations within allowable sea state and associated load chart capacities.
- Crane operations with simultaneous operations such as vessel operations, diving activities or helicopter movements.

5.8 Effects of wind on suspended loads

Strong winds may swing suspended loads (panels, formworks/shutters, etc.) out of balance and radius, making the lifting appliance unstable. If the appliance operator considers that full control of the load cannot be maintained, it should not be lifted or made safe during a lifting operation. The appliance operator has the primary responsibility for making the decision, in conjunction with the PIC. This should not be overridden by site management under any circumstances. Please see Appendix B for more information on this topic.

5.9 Lifting in close proximity to hazards including overhead power lines

During the planning of any lift, it is important to determine if any part of the equipment, load line, or load (including rigging and lifting accessories) could get close to a power line. Appendix B describes options to consider, starting with de-energising and grounding. A table (Appendix B.4) has been provided to help determine safe clearance distances based on voltage.

Note that other overhead hazards, fixed or mobile (e.g., drones), should also be considered in the risk assessment and associated controls included within lift plans.

Lifting over trafficable areas (e.g., railways/roads/canals) should be considered in a similar way to the above.

5.10 Technological innovations

Lifting operations represent a critical activity that needs to be constantly and effectively controlled and supervised, both from the safety and technical point of view. There are several new technologies and new devices that can provide effective support. Current examples include the use of motion detectors, smart helmets and glasses, and radio frequency identification (RFID) tags in lifting accessories to aid with certification/inspection checks.

IOPG will continue to search for and share innovative and technical solutions to assist in the safe management of lifting and hoisting operations, and encourages its Members to do the same.

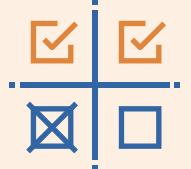
5.11 Dropped objects

Dropped objects represent a high hazard during lifting operations. Dropped objects can include; the load, part of the load, objects falling from the lifting appliance, lifting accessories, loose objects left on loads and occasionally items hidden in loads (for example, rocks / debris left in the fork pockets on a container lift).

The organization DROPS has provided a library of information available through their website (<https://www.dropsonline.org>) on how to prevent dropped objects and is a recommend resource, even if not specific to lifting and hoisting operations.

6. Equipment

This section provides guidance to complement the lifting principles related to equipment (Principles 7, 8, and 9).

Principle 7		<p>Lifting Equipment is thoroughly examined on a regular basis by an inspector who is sufficiently independent² from the on-site lifting crew, and who may be external or an in-house appointee. The examination refers to an acknowledged Standard for scope, methodology and acceptance/rejection criteria. All safety and monitoring devices installed on lifting equipment are operational and not bypassed or disabled.</p> <p><i>NOTE: Periods of inspections can be influenced by the nature and robustness of use and application as well as the environments of use.</i></p>
Principle 8		<p>All lifting equipment is visually inspected by a competent person before and after use. Equipment integrity is maintained and faulty equipment is removed from service and tagged as such. Inspection and maintenance activities are recorded in an equipment register.</p>
Principle 9		<p>Periodic audits and inspections are conducted by an Approved Competent Person.</p>

6.1 Definition and marking

Lifting equipment comprises lifting appliances (equipment performing the lifting), lifting accessories (devices that connect the load to the lifting appliance) and lifted items (load including items such as containers, baskets or drums).

Lifting appliances should be marked with:

- Safe Working Load (SWL) or Working Load Limit (WLL)
- Unique ID, mark, or serial number
- Certification Mark, CE mark, or equivalent
- Date of last certification/inspection

Lifting accessories should be marked with:

- Safe Working Load (SWL) or Working Load Limit (WLL)
- Unique ID, mark, or serial number
- Certification Mark, CE mark, or equivalent
- Tare weight (for lifting beams and/or spreaders and lifted item, as applicable)
- Diameter and/or length as deemed necessary (for lifting accessories, as applicable)
- Colour Coding
- Date of last certification

An equipment register and evidence of certification should be available onsite. An example is provided with this Report.

6.2 Design and certification

Equipment is fit for its intended purpose and operating conditions and designed and certified to a recognised standard.

Equipment is fitted with appropriate safety devices. Any safety device installed on lifting equipment is operational and not overridden. Retrofit safety devices need to be assessed and managed to avoid introducing additional hazards.

Equipment is designed in a way that does not give the operator any health or fatigue problems, and considers:

- Ergonomics (operators' comfort, view, joy sticks, etc.)
- Noise and vibration protection
- Weather protection (wind, temperature, rain, snow, etc.)
- Easy access and egress

The potential for an operator to accidentally create a dangerous situation or unintended movement of the equipment or load is reduced through the design of the equipment, for example, emergency stop buttons are protected against unintended activation.

6.3 Maintenance

In order to ensure safe operation of the lifting equipment, the proper working and operational conditions must be maintained. Maintenance encompasses activities such as monitoring, inspection, testing, and repair, ensuring that a good housekeeping regime is being practised. The maintenance schedule should be based on manufacturer's recommendations, business operating experience, international applicable standards and failure modes analysis. The maintenance schedule should integrate preventative and predictive activities. Maintenance schedules take into consideration the effects of age and usage history of the equipment.

6.4 Inspection

All lifting equipment should be inspected in accordance with a written scheme of examination detailing the frequency and types of inspections for lifting equipment⁴:

- A visual inspection of the lifting appliance – including functional tests - is performed by its operator before use and before and after each work shift.
- A visual inspection of the accessories is performed by a member of the lifting crew (e.g., slinger/rigger) before use and before and after each work shift.
- Frequency: Service routine inspections are carried out following the manufacturer's instructions at the manufacturer's or regulator's recommended frequency.

6.5 Thorough examination

Lifting equipment should be subject to a thorough examination by a competent person who has sufficient detailed knowledge of its design, operation, and failure modes to recognise significant defects (this is beyond the inspections outlined in section 6.4).

The scope, methodology, and standards of the examination, and acceptance/rejection criteria for the equipment, should be specified for all lifting equipment and may include periodic load-testing.

All lifting equipment should be thoroughly examined:

- Before using a lifting appliance for the first time
- If an installed lifting appliances has been assembled on site, it must be examined by an external technical authority (or equivalent – e.g., a certifying authority) to establish the assembly was correct and it is safe to operate.
- After events that may have resulted in damage to the appliance or change of significant components
- At regular intervals and in accordance with a written scheme of examination that has been drawn up by a competent person:
 - No longer than 12 months for lifting appliances and equipment (including certified lifting points integral to loads), or more often if required by legislation or actual use
 - No longer than 12 months for lifting accessories, or more often if required by legislation or actual use
- No longer than 6 months for equipment used in personnel lifting

⁴ Implementing organizations can define level of use and associated inspection time intervals, for example:

- Normal service – 6 months
- Severe service – Monthly to quarterly
- Special service – as recommended by a qualified person.

- Equipment with serious and significant notified defects must be immediately taken out of service until the defect has been put right.
 - If a lifting appliance is de-rated by a certifying authority, it must then only be operated within its new rated capacity.
- Equipment with defects that need to be rectified within a certain timescale is not to be used until repaired and recertified, or replaced. This must happen within the specified timescale.

For the purposes of a thorough examination, the competent person:

- should have enough appropriate practical and theoretical knowledge and experience of the lifting equipment so that they can detect defects or weaknesses, and assess how important they are in relation to the safety and continued use of the equipment
- should not be the same person who performs routine maintenance as they would be responsible for assessing their own work
- should be sufficiently independent and impartial to make objective decisions
- May be employed by a separate company, or selected by an employer from members of their own staff
- See also Example Competence Matrix in Appendix C

6.6 Colour coding

Lifting accessories (and lifted items, where applicable) may be colour coded to enable lifting crew and rigging loft controller to easily identify equipment that is within test date. At each thorough examination, the competent person should be instructed to remove the existing colour code and replace it with a new colour. The colour must be applied close to the SWL and cover the old colour code.

IOGP encourages organizations (operators and contractors) working in the same operational area to agree and standardize on the colour coding to be used.

7. Leading lifting operations

Understanding human factors and improving the working environment, behaviour, and culture are fundamental to achieving safe and efficient lifting operations. This section provides basic guidance on key human factors aspects to consider for those who plan and lead lifting operations.

When scheduling and resourcing a job:

- Ensure there are enough people to manage the lifting operation safely
- Ensure the team members are competent to fulfil their specific roles and responsibilities
- Ensure all required equipment is available and certified as safe for use
- Schedule the work to maximise operating in daylight hours, avoid working in the hours of darkness when possible
- Schedule the work to take account of any adverse weather and visibility issues
- Conduct a pre-start safety meeting (toolbox talk), take the time to review both the risk assessment for the tasks and the lift plan.
- Highlight any differences observed between the risk assessment and the lift plan and the current status observed pre-start and where required update the risk assessment and the lift plan accordingly.
- Review each of the differences in turn and identify actions to reduce risk
- If it is not possible to reduce the risk, then the PIC should escalate to senior management and consider postponing the job
- Run through the sequence of work and make sure everyone involved fully understands how the job will be conducted

Reinforce, practice and thank people for stopping the job:

- During the pre-start safety meeting:
 - Provide them with the Start-Work Check for Mechanical Lifting – the Check is a tool the lifting crew can use to confirm the controls/safeguards designed to prevent fatalities and serious injuries during lifting operations , the crew should go through the Check not during the meeting, but only once they are at the work site and ready to start the operation.
 - repeat clearly the need for everyone involved to remain alert at all times and to stop the job if they consider that there may be an unsafe act or condition
 - remind the team of the Life-Saving Rule for Safe Mechanical Lifting and Work Authorization
- Lead by example and use opportunities to stop the job, so that other team members can witness first-hand the importance and positive message/environment
- Regardless of the outcome of a 'stop the job' intervention, publicly thank the individual and back it up later in a safety meeting

Fatigue and monotony

- Schedule complex lifting operations during the first half of a shift, as the team will be less tired and more focused
- For lifting operations that are conducted over a longer duration, monitor the condition and attitude of the team, look for signs of fatigue and, if necessary, call a time out to give everyone a rest and time to refocus
- People are more likely to be fatigued:
 - Towards the end, or after, a long shift
 - If working in extreme heat/cold, especially for after long periods
 - If starting work after a long journey
 - If they have recently changed shifts – from day to night and vice versa
 - On first days back on shift after days off
 - When performing repetitive and monotonous tasks
- Where work has become repetitive or monotonous, look for signs and symptoms of boredom or a lack of concentration. Build in breaks, rotate job tasks if safe to do so, and take time to reset and refocus the team.
- Conduct regular worksite visits with a team comprising of the Approved Competent Person, HSE Representatives from operator and contractor(s) focused solely on lifting and hoisting and mobile heavy equipment operations, with the intent to give recognition for implementation of good practices and adherence to procedures, record and communicate observations regarding improvement opportunities.

Further Reading

These organizations produce standards and other lifting guidance:

- American Petroleum Institute (API): <https://www.apiwebstore.org/>
- ASME B30 (Cranes and Related Equipment-Cableways, Derricks, Hoists, Hooks, Jacks, and Slings)
- Australian Petroleum Production and Exploration Association (APPEA): <https://www.appea.com.au/news-media/?publications>
- British Standards: <https://shop.bsigroup.com/>
- Bridon-Bekaert, The Ropes Group: <https://www.bridon-bekaert.com/en-gb>
- DNV GL: <https://www.dnvglobal.com/rules-standards>
- Energy Institute: <https://publishing.energyinst.org/>
- Energy Safety Canada: <http://www.energysafetycanada.com/resources/resourceslist/resources-list.cfm>
- International Association of Drilling Contractors (IADC): <https://store.iadc.org/>
- International Marine Contractors Association (IMCA): <https://www.imca-int.com/core/lifting-rigging/publications>
- International Organization for Standardization (ISO): <https://www.iso.org/store.html>
- Lifting Equipment Engineers Association: <https://leea-int.com/leea-library>
- United States National Commission for the Certification of Crane Operators (NCCCO)
- Norwegian Oil & Gas: <https://www.norskoljeoggass.no/en>
- North Sea Lifting (NSL): <https://nsl.ascoworld.com/reports-and-publications>
- United States Occupational Safety and Health Administration: Home | Occupational Safety and Health Administration (osha.gov) guidance such as: US OSHA 29 CFR 1926.753 (Construction Standard) and US OSHA 29 CFR 1910.178 (Powered Industrial Trucks)
- Offshore Mechanical Handling Equipment Committee - <https://www.omhec.com/guidance-documents>
- OEUK: <https://oilandgasuk.co.uk/publications/>
- Standards Norway (NORSOK): <https://www.standard.no/en/webshop/>
- Step Change in Safety - <https://www.stepchangeinsafety.net/>
- United Kingdom Maritime and Coastguard Agency: <https://www.gov.uk/government/organizations/maritime-and-coastguard-agency>
- United Kingdom Health and Safety Executive: <https://www.hse.gov.uk/guidance/index.htm>
- United Kingdom Chamber of Shipping: <https://www.ukchamberofshipping.com/library/>

Glossary

Term	Definition
Banksman	Title or role used to describe a person who directs crane operations.
Blind Lift	A lift where, at any point during the lift, the appliance operator cannot directly see the load.
CE	CE marking is a mandatory conformity marking for certain products sold within the European Economic Area (EEA) since 1985. The CE marking is also found on products sold outside the EEA that are manufactured in, or designed to be sold in, the EEA.
Certified	Signifies that the equipment has valid certification.
Certification	Written confirmation that an item of equipment is compliant with defined criteria.
Colour Code	A method of marking equipment (tagged or painted), to give a visual indication of its certification status. This colour should be changed at each thorough examination. Paint should not cover any structural welds or load bearing locations that will be subject to visual inspection.
Competent Person	Authorised individual, who has sufficient training and experience or by defined assessment is capable of carrying out a task safely.
Defect	Fault or weakness in equipment, or any of its components, which could arise during the manufacture, construction, installation, or use.
Lifting equipment inspector	A person competent to assess the condition and compliance of lifting equipment. See also competence Matrix in appendix C.
Ground Bearing Capacity	The grounds ability to withstand an applied force.
Hands Free Lifting	Method of keeping personnel away from lifting hazards when the load is lifted and being landed.
Inspection	Visual and functionality check by the user.
Lifting Accessory	Item of lifting equipment that is used or designed to be used directly or indirectly to connect a load to a lifting appliance and which does not form part of the load.
Lifting Appliance	Item of lifting equipment that is used or designed to be used for lifting or lowering a load and includes any attachments used for anchoring, fixing or supporting it.
Lifting Equipment	Collective term for lifting appliances and lifting accessories. Lifting equipment comprises lifting appliances (equipment performing the lifting), lifting accessories (devices that connect the load to the lifting appliance) and lifted items (load).
Lifting Operation	An operation concerned with the Moving, lifting or lowering of a load.
Live Plant	Equipment, protected or unprotected, having any single or combination of the following characteristics: plant containing hazardous, pressurised, energised, or strategic "fluid". It also includes primary power generation units and their exhaust systems.
Load	Anything that is lifted or lowered by lifting equipment, including people and other living organisms, and what they are supported by/contained in (e.g pallets or drums).
Load Chart	Diagram or table showing the rated capacity relative to the radius, environmental conditions, out of plane influences and type of operation.
Load Integrity	The loads ability to safely withstand the forces applied during lifting, including under its own weight.

Term	Definition
Mechanical Lifting Operation	Risk based activity that uses lifting equipment to lift or lower a load. If the lifting equipment parted the load would move.
Permit to Work	A permit to work system is a formal written system used to control certain types of work that are potentially hazardous. A permit to work is a document which specifies the work to be done and the precautions to be taken. A formal approval process must be defined and implemented before work may commence.
Person in Charge	Person with the applicable competency level, who is required to take responsibility for a lifting operation.
Pre-use Inspection	A visual check and, where necessary, a function check of the lifting equipment by a competent person before each use.
Red Zone	Red Zones, sometimes also known as Exclusion Zones or No-Go Zones, are areas where access is controlled and no one can enter unless authorized to do so. They should be clearly marked, ideally with physical barriers, so that a person cannot accidentally enter one.
Rescue Plan	Documented process that describes the process of retrieving personnel safely in the event of an accident or incident.
Rigger	Title or role used to describe a person who uses portable lifting equipment to lift, lower and position loads, usually where cranes cannot, and in areas where space and access are limited.
Rigging	Common term for lifting accessories.
Rigging Loft	A designated area for the storage of portable mechanical lifting equipment and associated documentation.
Signaller	Same as Banksman.
Slinger	Title or role used to describe the person who slings/ rigs loads, working under the Banksman's direction.
Tag Lines	Rope attached to loads to aid in their orientation during lifting.
Tare	Weight of empty/unladen container.
Test	Procedure to establish the quality, performance or reliability of an item of equipment.
Thorough Examination	Systematic detailed visual and functionality check, which may be supplemented with non-destructive testing techniques, for the purpose of confirming that the equipment is safe to use at the time of the thorough examination.
Uncertified	Refers to an item of equipment that does not have valid certification or supporting calculations.
Utilization	Percentage of capacity used against the maximum capacity.
Working Load Limit (WLL) and Safe Working Load (SWL)	Interchangeable terms used to describe the maximum capacity that an item of lifting equipment is designed to raise, lower or suspend under particular service conditions.
Written Scheme of Examination	Documented process, produced by a Competent Person that defines the periodic thorough examinations and testing requirements of lifting equipment.

Appendix A: Lifting Operations Risk Management

A.1 Tandem Lifts

Lifts involving two or more cranes (including top and tail, load transfer/multiple hooks) are complex operations requiring considerable planning. The Approved Competent Person must be engaged in the process of developing a detailed lift plan that contains:

- Crane positioning
- Rigging arrangement for each crane
- Lift sequence and applicable steps including load distribution
- Load movement (the longest radius of each crane for the complete operation must be measured exactly)
- Weight and clearance of obstructions
- Load distribution and variation between appliances, as applicable
- Clearance between load and crane boom environmental considerations, particularly with regards to large windscreens surface
- For tandem lifts where the unity check (ratio between weight of the load – including accessories – and SWL at a given radius) of one (1) of more appliances exceed 75%, a calculation justification is to be provided, including additional extra allowances as required (an example is given in Figure 6).

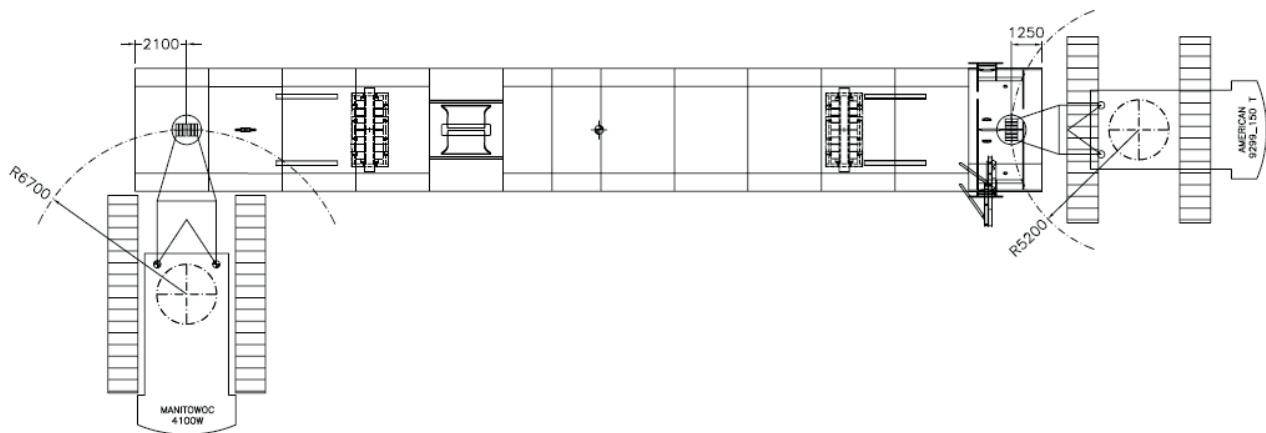


Figure 5: Example schematic for a tandem lift

Hook Load calculation:

– Design Weight:

$$\text{DesignW} = \text{NetW} + \text{Contingency} = 229,3 \text{ t}$$

– Design Weight on ith-crane:

$$\text{DesignW}_{C1} = \text{DesignW} * \left(\frac{l_1}{l_1+l_2} \right) \equiv \text{DesignW}_{C2} = 114,7 \text{ t}$$

– Hook Load on crane 1:

$$\text{HL}_{C1} = \text{DAF} * \left((\text{CoG} * \text{DesignW}_{C1}) + W_{rig} \right) = 124,6 \text{ t}$$

Crane Selection:

CRANE 1 – M15000 (208t)

$$L = 36,6 \text{ m}$$

$$r = 6,7 \text{ m}$$

$$\text{Capacity Q}=126,1 \text{ t}$$

$$\text{UC}=\text{HL}/\text{Q} = 98,9\%$$

	BOOM LENGTH, FEET	OPER. RAD. FEET	BOOM ANG. DEG.	BOOM ELEV. FEET	CAPACITY POUNDS
1	22	81.4	125.6	285,000*	
2	26	80.1	125.3	271,700*	
3	26	79.4	125.0	259,800*	
4	26	78.5	124.6	235,300*	
5	30	77.5	124.2	212,100	
6	32	76.5	123.7	192,400	
7	34	75.8	123.4	176,600	
8	36	75.1	122.7	162,800	
9	38	73.5	122.1	150,900	
10	40	72.5	121.5	140,500	
11	45	70.0	119.8	119,500	
12	50	67.5	117.8	103,700	
13	55	65.2	115.5	90,700	
14	60	62.2	113.1	81,300	
15	65	59.4	110.3	73,100	
16	70	56.6	107.2	66,200	

Figure 6: Calculating tandem lifts

A.2 Tag lines

Tag lines are only used in normal operating conditions to adjust the position of a load that is stable and under full control of the crane or powered equipment operator. Tag lines must be free of knots and fraying.

Tag lines can introduce risk and are only to be used after risk assessment. Consider the following before executing the lift:

- Personnel being struck by a dropped object when retrieving a tag line that is in close proximity to the load
- Tag line becoming tangled around the body, limb, and/or hand of personnel
- Tag line becoming snagged on an adjacent fixed structure
- Length of tag Line
- How tag lines will be recovered without going under suspended load
- The proximity of personnel to the load

A.3 Wind conditions

The Construction Plant-hire Association, together with the UK Health and Safety Executive, has produced Technical Information Note 020, *The Effect of Wind on Tower Cranes in Service*. Readers are recommended to consult this document in full, available here: <https://www.cpa.uk.net/tower-crane-interest-group-tcig-publications/>.

Summary of key points from TIN 020⁵:

- Strong winds may swing suspended loads out of balance and radius, making a mobile crane unstable:
 - For large light loads, such as formwork panels/shutters, a mobile crane may become unstable at wind speeds some way below the crane's design limiting wind speed

⁵ Construction Plant-hire Association and UK Health and Safety Executive. "Tower Crane Technical Information Note 020: The Effect of Wind on Tower Cranes In Service". 2014.

- Where low density loads with a large area in relation to their mass are being lifted the maximum in-service wind speed must be reduced in accordance with the crane manufacturer's instructions.
- Operators should not lift a load if they do not feel that they can maintain full control of it.
 - An operator's decision to take a crane out of service should not be overridden by management under any circumstances
- Operators should monitor the wind speed constantly, using the anemometer display in the cab, if fitted.
 - Operators should take the mobile crane out of service before the limiting wind speed is reached.
 - Putting the crane in the out of service condition should be carried out by following the procedure set out in the manufacturer's instructions manual.
 - Note: For offshore cranes, lifting operations should strictly follow the offshore Manual of Permitted Operating (MOPO) wind speed limit for the respective facility/platform.
- During the planning of all lifts, take into consideration the anticipated wind speeds from site-specific weather forecasts.
- Lifts should not be started in rising winds.
 - Most weather forecast wind speeds are for a height of 10m above ground and should be corrected for greater heights.
 - In open countryside, wind speed increases with height as shown in the table below:

Height above ground (meters)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Wind speed multiplier	1.00	1.10	1.17	1.22	1.26	1.29	1.32	1.35	1.37	1.39	1.41	1.43	1.44	1.46	1.47

- In city centre locations, nearby buildings can have a very significant influence on wind forces, often providing shelter if at the same height as the crane, however local wind loads can be increased in some situations. Where surrounding buildings are significantly taller they will often generate increased wind loading on nearby lower cranes.

These points, together with site-specific factors, should be considered when carrying out a risk assessment as part of the lift planning process. There are formulas to calculate the allowable wind speed for a specific lift as per standard practice and manufacturer's instructions. An engineer should be contacted for this calculation.

A.4 Overhead powerlines

During the planning of any lift, it is important to determine if any part of the equipment, load line, or load (including rigging and lifting accessories) could get close to a power line. If so, consider the following options:

- Option 1: De-energize and ground. Confirm from the utility owner/operator that the power line has been deenergised and visibly grounded at the worksite.
- Option 2: Ensure sufficient clearance in consultation with the utility owner/operator and in compliance with regional regulations
- Option 3: Use Table B4 to determine if any part of the equipment, load line or load (including rigging and lifting accessories), while operating up to the equipment's maximum working radius in the work zone, could get closer than the minimum approach distance of the power line. If tag lines are used, they must be non-conductive.

This table is provided for guidance only; please confirm clearance distances with local legislation to ensure compliance.

Table A1: Minimum clearance distances⁶

Voltage (nominal, kV, alternating current)	Minimum clearance distance (meters)
up to 50	3
over 50 to 200	4.5
over 200 to 350	6
over 350 to 500	7.5
over 500 to 750	10.5
over 750 to 1,000	13.5
over 1,000	(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: The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.

This section has been adapted from Occupational Safety and Health Administration *Cranes and Derricks in Construction; Final Rule* - Federal Register/Vol. 75, No. 152/Monday, August 9, 2010, which is available from <https://www.govinfo.gov/content/pkg/FR-2010-08-09/pdf/2010-17818.pdf>.

⁶ United States Department of Labor, Occupational Safety and Health Administration. 29 CFR Part 1926 Cranes and Derricks in Construction; Final Rule. 75 CFR § 1926.1408 2010, page 48144.

Appendix B: Example roles and competence matrix

Notes about the competence matrix:

- 1) Proven experience supplemented with associated certification should be understood as the main factor of competence assurance.
- 2) Other international standards, certification, and/or experience equivalent to that listed in the table, can be acceptable if approved in writing by the relevant Approved Competent Person.

Generic Job Title	Main Purpose	Legislation [most relevant]	Level of Competency – Offshore	Level of Competency – Onshore
SLCP	Approval of lift plans & controls the execution of site lifting operations	LOLER ⁷ applicable	CPCS Appointed Person or ECITB Level 4 Appointed Person Moving Load or EAL Certificate of Competency Level 2 A+B+C or OPITO LOLER Competent Person	CPCS Appointed Person or ECITB Level 4 Appointed Person Moving Load or EAL Certificate of Competency Level 2 A+B+C or OPITO LOLER Competent Person or NPORS Appointed Person
		US applicable	API Qualified Offshore Rigger (Advanced API RP 2D 2-day Course)	NCCCO – Certified Lift Director or NCCCO Mobile Crane & NCCCO Rigger Level II
Rigger	Uses portable lifting equipment to perform lifting operations (e.g. chain block, hoists, Tirfors)	LOLER applicable	SVQ/NVQ Level 3 Moving Loads/ Technical Services or ECITB Level 3 Moving Loads / Technical Services or EAL Certificate of Competency Level 2 A+B or OPITO Stage 3 Rigger or NPORS Rigging and Fleeting Loads	SVQ/NVQ Level 3 Moving Loads/ Technical Services or ECITB Level 3 Moving Loads / Technical Services or EAL Certificate of Competency Level 2 A+B or OPITO Stage 3 Rigger or NPORS Rigging and Fleeting Loads
		US applicable	API Qualified Offshore Rigger (Advanced API RP 2D 2-day Course)	NCCCO – Certified Rigger Level II

⁷ UK HSE Lifting Operations and Lifting Equipment Regulations 1998 (LOLER)

Generic Job Title	Main Purpose	Legislation [most relevant]	Level of Competency – Offshore	Level of Competency – Onshore
Banksman	Gives instructions to equipment operators	LOLER applicable	ECITB Level 2 Lifting and Slinging Engineering or EAL Certificate of Competency Level 2 A+C or OPITO Stage 3 Banksman	ECITB Level 2 Lifting and Slinging Engineering or EAL Certificate of Competency Level 2 A+C or OPITO Stage 3 Banksman or NPORS
			API Qualified Offshore Rigger (Advanced API RP 2D, 2-day Course)	NCCCO Certified Signal Person
Slinger & Load Handler	Connects the load to the lifting equipment	LOLER applicable	Completed EAL Certificate of Competency Level 1 A+C or OPITO Stage1 Banksman Slinger, working towards Stage 2. or ECITB Level 2 Lifting and Slinging Engineering or NPORS Slinger Signaller	Completed EAL Certificate of Competency Level 1 A+C or OPITO Stage1 Banksman Slinger, working towards Stage 2. or ECITB Level 2 Lifting and Slinging Engineering or NPORS Slinger Signaller
			API Qualified Offshore Rigger (API RP 2D, 2-day course)	NCCCO Certified Rigger Level I
			Equipment familiarisation and ECITB Level 2 Lifting and Slinging Engineering or EAL Certificate of Competency level 2+ B or NPORS Operators Training (Note Courses are specific to equipment type)	Equipment familiarisation and ECITB Level 2 Lifting and Slinging Engineering or EAL Certificate of Competency level 2+ B or NPORS Operators Training (Note Courses are specific to equipment type)
Powered Lifting Equipment Operator (e.g. winches, air hoists)	Operator of powered lifting equipment	LOLER applicable	Equipment familiarisation and API Qualified Offshore Rigger (Advanced API RP 2D 2-day Course)	Equipment familiarisation and NCCCO Certified OHC Operator
			Equipment Familiarisation and Stage 3 Operator (e.g. Sparrow, Enermech) or Norwegian G5 Operator)	Not Applicable
Offshore Crane Operator [Dynamic lifts]	Operator of an offshore crane in dynamic & non-dynamic conditions	LOLER applicable	Seatrax 3-day advanced crane operator course completed every 4 years (stage 2 crane operator) 1-day crane simulator assessment conducted at HOLC and completed every 4 years.	Not Applicable

Generic Job Title	Main Purpose	Legislation [most relevant]	Level of Competency – Offshore	Level of Competency – Onshore
Onshore Crane Operator	Operator of an onshore crane	LOLER applicable	Not Applicable	Equipment Familiarisation and Licenced by local authority (Government or regulatory board)
		US applicable	Not Applicable	Equipment Familiarisation and Licenced by local authority (Government or regulatory board) and NCCCO Certified Crane Operator
Technician [Can only work under adequate supervision or held to appropriate level of competency detailed for the role being undertaken]	Engineering trade Technician that uses lifting equipment to install, repair or maintain mechanical or process equipment	LOLER applicable	Completed EAL Certificate of Competency Level 1 A+C or OPITO Stage1 Banksman Slinger, working towards Stage 2. or ECITB Level 2 Lifting and Slinging Engineering	Completed EAL Certificate of Competency Level 1 A+C or OPITO Stage1 Banksman Slinger, working towards Stage 2. or ECITB Level 2 Lifting and Slinging Engineering
		US applicable	API Qualified Offshore Rigger (API RP 2D 2-day course)	NCCCO Certified Rigger Level I
Forklift Operator	Operator of a forklift [onshore or offshore]	LOLER applicable	CITB Forklift Operator CPCS Forklift Operator RITITB Forklift Operator NPORS Forklift Operator	CITB Forklift Operator CPCS Forklift Operator RITITB Forklift Operator NPORS Forklift Operator
		US applicable	OSHA 29 CFR 1910.178	OSHA 29 CFR 1910.178
Forklift Banksman	Gives instructions to forklift operators	All areas	See Banksman above	See Banksman above
Lifting Equipment Inspector	Person responsible to thoroughly examine and test lifting equipment	LOLER applicable	LEEA Qualified for the class of equipment being inspected.	LEEA Qualified for the class of equipment being inspected.
		US applicable	Qualified API lifting equipment inspection & maintenance course.	NCCCO Crane Inspector
		All areas	Classification society certification	
Rigging Loft Controller	Person responsible to manage and issue equipment from the rigging loft	All areas	Trained in either Rigging Loft Management Course or Equipment Inspection Course	



This Report hopes to enable a significant reduction in lifting incidents among IOGP Member Companies and our contractors by highlighting the essential principles of safe lifting and encouraging their strict application to lifting and hoisting operations.

Secondly, this report aims to assist those responsible in planning, managing, and controlling lifting and hoisting operations by providing high level principles and operative questions to check safety and technical compliance at working sites.

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