International Regulators' Forum
Lifting Working Group

Guidance on using the IRF lifting inspection templates

November 2007

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NOTE 1
This guidance document and the accompanying four inspection templates have been drafted for international use. Some terms and definitions may mean different things in different countries. For example, in Canada and the USA a 'rigger' is the person who attached the slings to the load. In Norway and the UK, a 'rigger' is an experienced person who undertakes complicated lifts using a variety of loose lifting equipment, often involving lifting and cross hauling etc. Some of the more common terms are described in section 5.

The templates refer to a wide variety of guidance documents, some more common in parts of the world than others. Where a choice of guidance is provided, it is suggested that the inspector follows the guidance more commonly used in that part of the world.

1. INTRODUCTION

Crane operation is an inherent part of offshore oil and gas operations in all geographic provinces. Crane operations are used to lift material and personnel to and from onshore and offshore facilities and marine vessels utilizing large permanently or temporarily installed fixed cranes. Cranes are also used to assist with various installation operations. However, the use of cranes during these operations is not without risk and these risks generally relate to exposure of equipment to ever-changing weather conditions and to the variety of lifting operations encountered.

Injuries and dangerous occurrences arising from lifting operations account for a significant proportion of the total of those occurring offshore. For example, in the period 1998 to 2003, lifting and mechanical handling accounted for about 20% of all reported incidents on the UKCS. A similar pattern is thought to exist worldwide.

The International Regulators' Forum (IRF) is an informal group of offshore oil and gas regulators from Australia, Brazil, Canada, Netherlands, New Zealand, Norway, UK, and USA. The IRF decided that it would be beneficial to look at the worldwide lifting picture to review national initiatives and to share best practice in order to improve our effectiveness in regulating these risks.

Our initial survey identified that the top five concerns were:

- Planning of lifting operations,
- Competency assurance,
- Maintenance,
- Man riding using winches, and
- Incident analysis.

Following the International Regulators' Offshore Safety Forum conference in April 2005, a mandate was given to develop a global regulatory strategy to address lifting operations. This document introduces that strategy.

At the same conference, the International Association of Oil and Gas Producers (OGP) pledged to develop global guidance[1] for offshore lifting operations. It was agreed that this new guidance could be used as one of the main benchmarks to inform regulatory enforcement.

2. KEY POINTS OF THE REGULATORY STRATEGY

The aims of the strategy are to:

- Achieve a sustained reduction in injuries,
- Raise awareness of the offshore workforce to the risks and control measures associated with offshore lifting, and to
- Capture best practice in the industry.

The strategy addresses:

- inspection,
- investigation, and
- incident analysis.

Inspection is addressed by using a series of templates covering the priority concerns identified above. **The purpose of the inspection templates is to target our resources to the key areas of concern and to provide a consistent means of reporting back the findings into a central database using a simple traffic light system.**

It is not intended that ALL of the templates be completed during a single inspection. Inspectors should use their discretion to balance priorities and complete what templates they can in the time available.

The strategy proposes a common methodology to determine the root causes of investigated lifting incidents. On completion of a lifting incident investigation, inspectors are asked to complete an investigation report form comprising very brief details of the incident along with the root causes codified in a prescribed way. This is to enable the analysis of a large number of lifting incidents to identify trends and topics that may require more focused intervention.

The summaries of the findings arising from inspection and investigation are saved in a central database. Reports of the findings derived from the database will be published periodically on the IRF web site (www.irfoffshoresafety.com).

3. INSPECTION

Each regulator will continue to decide which installations are to be inspected and how often. Where lifting operations are to be inspected, regulators are asked to use the IRF templates to assess compliance in the topic areas of planning, competency assurance, maintenance, and man riding. Other aspects of lifting operations may be inspected but there is no requirement to report back on these centrally.

3.1 Inspection Templates

An inspection template is provided for each of the four priority topic areas. Supplementary guidance giving pointers on the benchmarks expected is provided in section 3.2 of this handbook.

Some of the template questions and comments are highlighted in bold font. **These are the key issues on which to form your judgement when assigning a traffic light score.** The other questions (in normal font) are there to act as prompts; these may be asked at the inspector's discretion.

The templates are aimed mostly at offshore inspection. However, strategy / policy issues and monitoring / auditing issues may need to inspected onshore. Generally, onshore issues should be addressed to the persons responsible for setting technical standards and to those responsible for controlling resources required to implement safe lifting operations. Offshore issues are normally addressed with the crane operator, riggers, deck crew, supervisors and maintenance staff etc.

Every template includes a Template Response Form to summarise the findings. This is described below in section 3.1.3.

3.1.1 Inspection Report Format

Each regulator has their own house style and reporting procedures. These remain the same and each regulator will complete their inspection letters and reports in their normal way. For the purpose of the IRF initiative, the only additional work is to complete the Template Response Forms and then send them to your local IRF database administrator (see section 5). Every template includes space to record notes made during the inspection. These are not required for the database.

3.1.2 Traffic lights

To simplify the presentation of the inspection findings, the Template Response Forms adopt traffic light scoring to summarise the result of inspections. The traffic light colours are defined as follows:

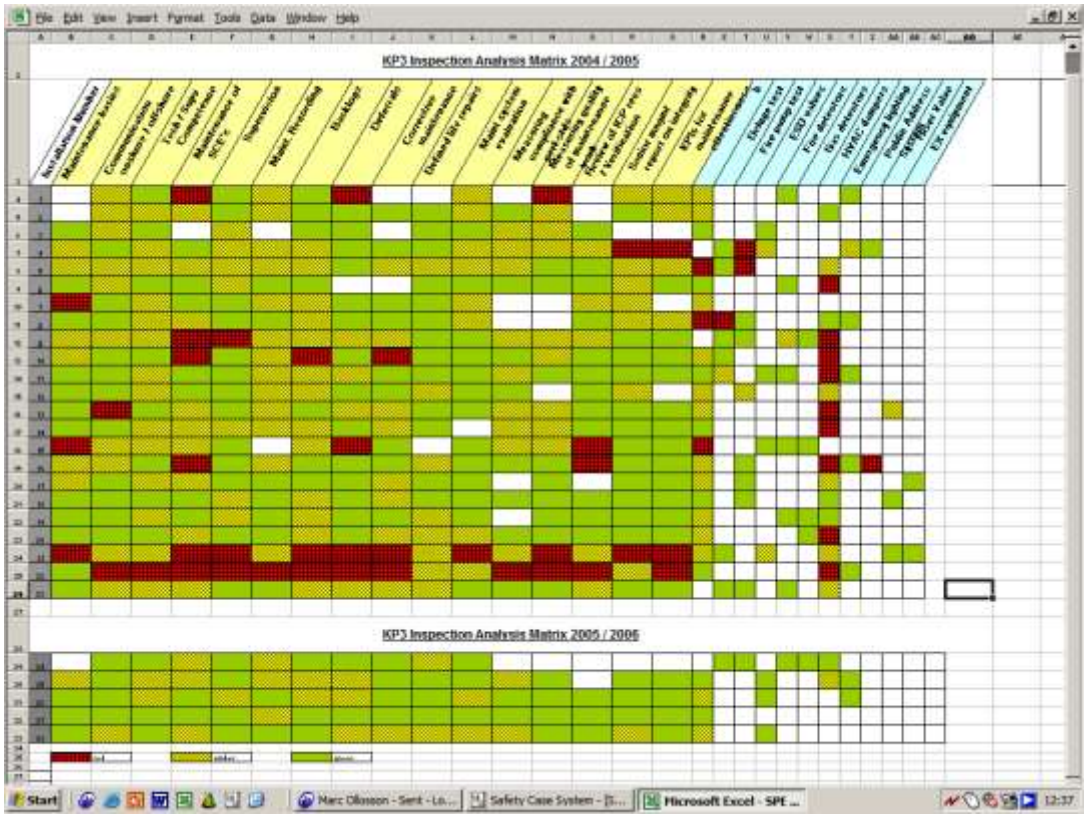
NON COMPLIANCE / MAJOR FAILING **ENFORCEMENT ACTION**	A degree of non-compliance with legislation that warrants some form of enforcement action; e.g. a letter, an enforcement notice, or prosecution.
ISOLATED FAILURE / INCOMPLETE SYSTEM **NEEDS IMPROVEMENT**	Where duty holder is considered to be not fully compliant with legislation. As a minimum, issues in this category should be raised in the letter to the duty holder, but may also include the use of notices.
IN COMPLIANCE / OK **MEETS EXPECTATIONS**	Inspected but with no significant issues found, complies with regulations etc.
NOT EVALUATED	The topic was not inspected or the responses were unclear and should re-inspected at later date. Issues in this category should include an explanatory note

Following the inspection, evidence should be assessed and professional judgement applied to decide, in the normal way, what, if any, enforcement action should be taken. Where enforcement action has been taken, the corresponding traffic light will be amber or red. There is no change to any of the regulators' enforcement strategy.

Traffic lights are a powerful indicator of duty holder performance, allow comparison, and can identify generic issues.

For example, in the illustration below, each row represents an individual installation, and each column represents an inspection topic (yellow header) or a system test (blue header).

The two installations represented in rows 21 and 22 were awarded a very large number of red traffic lights. Both installations were subject to formal enforcement action. The system test represented by the seventh column (blue headers) also shows many reds. This indicates a generic problem and an industry / regulator working group was established to identify best practice and make recommendations to secure an improvement in safety.



3.1.3 **Template Response Form**

The Template Response Form is an electronic form used to record a summary of the inspector's findings, including any action taken. The form also includes space to record any items that the inspector regards as 'best practice' so that it can be promulgated to the industry. Inspectors should be clear in their reporting as to why they have chosen the traffic light they have.

It should be noted that the traffic light response recorded should describe the worst finding against the template questions. Further details of findings may be provided in the description boxes against the specific questions asked.

On completion of each electronic Template Response Form, it should be e-mailed to the local IRF database administrator who will ensure that the information contained within the form is added to the IRF lifting database.

Example of a completed template response form

Template #:	MAINT3	NOTE: Drop Down List for each template
Template Name:	MAINTENANCE ACTIVITIES	NOTE: Drop Down List or Automatically Filled Based on Template #
Country:	CANADA	NOTE: Drop Down List for each Country
Duty Holder:	#1 OIL EXPO CO	NOTE: Drop Down List for each Duty Holder
Facility Owner:	MEGABUCKS INC	NOTE: Drop Down List for each Facility Owner
Installation:	JACK UP DRILL III	NOTE: Drop Down List for each Installation
Installation Type:	FLOATING INSTALLATION	NOTE: Drop Down List for each Installation Type
Date:	23 / JUN / 2006	NOTE: Should have set format for this field.
Traffic Light:	**RED**	NOTE: Four Items in Drop Down List – Red, Amber, Green & White (Could have definitions set up for each)
Description of Any Non-compliance Issues:	RED West crane operated with hoist rope having severe local damage – core protruding through outer strands. Immediate discard required AMBER The last weekly crane inspection was carried out 12 days ago.	
Action Taken:	Notice served - prohibited use of crane until hoist rope replaced	
Examples of Best Practice:	None	
Submitted By:		Date:

3.2 Guidance for use of Inspection Templates

3.2.1 Maintenance of Lifting Equipment Inspection Templates

The purpose of the maintenance templates are to aid regulatory inspectors in the inspection of the effectiveness of a duty holder's maintenance arrangements for offshore lifting equipment. There are five inspection templates covering relevant topics of enquiry.

As there is a very wide range of lifting equipment used offshore, the scope of the templates has been limited to the maintenance of pedestal cranes and lifting accessories used to secure a load to the crane hook. These are described in Section 3.2.1.2 and 3.2.1.6 respectively. However, the principles described in these templates can be used to assess the maintenance of other lifting equipment.

3.2.1.1 Overview

Maintenance is *"the combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function*". For the purposes of satisfying national legislation, maintenance can be defined as the process of ensuring that plant and equipment is preserved in a suitable condition to ensure that it continues operates safely. However, from the user's perspective, maintenance has a wider scope and includes other actions to ensure that the equipment operates efficiently and productively with the aim of reducing operating costs by maximizing the time that the machinery is available for use.

In order to secure the above objectives, maintenance must be managed effectively. Maintenance should be incorporated into the duty holder's safety management system (SMS). Typically, the SMS is organised along similar lines to the POPMAR model (Policy, Organisation, Planning & implementing, Monitoring, Audit, and Review) – see HSG 65[7]. A structured approach to auditing the effectiveness of a maintenance management system needs to address the following areas:

a) Maintenance basics (strategy, asset register, prioritisation etc)
b) The level of support provided by onshore technical authorities to offshore maintenance technicians
c) Competency assurance of technicians and their supervisors
d) Identification and maintenance of safety critical elements
e) Supervision of maintenance technicians
f) Recording of completed maintenance work
g) Backlogs (what triggers extra resource?)
h) Technical justification for deferrals
i) Corrective maintenance
j) Temporary repairs

k) Measuring the effectiveness of the maintenance system
l) Measuring the quality of maintenance work
m) Third party thorough examination / verification
n) Review of audit recommendations
o) Reporting to senior management

Advice on assessing the effectiveness of a maintenance management system is provided in reference. [8]

Maintenance should be assessed by inspecting both the condition and functionality of plant, and by inspecting the maintenance system. The purpose of assessing the maintenance system is to determine whether the condition of the plant arises through good management or by accident. Onshore, the inspection should focus on the persons who control the resources required to implement an effective maintenance system, and those responsible for setting the technical standards to ensure that the correct maintenance is carried out to an acceptable quality. Offshore, the inspection should address those who supervise and control maintenance activities offshore, and those who actually carry out the work.

3.2.1.2 Strategy for Crane Maintenance (MAINT1)

Crane maintenance should be carried out in accordance with the manufacturer's instructions. Those instructions are based on the designer's anticipated usage and known limitations and life of the components that comprise the crane. However, with older cranes the manufacturer may have ceased trading, so a competent authority may need to be consulted. The maintenance strategy should take account of the crane duty, usage, condition, and equipment criticality. Assessment of equipment criticality should include both the consequence of failure and its probability. The assessment of the probability of failure is implicitly expressed by the maintenance interval, which should be guided by field experience, maintenance history, and known causes of in-service degradation.

An effective crane maintenance regime should identify failure modes and their consequences. Studies such as FMEAs (Failure Modes and Effects Analysis) and FMECAs (Failure Modes, Effects and Criticality Analysis) are useful tools to help prioritise where maintenance resource should be directed. From these studies, appropriate Preventative Maintenance Routines (PMRs) should be devised to ensure that deterioration is detected and remedied before it results in unacceptable risk. The scope, nature and frequency of the PMRs should reflect the deterioration mechanisms identified (e.g. corrosion, wear and fatigue) and the consequence and likelihood of failure. Typically, components at risk include structural elements such as the boom etc, and mechanisms such as the hoists and brakes.

Particularly at risk, are some older cranes, having hoisting and braking systems that contain 'single line components'; the failure of one such component will result in the failure of the system. This failure will almost always result in the uncontrolled lowering of the boom and/or the load. It is therefore essential to ensure any such components are identified and that maintenance and inspection activities are sufficiently robust to ensure the continued integrity of these systems. HSE Safety Notice 2/2005[9] describes typical actions expected of duty holder to demonstrate such integrity.

Typically, maintenance includes a combination of pre-use checks, in-service inspection, routine preventative maintenance, condition based maintenance, repair, testing, and third party thorough examination / verification. Each of these activities is essential if the crane is to function safely and reliably.

The maintenance system subject should be subject to an internal or external audit. Non-conformances identified during audit should be reviewed and corrective action taken.

3.2.1.3 **Pre-Use Checks & In-Service Inspections (MAINT2)**

Pre-use checks include visual checks and functional tests carried out by the crane operator at the start of each shift. Their purpose is to ensure that the crane has not suffered any obvious damage or failure, and is safe to go to work.

In-service inspections are carried out by the crane operator or qualified inspector, generally at weekly or monthly intervals, and cover items additional to the pre-use check.

The crane operator should have received appropriate training, information and instruction to carry out a pre-use inspection of the crane.

A defect reporting system should be in place to alert a competent person to assess the significance of defects found and to take remedial action where appropriate.

Infrequently used cranes, such as those found on a normally unattended installation may require more detailed inspection prior to use. Such cranes will be subject to corrosion and sticking of moving parts etc. Also, they are unlikely to have a regular crane operator undertaking these checks so gradual deterioration may go unnoticed.

Detailed guidance on the scope and nature of pre-use checks and in-service inspections is provided in the manufacturer’s handbook. A typical list is also found in OPG guidance Appendix 11.

3.2.1.4 Maintenance Activities (MAINT3)

Cranes must be maintained by competent technicians who have access to specialist technical advice should they encounter an unfamiliar situation.

Maintenance work orders are usually produced automatically by a computer based maintenance system. Technicians need to be able to obtain work orders and reports etc from the system. They also need to enter data on completion of maintenance work.

For crane maintenance to be effective, it should be adequately resourced. Backlogs in crane maintenance indicate that other areas are getting priority. Should crane maintenance need to be deferred, the effect on safety needs to be technically evaluated and justified.

Design modifications and replacement of parts that are not 'like-for-like' should be assessed under the duty holder's 'management of change' process.

3.2.1.5 Thorough Examination & Expert Verification (MAINT4)

Thorough examination means *"Examination by a competent person in such depth and detail as the competent person considers necessary to enable them to determine whether the equipment being examined is safe to continue in use".* In the context of this document, the terms 'thorough examination' and 'expert verification' have the same meaning. Both provide a safety barrier additional to maintenance activities where the lifting equipment is examined by a third party. Thorough examination is normally carried out by third parties to ensure that the competent person is independent of those undertaking maintenance so that they can take decisions without fear or favour.

Thorough examination is carried out:

a) To ensure new lifting appliances are safely installed,
b) Periodically, to detect in-service deterioration, and
c) Following exceptional circumstances, such as overload, repairs to load bearing parts, and accidental damage etc.

Thorough examination should be carried out in accordance with a written scheme devised by a competent person. The scheme should identify and describe the examinations necessary, including visual observation and testing.

Typically, a scheme of examination would include:

- Contact details of the competent body drawing up the scheme.

- A means of identifying the crane (e.g. make, model, location and serial number etc)
- Information and references used in drawing up the scheme. This may include the manufacturer's manuals, or specific information from the designer on the design life of the crane structure and mechanisms.
- Identification of those safety critical parts of the crane requiring thorough examination. This should include the load management system.
- Details of the scope, nature and frequency of the thorough examination of those safety critical parts and the acceptance criteria. Note, the nature and frequency of the examination will vary from part to part.
- The competent person may require the opening up of concealed or encased parts by a skilled person at the time of the thorough examination, or alternatively will require evidence that such internal examinations have been undertaken and then review the results of those examinations. Note should also be taken of the manufacturer's instructions.
- A review of the complete maintenance history should be carried out by the competent person.
- An indication of any specialist work required such as non destructive testing, grease sampling, and load testing etc. Testing can take many forms, including functional testing, performance testing and overload testing. The precise scope and nature of the testing required is at the discretion of the competent person and must be defined in the scheme of examination.
- Details of any data logging system, where fitted to the crane, including a listing of the parameters monitored and the means by which data retrieval, monitoring and storage is achieved. Describe any changes to the crane condition, or operational parameters that would require a review of the scheme. These may include damage to the crane structure, or change of use.
- The date at which the scheme should be next reviewed.
- The life of the crane should be periodically reviewed taking into account actual service compared to design life (data logger can be used to inform this process).

The competent person undertaking the thorough examination should issue a report of their findings. Deficiencies should be clearly identified along with an indication of their severity and the necessary remedial action.

The OMHEC Standard – *Competence and skills requirement for an Enterprise of Competence (EOC) of offshore cranes*[10] outlines the competence requirements for business organizations and personnel involved in expert verification of offshore cranes and the tasks involved in expert verification. The document defines expert

verification as: *An examination and testing by an enterprise of competence in order to assess whether lifting equipment is in compliance with the requirements of the regulations and is assembled and maintained in a fully satisfactory manner.* From a regulatory standpoint, this means an examination that will ensure that the crane is suitable for its intended use and is maintained as required by national legislation.

The "enterprise of competence" is the competent person organization that undertakes "expert verification" tasks. The OMHEC standard defines the competencies that such a body needs in order to exercise those tasks. The OMHEC guidance recommends duty holders *approve and implement an expert verification scheme.* Elements of the scheme include:

- Appointing an EoC to be responsible for expert verification
- The EoC develops a written scheme for expert verification
- The duty holder approves and implements the scheme
- The duty holder appoints contractors to:
    - Organize work in accordance with the scheme
    - Carry out inspection
    - Monitor technical integrity
    - Carry out maintenance
    - Carry out repairs
- Periodically review the scheme

Expert verification covers the same ground as maintenance and thorough examination, but formally ties the two together into an integrated whole. Essentially, it provides part of the monitoring function of the SMS used to control crane maintenance. The advantages for the duty holder are improved clarity and control. Annex H of Norsok R-003[11] gives practical advice on the implementation of an enterprise of competence.

3.2.1.6 **Management of Lifting Accessories (MAINT5)**

Lifting accessories are used to connect the load to the crane hook. Typically, they include pennants, wire rope slings, fabric slings, shackles and eyebolts etc. Lifting accessories are designed with relatively high factors of safety because they are frequently subject to misuse. Misuse takes many forms including overloading, dynamic shock loading, incorrect slinging, and deterioration due to poor storage. Such misuse can substantially reduce their life and increase the risk of failure.

Lifting accessories used offshore are normally kept in a secure rigging loft with access restricted to authorised persons. Correct storage reduces the risk of accidental damage, slows down the onset of deterioration and prevents unauthorised use.

The issue and return of lifting accessories from the rigging loft should be subject to a procedure (often 'T-cards' are used). The procedure should include provision for a pre-use check of the accessory's condition. Riggers should be competent in the identification of defects and deterioration.

The rigging loft should be provided with a clearly marked quarantine area for lifting accessories that are not fit for service. Some rigging lofts have separate designated areas for the storage of fabric slings.

Lifting accessories should be subject to a thorough examination by competent person, typically every 6/12 months according to national requirements. A person should be appointed with responsibility for ensuring this happens. Lifting accessories are often colour coded to help identify and take out of service items whose examination period has expired. If the rigging loft is set up inside a container, it is often more convenient to exchange the complete loft. Further guidance on the inspection, certification, and colour coding of lifting accessories is provided in the OGP *Lifting and Hoisting Recommended Practice*[1], page 8 and Appendices 9 and 10.

Careful planning is required to select a suitable range and number of lifting accessories with which to stock the rigging loft. Sufficient spares should be held to take account of loss or damage.

Major engineering works (such as installing a new gas turbine) will involve non-routine lifting and rigging activities. Frequently, such jobs are planned onshore and all of the equipment, including lifting accessories, may be provided as a complete package. These lifting accessories should be subject to procedures and controls equivalent to those employed in the rigging loft.

3.2.2 Planning & Control of Lifting Operations Inspection Templates

The purpose of the planning templates are to aid regulatory inspectors in the inspection of the effectiveness of a duty holder's planning of lifting operations. There are three inspection templates which covers the planning of all lifting operations.

3.2.2.1 Overview

All lifting operations must be properly planned to ensure that they are carried out safely and that all foreseeable risks have been taken into account. Procedures should be documented and approved for each type of lifting operation to provide guidance on how the lift will be safely conducted and to outline the responsibilities of those attending to the lift. Planning should be carried out by competent

personnel who have appropriate knowledge for the lift being undertaken.

The first step is to define the lift. This should take account of:

- the load, including its weight, size, fragility, centre of gravity, and the method of slinging
- the handling route, including pick up point, set down area, proximity hazards, deck space, identification of blind spots, changes of level, and measures to prevent personnel from entering the area, etc
- environmental conditions including sea state, wind speed and daylight.

For routine or repetitive lifts, generic risk assessments and lifting plans may already exist and these should be used once it has been confirmed that they remain valid. However, most accidents occur during routine lifts because most lifts are routine. Also, personnel can mistakenly consider that a 'routine' lifting operation is a 'safe' lifting operation. This can introduce a risk of complacency leading to reduced awareness of hazards introduced should conditions change during the lift.

Further guidance on the planning and control of lifting operations is provided in the OGP *Lifting and Hoisting Recommended Practice*[1], pages 3 – 5 (Sections on Planning and Control) and Appendices 1 and 2.

3.2.2.2 Hazard Identification & Risk Assessment (PLAN1)

Every lifting operation should be risk assessed before the work begins. Advice on the risk assessment process is provided in the Step Change Task Risk Assessment Guide[2]. The guide includes example Risk Assessment Matrix charts to help decide the level of risk. It also includes example risk assessment forms to record initial risk assessed, the control measures put in place and the level of residual risk.

Typically, the hazards to be considered during lifting operations include but may not be limited to:

- Dropped load from a variety of causes such as inappropriate slinging, etc
- Crushing injuries from swinging / overturning loads
- Tripping and proximity hazards
- Falls from height during slinging
- Equipment failure
- Changes in environmental conditions
- Lighting at the pick-up and set-down areas
- Use of taglines
- Communication barriers (differences in languages)

If, during the execution of a lifting operation, there is a change in operational conditions or in the assumptions on which the risk assessment was based, the lifting operation should cease and the assessment and lifting plan should be reviewed. Any changes should be documented to improve learning for subsequent lifts.

Categorising the lift helps to identify the degree of risk, the necessary control measures, and the extent of planning required. It also helps define whether the person planning the lift is competent to do so, or whether he/she will need to ask for assistance from a technical authority for some of the more difficult lifts.

Lifts are normally categorised as routine or non-routine. Typically, non-routine lifts may be categorised further into simple / complicated / complex. An example lift categorisation scheme is described in Appendix 1 of the OGP guidance[1]. Examples of the documentation and controls required are given for each the category.

3.2.2.3 **Suitability of the Lifting Plan (PLAN2)**

All lifting operations should have a lifting plan supported by an analysis of the hazards and risks. The detail required is related to the risk and complexity of the lift. Frequent or routine tasks may only require a generic lifting plan supported by an onsite hazard identification and risk assessment and team briefing whereas other, more complex lifts may need further engineering design and analysis. Generic lifting plans may be appropriate for a series of similar or routine lifts but should be subject to periodic formal review.

The lift plan should take into consideration the additional logistics required as well, which will include lift planning, supply vessel and installation deck space, simultaneous operations, the sequence of lifts and the cargo manifest.

The lift plan should describe:

- The number of personnel required, their specific roles and competencies, and how they will be briefed;
- The nature and weight of the load and lifting points;
- The lifting appliances and lifting accessories required, the method of slinging and the crane configuration;
- Pick up and set down points and constraints such as proximity hazards, changes of level, and blind spots;
- Barriers to prevent personnel from walking or standing under the suspended load;
- Step-by-step instructions, including sketches where appropriate;

- Communication methods (this should take into consideration an agreement on language to be used if there are differences in common language) to be used;
- Restrictions on the lift such as wind speed, lighting, sea state, etc.;
- Access and egress for slinging and un-slinging the load;
- How the lifting operation can be executed safely in relation to simultaneous operations.
- Emergency and rescue plans.

Example lift plans are provided in Appendix 2 of the OGP guidance [1] and in the appendices of the Step Change *Lifting & Mechanical Handling Guidelines.*[3] Note, with both examples, the boxes allocated for the step by step instructions are likely to extend to several pages for a non routine lift.

The lifting plan should include or refer to procedures for landing the load should the lift need to be aborted. The plan should be reviewed by a competent person and the rigour of this review is dictated by the lift category. For lifts to and from the supply vessel, the lifting plan should be communicated to and agreed by both the lifting personnel on the supply vessel and the installation.

3.2.2.4 **Carrying out the Lift in Accordance with the Lifting Plan (PLAN3)**

It is important to communicate the lift plan and associated hazard identification and risk assessment to those persons who will undertake the lift. Typically, this is done by face to face discussion during a tool box talk. Sketches and diagrams help explain details in the lifting plan and can be used to prompt discussion and review.

A key outcome of the toolbox talk is to allocate a person to be in charge of the lift. It is their responsibility to ensure that the lifting operation is carried out in accordance with the lifting plan. They should also ensure that everyone taking part in the lifting operation is aware of their task and responsibilities and the procedure to be followed.

It is safe practice for one person to attach the load to the crane hook (load handler or slinger) and for another person (the banksman / signaller / flagman) to give instructions to the crane operator. Where control of the load passes from one team to another, handover must take place using an agreed form of signalling.

Lifting operations must be managed effectively.

- Someone must have overall responsibility for the ensuring that the lifting operation is managed in a safe and environmentally sound manner.

- Someone must be responsible for planning the lifting operation, undertaking the risk assessment, and preparing a method statement.

Someone must supervise the lifting operation and ensure compliance with the lifting plan, risk assessment and method statement. Duty holders should ensure that a Safety Management System is in place, that specifies company expectations and minimum requirements with respect to the key factors that impact on safe lifting operations, including, but not necessarily limited to the following:

- Personnel roles and responsibilities
- Suitable lifting equipment and accessories
- Procedures that document how lifting operations are to conducted
- Clarity of ownership, responsibility, and accountability
- Organization and planning of lifting operation
- Management of contractors and third party equipment owners
- Training, competency assessment, continuous improvement and recertification

Pages 4 and 5 of the OGP guidance[1] describes four key positions in the lifting operation – the Person in Charge (PIC), the Crane Operator, the Banksman and the Load Handler. This document utilizes the descriptions of each position.

Person in Charge (PIC) / Supervisor / Competent Person

The PIC has operational control of the lift. The PIC:

- Is designated as being in charge of coordinating, controlling and executing the lift;
- Reviews the lift plan and ensures that the required controls are in place;
- Ensures that the *lifting equipment* is inspected and appropriate for use;
- Checks that load integrity and stability is satisfactory;
- Ensures that people involved are competent for performing their task, aware of the task and procedures to be followed, and aware of their responsibilities;
- Briefs people involved in or affected by the lift;
- Ensures the lift is carried out following the plan.
- Suspends the lift if changes or conditions (e.g., wind) occur that would cause a deviation from the plan;
- Monitors the performance of all involved personnel to ensure that adequate standards of performance are maintained;
- Checks that there is no deviation from standards for routine lifts;
- Allows for concurrent or simultaneous operations that may affect or be affected by the lift, e.g., helicopter operations, ballast control, other cranes.

Crane Operator

Besides responsibility for proper crane maintenance, the crane operator should ensure before the lifting operation starts, that;

- crane safety limits and alarms are all functioning properly
- safe load indicator (SLI) is set at the appropriate mode (static, dynamic, personnel).

The crane operator's primary responsibility once the lifting operation has started is to:

- ensure the lift is within the SWL capacity of the crane at boom angle
- hoist/boom up the load after the banksman has given the "hoist load" signal
- hoist and slew the load towards the landing area
- lower the load to the approved landing area after the banksman has given the "load lower" signal.
- Raise the load hook once given the signal to do so by the banksman
- stop the lifting operation if something seems to be wrong and consult with the banksman and rigger before resumption. Sound the alert horn if necessary.
- stop the lifting operation immediately if an "emergency stop" signal or instruction is given by anyone.

Banksman

The banksman's prime responsibilities before the lifting operation has started is to;

- ensure area is clear of obstructions and unassigned personnel
- ensure that hi-visible clothing/vest and gloves are worn to indicate the position of authorized banksman.
- review the cargo manifest with the crane operator and rigger
- ensure the load pendants are tagged, properly colour coded and "fit for purpose"
- reject any piece of lifting gear that is suspect
- inspect containers and open baskets to ensure goods are properly stowed
- take a position where line of sight with the crane operator and rigger is clear and with a clear view of the load path.
- be aware and identify escape routes for the lifting deck crew should a problem develop during the lifting operation
- ensure he is in a position to maintain a clear view of the crane operator and load handler during a blind lift.

The banksman's prime responsibility once the lifting operation has started is to;

- give continuous clear signals to the crane operator as to how to move the load
- maintain an overview of the lifting operations area including potential areas where the boom may come in contact with a fixed structure
- report any anomalies that may affect the continued safe operation to the crane operator, and signal the crane operator to stop the operation if necessary.

Load handler

The primary responsibility of the load handler is to;

- review the cargo manifest and be aware of the heaviest lift in the operation to ensure the SWL of the pendants and slings are adequate
- ensure the slings are tagged, colour coded with no visual damaged
- ensure the sling legs are not twisted prior to hook-up
- ensure pins and shackles are properly secured to the pad eyes
- reject any piece of lifting gear that is suspect
- ensure the load hooks, swivels, safety latches are working properly
- attach slings connected to the load, to the crane load hook
- detach slings from the crane load hook after the crane operator has positioned the lift in its final resting place.
- ensure the lead leg of the sling set is draped over the container or positioned on the load, so that the next load handler has quick access to the sling's master link.
- inform the banksman when the slings have been attached or detached
- attend approved tag lines if attached to the load but do not go near, under, or touch the load until the crane operator places it in its final location
- keep unauthorized personnel away from the loading/landing area
- be aware of where the load and banksman are at all times
- be aware of an escape route should a problem develop during the lifting operation that would necessitate a quick exit from the loading/unloading area
- report any concerns with the lifting gear or lifting operation to the banksman

3.2.3 Competency Assurance Inspection Templates

The purpose of the competency assurance templates are to present consistent implementation practices to regulatory inspectors and to aid the inspector in the inspection of the effectiveness of a duty holder's responsibility to ensure that the employees they hire are competent to perform their assigned duties. The IRF recognizes that there is a very wide range of lifting equipment used offshore. There are five templates for competency assurance of personnel.

3.2.3.1 Overview

The objective of the competency templates are to focus on specific training and competence issues, e.g., as defined by the various international training elements that are necessary for personnel involved in lifting operations to perform these operations in an environmentally sound and safe manner. Special emphasis has been placed on the offshore crane operators' elements as they must possess the necessary professional skills and competency to carry out their work safely and efficiently.

3.2.3.2 Competency Assurance Program for All Personnel involved in Lifting Operations (COMP1)

The purpose of this template is to ascertain that the duty holder has ensured that there is an adequate complement of qualified personnel on the competent lifting team to ensure that lifting operations are carried out safely.

The Step Change *Lifting and Mechanical Handling guideline [3] identifies* on page nine the four key stages that an individual has to pass through to reach full competency. It is important to ensure that following completion of stage 1 (initial training and assessment normally undertaken onshore) that persons progressing on to stage 2 do not undertake lifting operations on their own. They should be considered as 'apprentices' and be supervised by a qualified person. The chart on page ten of the guidelines identifies the categories of personnel who undertake lifting and mechanical handling operations and sets out details of the training and competence assessment required.

Page 6 of the OGP guidance *Lifting & hoisting safety recommended practice* [1] offers practical advice on competency issues. Appendix 5 describes example responsibilities and competencies for persons engaged in the planning and execution of lifting operations. Specific responsibilities for the Person In Charge (PIC) are outlined

on page 4. Appendix 6 provides an example of a training matrix for persons involved in lifting operations.

3.2.3.3 Competency Assurance of Person in Charge (COMP2)

The Person in Charge (PIC) is someone who has the required level of competency to plan and supervise lifting operations. The person must have the practical skills, theoretical knowledge and ability to carry out risk assessments, produce and assess lift plans and conduct toolbox talks. The PIC may or may not supervise the lifting operation but is the focal point of authority for the technical aspects of the lift. This person must know their competency limitations, work within them and know when technical support is needed. The level of competency required to perform this role is included in Section 5 of this of the Step Change *Lifting and Mechanical Handling guidelines* [3].

In accordance with Section 5.2 of the Step Change *Lifting and Mechanical Handling guidelines* [3], personnel responsible for managing lifting operations should normally have at least 3 years' operational experience of lifting operations before undertaking the role of the PIC. The formal training prior to the minimum of 3 years' operational experience should be equivalent to that defined in Stages 1 to 3. They must have experience in producing lift plans and should undertake further training in advanced rigging and lifting, where appropriate.

All persons involved in the management of lifting and mechanical handling operations shall receive appropriate training and experience with the type of lift to be undertaken.

3.2.3.4 Competency Assurance of Crane Operators (COMP3)

Crane operators involved in the lifting and mechanical handling operations shall be trained and have the required experience for the type of lift to be undertaken. They also need to be formally assessed as competent.

Detailed guidance is provided in the OMHEC Training Standard *Certificate of expertise requirements for skills and competence for the Crane Operator and Banksman offshore* [5]. This guidance covers training of the banksman (covering the separate roles of load handler & signaller) and of the crane operator. The training standard defines:

- the functions of slinger, signaller and crane operator,
- the necessary skills to fulfill said functions,
- the required training to achieve said skills, and
- the required training facilities.

It also touches upon the basic training skills required by instructors and assessors at training establishments. API RP 2D *Guidelines – Operation and Maintenance of Offshore Cranes* [6], sets out on page seventeen the requirements of competency for the Competent Person, as defined by the guidelines in C.3.2.3 Moving the Load.

All lifting operations should be properly planned and carried out by competent personnel. Procedures should be documented in the form of a lifting plan and approved for each type of lifting operation to provide guidance on how the lift will be safely conducted and to outline the responsibilities of those attending to the lift.

3.2.3.5 Competency Assurance of Load Handlers/Riggers (COMP4)

Rigging operations shall be performed only by trained and competent personnel. Competent Roustabouts (Deck Operators), Banksmen / Slingers / Signallers shall undergo rigging and slinging training in accordance a recognised standard such as API RP 2D[6] or the OMHEC Training Standard[5]. This should include:

- Classroom training in rigging hardware, sling configuration, angle and safe working limits, procedures for inspections, personnel transfer, sling handling and storage and rigging basics.
- Hands-on training on proper inspection, use selection and maintenance of loose gear.
- Training should also include an examination

3.2.3.6 Competency Assurance of Crane Inspectors and Maintenance Staff (COMP5)

All persons involved in crane inspections and inspections of other material handling equipment must be trained, and have the required experience for the type of inspections to be conducted and be formally assessed as competent.

Appendix 5 of the OGP guidance[1] addresses the competence and skills required for staff engaged on crane maintenance, such as a ‘qualified inspector’ A qualified inspector is a person so designated by the employer who by reason of appropriate experience and training, has successfully completed classroom-type training on crane maintenance and troubleshooting; on hoist troubleshooting and overhaul; and on the structural aspects of offshore cranes, which gives knowledge of structurally critical components and critical inspection areas as outlined in Appendix A2 of API RP 2D[6].

With successful completion of this minimum training supplemented with appropriate refresher training at a minimum of say, every four years, the inspector is considered qualified to perform the initial, pre-use, monthly, quarterly, and annual inspections. The scope of these inspections is outlined in clause 4.1.2 of API RP 2D[6].

3.2.4 Man Riding Using Winches Inspection Templates

The purpose of the man riding templates is to outline measures that shall be taken to reduce or eliminate man riding using winches. In the event that manriding operations cannot be eliminated, guidance is provided related to the design, manufacturer, certification, testing and inspection of manriding equipment and components and their safe operation. This guidance applies to all equipment and associated components used for purposes of man riding anywhere on an offshore installation with the exception of crane assisted personnel transfers. Lifting of persons in baskets using manriding winches is prohibited.

3.2.4.1 Overview

Man riding operations are one of the major causes of fatalities and serious incidents in offshore operations. Because of the risk and incidents that have occurred, man riding should be avoided and used only where no other practicable means of access exists. Duty holders of facilities are encouraged to provide safer alternatives to using man riding winches and associated equipment.

3.2.4.2 Risk Assessment (MAN RIDE1)

A hazard identification and risk assessment shall be conducted on all activities that require work at elevation. A duty holder shall be able to demonstrate that they have taken all reasonable steps to reduce the risks associated with working at elevation to as low as reasonably practicable. The hazard identification and risk assessment process should follow an established guideline. An example of one process is provided in the Step Change *Task Risk Assessment Guide*[2] . The guide includes example Risk Assessment Matrix charts to help decide the level of risk. It also includes example risk assessment forms to record initial risk assessed, the control measures put in place and the level of residual risk.

Typically, the hazards to be considered during man riding activities include but may not be limited to:

- Crush injury hazards
- Free-fall from height
- Equipment failure
- Dropped objects

3.2.4.3 Design, Selection & Certification of Manriding Equipment & Accessories (MAN RIDE 2)

The duty holder shall have a process in place for purchasing equipment. These procedures should be aligned with the latest ISO quality management standards or equivalent. The duty holder should have a list of approved equipment manufacturers.

The design of each component shall meet the appropriate design requirements that are specified in each respective jurisdiction. Operating assumptions and design criteria for each piece of equipment/component should be prepared and reviewed by a competent person. This need only be completed once during the initial design approval stage, or when there is a major change in the equipment. The competent person may be a third party representative of the duty holder. The winch shall be approved for man riding by both the equipment manufacturer and the certifying authority / verification body.

An independent fall protection system shall be designed, approved, installed at locations where man riding may be required. All fall protection systems shall be certified to an appropriate standard. The type of equipment and its placement shall be approved by a competent person. If a bosun's chair is to be used it shall be used in conjunction with a full body harness. A full body harness is required to be worn at all times. Pad eyes and anchorages associated with man riding shall designed with at least a factor of safety against failure of 10. If a stabbing board is accessed by man riding, it should be fixed and of a design that provides safe access and use for personnel.

Recommended safety devices to be fitted to man riding winches are described in Appendix 8 of the OPG guidance, and at paragraphs 269 to 274 of HSG 211 Technical guidance on the safe use of lifting equipment offshore[12] and page 13 of the Step Change Best practice guide to manriding safety [13]

3.2.4.4 Inspection, Testing, Maintenance and Repair Program (MAN RIDE 3)

The duty holder shall have operations and maintenance manuals for each component that is used in the man riding operation. Discard criteria should be clearly defined within the manuals. The operations and maintenance manuals should be developed based on manufacturer’s recommendations. All inspection, testing and maintenance shall be carried out by a qualified person.

Documentary evidence of the maintenance work carried out on man-riding equipment and components should be reviewed to verify that the work is being carried out as scheduled. During the review, it should be confirmed that each report has been signed off by the qualified person and it should be traceable that all recommended actions affecting the safe operation of the unit were completed prior

to putting equipment back in service. There should be no backlog of maintenance that will have an adverse affect on safety. As a minimum the following records should be reviewed:

- Pre-use inspections (ref Appendix 12 of the OGP guidance[1])
- Maintenance
- Inspections
- Repairs
- Testing and recertification
- Degradation reports
- Like for like replacement records
- Formal Change in kind records which may result in changes to operating and maintenance manuals and training.

3.2.4.5 Training and Competency Assessment (MAN RIDE 4)

Every duty holder shall conduct a task analysis of the man riding operation to identify the hazards, assess the risks and specify the skills that will be required to reduce the risk to as low as reasonably practicable. The operation shall be conducted with a minimum of three people and shall involve the supervisor of the operation, the winch operator, the signalling and the person attached to the winch. This should take into consideration any training that will be required for rescue personnel.

All personnel who are involved in lifting operations, or with maintenance of the lifting equipment shall be able, competent and adequately trained to carry out the tasks for which they have been assigned. Training can be provided by a third party company or by the duty holder. In either case, the training shall be formally documented and shall include classroom and/or hands on training. Training should make reference to relevant sections of the operations and maintenance manuals for the type of equipment that will be used and the specific operations procedures that are in place. Training shall also include a review of relevant legislation. Each person shall be formally assessed as competent prior to performing man riding operations. Personnel under training shall only be assigned tasks that are appropriate for their competence at the time, as assessed by the duty holder.

3.2.4.6 Operating Procedures (MAN RIDE 5)

A procedure shall be prepared by a qualified person and shall be signed off by appropriate senior management. The procedure shall be a controlled document and shall include or make reference to other procedures as appropriate. The procedure shall be based on relevant legislation, standards, operations and maintenance manuals from the manufacturer and recommendations from risk assessments.

The procedures should identify that if a blind lift is required, an independent risk assessment shall be conducted to ensure that the lift can be completed safely. The risk assessment should result in the addition of signallers and specify additional communications procedures to be followed during the operation.

4 REFERENCES

The following documents are mentioned in the inspection templates and offer further guidance on aspects of safe lifting.

1 OGP - *Lifting & hoisting safety recommended practice.*
http://info.ogp.org.uk/liftingandhoisting/

2 Step Change - *Task Risk Assessment Guide*
www.stepchangeinsafety.net/

3 Step Change - *Lifting & Mechanical Handling Guidelines*
www.stepchangeinsafety.net/

4 Step Change - *Fatality report*
www.stepchangeinsafety.net/

5 OMHEC Training Standard - *Certificate of expertise requirements for skills and competence for the Crane Operator and Banksman offshore*
www.**omhec**.org/

6 API RP 2D *Guidelines – Operation and Maintenance of Offshore Cranes* – 5th edition June 2003.
http://www.api.org/

7 HSE – HSG 65 Successful Health & Safety Management
http://www.hsebooks.com/Books/

8 HSE – Research Report 237 *Maintenance system assessment*
http://www.hse.gov.uk/research/rrhtm/rr237.htm

9 HSE – Safety Notice 2/2005 *Single line components in the hoisting and braking systems of offshore cranes*
http://www.hse.gov.uk/offshore/notices/sn_02_05.htm

10 OMHEC Standard – *Competence and skills requirement for an Enterprise of Competence (EOC) of offshore cranes*
www.**omhec**.org/

11 Norsok R-003 *safe use of lifting equipment* – Rev 2 July 2004
http://www.standard.no/imaker.exe?id=6910

12 HSE - *HSG 211 Technical guidance on the safe use of lifting equipment offshore*
http://www.hsebooks.com/Books/

13 Step Change - *Best practice guide to man riding safety*
www.stepchangeinsafety.net/

5 TERMS AND DEFINITIONS

The following terms and definitions appear in the inspection templates.

Banksman / Signaller	Competent person positioned so that he has an unrestricted view of the load and the crane operator, to give load-manoeuvring instructions to the crane driver via hand signals or radio. The banksman may be given responsibility for directing movements of the crane and load instead of the Signaller, provided that only one person has the responsibility at any one time.
Competent Person *NORSOK R-003, Rev. 1-09-1997* *ISO 15513:2000(E)*	A person who has sufficient theoretical knowledge, practical experience and the required qualities for the task in hand. Is able to perform the activities within an occupation or function to the standard expected in the task.
Enterprise of Competence (EOC)	Means a person in an enterprise of competence who has sufficient theoretical knowledge and practical experience to understand the lifting equipment design, its function, to perform calculations, examinations and testing as required and to issue a certificate of application and other certificates prescribed by the authorities.
Maintenance *ISO 13306: 2001*	The combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function.
Qualified Operator API RP2D	A person so designated by the employer who has appropriate offshore experience and training. Such appropriate experience and training must comprise minimum amount of classroom-type sessions and hands-in field training, in cranes specific to the type of crane to be operated by the qualifying operator.
Qualified Inspector API RP2D	A person so designated by the employer who by reason of appropriate experience and training, has successfully completed classroom-type training on crane maintenance and troubleshooting; on hoist troubleshooting and overhaul; and on the structural aspects of offshore cranes, which gives a knowledge of structurally critical components and critical inspection areas.
Qualified Rigger / Load Handler /	A rigger is anyone who attaches or detaches lifting equipment to loads or lifting devices. In

Slinger	order to be considered a qualified rigger, the person shall have successfully completed a rigger-training program.
Sufficient Competence	Sufficient competence means a sufficient and verified practical and theoretical knowledge involved in the enterprise of competence relating to expert verification and control of offshore cranes.
Thorough examination	Examination by a competent person in such depth and detail as the competent person considers necessary to enable them to determine whether the equipment being examined is safe to continue in use
Training	A programme drawn up to teach a person the necessary skills and knowledge to fulfil a function / job.