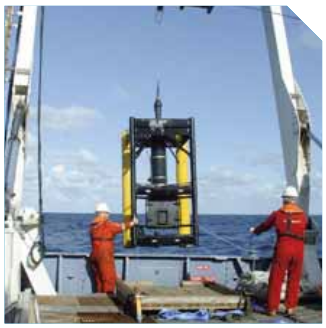
Guidelines for
Lifting Operations



The International Marine Contractors Association

www.imca-int.com

IMCA SEL 019, IMCA M 187
October 2007

The International Marine Contractors Association (IMCA) is the international trade association representing offshore, marine and underwater engineering companies.

IMCA promotes improvements in quality, health, safety, environmental and technical standards through the publication of information notes, codes of practice and by other appropriate means.

Members are self-regulating through the adoption of IMCA guidelines as appropriate. They commit to act as responsible members by following relevant guidelines and being willing to be audited against compliance with them by their clients.

There are two core activities that relate to all members:

- Safety, Environment & Legislation
- Training, Certification & Personnel Competence

The Association is organised through four distinct divisions, each covering a specific area of members' interests: Diving, Marine, Offshore Survey, Remote Systems & ROV.

There are also four regional sections which facilitate work on issues affecting members in their local geographic area – Americas Deepwater, Asia-Pacific, Europe & Africa and Middle East & India.

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These guidelines were prepared for IMCA under the direction of its Marine Division Management Committee.

IMCA thanks its members for their valuable contributions in developing this document.

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Appendices

Definitions

Banksman/slinger/signalman	Definitions vary internationally. Generally identifies someone who directs the crane operator during the lift. See also 'load handler'
CoG	Centre of gravity
Competent person	Someone with the skills to plan and supervise a lift (see 3.2)
Company	The entity facilitating the responsibilities listed in Table 1 (below)
Company focal point (equipment)	The person responsible for safety of all company equipment
Company vessel (or site) focal point	The person responsible for the safety of the vessel (or site) equipment
Crane authorisation	Document issued by owner's/operator's company when a proposed load is more than a certain percentage of the SWL of the crane or there are other potential issues, for example a possibility of a connection to or penetration of the seabed
Crane operator	Person operating the controls of a crane
DAF	Dynamic amplification factor, where the forces acting on a load amplify the force exerted by its own weight and defined as: $DAF = \frac{\text{dynamic load + static load}}{\text{static load}}$ where: dynamic load is a load subject to dynamic forces such as when in water, going through the splash zone, being affected by shape, size, weight, contents, vessel motions etc. static load is a weight unaffected by external forces
DHL	Dynamic hook load: DHL = DAF x (weight of object + weight of rigging) + additional hook load due to extra loading Note: *'Extra loading' as for example from tugger line loads, guide loads, wind loads, hydrodynamic and hydrostatic loads*
Duty factor	Factor that is applied to the basic permissible stress on the structure of a crane
FoS	Factor of safety. The factor of safety is the ratio between the minimum breaking load and the safe working load

HIRA	Hazard identification and risk assessment
ICP	Independent competent person. A person who is sufficiently competent and independent to allow impartial, objective decisions to be made concerning the lifting equipment (see 6.1)
JRA	Job risk assessment (also task risk assessment (TRA) or job safety analysis (JSA))
Lifting equipment operator	Person operating the controls of a lifting device
Lift plan	The documented plan of the proposed lifting operation
Lift plan summary drawing	A simple drawing that collates the crane curves, or capacity at a given radius, the lift rigging and the lift location/overboarding details
Lift supervisor	The person who supervises the lift and the lifting team. Examples of a lift supervisor could be: deck officer, diving superintendent, deck foreman, banksman/slinger, shift supervisor
Lifting operations flowchart	A flowchart which shows the process of lifting operations for routine and non-routine lifts
Lifting safety pocket cards	Pocket sized laminated card with appropriate lifting operations checklists
Lifting team	Personnel carrying out lifting operation. Minimum of three: lift supervisor/load handler/lifting equipment operator
Load handler	Any person in the lifting team who is intended to handle the load
MBL	Minimum breaking load
MRU	Motion reference unit
MoC	Management of change – a means of safely and efficiently making changes in a controlled manner (see 5.10)
Non-routine lifts	Lifts that cannot be defined as routine lifts (see 4 and specifically 4.2.2)
Pre-lift meeting	A briefing meeting with all relevant personnel to discuss the lift plan and to expedite the lift
PMS	Planned maintenance system
Responsible person	Person who has overall responsibility for the work (see 3.1)
Rigger	Definition varies internationally. Generally intended to identify a person who is experienced and competent in rigging lifting equipment and slinging loads. See also load handler
Rigging specification summary	Details the results of the lifting analysis to enable the engineer to specify the rigging
Risk	A product of hazard severity and hazard probability
Risk assessment matrix	A document that assists in quantifying risk
Routine lifts	Generally, these are lifts that are carried out on a regular basis that require no detailed engineering planning and which have been previously subject to a generic risk assessment and lift plan as appropriate, but see 4 and 4.2.1
Safety measures	A list of safety considerations in the lift plan that need to be considered onshore and offshore prior to carrying out the lift
Signalman	See 'banksman/slinger/signalman'
Slinger	See 'banksman/slinger/signalman'
SWL	Safe working load. The maximum load the lifting equipment is certified to withstand under normal use
Technical authority	Someone who is technically competent and who can make an impartial judgement of the lifting operations plan (see 3.3)

Thorough examination	A thorough examination (see 6.3.1) is an examination carried out by an ICP (see 6.1), carefully and critically, and where necessary supplemented by other means such as measurement, non-destructive testing or other testing, in order to detect defects or weaknesses and to assess their importance in relation to the safety and continued use of the lifting equipment
Verifying authority	Classification society or flag state regulatory body
WLL	Working load limit. The maximum load that lifting equipment is certified to withstand under normal use and in a given configuration

Entity	Responsibility includes
Company	Providing procedures for the lifting operations, equipment, safe work place and appointing competent personnel
Company focal point	All equipment safety
Company vessel (or site) focal point	All vessel (or site) equipment safety
Verifying authority	Providing certification and regulation
Responsible person	Identifying when lift is required/advising competent person
Company engineering/operations department	Calculations, drawings, lift plans, rigging specifications, lift plan summary drawings
Competent person	Planning and supervising a lift/review lifts, select equipment and lifting team
Independent competent person	Inspections, thorough examinations and marking of equipment
Technical authority	Providing an impartial judgement of the lifting operations plan. Reviewing lift plans as required
Lift supervisor	Supervising the lift and lifting team
Lifting team (minimum: lift supervisor, load handler, lift equipment operator)	Reviewing lift plan, carrying out toolbox talk, pre-use equipment checks, complete lift, debrief, report
Load handler (includes banksman/slinger/signalman/rigger	Handling the load, including work such as signalling, rigging and slinging
Lifting equipment operator	Operating the controls of a lifting device

Table 1 – Significant personnel and authorities

1

Introduction

1.1 General

IMCA's Crane & Winch Operations Workgroup (established under the Marine Division Management Committee) has developed this guidance primarily for subsea lifting operations, but the principles described are relevant to all offshore lifting operations and generically to lifting operations anywhere.

On a typical vessel, lifting is endemic to operations and ranges from lifting of stores and spares handling through to complicated and heavy lifts. One survey showed that there could be more than 200 different lifting operations on a vessel. Each lifting operation has a risk of injury to people. Although many tasks are repetitive and of low risk, a percentage of them will be of greater risk and will require appropriate scrutiny and input to reduce risks to an acceptable level.

It is worth noting that many accidents occur in what are perceived as low risk everyday operations. It is therefore important to ensure that appropriate procedures are in place to try to ensure that lifting teams remain alert to all likely risks regardless of the ease or difficulty of an operation.

The guidance offers basic criteria. It is based on existing practice collated from major companies, adopts improved methods for lifting and is intended to be of use for world-wide operations.

This guidance is intended to show essential components that should be included in company procedures for lifting operations and offers advice on the steps within a lifting operation process that will promote safety.

Member companies use their procedures in operations internationally, supplemented, if necessary, by any additional local regulatory demands.

This document can be applied to all vessels, their support bases and other shore operations. The main objective is that, regardless of location, if each step of the process outlined in this guidance is followed and suitably applied then every lift should be carried out in a safe manner because it is:

- completed within an appropriate management system;
- properly planned;
- risk assessed;
- supervised; and
- completed with competent personnel and the proper equipment.

1.2 Management Systems

Safe, successful lifting operations rely on clear leadership to encourage safety and efficiency in lifting operations and the personnel performing them in accordance with company management systems, which should contain:

- the commitment of senior line management to provide policy objectives;
- corporate HSE policies and lifting, hoisting and communications procedures in appropriate language;
- the provision of adequate and appropriate personnel and equipment;
- the requirements for inspection, maintenance, removal of unsuitable equipment and record keeping.

This document provides guidance to assist with the development of company management systems and practical assistance to those involved with lifting operations.

2

Summary of Guidance

This document contains guidance on the key aspects of a lifting operation:

- personnel involved in planning a lifting operation (section 3);
- identifying the lift category (section 4);
- operational planning including risk assessments, lift plans, selection of equipment and lifting teams, toolbox talks and post-job actions (section 5);

It also provides guidance on:

- inspection, examination and marking of equipment (section 6);
- maintenance (section 7);
- record keeping (section 8); and
- provides examples of documents in appendices.

2.1 Lifting Operations Flowchart

The following flowchart and brief description define every step within the lift planning process. The steps remain the same for each location and work activity. However, the competent person would decide which lifts lie within the appropriate planning route.

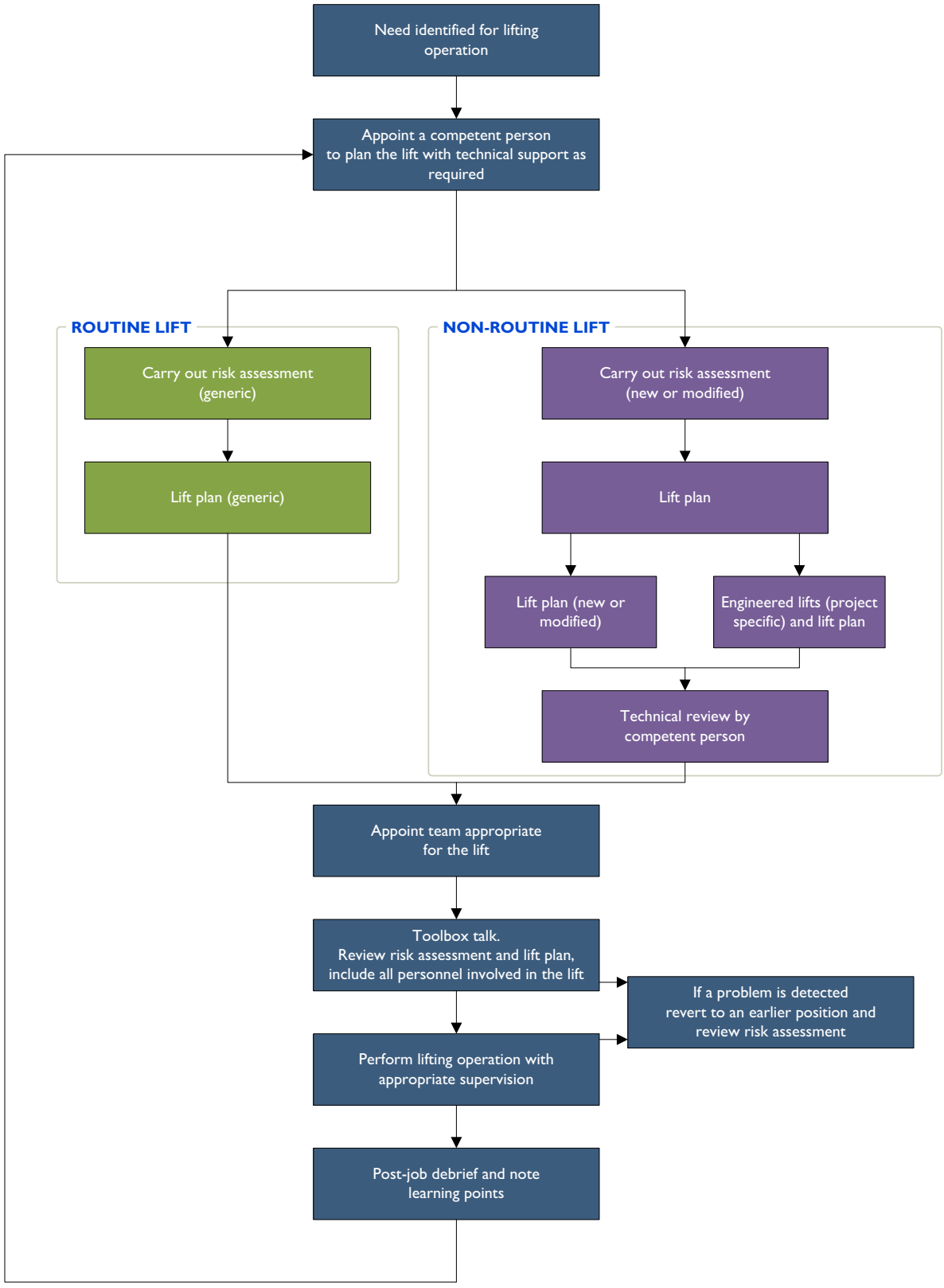


Figure 1 – Lifting operations flowchart

3

Personnel

3.1 Responsible Person

The responsible person is defined for the purposes of this guidance as the person who has overall responsibility for work activities. This person might be, for example, the project manager, project construction manager, vessel master, offshore construction manager, shift supervisor, base manager or project engineer. The responsible person recognises, or is advised of, the need for a lifting activity and either notifies the competent person or seeks the appointment of a competent person to plan the lifting operation.

3.2 The Competent Person – Appointed to Plan the Lift

The competent person is defined in this guidance as a specifically identified person who is designated by their company as having the required level of competency to plan and supervise the specific lifting operation as described below.

The competent person should have the practical skills, theoretical knowledge and ability to carry out risk assessments, produce and assess lift plans, conduct pre-lift meetings and have the supervisory skills and experience required to organise the specific lifting operation.

Typical examples of a competent person are offshore engineer, vessel master or deck officer, foreman rigger, dive supervisor, shift supervisor, assistant offshore manager or offshore manager.

The competent person may or may not supervise the lifting operation, but is the focal point of authority for the safety and technical aspects of the lift. In certain circumstances, the responsible person (see 3.1) may undertake the duties of the competent person, providing he or she has the necessary competence and practical skills as described above.

The designated competent persons should know their competency limitations, work within them and know when technical support is needed. Thus, for some lifts, there might be more than one competent person involved.

The competent person's responsibilities could include:

- categorising the lift (see 4 and 4.2);
- risk assessment (see for example 5.1, 5.5.1);
- developing the lift plan (see 5.2);
- technical review (see 3.3 and 5.9);
- selection of personnel (see 3.5);

- selection of equipment (see 5.4.2 and 5.5);
- toolbox talk (see 5.12); and
- post-job debrief (see 5.13).

A review by a technical authority may be requested by the competent person if he/she requires additional technical support.

3.3 Technical Authority

The technical authority is defined in this guidance as someone who is technically competent and can make an informed and impartial judgement of a lifting operation plan or installation procedure and provides a technical authority review; for example a structural engineer, naval architect, rigging supervisor or senior project engineer.

3.4 Lift Supervisor

The lift supervisor, who should be nominated by the competent person, is defined in this guidance as the person who is charged with actively supervising the lifting operation on site. This could be a deck officer, diving superintendent, competent person, deck foreman, banksman/slinger, shift supervisor or similar.

Supervision should be proportionate to the exposure to risk created by the lifting operation and the experience and capabilities of the personnel involved in individual lifting operations.

Levels of supervision appropriate to the nature of the work and the competence of those involved in using equipment and assisting with the lifting operation should be established and described within the lift plan (see 5.2 and 5.3). These arrangements should be reviewed in the event of changes to equipment, the lifting operation or to the personnel involved with the lifting operation.

Every lift should be adequately supervised by a nominated lift supervisor; each step of the plan should identify the extent of supervision required.

The lift supervisor should be clearly identifiable, should have a clear view of the lift and should ensure that lifting activities follow the agreed plan.

If the load is not always visible to the lifting equipment operator, the lift supervisor should ensure that clear communication systems are in place to ensure sufficient co-ordination between pick-up and lay-down areas.

There may be a requirement for the lift supervisor to assist in the preparation of the load, for example with slinging activities; however, the lift supervisor should not touch the load during the lifting operation.

3.5 Lifting Team

Only suitably trained and experienced personnel should be selected, that is, those who:

- have had their competence to supervise and/or perform the type of lifts identified as satisfactory for the specific operation;
- have experience of, and demonstrated competency in, the safe use and operation of the equipment and techniques required to perform the subject lift in the prevailing situation and conditions.

All personnel have an equal responsibility to know, and work within, their own competency and experience to complete the lift.

If any personnel in a lifting team consider that the operation exceeds their level of competency or experience, they must stop the operation until a suitable person with the required competence and experience is able to assist or take over.

Although persons designated to be in charge of lifting operations are responsible for ensuring the lifting operation is carried out in a safe manner, all personnel involved also have a responsibility for ensuring that the lift is carried out safely.

The competence of personnel involved in different lifting activities can vary widely, even between members of the same lifting team. Care should be taken to ensure that new members to a lifting team are appropriately competent and properly briefed.

All personnel in the lifting team should attend and participate in pre-lift meetings, carry out pre-use inspections of lifting equipment, assist with the lifting operation; and they are able to stop any operation if they are concerned about safety.

They should be conversant with and observant of the regulatory requirements for lifting operations generally, specifically the regulations and guidelines applying to the particular operation. Issues to consider include for example:

- implications of environmental/meteorological conditions;
- use of lifting equipment in restricted locations (headroom, access, egress and stabilising arrangements);
- visibility and communications during lifting operations;
- proximity hazards/encroachment by other cranes/lifting equipment;
- prevention of load striking any person or object;
- pre-checking of lifting equipment and identification of faults and defects;
- attaching, securing and detaching loads;
- overloading and de-rating of lifting equipment;
- overturning, tilting, slipping and dragging loads;
- not working under suspended loads;
- not leaving loads suspended;
- lifting of persons;
- continuing integrity of lifting equipment and accessories.

Competency standards for offshore marine personnel can be aligned with IMCA C 002 – *Competence assurance and assessment: Guidance document and competence tables: Marine Division*.

4

Categorisation of Lift – Routine or Non-Routine?

There is a wide range of lifting operations carried out in the offshore construction industry. To categorise all lifts as 'routine' or 'non-routine' or into a sub-category that would be applicable throughout the industry is likely to be impossible. For example, a company might categorise a lift as routine because it may be carrying out such lifts over a long period on a very regular basis; another company would categorise the same lift as non-routine because it would be unfamiliar to them and involve extra planning.

It is however vital for companies to have procedures whereby a careful risk assessment is made for each lifting operation and that a lift plan is available or developed for all lifts. This might be a generic lift plan for what are perceived as routine lifts. In such a case, each lifting operation needs to be individually risk assessed, taking into account all relevant issues and the specific conditions at the time, so that the lifting team can check that the lift envisaged exactly matches the established generic lift plan. If it does not, an appropriate lift plan should be developed.

For simplicity in this guidance, only the terms 'routine' and 'non-routine' are used, such that if a lift cannot be defined as shown in 4.2 to be routine, then it would be defined as non-routine.

For any lift plan an auditable paper trail should be established to demonstrate that the lift has been appropriately risk assessed and planned.

Lift plans should be developed by a designated competent person (see 3.2) with appropriate assistance where necessary (see 3.2, 3.3).

Guidance that will assist with the categorisation of lifting operations is as follows.

4.1 Factors to Consider for Lift Categorisation

Some information is provided through any pre-engineering or assessment of the lift, but the plan and preparation for the lift should take into account all relevant local factors as well as any information already obtained.

4.1.1 Lifting Equipment

One assessment of a typical contractor's vessel showed that a vessel may have 30 different types of lifting equipment. These can range from the main vessel cranes to winches, reels, runway beams, pad eyes, lifting bags all the way down to small pieces of lifting equipment like Tirfors, chain lever hoists and so on. Lifting equipment may be very specialised, such as heavy lift cranes.

There are also life-saving appliances, diving systems and onshore lifting equipment systems. Each type of equipment requires specific operating practices and company procedures.

4.1.2 Loads and Lifting Arrangements

IMCA members lift many different types and sizes of loads, for example reels, containers, tanks, subsea equipment and various items including heavy lifts like modules and platform structures. Loads can be in all shapes, sizes and internal content, the centre of gravity of which may not be in the centre of the load.

The dimensions, strength and the method of use of the lifting arrangement, including the way it is attached to the load and the lifting equipment, can affect the lifting operation.

In addition the lifting of people requires special procedures and equipment (see 5.6).

These different loads present different hazards that need to be addressed by lift planners and all in the lifting team.

4.1.3 Lifting Environment

IMCA members undertake lifting activities in different environments such as those found in on and offshore activities including:

- onshore operations;
- internal spaces of vessels and rigs;
- mobilisations at the quayside or at sea;
- transferring equipment from other vessels and platforms;
- moving equipment around the deck at sea; and
- submerging or recovering equipment in the sea, including placing and removing equipment on the seabed.

Specific effects on offshore environments include:

- vessel motion and stability;
- weather, wind and sea forces;
- adjacent structures, vessels;
- seabed suction and dynamic loading; and
- noise, light, spray etc.

All relevant environmental effects need to be considered.

4.1.4 Lifting Team

Categorisation of a lift needs to take into consideration all personnel involved and their competencies. This should also include the consideration of all aspects of the lift. For example, if the control of the lift passes from a deck supervisor supervising a lift off deck, to a dive supervisor who completes the lifting activity in the subsea section of the operation.

4.1.5 Communications

Communication options should be considered. They could be verbal, visual and audible with a number of people often operating different equipment, potentially each working in dissimilar environments.

The factors listed above are not exhaustive, but are typical of those to be considered when categorising the lift to a specific company procedure, as described next.

4.2 Defining Routine and Non-Routine Lifts

For the purposes of this guidance, two categories of lifting are identified, routine and non-routine.

4.2.1 Routine Lifts

Routine lifts can be identified and described as those which:

- are covered by a job risk assessment (JRA) (see 5.1);
- may not require a new lift plan;
- are lifts for which the lift plan can be generic but should still be discussed/reviewed at the pre-lift meeting. Such pre-lift meeting can, for example, be in the form of a toolbox talk at the start of a shift or as required during the shift;
- are known, repetitive[1] lifts, familiar to all of the lift team;
- are repetitive lifts which are covered by a previously prepared JRA and lift plan, however this should be reviewed by the competent person;
- are where the identified lifting team is trained in the use of the specific lifting equipment and familiar with its limitations; and competent to complete the entire operation;
- are where the lifting team has performed their identified roles previously;
- are where all personnel involved are familiar with the written risk assessment and the lift plan for the operation being conducted; and
- are where the lift plan is verified as the current issue before the operation.

For routine lifting operations, the lift plan should be properly planned by a competent person together with the people normally using the lifting equipment.

The lift should be appropriately supervised and carried out in a safe manner.

All lifts require a lift plan. When operations are considered to be 'routine' the company should have a process in place to ensure that sufficient planning has been conducted. Due to the repetitive nature of such operations, an individual plan should not be required on each occasion that the operation is conducted, unless any of the significant matters to which the plan relate have changed and need to be taken account of. If in doubt, a lift should be considered 'non-routine'[2]. See Appendix 3 for an example of two routine lift plans.

4.2.2 Non-Routine Lifts

Non-routine lifts are those which do not meet all the criteria for routine lifts. An engineered lift (see 5.3) is a typical non-routine lift.

A non-routine lift is where:

- a job risk assessment (see 5.1) is required to identify and mitigate the risks and a completed lift plan (see 5.2) is required, signed off by the persons identified in the relevant boxes of the lift plan (see Appendix 3 and Appendix 4);
- a new specific lift plan is required based on a risk assessment, for example a HIRA (hazard identification and risk assessment) or site specific JRA (see 5.1); and
- a pre-lift meeting or toolbox talk should be conducted involving all relevant parties. Those at this meeting would use the lift plan, relevant drawings and JRA as a basis to summarise the proposed lifting operation (see 5.12).

See Appendix 3 for an example of a lift plan which can be used for non-routine lifts. Appendix 4 provides an example of a completed lift plan for an engineered lift (see 5.3).

1 A repetitive lift could be for example one that is carried out by the same lifting team at least once in every four-week period

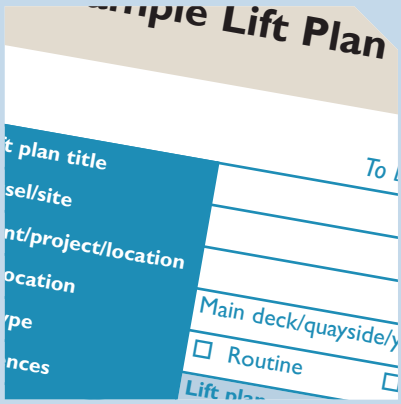
2 The competent person should ensure that all the criteria have been met for these activities to be considered 'routine', as circumstances can change dependent for example on location, operations, personnel, weather, equipment or competency levels

The degree of planning can vary considerably and will depend on the type of equipment to be used and the complexity of the operation (see 5 to 5.14).

A non-routine lift plan (see 5.2, 5.3) should be prepared by a competent person. This then needs to be reviewed and approved by another competent person and/or a technical authority. It should then be reviewed and finalised by the on-site competent person and the lift supervisor carrying out the lift.

A non-routine lift plan can be produced on-site by a competent person if the need arises. The same review and approval, by a second competent person and/or technical authority and the on-site lifting team and lift supervisor carrying out the lift, should be required. A management of change procedure (see 5.10) should describe and authorise the work scope.

5



Operational Planning

5.1 Risk Assessments

5.1.1 Job Risk Assessment (JRA)

A suitable documented risk assessment is needed for any lift. However this may already exist, for example for a routine lift. This may be in the form of a HIRA document, an operational review document and/or a site specific job risk assessment. If a risk assessment already exists then it should be reviewed for its applicability to the current situation prior to carrying out the lift. The assessment of lifting equipment see 5.4.2 and 5.5, should also be included in the JRA.

If there is any change to the site specific JRA, then the JRA should be reviewed, updated and documented.

The competent person, together with the lifting team, should carry out a site specific JRA before the work begins. This is normally carried out using a job risk assessment form. An example is shown in Appendix 1. The competent person should ensure that appropriate controls are in place for those hazards identified in the written risk assessment such that the risks are managed as an integral part of the lift plan.

5.1.3 Risk Assessment Matrix

A risk assessment matrix can be used with the job risk assessment. This permits the quantifying of the probability and severity of the hazards for a particular activity. The product of both indicates the level of risk. A typical risk assessment matrix is shown in Appendix 2.

5.2 Lift Plans for all Lifts, Routine and Non-Routine

Proper planning is a combination of:

- initial planning to ensure that the equipment provided is suitable; and
- planning of the individual lifts to ensure they are carried out safely:
  - the lift plan should be prepared by a competent person (see 3.2) together with others where necessary, as indicated in 4.2.1 and 4.2.2;
  - the lift plan should be based on a risk assessment;
  - the lift plan should address the risks identified by the risk assessment and should identify the resources, procedures and responsibilities to allow the lifting operation to be carried out safely;
  - the lift plan should ensure that the equipment selected is safe (see 5.5) and remains safe for the range of operations for which it will be used;
  - the lift plan should define the pre-use checks required and their frequency (see 5.4.3);
  - the lift plan should cover procedures that include identification of methods of communication and language;
  - the lifting team should be selected (see 3.5);
  - the degree of planning can vary considerably and should depend on the type of equipment to be used and the complexity of the operation;
  - if the established company procedures are changed, then a management of change procedure is required (see 5.10);
  - where there is more than one 'employer' involved in a lifting activity, the lift plan should detail specific roles and responsibilities for the operation. The lifting operation should be co-ordinated by the lift supervisor. Personnel involved in the lifting operation should be suitably instructed and consulted in the planned operation so that they are aware of their responsibilities, the control measures to be used and the sequence of events to be followed (see 3 and 5.10);
  - prior to commencing a non-routine lifting operation, a pre-lift meeting should be conducted with all relevant parties. Those at the meeting should use the risk assessment, lift plan and relevant drawings as a basis to summarise the proposed lifting operation. See Appendix 3 for an example lift plan and note the wide range of items that the sample plan addresses.

5.3 Lift Plans for Engineered Lifts

This section covers issues relating to engineered lifts. Engineered non-routine lifts are those which are project-specific and the equipment has been specifically designed or selected for the operation. The planning process begins within an engineering department, usually onshore, resulting in an installation procedure being written and a lift plan for an engineered lift being developed.

Lift plans for engineered lifts are often prepared onshore. Company procedures should set out a format which provides a simple and consistent practice for engineers to follow when preparing documentation for engineered lifting operations onshore or offshore. The engineering planning should incorporate careful analysis of the proposed lift.

An engineered lift plan and associated drawings should be prepared during the engineering phase and incorporated in the appropriate project installation procedure. An example is shown in Appendix 4. In essence:

- the engineered lift plan would not be intended to replace the installation procedure, but could act as a summary of points to be considered by all parties prior to commencing a lifting operation onshore or offshore;
- preparing an engineered lift plan should have the effect of highlighting any concerns that need to be addressed in the project installation procedure;
- an engineered lift plan for an engineered lift should be treated as a live document right up to the execution of the lift on site or offshore. It should be subject to the same reviews as for a general lift plan; and
- once on site the engineered lift plan should then be finalised by the relevant competent person (see 3.2).

Following this format should help generate consistency throughout a company's worksites from the outset, at and through the engineering planning phase and continuing through the execution of the lifting operation.

5.3.1 Rigging Specification Summary Drawing

For an engineered lift a rigging specification summary drawing should be completed during the engineering preparation phase for the lift (see Appendix 5).

The purpose of a rigging specification summary drawing is:

- to summarise the results from the engineering planning;
- to specify requirements for the lift rigging to the rigging suppliers;
- to act as a material take-off table and quality control check for relevant company departments; and
- to provide the lift supervisor on site or offshore with all the details required on one drawing to refer to whilst rigging the load.

Sample rigging specification summary drawings provided in Appendix 5 illustrate the typical details that should be included.

5.3.2 Lift Plan Summary Drawing

For engineered lifts a lift plan summary drawing (see Appendix 6) should be completed during the engineering preparation phase for the lift.

The lift plan summary drawing should provide information that, for example, allows:

- the engineer to check that the correct crane details, crane curves and available hook heights are used for the lifting operations, when lifting the load both onshore and offshore;
- relevant personnel such as the competent person (see 3.2) and lift supervisor (see 3.4) to verify that there is enough clearance between the crane block/crane boom to allow the load an unobstructed lift path, for example over side rails of the vessel.

A sample provided in Appendix 6 indicates the sort of details that should be included in a lift plan summary drawing.

5.3.3 The Use of Crane Curves for Engineering a Lift Plan

There are different types of crane curves available when preparing a lift plan for an engineered lift, for example:

- Harbour lift crane curves — A sheltered-water lift in port (or a crane curve where Hs = 0m, where Hs = significant wave height);
- Offshore lift crane curves — Deck to subsea, deck to deck;
- Offshore lift crane curves — Vessel to vessel, vessel to platform.

Each of the above curves has different dynamic amplification factors (DAF) and a duty factor for the crane. The duty factor is a factor that is applied to the basic permissible stress on the structure of the crane.

These DAFs and duty factors are included within the crane curves; the wrong factors could be used if the crane curves are modified and/or re-interpreted incorrectly.

If project personnel want to use crane curves or factors other than those the company has specified, then they should consult with the appropriate competent person.

Note: It is essential that harbour lift crane curves are not used to engineer offshore lifts, whether they are deck, subsea or vessel to vessel lifts.

It is essential to always check which crane curve is to be used when planning and engineering a lifting operation.

5.4 Considerations for all Lifts, Routine and Non-Routine

The checks listed here are not exhaustive and are intended to act as reminders.

5.4.1 Initial Considerations for the Assessment of the Load and its Handling

For any type of lift an assessment of the load is vital.

- What is the weight of the load?
- Is the weight verified?
- Is the load designed for offshore lifting, for example container type?
- Are the lift points certificated/adequate?
- Can slinging points be accessed safely?
- Is the load slung in a stable fashion with no loose items in or on it?
- Is the centre of gravity (CoG) known?
- Does the load have integrity and internal stability?
- Is the shape or size difficult to sling?
- Is it a very long load, liable to rotate etc?
- Will it flex under suspension?
- Does it require securing to its pallet?
- Does the load contain liquids?
- Is it fragile?
- Is it high value?
- Are there chemicals in the load?
- If subsea, consider shock loads and changes to weight in air due to the effects of flooding and draining, seabed suction, plus marine growth or debris/grout if removing existing subsea structures, added mass, the splash zone, which will be affected by sea state, changes to buoyancy and the centre of buoyancy.
- Are there any sharp edges?
- Are hold down bolts/sea fastenings removed?
- Are necessary permits obtained for its lift?

5.4.2 Considerations for the Selection of Lifting Equipment

Selection of lifting equipment is covered generally in section 5.5. Initial assessment should include the following:

- Is correct PPE identified and used?
- Sling angles and lifting attachment angles.
- Are attachment points adequate?
- How are slings to be attached?
- Is the hook type appropriate?
- Manual handling of heavy rigging?
- Will divers or ROV be involved and are slings/attachments compatible with underwater work?
- Is there a lifting point available directly overhead?
- Is the sling arrangement suitable for the CoG?
- Sling lay direction – left hand lay and right hand lay should not be connected.
- Will the layout and lay-down of the slings affect control of the lift?

- Any problems with geometry of slings and crane hook?
- Is buoyancy attached to sacrificial slings for ROV cut?
- Are there remote or local release shackles (spring loaded/acoustic)?
- Are tag lines required and does the lifting team understand the safe use of tag lines?
- Is a tandem lift necessary?
- Is cross hauling required?
- Will heave compensation systems be in use?
- Are sheaves and attachment points adequate for the possible winch/crane loading?
- Is there a method of observing spooling on drums and rope path through sheaves?
- Is suitable lifting equipment available (see 5.5)?
- Will lifting equipment need to be moved to another location(s) during the lift (see 5.4.5, 5.5.2.4)?
- Is the load to be manipulated on the seabed?
- Will ROVs be of use in the operation?
- Is wire rope sufficient in length/construction for deep water (consider cabling)?
- Will sling dynamics have an effect?
- Is there protection for any control umbilicals?

See 5.5 regarding selection of equipment.

5.4.3 Pre-Use Checks

Prior to use, the operators of lifting equipment and accessories should perform a pre-use check in order to identify faulty equipment. The frequency of checking should be determined in the lift plan and is intended to detect faults due to wear and tear, but should be not less than once during each working day or at the beginning of each shift. Refer also to inspection and examination in 6 to 6.4. The amount of pre-use checks could vary, depending upon operational issues, such as the type of lifts or environmental aspects.

5.4.4 Considerations for Selection of the Lifting Team

- Is the team appropriate (experience/competence) for lifting this type of load? (see 3.5)
- Who is the lift supervisor? (see 3.4)
- Is the lift supervisor clearly identifiable to all of the lifting team?
- Are there a sufficient number of people in the lifting team?
- Will control of the lift pass to another person at any stage and if so are these persons identified to all of the lifting team and are clear, agreed procedures in place?

5.4.5 Considerations for Assessment of the Lift Path and Movement of Lifting Equipment

- Will the load need to be rotated or changed in aspect to lift safely?
- Is there adequate space to lift and manoeuvre the load?
- Lifting to or from inboard/outboard – check free height over rail.
- Is the lift path clear?
- Will movement of the vessel or lifting equipment during the operation impose problems with the lift path?
- Are there any conflicting operations (for example other crane jibs working in near areas)?
- Crane boom clearance from other cranes, vessels, platforms or obstructions.
- What checks are required for clearance of subsea architecture, moorings?

- Is the set-down area suitable regarding:
  - Space?
  - Weight bearing?
- If set down in subsea location is there:
  - Observation?
  - Control?
  - Marking of the landing point?

5.4.6 Considerations Regarding Environmental Effects

- Does the load have a large windage area?
- Will vessel movement affect the operation?
- Will the load move through potential changes in environment, for example the splash zone, on its lift path?
- How is the vessel controlled at the time of the lift, for example is it under way, under dynamic positioning (what DP category?), anchored, moored, berthed alongside; will a change of position, heading, trim, heel or vessel motion affect the environmental forces acting on the lift?
- Consider effects from waves breaking over decks.
- Is heave compensation to be used and has its use been risk assessed?
- If the load is going subsea is it suitably prepared?
- Will the load flood as it submerges or drain out water as it surfaces?
- What is the expected rate of flooding/draining?
- Possibility of trapped air?
- 'Slack line' considerations.
- If subsea, assess effects of buoyancy and/or added mass.
- If working in deep water other dynamic forces on the load and the wire ropes might apply.
- Lifts can take place in a variety of environments each likely to affect the lift in different ways, for example to and from quay and vessel, on deck, vessel to vessel or platform.
- A vessel is rarely entirely still and apart from movement induced by environment, dynamic loading from forces such as a load passing through a splash zone or operating to and from the seabed can all affect its inertia. Thus the effective weight can increase during certain parts of the operation.
- Possible use of MRUs for crane tip accelerations.
- The effects of rain, snow, ice, wind, noise, lack of light or the effects of light source(s) and shadow (for example crane operator or banksman looking into bright sun; or from looking from light to dark and the effect on eyes or camera lens) can all affect the way in which a load will need to be controlled and handled.

5.5 Selection of Equipment

The competent person should identify the appropriate lifting equipment and accessories required considering general issues such as those identified in section 5.4; confirming that all of the lifting equipment is fit for purpose, has appropriate certificates and is checked for defects before use.

The competent person should take into consideration, for example:

- the technical specification and integrity of equipment;
- the place where it will be used;
- the conditions under which it should be used;
- the purpose for which it should be used;
- inherent risks to health and safety as a result of its use;
- identification and use of appropriate PPE;
- ergonomic risks;
- manual handling;
- maintenance and inspection requirements.

The company should implement procedures that subject all lifting equipment and lifting accessories to a thorough examination scheme (see 6.3) and in-service inspections to ensure continued integrity.

One example of such a procedure would be that a company might stipulate requirements in respect of crane authorisation. For example, if the prepared load to be lifted is greater than a certain percentage of the specified SWL of the crane, then approval for the proposed lift would require the authorisation from an identified competent person. Other factors may vary the load on the crane such as the examples identified in 5.4. Crane authorisation could typically involve a lifting analysis report being issued to an identified competent person for review and approval prior to the commencement of the lifting operation.

If selecting a crane for a project, IMCA M 171 – *Crane specification document* – provides useful guidance.

5.5.1 Equipment Risk Assessment

An equipment risk assessment should be completed as part of the JRA (see 5.1.1).

The objective of the risk assessment is to identify the hazards and assess the risks associated with the equipment for the foreseeable range of lifting operations, for example the applications, loads and configurations for which the equipment might reasonably be used.

The equipment risk assessment should consider, but not necessarily be limited to, the following:

- Is the equipment designed for this type of lift?
- Have any modifications been made to the equipment?
- Could alarm settings require attention, e.g. if changes have been made to wire rope length on drums?
- strength and stability of lifting equipment, rigging and load (see 5.5.2);
- ergonomic considerations;
- operator protection;
- environmental conditions;
- location/proximity/environmental hazards;
- the nature of the anticipated load(s) (e.g. hazardous or dangerous substances);
- whether it involves lifting of persons;
- means of attaching/detaching and securing loads;
- loading and set-down arrangements;
- access and egress arrangements, particularly in emergency situations;

- overturning and overloading;
- other emergency situations;
- maintenance and inspection requirements whilst in use;
- dismantling and storage requirements;
- transportation methods for continued integrity.

Where the lifting operation involves the fabrication of new equipment, modifying existing equipment or selecting materials for lifting operations, the proposed design should be submitted to the competent person. There may also be a need to consult, for example, a verification body (see Table 1), a technical authority (see 3.3) or manufacturer, who would provide guidance on the suitability of the design. This competent person should conduct a design review, taking into account design codes, standards and practices as well as compliance with all applicable regulations.

Through the application of the steps indicated under 5.5.2, the safe working parameters of each lifting equipment configuration can be identified, and the level of risk assessed, with the intention of establishing a safe basis for the range of lifting operations for which the equipment is to be used.

5.5.2 Strength and Stability

5.5.2.1 Strength

Company procedures (see 1.2) should provide a process for:

- ensuring lifting equipment is of adequate strength for the load and provides an appropriate factor of safety against failure;
- ensuring that the load and all attachments and lifting accessories are of adequate strength and integrity;
- ensuring all hazards identified in relation to the strength of the equipment are addressed in relevant risk assessments;
- ensuring all risks associated with the strength of the equipment are addressed in the lift plan.

As part of the selection of equipment process, an equipment risk assessment (see 5.5.1) should be undertaken. The risk assessment process requires that the equipment's strength and stability has been adequately determined and verified.

An example process for assessing adequate strength is outlined in Appendix 7.

5.5.2.2 Equipment Stability

Determining adequate equipment stability requires assessment of the lifting operation in order to:

- ensure the lifting equipment has adequate stability in use and under load for its proposed use taking into account any combination of de-stabilising forces that may affect the lifting equipment;
- ensure suitable effective measures to provide sufficient resistance to overturning;
- ensure all hazards identified, in relation to the stability of the equipment, are addressed in relevant risk assessments and in the lift plan;

Factors to be considered that can affect the stability of lifting equipment include:

- the dynamic hook load should be used (i.e. including all dynamic effects);
- if subsea lifting note relevant bullet in 5.4.1;
- the maximum wind/wave/swell/current loading that could occur.

- the strength of the surface on which the lifting equipment is positioned or located, e.g. spreader plates may be needed so they can safely support the weight of the equipment and the maximum load to be lifted;
- stability of the surface under load and subject to vessel's motion conditions;
- whether the surface on which the lifting equipment operates is, or will be, on a slope (subject to any changes of vessel trim and heel) and the angle of any slope, as this imposes horizontal as well as vertical forces;
- the size and nature of the load, e.g. whether the load itself is unstable;
- how the load is intended to be lifted.

Various methods or combination of methods can be used to improve the stability of lifting equipment for example:

- designing a suitable base on which to position the lifting equipment;
- using an anchorage system.

Methods for resisting overturning may include:

- using outriggers/stabilisers and/or purpose-made rigging;
- using counterbalance weights;
- using ballast;
- the requirement for stabilising and use of methods for resisting overturning should be adequately addressed by the lift plan.

5.5.2.3 Vessel Stability

Vessel stability is of paramount concern to those planning lifting operations. The effects of raising loads from the deck and landing them elsewhere can affect the vessel's motion, trim, heel and stability, depending on the weight of the load in relation to the size of the vessel and the height and position of the crane tip in relation to the centre of gravity of the vessel. This can be of note even for relatively small loads, increasing in significance for heavy lift operations, such as for example, topside modules weighing thousands of tonnes, which rely on vessel ballasting to effect the lift.

When the lift is transferred to another floating unit the effects can be further complicated. Care should be taken that lift plans include proper consideration of affects on and from the stability of the vessel(s).

In addition the motion induced by changes in vessel stability can also affect the stability of the lifting equipment.

5.5.2.4 Equipment Positioning and Installation

For the purposes of this guidance, it is reasonable to assume that the term 'positioning' relates to mobile equipment, 'positioned' in a particular location, to carry out lifting operations. The term 'installation' relates only to lifting equipment assembled in a particular location and includes fixed equipment, designed to be secured in a location by additional means (bolts, welds, clamps etc.).

A process should be provided to ensure that the competent person reviews the positioning/installation of lifting equipment to reduce or eliminate risks.

All hazards identified, in relation to the position/installation of the equipment, should be addressed in the risk assessment.

All risks associated with the position/installation of the equipment should be addressed in the lift plan.

Lifting equipment should be positioned or installed in order to:

- avoid striking, trapping or crushing persons;
- avoid striking any other asset;
- remove risks to persons/assets along the path of the lift;
- avoid the possibility of lifting loads over people;
- offer efficient protection to minimise the risk of striking a person where its path is likely to be above deck level and below head height;
- prevent trapping points or any other hazards where equipment will be able to travel, or it has a luffing or slewing motion;
- ensure that access and egress paths, passageways and entry gaps are not compromised by risks arising from lifting operations;
- ensure appropriate measures are taken to prevent risks from uncontrolled movement/freefall of load or movement of lifting equipment;
- prevent unintentional release of a load in the event of power failure;
- avoid collision with other lifting equipment being used simultaneously, or with other structures;
- provide suitable gates/barriers to prevent inappropriate/unsafe access to any hoist way/lift shaft.

Note: This list is not exhaustive. Lift plans should be subject to initial and individual risk assessment; this should also ensure that the lifting equipment is and remains positioned or installed such that the risk of lifting equipment or load injuring people or assets is minimised.

5.6 Lifting Equipment for Lifting Persons

The need to use lifting equipment to transfer or lift people should be reassessed on every occasion. Ideally, the lifting of personnel should be eliminated as far as possible. If, after assessment, there is no alternative, the equipment used needs to be specifically designed or adapted for that purpose and operated within its design parameters.

All equipment used for lifting of persons should be reviewed to ensure that risks to persons being lifted are reduced to as low as reasonably practicable.

It is also necessary to check what local regulators require, for example regulators can require that all equipment suitable for lifting of persons needs to be clearly marked, such as 'suitable for lifting persons' and that any equipment not marked in this way should not be used for this purpose.

It should be ensured that:

- all hazards associated with the lifting of persons are identified;
- all risks associated with the lifting of persons are addressed in the lift plan;
- lifting equipment for lifting of persons continues to meet appropriate specifications.

The equipment risk assessment (see 5.5.1) should result in a review of the technical specification to be applied to lifting equipment for lifting persons. This process should include consideration of current industry and manufacturing standards and relevant legislative requirements.

Risk assessment should include consideration of the nature and extent of the lifting operation required and that a safe system of work for individual lifting operations involving lifting of persons should be maintained.

The independent competent person (see 6.1) should verify during thorough examinations (see 6.3) that the technical specification for such equipment is and remains compliant with current requirements. Any item of equipment that does not comply should be recorded as defective in accordance with company procedures and removed from service.

5.7 Communication

Failures in communications are often root causes of lifting incidents and can also be the most difficult to detect. Good training and adherence to correct procedures are vital but checking the actual situation at the worksite is of utmost importance. For example, are the personnel concerned all from the same company? Do they all understand a common language? If not is there an established system of signals in strict use that they all know and understand? Is it displayed where the lift team will be able to see it? What different methods of communication are able to be used? What communication is required between the worksite and the source of any technical assistance elsewhere?

Communication also extends to warning personnel of the lifting activity and keeping the lift area clear of personnel not involved in the lifting operation.

This document does not give detailed guidance on communications in lifting, but the quotation below is taken from IMCA M 175 – *Operational communications: Part 1 – Bridge and dive control* – to which reference should be made regarding communication procedures:

> *Company procedures should ensure that a very high level of communications discipline is exercised at all times. Effective communications are vital to the safety and success of any operation and the term 'communication' covers all means of communication, such as hard wire systems, sound powered systems, radios and emergency back-up systems; computer systems, alarm, warning and indicator lights and audio alerts; CCTV, word of mouth, hand signals, other visual signals, toolbox talks and post operation debriefing. With regard to the latter two, supervisors' encouragement toward clear comprehensive communication is extremely important at these talks and debriefings.*

All members of the lifting team should know what task is assigned to each person and what the communication arrangements are. Designated signallers (such as banksmen/slingers or as described in company procedures or in the local terminology) should be clearly and separately identifiable, perhaps by use of reflective jackets or other conspicuous clothing or marking.

Where any part of the lift is out of sight of any of the members of the lift team, ensuring good quality of the communications is essential.

If a signal is not clear to a member of the lift team operating any lifting equipment, then the operation should be stopped.

5.8 Stopping the Job

Any person should be able to stop the lifting operation whenever there is a potential safety issue, leading to consideration of a management of change (MoC) procedure (see 5.10 and 5.10.1).

This may occur because of any potential safety issue, for example:

- a signal is not clear;
- an alarm sounding (for example in the crane cab);
- specific competence exceeded.

5.9 Technical Review by the Competent Person

Following completion of initial planning of a non-routine lifting operation it should be subject to review by the competent person. Generic lift plans should also require review by the competent person.

5.10 Management of Change

Management of change (MoC) procedures can apply to all aspects of operations. Any member of the lifting team can request a management of change procedure to be invoked and suspend the activity. Assessment should then be undertaken to determine if an MoC is required. If it is required the activity should not resume until the MoC procedures has been approved and implemented.

MoC procedures cover:

- deviation from an approved procedure;

- deviation from standard company procedures;
- unplanned modifications to vessels and equipment;
- changes to equipment;
- major changes to the sequence of operations;
- deviation from specified safe working practice or work instructions;
- use of an existing piece of equipment for an activity not included in the lift plan;
- weather and environmental issues;
- implementation of new systems;
- significant changes of safety-critical personnel;
- change instigated and/or requested by the client or regulator or other relevant party.

MoC procedures provide the route to follow to ensure that changes are managed safely and efficiently.

Procedures should be developed by the company, perhaps by the project team, for a given work scope to meet a contract specification. The procedures should be compiled from company work practices and methodologies for specific activities, refined through formal operational reviews and risk assessment and other studies, resulting in a new lift plan, prior to final approval by the relevant competent person (see 3.2) and the client, as appropriate.

On a construction project, the project procedures could be issued as 'approved for construction' (AFC) or approved according to company protocol. AFC procedures which require revision due to a change in method, unforeseen work or other circumstances should be subject to MoC procedure and a job risk assessment should be carried out.

New tasks or lifts that are not part of the approved procedures should be subject to the MoC procedure and a JRA prior to carrying out the task.

5.10.1 Contingency Plans

Planning of operations should include emergency fall-back procedures. For example, back-up set-down areas, planning for excessive changes in environment, consideration for the effect of vessel position loss or effects of failures of any nearby operations.

5.11 Selection of the Lifting Team

The competent person should select a competent team for the specific lifting operation (see 3.5).

5.12 Explanation of a Toolbox Talk

Once at the worksite, the competent person should review the findings of the risk assessment and approved lift plan with the lifting team at a pre-lift meeting or toolbox talk. Individual responsibilities should be allocated to each person involved in the lifting operation, together with clear identification of the lift supervisor.

The risk assessment and lift plan should be discussed step-by-step to ensure that everyone clearly understands and agrees with the methods and control measures to be used. Using a lifting safety pocket card (see below) as a guide, any questions raised by anyone else involved in the lift should be discussed and accounted for within the risk assessment and lifting operations plan. If there is an agreed change to the risk assessment and/or lift plan, the documentation should be amended and re-approved by the competent person, following MoC procedures.

Typical prompts for a toolbox talk are provided in Appendix 10, which shows IMCA safety pocket card number 3 – Toolbox Talks. The prompts are as follows:

Prompts	
Objective of the job	*What is the intention?*
Plans and methods	*How is it to be done?*
Responsibilities	*Who does what?*
Manpower and skills	*How many? What skills needed?*
Access and evacuation	*Can we get in and out safely?*
Work environment	*Is it a safe area?*
Hazards	*Risk assessment*
Permit to work	*Obtain documented authority*
PPE	*What personal protective equipment is required?*
Equipment	*What equipment required?*
Materials	*What materials required?*
Isolation	*Safety barriers deployed?*
Conflicting activities	*What else is going on?*
Information	*Alert anyone who could be affected*
Motivation	*Why the task is necessary*
Communication	*Establish communication procedure*
Debrief or post-job talk	*What was good or bad? Lessons learnt?*

Table 2 – Toolbox talks

5.13 Post-Job Debrief and Learning Points

After completion of a lift, a debrief session will provide all personnel with an opportunity to identify:

- learning points;
- good practices;
- improvements.

Any learning points noted on the lift plan should be reviewed by the competent person and subject to action as appropriate. For example, this may include feedback on equipment effectiveness, lifting techniques, communications and so on, information which could be vital to the next lift.

5.14 Records of Lifting Procedures

Information relevant to monitoring and controlling lifting operations procedures should be retained in order to demonstrate the effectiveness of company procedures and to assist in identifying opportunities for improvements and to demonstrate the procedures to regulators or clients.

To assist those planning lifting operations, it is desirable that they have convenient access to records of previous lift plans, risk assessments and any relevant material such as post-job debriefs.

6

Inspection, Examination and Marking of Lifting Equipment

There are two forms of assessing lifting equipment:

- inspection (see 6.2); and
- thorough examination (see 6.3).

Inspections may be carried out by personnel with sufficient experience and competence to do so as specified in company procedures. Thorough examinations and the marking of equipment are carried out by the independent competent person (see 6.1).

6.1 Independent Competent Person (ICP)

For the purposes of this guidance, an independent competent person (ICP), appointed to perform the thorough examinations (see 6.3) on behalf of the company, is a person who is sufficiently competent and independent to allow impartial, objective decisions to be made concerning the lifting equipment.

This does not mean that such ICPs need necessarily be employed from an external organisation, if the necessary competence can be found from within the company. If so, the company should ensure that their in-house examiners have the genuine authority and independence to ensure that examinations are properly carried out and that the necessary recommendations arising from them are also carried out.

Thus the ICP referred to in this guidance can be an appointed independent lifting contractor, but the company might appoint an appropriately competent in-house person.

The competence necessary would include the practical and theoretical knowledge and experience of the lifting equipment appropriate to carrying out a thorough examination.

The position of ICP is not the same as the position of competent person as described in 3.2.

6.2 Inspection

An inspection is defined for the purposes of this guidance as a visual check, supplemented where practicable by a function check, to determine no obvious damage or deterioration to the lifting equipment and to ensure that health and safety conditions are maintained, with any deterioration detected and remedied in good time.

Examples of inspection include:

- checks prior to equipment being used on each occasion;

- checks at appropriate/periodic intervals or under prevalent conditions as may be identified by the lift plan and as a result of risk assessment.

Checks should be made by appropriately competent personnel, not necessarily the ICP.

Pre-use inspection procedures may be reviewed and revised as necessary. Approval of such revisions should be by the relevant line management responsible for issue/approval of the original procedures.

6.2.1 Frequency of Inspection

All lifting equipment should be inspected in accordance with the company's planned maintenance schedule and with the requirements of relevant regulators, but as a general guide as follows:

- before use on each occasion (pre-use check);
- at weekly intervals for items of lifting equipment in use;
- at other intervals or under conditions identified by the manufacturer or risk assessment;
- where review of lifting equipment records indicates it may be prudent to do so.

Inspections should be recorded. Pre-use checks should be recorded in the lift plan.

6.3 Thorough Examination

A thorough examination is an examination carried out by an ICP (see 6.1), carefully and critically, and where necessary supplemented by other means such as measurement, non-destructive testing or other testing, in order to detect defects or weaknesses and to assess their importance in relation to the safety and continued use of the lifting equipment.

A thorough examination procedure should include, but not necessarily be limited to, establishing processes whereby:

- all lifting equipment has a thorough examination to detect defects and weaknesses and to assess the importance of those defects and weaknesses in relation to the safe use of the equipment;
- clear marking ensures that users can ascertain that the lifting equipment has been thoroughly examined and is therefore should be safe for use;
- examinations are undertaken which verify the equipment remains in an appropriate condition for safe use.

6.3.1 Thorough Examination Procedures

Procedures should establish a scheme of thorough examinations to be carried out by the ICP.

- a scheme of thorough examination should be operated ensuring equipment is examined at appropriate intervals (see 6.3.2);
- the scheme should take into account equipment condition, the environment in which it is to be used and the number and nature of lifting operations for which the equipment is used;
- thorough examinations and defects found should be recorded;
- valid records of examination should be available for inspection at the location where equipment is to be used;
- valid records of examination should accompany lifting equipment provided by others for use by the company, or provided to others by the company;
- review of equipment records should determine the continued effectiveness of the scheme and/or to identify necessary adjustments to the frequency and extent of the scheme of examination of equipment.

Thorough examination procedures may require to be revised following risk assessments which may impact on:

- the intervals between examination/inspection (see 6.3.2);

- the extent and nature of the examination required.

All such amendments/revisions to approved procedures should be approved by the company prior to issue and use.

6.3.2 Frequency of Thorough Examinations

All lifting equipment and accessories should be subject to thorough examination on a regular basis, as required by the relevant regulator or, in the absence of relevant regional regulations, as identified by the ICP as meeting the appropriate legislation and as recommended by the manufacturer, or by frequency of use. Where it is demonstrated by risk assessment that this period should be reduced or extended with no additional risk to users or equipment, it might be possible to obtain dispensation from the relevant regulator or to implement a company dispensation procedure from an appointed responsible person.

This depends upon relevant regulatory requirements. There may be a choice between following a 'specified period' approach to the thorough examination of lifting equipment or an alternative approach of having a written examination scheme drawn up whereby the equipment can be examined in accordance with a regulator's scheme, instead of at specified periods.

The frequency and extent of examinations of equipment should be determined by manufacturers' recommendations or by risk assessment or from use of the equipment (see 6.3.2).

In addition to the periodic thorough examination, lifting equipment should be thoroughly examined:

- before being brought into use for the first time, unless it has been accompanied by valid regulatory documentation (see Appendix 8 for examples of certification) or report of thorough examination;
- where a regulatory requirement was received more than six months before the lifting equipment is put into service, or as the relevant regulator requires;
- where the equipment is involved in an accident or dangerous occurrence;
- after a significant change in conditions of use (determined by the ICP), for example after installation/assembly/relocation/modification/repair;
- after long periods out of use (determined by the ICP);
- in the case of lifting equipment for lifting persons at intervals not exceeding six (6) months;
- each time that an exceptional circumstance (such as overload) is liable to jeopardise the safety of the lifting equipment.

6.3.3 Report of Thorough Examination

A report is issued by the ICP giving the results of the thorough examination.

6.3.4 Reports and Defects

All thorough examinations should be recorded and any defects should also be recorded.

A report of thorough examination should detail the defects found or include a statement to the effect that the equipment is fit or unfit for continued safe use. The report of thorough examination should be retained and copies made available as required by users.

The ICP should notify the relevant company focal point immediately upon discovery of any defect in the lifting equipment that, in the opinion of the ICP is, or could become, a danger, so that appropriate action can be taken to repair or replace the equipment, or otherwise ensure that potentially dangerous equipment is withdrawn from use as soon as possible.

In situations involving an existing or imminent risk of serious personal injury, the ICP may be required to notify the relevant enforcing authority by sending a copy of the report. Reports of thorough examination should be forwarded to the relevant company focal point as soon as is practicable (but a

requirement could be established by the company such as, for example, within 28 days from the date of examination). All defects should be reported on a daily basis.

6.4 The Marking of Lifting Equipment

The identification of safe working load (SWL), operating mode and configuration for the safe use of equipment, is required to ensure that lifting equipment and accessories are used only within the range of operating parameters appropriate to their safe use.

SWL is defined as the maximum load the lifting equipment is certified to withstand under normal use. Thus it is a value or set of values based on the strength and/or stability of the equipment when lifting. A range of SWLs can be specified for the same equipment when used in different configurations.

Some specialised equipment, for example chain lever hoists, have maximum and minimum SWLs.

All equipment and accessories provided should be clearly and permanently marked with their SWL and unique identification markings as required by procedures.

Additional client/site marking requirements should be communicated to all users.

The marking of equipment should not damage it or alter its use.

Equipment designed for lifting persons should be clearly marked as such and as required by relevant regulators.

The relevant ICP (see 6.1) is responsible for re-marking equipment where there has been any change to it or its use, affecting the SWL.

It is advisable for companies to ensure not only that there are procedures to have lifting equipment and accessories adequately marked to indicate their SWL, but that it is clear which department and/or personnel are responsible for ensuring that this occurs. An ICP could advise the company of the following:

- when any item of equipment subjected to a thorough examination is not appropriately marked in accordance with regulatory requirements;
- how the marking can be applied sufficiently to comply with regulatory requirements, for example how information which clearly indicates SWL for equipment with variable configurations may be best provided, either by marking or by providing suitable instructions convenient to the equipment.

The ICP conducting the thorough examination should remove from service any item of equipment not so marked in accordance with regulations.

The ICP should re-mark the equipment in accordance with regulations after verifying the required markings by viewing the appropriate certificate of conformity or test certificate for the item.

The company should maintain a check on this process by ensuring that markings are inspected as part of pre-use inspection procedures.

Only the ICP should conduct re-marking.

7

Maintenance

All work equipment should be maintained in an efficient state, in safe, effective working order and in good condition through a planned maintenance system.

There should be a process provided for:

- ensuring work equipment is adequately maintained at appropriate intervals;
- ensuring work equipment maintenance logs are kept up to date;
- ensuring work equipment maintenance frequencies are recorded and the internal audit process utilised to monitor this;
- formalising the maintenance management system; whether that is planned preventative, condition monitoring or breakdown maintenance.

(Some useful guidance on wire rope maintenance is provided in IMCA SEL 012 – *Guidance on the management of life cycle maintenance of non-man-riding wire ropes*.)

All relevant data should be recorded as a basis for trend analyses on the overall performance of the equipment.

Lifting equipment begins to deteriorate from its first use, most especially in offshore operating conditions. Inventories usually consist of equipment that has been in use for several years. A system should be developed to identify equipment whose life expectancy is nearing its end in order to overhaul it or withdraw it from service. The aim is to reduce the instances of defective or worn out equipment before it becomes a risk.

Equipment can be returned to a third party for equipment maintenance. It is essential that any defects found must be notified to the equipment owner within the company. Where legislation dictates that this is of a significant risk, it may need to be reported to the local enforcing authority.

Where maintenance intervals are set for lifting equipment, according to manufacturer's recommendations or by risk assessment, these intervals should be adhered to. If equipment is due for mobilisation and a planned maintenance routine is expected within that time, the equipment should be subject to planned maintenance prior to mobilisation or arrangements made for that maintenance to be conducted during its in-service period.

See Appendix 9 for an example maintenance assessment table.

8

Record Keeping

- A systematic method of record retention should be operated to ensure that information is readily available to competent persons.
- The competent person should be able to access the relevant lifting equipment certificates.
- It is useful to have printed company check lists for all rigging and lifting equipment, for use and retention.
- Lifting equipment reports and records should be retained for periods that satisfy regulatory requirements as a minimum and for longer where they provide information useful for identifying trends or opportunities for improvements. The retention periods for specific documents should be listed in company documentation. Reports and records may for example be kept for longer periods if the information they contain assists in identifying repeated defects or indicating trends.
- Original documented records should be kept in a central location within a secure system (e.g. for all equipment coming under the control of a particular vessel, project, location, region, as appropriate).
- All relevant documentation should be available or copied to appropriate persons at the location where the equipment is to be used and available to inspectors from the relevant enforcing authorities upon request.
- Documentation should be reviewed periodically in line with examination intervals and review of lifting equipment records and reports should form part of the procedures for controlling the lifting equipment and should be addressed within the formal management system audit and review programme.
- Review of records should enable consideration of ongoing effectiveness and improvements.
- Management system arrangements provided in support should be auditable and subject to formal change control.
- The relevant reports, records and other documentation could be kept in hard copy form, stored electronically or on computer disk. If a computer system is used to keep this information then it needs to be protected from unauthorised alteration. It should be possible to provide a written copy when necessary. Appropriate procedures within the management of the company should be established describing the control of such information.
- Other related documents and information, such as for example management system procedures, communications, audit reports, records of management review, etc., should be retained in accordance with the relevant management system arrangements and contractual requirements; in particular documents demonstrating the application of management of change procedures.

For an example of a lifting equipment record see Appendix 8.

9

Related IMCA Publications

IMCA S&L 001	*Guidance for the Management of Change in the Offshore Environment*
IMCA SEL 012	*Guidance on Management of Life Cycle Maintenance of Non-Man Riding Wire Ropes* – provides useful general guidance on wire rope care.
IMCA M 171	*Crane specification document* – highlights pertinent issues in consideration of cranes.
IMCA M 179	*Guidance on the use of cable laid slings and grommets* – is of particular use when using slings and grommets over 60mm.
IMCA D 016	*Underwater air lift bags* – gives guidance on sub sea operations with air lift bags.
IMCA D 024	*Diving Equipment Systems Inspection Guidance Note (DESIGN) for saturation bell systems* – gives guidance in particular regarding bell wire ropes.
IMCA D 028	*Guidance on the use of chain lever hoists in the offshore subsea environment.*
IMCA D 032	*Cross hauling of bells.*
IMCA D xxx	*Concrete mattress handling, deployment, installation, repositioning and decommissioning* (in draft)
IMCA C 002	*Competence assurance and assessment – Guidance document and competence tables – Marine Division.*
	Crane Operators Logbook (for offshore vessels).

IMCA produces a number of safety pocket cards and posters which aid focus on safety. Further cards are being developed, but those currently available are listed below and it can be seen that a lot of them relate to lifting operations:

Safety pocket cards:

01	*Manual handling safety guide*
02	*Preventing slips and trips*
03	*Toolbox talks*
04	*Lifting operations*
05	*Lifting equipment*
06	*Working at height: preventing and dealing with falls*
07	*Drug and alcohol misuse: The effects*
08	*Watch your hands: you've only got one set*
09	*Confined spaces can be deadly*
10	*Workplace safety self assessment*

11 *Stay safe at the wheel – Cutting and grinding safety*

12 *Avoiding dropped objects*

13 *Personal security*

14 *Keep your eyes on safety*

Safety posters:

01 *Manual handling: Watch your back*

02 *Preventing slips, trips and falls*

Appendix 1

Job Risk Assessment

Project	
Location	
Job description	
Date	
JRA number	
JRA leader	
JRA team	

Initial assessment							Final mitigated assessment		
Item no	Specific activity	Hazards identified	Existing control measures	Severity (1-5)	Probability (A-E)	Initial risk*	Additional risk-reducing measures	Final risk*	Action assigned to

** Risk = Severity x Probability*

Appendix 2

Example Risk Assessment Matrix

Hazard severity category	Descriptive words	Actual/potential consequences			Probability rating				
		Personal illness/injury	Environmental *(any incident that ...)*	Cost of loss	A very likely	B likely	C possible	D unlikely	E very unlikely
1	**Very high**	Fatality(s), terminal lung disease or permanent debility	potentially harms or adversely affects the general public and has the potential for widespread concern regarding the company's operations. Can have a serious economic liability on the business	>$1m	1	1	1	2	3
2	**High**	Serious injury, poisoning, sensitisation or dangerous infection	potentially harms or adversely affects employees and the environment at the worksite. Requires specialist expertise or resources for correction	>$250,000	1	1	2	2	3
3	**Moderate**	Injury leading to a lost time accident or persistent dermatitis or acne	potentially harms or adversely affects employees and the environment at the worksite. Requires general expertise or resources for correction	>$50,000	1	2	2	3	3
4	**Slight**	Minor injury requiring first aid treatment or headache, nausea, dizziness, mild rashes	presents limited harm to the environment and requires general expertise or resources for correction	>$10,000	2	2	3	3	3
5	**Negligible**	Negligible injury or health implications, no absence from work	presents limited harm to the environment and requires minor corrective action	>$10,000	2	3	3	3	3

Probability rating

A	*Very likely*	Almost inevitable that an incident would result
B	*Likely*	Not certain to happen, but an additional factor may result in an incident
C	*Possible*	Could happen when additional factors are present but otherwise unlikely to occur
D	*Unlikely*	A rare combination of factors would be required for an incident to result
E	*Very unlikely*	A freak combination of factors would be required for an incident to result

Risk priority code

1	*High risk*	Must not proceed – change task or further control measures required to reduce risk
2	*Medium risk*	Can only proceed with senior management authorisation
3	*Low risk*	Permissible by those trained and authorised to do so, but a review should be carried out to see if risk can be reduced further
		Note: Risk priority code of less than 3 is not acceptable for hazards that target personnel

Potential costs of loss shown could vary dependent on company and operations

Appendix 3

Example Lift Plan

To be completed by the competent person

Lift plan title				
Vessel/site				
Client/project/location				
Lift location	Main deck/quayside/yard/etc.:			
Lift type	☐ Routine ☐ Non-routine			
References	**Lift plan no.**		**Procedures ref.**	
	Risk assessment no.		**Drawings ref.**	
	Permit to work no.			

Load details/crane details *(maximum hook load not to be exceeded)*

Load identification (include load dimensions):	Centre of gravity: ☐ Obvious ☐ Estimated ☐ Drawing	Design lift conditions (maximum): Wind (knots): Wave (m):
Gross lift weight/maximum hook load In air: ☐ Actual In water: ☐ Assessed	Water depth:	Crane configuration/mode:
Maximum radius:	SWL at this radius:	Design hook height: Maximum hook height:

Description of lifting operation

Possible safety measures to be considered *(tick as applicable and detail in 'step-by-step' section overleaf)*
To be completed onshore for safety measures included in installation procedure/offshore by lift supervisor for any additional considerations

☐ Weight not verified	☐ Lifting equipment/accessories certificates	☐ Emergency/rescue plans
☐ Stability of load	☐ Stability of lifting equipment	☐ Environment: visibility/wind speed/wave height/ tide
☐ High centre of gravity	☐ Pre-use equipment checks	☐ Sudden changes in environmental conditions
☐ Awkward size/shape/sharp edges	☐ Crane mode verified	☐ Load visibility during night/subsea working
☐ No dedicated lift points	☐ Vessel stability	☐ Blind lifting
☐ No certified suspension points for lifting equipment	☐ Vessel ballasting required	☐ Lighting pick-up and set-down areas
☐ Packing protection load/lifting equipment/assets	☐ Lifting over plant/equipment/assets	☐ Dynamic factors involved
☐ Loose objects removed from load	☐ Restricted head room	☐ Seabed suction
☐ Load on pallet requires securing	☐ Lay-down area size/strength/stability	☐ Seabed conditions
☐ Tag lines required	☐ Route and lay-down area clear	☐ Competent and sufficient personnel
☐ Buoyancy of objects	☐ Route and lay-down area obstructed	☐ Suitable adequate supervision
☐ Lifting of chemicals	☐ Lay-down in operational radius of lifting equipment	☐ Correct PPE
☐ Access and egress for slinging	☐ Conflicting operations	☐ Toolbox talk required
☐ No lift point directly above load	☐ Cultural, communication, language issues	☐ Sea fastenings removed
☐ Accessories/equipment fit for purpose/SWL	☐ Diving operations – precautions	☐ Pre-use equipment check

Lifting of personnel *(attach task risk assessment with information on the following)*

☐ Prevention of person(s) becoming stuck/trapped	☐ Environmental hazards	☐ Vessel-/site-specific procedures
☐ Prevention of person(s) falling/being crushed	☐ Correct PPE/harnesses/etc.	☐ Equipment secured in transporter
☐ Communications between passengers/operator	☐ Trained/competent personnel	☐ Efficient means of rescue
☐ Suitability of equipment and accessories	☐ Certification/pre-use checks	☐ Limiting conditions of use

Any further safety measures *(as identified in the risk assessment; remember SIMOPs)*

Communications

Communications available: ☐ Primary (VHF) ☐ Secondary (hand signal) ☐ Other (specify):	Communication checks: ☐ Primary checked ☐ Secondary checked

Lifting equipment and accessories to be used *(specify type, SWL and configuration)*

Step-by-step details of lifting operation		*(Responsible)*

Technical review	
Has a technical review been conducted?	☐ Yes *(attach details)* ☐ No

Sketches	
Sketch detailing the rigging-up of the lifting equipment and lifting accessories *(optional)*	Sketch of initial pick-up location, load path and lay-down area *(include any obstructions or equipment clashes that may occur and how they will be avoided)*

Debrief and learning points *(did the lift go as planned or are changes to the lift plan required?)*

Competent person	Print name	Signature	Date
Lift supervisor(s)	Print name(s)	Signature(s)	Date

Appendix 4

Example Lift Plan – Worked Example of an Engineered Lift

Vessel	Acergy Osprey
Location *(back, deck, quayside, etc.)*	Quayside to work deck
Lift plan number	OSP-07-LP0031
Risk assessment number	-
Permit to work number	-
Weight of lift	90 Te
Type of lift	☐ Routine lift – plan covers general lifting operations ☑ Non-routine lift – plan covers a specific lifting operation
Description of lift	Lifting of protection structure from quayside onto dedicated grillage

Possible considerations *(not exhaustive – tick if relevant and address each point in 'step-by-step' plan below)*		
☐ Weight of load not defined	☐ Load on pallet requires securing	☐ Large crane head to hook height
☐ High centre of gravity	☑ Certified and correctly installed rigging	☐ Dynamic factors involved
☐ Stability of load	☑ Restricted/confined work area	☑ Hazards to people/people position
☑ Awkward size/shape/sharp edges	☐ No lift point above load	☑ Clear communications
☐ No dedicated rigging	☑ Crane power and fuel tank levels checked	☑ Tag lines/tugger lines
☐ No dedicated lift points	☑ Ballast and fuel in accordance with stability calculations	☑ Adequate lighting
☐ Seafastening removed?		
☐ Lifting of chemicals		

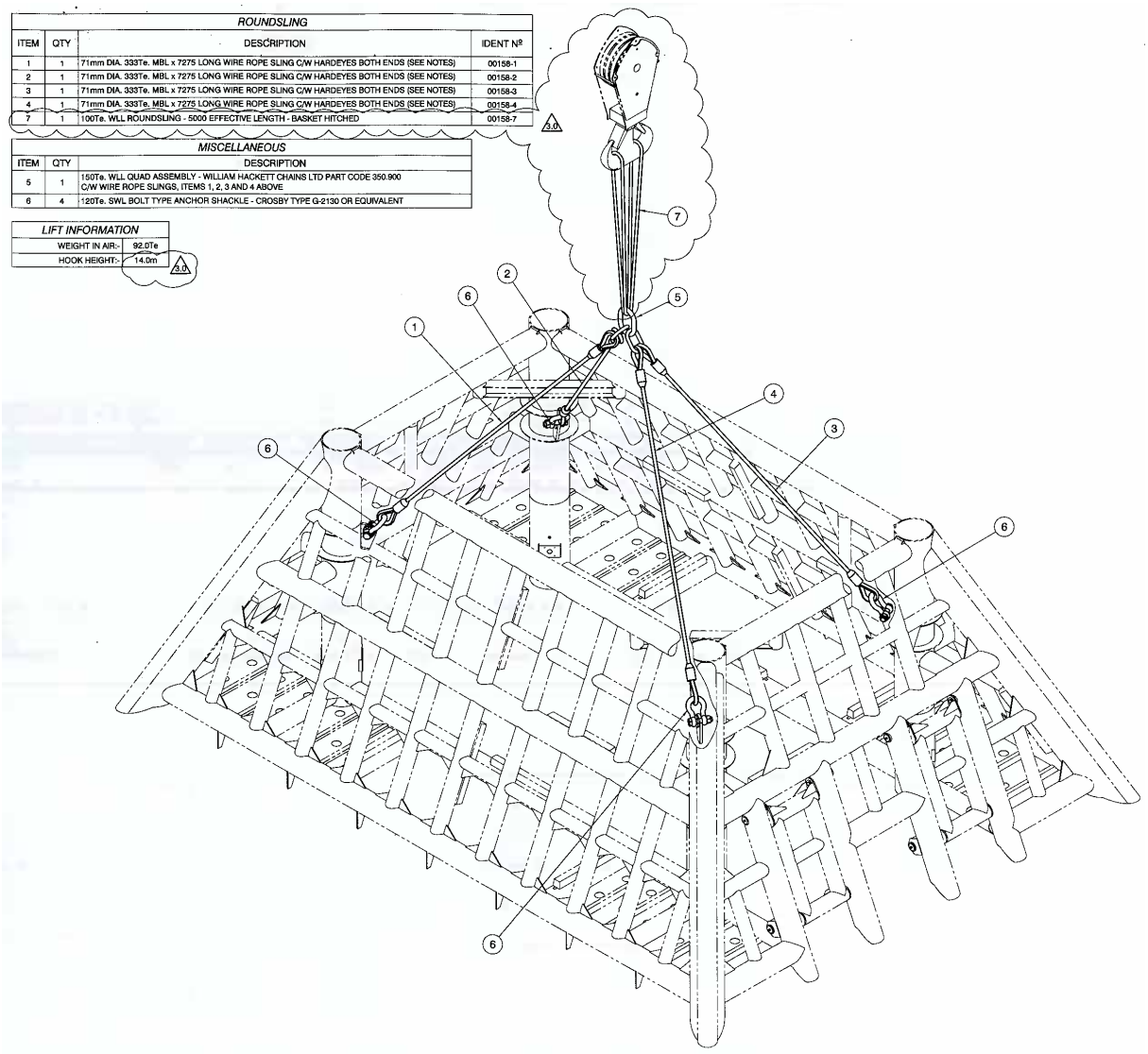
Route to be travelled and lay-down area *(if you answer 'no' to any question, explain in the 'step-by-step' plan below)*		
1	Are the route and lay-down area clear of obstructions?	☑ Yes ☐ No ☐ NA
2	Is the lay-down/landing area adequate in terms of size and load-bearing ability?	☑ Yes ☐ No ☐ NA
3	Is suitable packing available for protection of load?	☐ Yes ☐ No ☑ NA
4	Have barriers been positioned to prevent access by unauthorised people?	☑ Yes ☐ No ☐ NA
5	Have you confirmed that the lay-down area is within the operating limits/radius of the crane?	☑ Yes ☐ No ☐ NA
6	Have weather conditions been considered with regard to the safety of the lifting operations?	☑ Yes ☐ No ☐ NA
7	Will the crane driver be able to see the banksman throughout the operation, or have other suitable means of communication been checked and made available (e.g. radios)?	☑ Yes ☐ No ☐ NA

List rigging
Dedicated rigging

Step-by-step plan of the operation
Obtain heavy lift PTW
Deck foreman to check comms between deck, crane and bridge
Toolbox talk has been completed
Attach taglines
Attach crane hook to lift rigging
Plumb the crane hook over the load
Deck foreman to confirm that the crane is plumb
Crane op. to come up in 10 Te increments until the crane starts to take the load
Deck foreman to ensure he has at least two riggers/competent crew on the quayside and two riggers/competent crew on the vessel deck who are in control of the taglines
Lift the structure until it is clear of the quayside and is high enough to avoid the crash barriers on deck (approximately 2.5m)
Slew the crane until it brings the structure above the dedicated grillage
Crane op. to come down slowly on the crane
Deck foreman to guide crane op. to land the structure down onto the grillage posts
Land the structure
Detach lift rigging and secure to side of structure, allowing subsequent lifts to be placed inside
NB Bridge to ballast vessel accordingly throughout

Manning *(specify the number of people required for each selected position)*				
Position	Banksman	Rigger	Lifting technician	Support engineer
Number required	1			

Planned by	Name	
	Job title	Field Engineer
	Date	13 March 2007
	Recorded	ABZ/SCS
Reviewed by	Name	OSP-Eng/OSP/SCS
	Date	15 March 2007



Notes:

1 The latest issue of the relevant codes, statutory regulations and specifications referenced shall apply to the work, unless otherwise stated (UOS)

2 All dimensions in millimetres (mm) UOS

3 Wire rope slings (6 x 36 construction) IWRC Grade 1960 in accordance with BS EN 12385 1&2

4 Sling assembly – manufactured in accordance with BS EN 13414-1

5 Complete assembly – tested and certified suitable for SWL from 0° to 90°

6 Sling lengths quoted are from bearing point to bearing point

7 All slings: hard stamp on both ferrules with the identification no. 00158-1

8 Certification for materials and testing to company for approval

9 Rigging certification originals to company and verified copies to accompany rigging items aboard installation vessel

10 Shackles to be in accordance with BS EN 13889 – Forged Steel Shackles for General Lifting Purposes – Dee Shackles and Bow Shackles – Grade 6 –Safety

11 Steel ferrules only to be used for sling fabrication

12 Sling manufacturer to confirm shackle fits through hard eye. Refer to company if shackle is unspecified

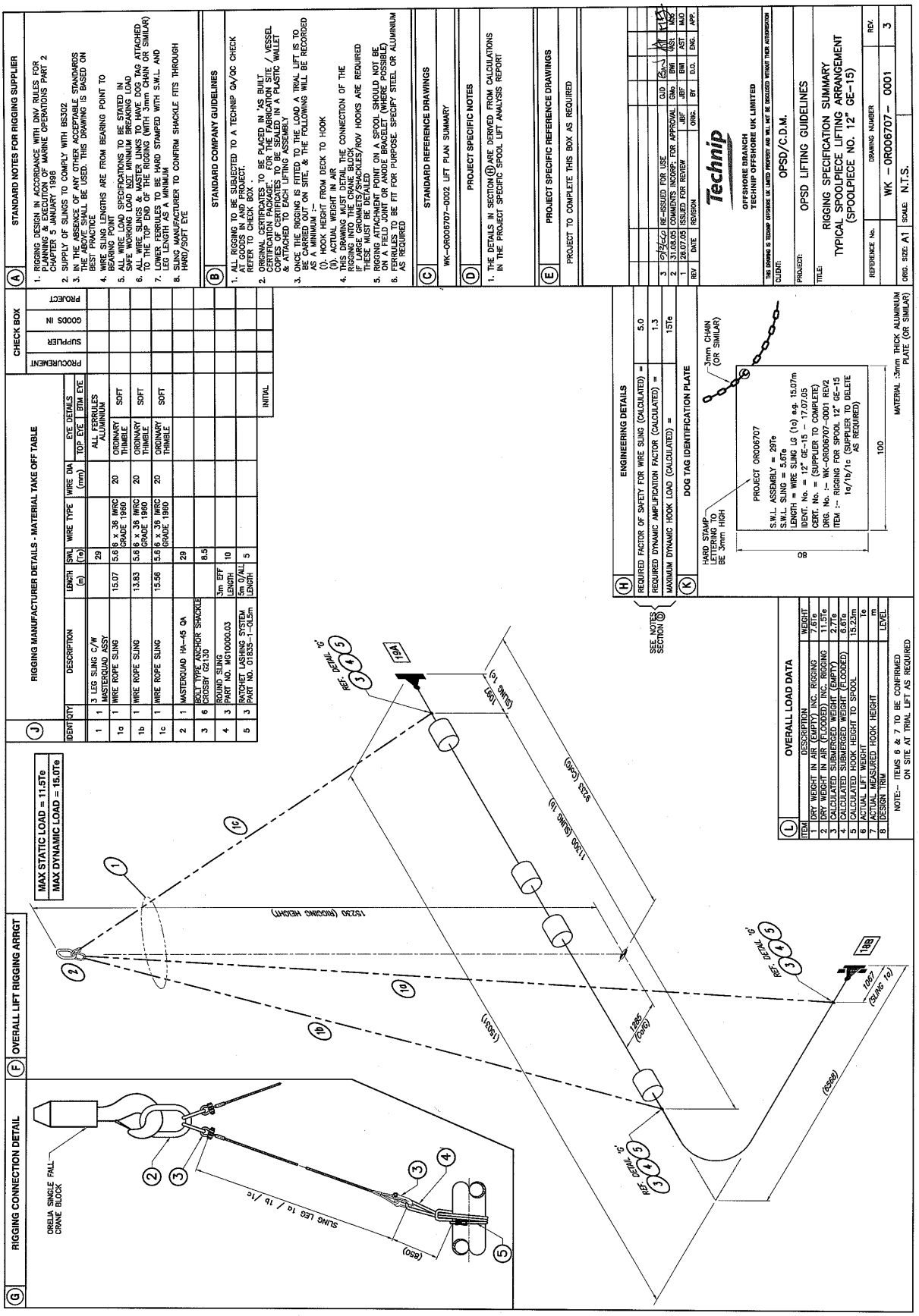
Referenced drawings:

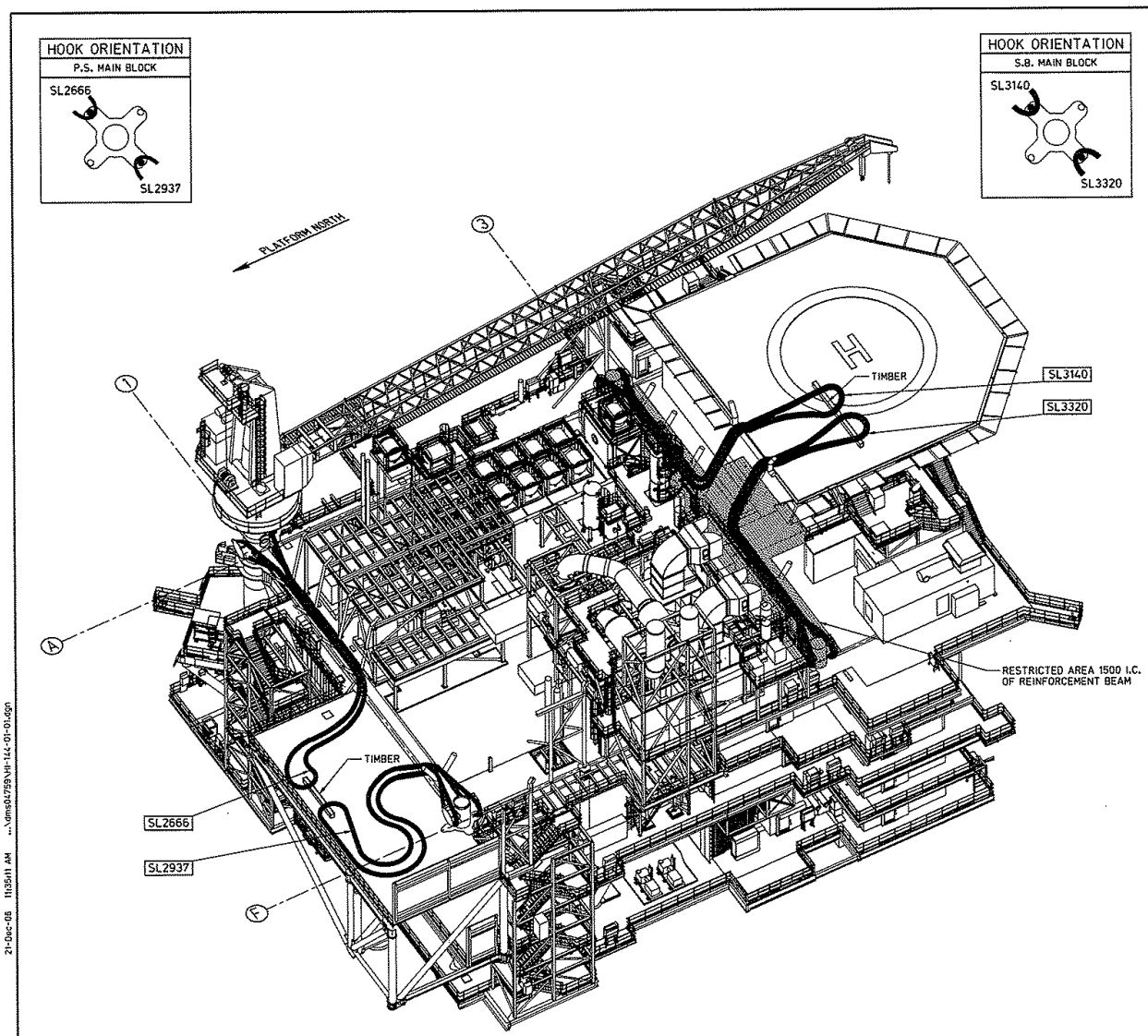
1 Protection structure general arrangement

2 Protection structure main lift pad eyes – general arrangement and details

Appendix 5

Example Rigging Specification Summary Drawings





GENERAL NOTES

1. THIS DRAWING IS AN EXAMPLE ONLY AND PENDING FINAL PROJECT DETAILS SUBJECT TO FURTHER ENGINEERING.

RIGGING ARRANGEMENT

LIFT POINT	SLING No.	LENGTH mm	S.W.L. m.T.	DIA mm	SHACKLES m.T.
F3	SL3320	64950	2400	413	-
A3	SL3140	64930	2400	404	-
F1	SL2937	60900	1100	283	-
A1	SL2666	60850	1100	286	-
TOTAL RIGGING WEIGHT = ~170 m.T.					

EXAMPLE DRAWING

REV.	DATE	DRAWN	DESCRIPTION	APPROVED ENGINEERING	APPD CPS.

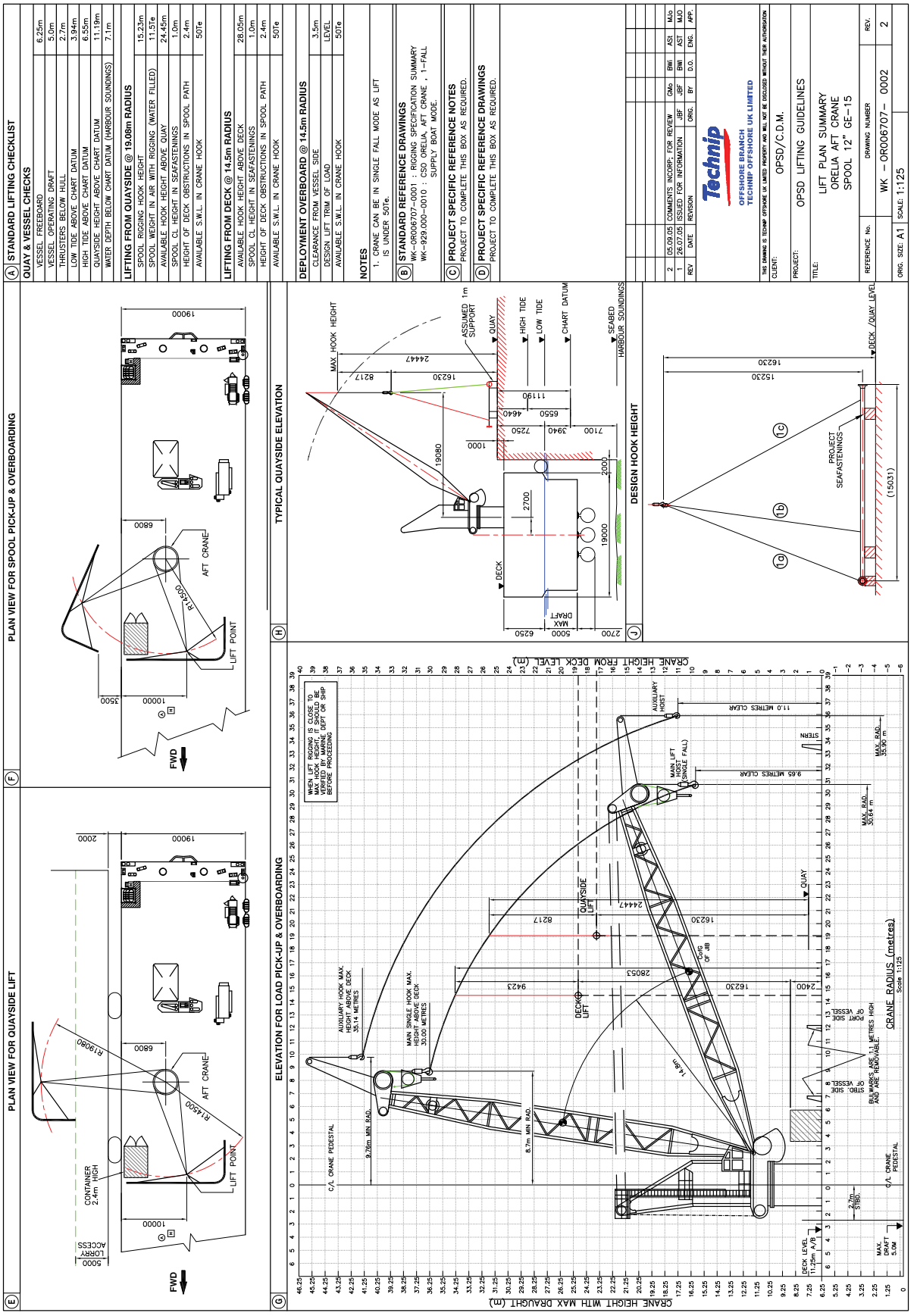
PROJECT: FIXED STRUCTURES EXAMPLES

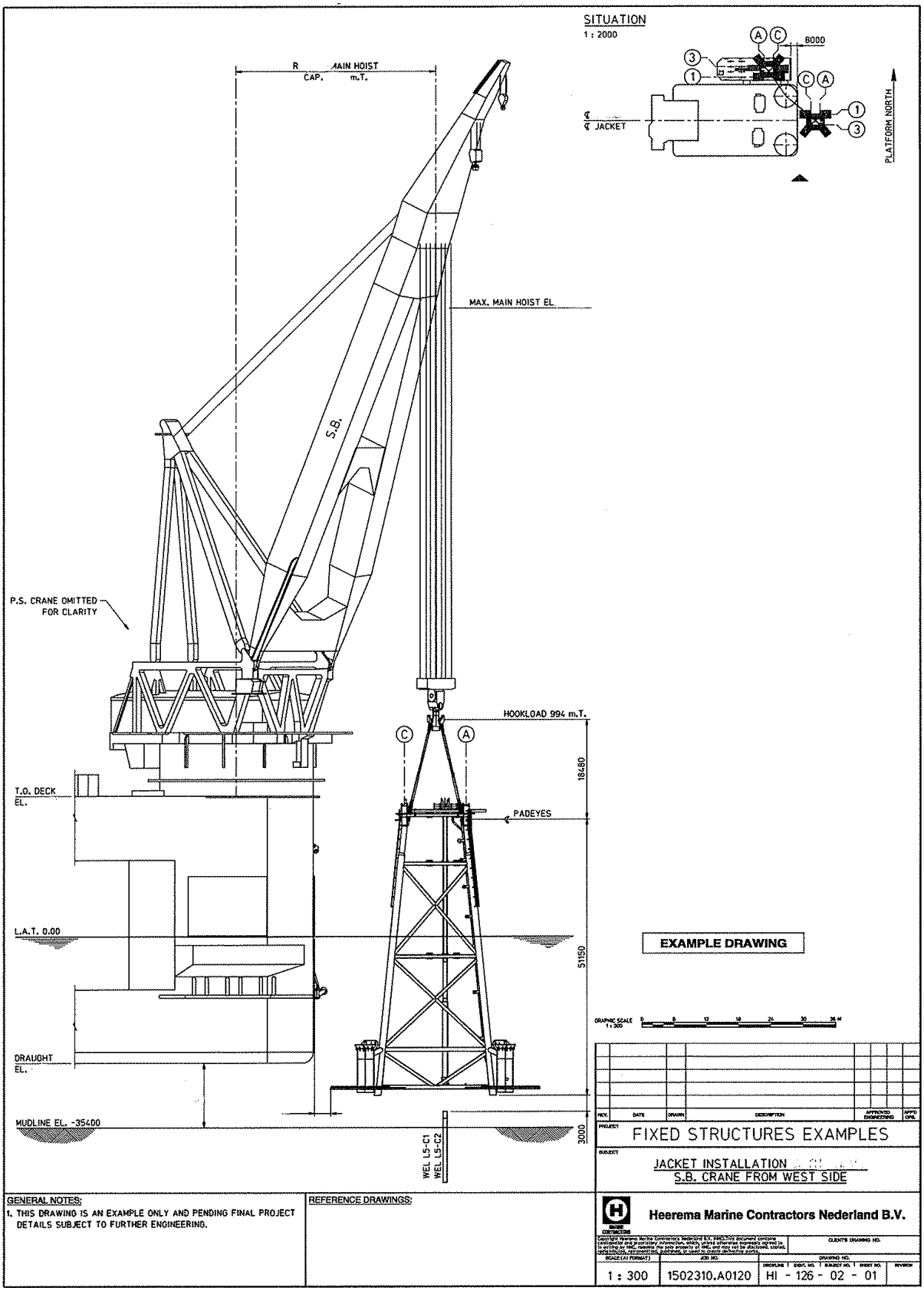
SUBJECT: DECK RIGGING ARRANGEMENT

Heerema Marine Contractors Nederland B.V.

SCALE (A1 FORMAT)	JOB NO.	DRAWING NO. (DISCIPLINE / DWG. NO. / SUBJECT NO. / SHEET NO.)	REVISION
N.T.S.	1502310.A0120	HI - 144 - 01 - 01	

Example Lift Plan Summary Drawings




SITUATION
1 : 2000
8000
JACKET
PLATFORM NORTH
R MAIN HOIST CAP. m.T.
MAX. MAIN HOIST EL.
S.B.
P.S. CRANE OMITTED FOR CLARITY
HOOKLOAD 994 m.T.
18480
PADEYES
T.O. DECK EL.
L.A.T. 0.00
51150
DRAUGHT EL.
MUDLINE EL. -35400
3000
WEL L5-C1
WEL L5-C2
EXAMPLE DRAWING
GRAPHIC SCALE 1 : 300
PROJECT
FIXED STRUCTURES EXAMPLES
SUBJECT
JACKET INSTALLATION
S.B. CRANE FROM WEST SIDE
GENERAL NOTES:
1. THIS DRAWING IS AN EXAMPLE ONLY AND PENDING FINAL PROJECT DETAILS SUBJECT TO FURTHER ENGINEERING.
REFERENCE DRAWINGS:
Heerema Marine Contractors Nederland B.V.
1 : 300
1502310.A0120
HI - 126 - 02 - 01

Appendix 7

Process for Assessing Equipment Strength

Example process for assessing adequate strength:

Stage	Requirement	Guidance
1	Identify the force or combination of forces to which the equipment will be subjected	The forces or combination of forces that the equipment can be subjected to include tensile, shear, bending, torsional and compressive. Particular attention should be paid to the stress induced at mountings or fixing points. Additional forces such as effects of high winds, tides and seabed suction should be considered and potential effects on operations inside as well as outside (inside wind effect can cause 'wind funnelling' in the case of open doors etc.).
2	Identify any foreseeable failure modes likely to arise in service, i.e. fracture, wear and fatigue, seizure	Where lifting equipment is anchored to other work equipment or structures, it should be ensured that this equipment or structure could withstand the forces that the lifting equipment and its use will impose on them. Checks should also be made for existing stresses on structures intended for use as anchoring points. Other foreseeable failure modes would include exposure to temperature variations or acid or alkaline atmospheres such as some grades of alloy steel, which are susceptible to hydrogen embrittlement.
3	Assess every part of the load itself and that anything attached to it and used in lifting it, is of adequate strength and integrity	The ability of every part of the load or anything attached to it to withstand forces should be considered. Special attention should be paid to attachment points on the load and, for example, the need for lifting frames or aids. The weight of lifting accessories should be taken into account.
4	Determine an appropriate factor of safety against failure under foreseeable failure modes	Product standards require items of equipment to be manufactured to incorporate minimum appropriate/regulatory factors of safety for man riding equipment. Equipment manufactured to these standards may not be suitable for the identified intended use and may not provide sufficient factor of safety for the risks identified for a particular operation.
5	Distribute the information to the supplier of equipment, or identified responsible person for the lifting operation	For difficult or unusual loads it may be necessary to contact the manufacturer or supplier to ensure that it is strong enough for the proposed use.
6	Verify that the supplier has taken due account of the assessment	The equipment to be used should provide an appropriate factor of safety. A competent person should ensure that the strength and stability of the lifting equipment continues to be adequate for the tasks for which the equipment is intended to be used.

Appendix 8

Lifting Procedures Records

Example of document/record retention requirements:

Document Title	Retention Instruction
Original certification of equipment	To be kept as long as the company owns the equipment.
Regulatory documentation, e.g.: ◆ EC Declaration of Conformity ◆ Lloyd's Register Type Approval ◆ UL (US product verification certification) ◆ CSA (Canadian product certification) ◆ CCC (China product certification)	To be kept as long as the company owns the equipment.
Report of thorough examination, for: i) All lifting equipment and lifting accessories in service or in storage (including equipment for lifting persons) ii) Where lifting equipment is installed in a new location or reconfigured	i) For one year after the report was made up until the company ceases to own the lifting equipment. *Note: A copy of the last thorough examination report should accompany equipment sold by the company to a third party.* ii) Until the company ceases to use the lifting equipment at the place it was installed.
Records of defects	Every record is to be kept until the company ceases to own the equipment/accessory or for five years, whichever is the later.
Records of inspection	Every record is to be kept until the company ceases to own the equipment/accessory or for five years, whichever is the later.
Records of maintenance	Every record is to be kept until the company ceases to own the equipment/accessory or for five years, whichever is the later.
Calculations and technical data associated with design or modification of lifting equipment	In accordance with governing standards, engineering procedures or contractual requirements, as applicable.
Lift plans and associated records of risk assessment	Available throughout the lifting operation (as a minimum) and retained in accordance with local management system arrangements, change control procedures and contractual document retention policy, as applicable.
Management system procedures	In accordance with local management system arrangements, change control procedures and contractual document retention policy, as applicable.

Appendix 9

Maintenance Assessment Table

Example process for assessment of the effectiveness of maintenance:

Stage	Requirement	Guidance
1	Develop a maintenance system based on manufacturer's advice or if this is not available identify the force or combination of forces to which the equipment will be subjected.	The forces or combination of forces that the equipment can be subjected to includes tensile, shear, bending and compressive. Particular attention should be paid to the stress induced at mountings or fixing points. Additional forces such as effects of high winds, tides, seabed suction should be considered and potential effects from operations inside as well as outside (inside wind effect can cause 'wind funnelling' in the case of open doors etc.).
2	Identify any foreseeable failure modes likely to arise in service (i.e. fracture, wear and fatigue, seizure) and where possible include these in the maintenance regime.	Where work equipment is anchored to other work equipment or structures, it should be ensured that this equipment or structure can withstand the forces that the equipment and its use will impose on them. Other foreseeable failure modes would include exposure to temperature variations or acid or alkaline atmospheres.
3	Assess every part of the work operation to identify vulnerable parts of the equipment needing regular maintenance.	The ability of every part of the equipment or anything attached to it to withstand forces should be considered. Where parts wear quickly, sufficient spare parts should be kept to ensure safe operation.
4	Define an adequate maintenance system for the equipment in order to ensure continuing suitability for its intended use.	The maintenance system should include the keeping of logs, especially for 'high risk' equipment. Such logs can provide information for future planning of maintenance activities and make other personnel aware of actions previously taken.

IMCA Safety Pocket Cards

Toolbox Talks

PROMPTS

- Objective of Job
- Plan and Methods
- Responsibilities
- Manpower and Skills
- Access and Evacuation
- Work Environment
- Hazards
- Permit to Work (PTW)
- Personnel Protective Equipment
- Equipment
- Materials
- Isolation
- Conflicting Activities
- Information
- Motivation
- Communication
- De-Brief or Post-Job Talk

IMCA

No. **3** in a series of pocket safety cards issued by
The International Marine Contractors Association

Issue 1 – April 2004

Toolbox Talks

How to Use the Prompts

- The prompt words overleaf help you to conduct a toolbox talk
- Work through the prompt words carefully – they will help you to complete your job:
  - **SAFELY**
  - **EFFICIENTLY** and
  - **RIGHT FIRST TIME**
- Discuss the topics with your team:
  - **before starting** a job
  - **anytime during** a job
  - **after completing** a job

KEEP THE PROMPTS AVAILABLE IN THE POCKET OF YOUR OVERALL

For more information on IMCA's safety-related initiatives, please visit our website at **www.imca-int.com**

IMCA

Lifting Operations

Job Site Review

- Is there a lift plan and risk assessment for the lifting operation and do they fully cover the actual tasks to be undertaken?
- If this is a generic lift plan for a 'routine' lifting operation, are there any changes for this lifting operation compared to the generic plan, e.g. change in weight, centre of gravity, vessel motion, wind, lighting?
- Has a competent person assessed the lifting operation as safe?
- Have you the authority/PTW required to proceed with the lift?
- Has there been a toolbox talk?
- Have you assessed the path the load will take?
- Have you ensured that the path does not pass over personnel?
- Have you prepared the set-down area?
- Have you checked and assessed tagline/hold-back requirements?
- Can tagline personnel be in safe positions throughout the lift?
- Has the lifting equipment been checked? Is it fit/certified/appropriate for use?
- Is adequate supervision present and who will be in control of the lifting operation?
- Have you considered vessel stability, vessel motion and dynamics?
- Have the environmental conditions been considered, e.g. vessel motion, wind, rain etc?
- Have all personnel been fully briefed?
- Are communications adequate?
- Has there been a check for potential dropped objects?
- Are the steps of the lift plan and individual responsibilities clearly understood by all those affected and/or involved?
- Are all personnel in the vicinity aware of the lift?
- Is lighting adequate in pick-up and set-down areas?
- Is lifting equipment correctly rigged and are there no twists or snags in wire ropes?
- Is the crane hook vertically over the centre of gravity of the load?
- Have all sea-fastenings/hold-downs been released?

No. **4** in a series of pocket safety cards issued by
The International Marine Contractors Association
Issue 1 – April 2004

Lifting Operations

Competent Person

- Has job site review been completed?
- Is there a new or existing lift plan which is adequate for the lifting operation?
- Has a risk assessment been undertaken and the risks managed through the control measures within the lift plan?
- Is the equipment selected fit for purpose, certified for use and identified in the lift plan?
- Do the personnel selected to undertake this lifting operation have the correct level of competence?
- Has there been a toolbox talk?
- Have the steps of the lift plan been communicated and understood by all involved?
- What could go wrong?...Has this information been fed into the lift plan and risk assessment?
- Is there a fall-back procedure?
- Have all potentially affected parties been informed of the lifting activities?
- Has permission for lift been given by appropriate personnel?

Lifting Equipment

Checks on Wire Slings, Shackles and Hooks

All lifting equipment should have appropriate certification

- Check that the colour coding is current and the sling is has a visible number and SWL that is correct for the load expected.
- Examine for wear, corrosion, abrasion and/or physical damage
- Confirm the rigging has been correctly fitted in accordance with your company's approved procedure
- Confirm that shackles are correct SWL and have the appropriate securing device fitted
- Confirm that the correct shackle pin is fitted
- Check that the slings have thimbles properly fitted in the eye if appropriate to reduce the bend radius on the wire
- Check hooks are of correct SWL, are appropriate for use and swivels/safety locks operate properly

Checks on Fibre Slings

- Check that the SWL is correct for the load expected
- Inspect thoroughly for signs of damage, such as cuts, tears, chafing, burst stitching or particles in the fibre
- Fibre slings which have any of the above are unsafe and must be destroyed immediately to prevent re-use
- Fibre slings protected by an outer sleeve must not be used if the sleeve is damaged
- All fibre slings should be stored so that they do not become contaminated by oil, grease or chemicals.
- Do not paint fibre slings to colour-code them. The paint may react with the fibres and degrade their performance
- Ensure fibre slings do not come into contact with sharp edges
- Inspect the slings after use. If they are in any way damaged, they must be quarantined for further inspection/destruction

Be aware of safety hazards and know company procedures before any lift takes place

No. **5** in a series of pocket safety cards issued by
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Lifting Equipment

Checks on Wire Ropes used for Lifting and Associated Equipment

(not including crane and winch machinery except for drums, sheaves, rollers and activation of controls)

All lifting equipment should have appropriate certification

- Are wire ropes checked for damage prior to use, or after any incident which could have damaged the rope or installation?
- Have you noted where the expected areas of wear would be on the wire ropes in use, e.g. where rope passes through sheaves, over rollers, is subject to any impacts or is particularly exposed when stowed?
- Are there any signs of deterioration in the wire, e.g. broken strands, distortion, corrosion, lack of lubrication?
- Have you checked the diameter of the wire against its size when new?
- Is the wire rope properly lubricated, clean from debris etc?
- Is it possible to inspect the inner core of the wire?
- If it is not possible/practical to manually inspect the inner part of the rope, when was it last tested by other means, e.g. non-destructive testing?
- If a section of the rope has been subject to destructive testing, what were the results?
- Is the wire properly coiled on to its drum?
- Is the drum in good condition, e.g. if it is grooved, are the grooves undamaged and do they match the wire size?
- Is sufficient wire rope coiled around the drum at the limit of rope pay out?
- Do the limit switches and crane/winch controls operate properly?
- Are all sheaves, rollers, swivels etc. in good condition and all parts operating correctly?

Be aware of safety hazards and know company procedures before any lift takes place