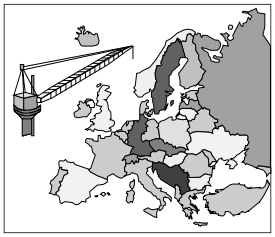
OMHEC Guidance



2. Maintenance for lifting equipment and lifting appliances

This document has been developed and issued by the Offshore Mechanical Handling Equipment Committee (OMHEC).

Members: Denmark, the Netherlands, Norway and the United Kingdom.

Approved by OMHEC: March 2006

Agreed by the following bodies:

The authorities of the countries operating in the North Sea area:

- DK – Working Environment Authority
- NL – State Supervision of Mines
- NO – Petroleum Safety Authority
- UK – Health & Safety Executive

Developed with the assistance of representatives of the offshore industry of the countries operating in the North Sea area.

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1 INTRODUCTION

1.1 OMHEC

The Offshore Mechanical Handling Equipment Committee (OMHEC) comprises members from the United Kingdom, Norway, Denmark and the Netherlands, all of whom are involved with the safety of lifting and hoisting equipment and lifting and hoisting operations offshore.

OMHEC is also adviser for the North Sea Offshore Authorities Forum (NSOAF) in matters related to lifting and hoisting offshore, formally stated in an agreement between the two parties and signed in the spring of 2014.

Members represent regulatory authorities, such as from the Danish Energy Agency, the Netherlands State Supervision of Mines, the Petroleum Safety Authority Norway and the UK Health and Safety Executive. OMHEC also includes e.g. industry organisations, independent verifications bodies, classification societies and other relevant organisations.

OMHEC wishes to express its concern with respect to the safety aspects of lifting and hoisting equipment and lifting and hoisting operations offshore.

The potential dangers that arise from the use of lifting and hoisting equipment necessitate the highest standards of safety being applied.

1.2 OMHEC Objectives

OMHEC shall contribute to improved safety in offshore mechanical handling, lifting and hoisting operations and be an arena for work, which will achieve good harmonised practices for these operations. In this respect the exchange of knowledge and understanding of causation and practical prevention of accidents and incidents plays an important part in the committee's work.

OMHEC has, and will continue to, establish work groups comprising across the board representation from all of the participating countries in order to develop documents that will constitute advisory guidance and good practice relating to lifting and hoisting equipment and their operation.

OMHEC shall also be a centre for information exchange and discussions related to legislative policy, guidance and procedures and other issues associated with offshore lifting and hoisting equipment and their operations on fixed as well as mobile offshore units.

OMHEC shall give advice to the North Sea Offshore Authorities Forum (NSOAF) on issues related to safety in lifting and hoisting equipment and their operations, both on their request, as well as being an independent organisation on its own.

The regulatory authorities mentioned above will accept OMHEC's guidance as being good industry practice.

1.3 Important Safety Elements

1.3.1 Design

Quality of design is essential. It is imperative that those responsible for the design of offshore lifting equipment, such as cranes, take into account the intended operational aspects of the equipment and also the environment in which it is to be used.

Organisations and people involved with the design of equipment must also have at their disposal all the design expertise necessary to result in the production of safe lifting equipment. This includes, for example static and dynamic design calculations as well as consideration of human elements and, where applicable, ergonomic factors.

The designer should take into account requirements for ease of maintenance, examination and inspection during use.

Risk assessment should be used during design to avoid, or at least alleviate, failures due to known identified failure modes. Such failure mode analysis should also take into account factors that may be present during possible unintended use of equipment.

1.3.2 Manufacturing

All manufacturers of lifting equipment should have a recognised, effective quality assurance system in place and organisations that purchase, rent or lease equipment from such manufacturers should, as far as reasonably practicable, check that the manufacturer has incorporated systems that will verify the attainment of such quality.

All functions, including safety systems, should, as far as reasonably practicable, be verified for correct operation at the manufacturer's premises before the manufacturer releases the equipment.

1.3.3 Operation

All personnel involved with lifting operations should have the necessary training, skills and experience of such operations. A competent person or entity should regularly assess such skills utilising industry-recognised codes of practice.

The equipment itself should only be operated within the limits specified by the manufacturer or supplier.

The duty holder or operator should have a robust safety management system in place which at least covers:

- the intended use;
- the limits of operation;
- the procedures;
- the instructions for use during the operation of the lifting equipment; and
- the lifting plans.

1.3.4 Maintenance

Maintenance and inspection should be carried out in accordance with a plan prepared from information including that supplied by:

- the manufacturer;
- the user of the equipment;
- independent verification authorities;
- classification societies; or
- other relevant bodies;
- together with appropriate details of the environment prevailing at the worksite.

1.3.5 Condition Monitoring

This is defined as the systematic examination and evaluation of the overall condition of an item ensuring that it has an acceptable level of integrity and the ascertainment of the requirements for maintenance.

1.3.6 Verification in Use

A competent person or entity should verify that the equipment is ready for use before it is put into operation.

Whenever the equipment has been modified or subjected to a major repair, a competent person or entity should verify that the equipment is safe to use in accordance with the relevant regulations and applied standards. Further, relevant manuals and procedure documents should be appropriately amended.

The user of the equipment should satisfy themselves that the competent person or entity has the necessary qualifications and experience and that best industry working practices are adhered to.

1.4 Members of the Maintenance Guidance Document Work Group

The following persons have been actively involved in the production of this guidance document:

United Kingdom	John Day	A1-safety Training Consultants Ltd
Norway	Olav Hauso Knut Dorsey	Petroleum Safety Authority (PSA) The Norwegian Society for Lifting Technology (NSLT)
Denmark	Ejnar Sørensen	Maersk Contractors
The Netherlands	Winifred Meester	NAM

2 REFERENCES

- EN 818 (1-7):2008 Short link chain for lifting purposes (production, use and maintenance standard)
- EN 1677 (1-9):2008 Components for slings (production, use and maintenance standard)
- EN 1492 (1, 2, 4):2008 Synthetic fibre slings (flat slings and round slings) (production standard)
- EN 13852-1:2013 Cranes, Offshore cranes
- EN 13414 (1-3):2008 Steel wire rope slings
- EN 10855 (1-3):2018 Offshore containers and associated lifting sets
- EN 12999:2018 Cranes, Loader cranes
- EN 13135:2018 Cranes, Safety, Design requirements for equipment
- EN 13155:2009 Cranes, Safety, Non-fixed load lifting attachments
- EN 13157:2009 Cranes, Safety, Hand powered cranes
- EN 14492 (1-2):2009/AC 2010 Cranes, Power driven winches and hoists
- EN 14985:2012 Cranes, Slewing jib cranes
- EN 15011:2014 Cranes, Bridge and gentry cranes
- EN 12385 (1-4):2008 Steel wire ropes
- ISO 4309:2017 Cranes, Wire ropes, Care and maintenance, inspection and discard
- ISO 8792:1986 Wire rope slings — Safety criteria and inspection procedures for use
- ISO 13702:2015 Petroleum and natural gas industries — Control and mitigation of fires and explosions on offshore production installations — Requirements and guidelines
- EN 13306:2017 Maintenance - Maintenance terminology
- IEC 61508:2010 Functional safety of electrical/electronic/programmable electronic safety-related systems
- ISO 14224:2016 Petroleum, petrochemical and natural gas industries — Collection and exchange of reliability and maintenance data for equipment
- ISO 12482:2014 Cranes — Monitoring for crane design working period
- ISO 16625:2013 Cranes and hoists – Selection of wire ropes, drums and sheaves
- ISO 2232:1990 Round drawn wire for general purpose non-alloy steel wire ropes and for large diameter steel wire ropes — Specifications
- API 9A:2016 Specification for Wire Rope

Discard criteria are found in the above referenced production standard.

3 DEFINITIONS AND ABBREVIATIONS

ABL	Actual breaking load – the actual load when the equipment breaks
BF	Breaking force EN 818-1: Breaking force is the maximum force which the chain withstands during the course of a static tensile test to destruction (for chains) EN 1677-1: Breaking force is the maximum force reached during the static tensile test of the component, at which the component fails to retain the load (mainly for rings and hooks)
Examination	Function test of all safety devices, such as limiting and indicating equipment, brakes, clutches etc. in order to verify that they operate within the tolerance requirements Note: An examination is more comprehensive than an inspection
FMEA	Failure mode and effects analysis
Inspection	Visual control of lifting equipment for defects, and check of operating controls, limit switches and indicators Note: Does normally not require disassembly
MBL	Minimum breaking load – a calculated figure giving the minimum breaking load
NDT	Non destructive testing
RCI/SLI	Rated capacity indicator/safe load indicator – gives details of the actual/ permissible loads and moments over the working area where the load is lifted or set down
SF	Safety factor – the arithmetic relation between the maximum load the equipment or machine is capable of withstanding, and the greatest working load the producer has guaranteed and marked on the equipment, tool or machinery
SIL	Safety integrity level
SWL	Safe working load – maximum load the lifting equipment is certified to withstand under normal use Note: SWL is normally used by ILO and should apply on all floating and other mobile installations and ships that are not covered by EU regulations
Test	Specific operation of lifting equipment, with or without a defined load, in order to determine whether the lifting equipment is suitable for use
Test load	Specified load that the lifting equipment should withstand within the manufacturer's specified limits without resulting in permanent deformation or other defects, and thereby confirming that the design, materials and manufacture comply with specification and statutory requirements
WLL	Working load limit: maximum load that a sling or a lifting component is certified to withstand under normal use and in a given configuration

4 MAINTENANCE GUIDANCE

4.1 Objective

The objective of this document is to provide guidance for planning the maintenance of cranes and lifting equipment. Furthermore the document sets out a systematic approach for developing a maintenance strategy. It also refers to relevant national and international standards.

4.2 Maintenance

The party responsible (as defined in national legislation) should ensure that equipment or parts thereof are maintained, so that they are capable of carrying out their intended functions in all phases of their lifetime.

The party responsible should establish work procedures and make arrangements to ensure that personnel performing repair, modifications and maintenance have the necessary, experience, skills and competence to perform such tasks.

Maintenance as defined in this document means the combination of all technical, administrative and managerial actions during the life cycle of any equipment which is necessary to retain it in, or restore it to, a state in which it can perform the required functions, cf. definition 2.1 (with associated terminology) in the standard EN 13306.

Maintenance encompasses activities such as monitoring, inspection, testing and repair together with ensuring that a good housekeeping regime is being practised.

The term 'function(s)' includes any function relating to safety. For these functions, the maintenance requirement should be that the required performance should be achieved at all times.

The term 'facilities' or 'parts of facilities' is defined as including temporary equipment on both manned and normally unattended offshore installations.

The term 'all phases' includes periods in which the facility or parts of the facility are temporarily or permanently shut down.

The responsible party should take into consideration the age and usage of lifting equipment when drawing up maintenance schedules, inspection programmes and thorough examination programmes.

4.3 Specific Requirements for Sharing of Experience

In order to prevent failure modes from reoccurring, it is important that information is shared within the company, the industry and with the manufacturers/suppliers.

Companies/owners/users should be responsible for alerting manufacturers on known critical failure modes on their products. Companies/owners/users should also take immediate action to alert other users of the same equipment within the company.

The manufacturer should be responsible for alerting users of their products when being made aware of such failure modes.

Manufacturers and operating companies should alert relevant industry organisations, including regulatory authorities and trade associations, of their experience regarding critical failure modes.

4.4 Classification

Systems and equipment should be classified with regard to health, environmental and safety related consequences of potential functional failures. The classification should be based on a risk assessment of the functions.

With regard to functional failures that may entail serious consequences, the party responsible should identify the different failure modes with associated failure causes and failure mechanisms, and estimate the failure probability in respect of the individual fault mode.

Classification requirements would form the basis for the choice and priority of maintenance activities and maintenance frequency.

Relevant national legislation and guidance should provide direction in respect of health, working environment and safety standards.

Failure mode, failure cause and failure mechanism as mentioned in the second paragraph, are defined in the EN 13306 standard.

4.5 Maintenance Programme

Failure modes and defects which constitute a risk to health, environment or safety should be systematically prevented by means of a maintenance and examination programme.

The programme should contain procedures for monitoring of performance and technical condition, which will ensure the identification and correction of failure modes and defects that are developing or have occurred.

The programme should also contain procedures for monitoring and control of failure mechanisms that may lead to such failure modes.

The age and usage of the lifting equipment should be taken into consideration when formulating the programme.

The maintenance programme should consist of inspection, examination, testing, preventative maintenance etc. Maintenance programmes should also specify test criteria after major maintenance and/or repair. The initial programme should be available at start up, and also contain a list of critical spares based on a criticality analysis.

When preparing the maintenance programme, the IEC 60300-3-11 standard or equivalent may be used in respect of health, working environment and safety. For procedures relating to health, working environment and safety issues:

a) the ISO 13702 standard Appendix C7, the IEC 61508 standard or equivalent could be used for safety systems;

b) **the emergency shutdown system** should be verified in accordance with the safety integrity levels stipulated on the basis of the IEC 61508 standard or equivalent.

For equipment that is not encompassed by these standards and these guidelines, the operability should be verified through a full-scale function test at least once each year. The test should cover all parts of the safety functions. Recording of the equipment's functionality in situations where the function is triggered or put to use may replace testing of the equipment.

Relevant national legislation and guidance will give direction on monitoring the condition of **structures**, **preservation**, control of **lifting appliances and lifting gear**.

4.6 Planning and Priorities

An overall plan should be prepared for conduct of the maintenance programme and corrective maintenance activities.

There should be established criteria for attributing priorities and time-limits for individual maintenance activities. These criteria should take into account the classification requirements mentioned above in 4.4.

In order to fulfil requirements in respect of time-limits, the limits should be calculated from the time when a failure mode or defect has been identified as having occurred, or is developing.

4.7 Evaluation of Maintenance Effectiveness

The effectiveness of the maintenance should be evaluated systematically on the basis of recorded data for performance and technical condition in respect of equipment or parts thereof.

The evaluation should be used for a continual improvement of the maintenance programme.

Maintenance effectiveness could for example be the ratio between the requirements for planned maintenance and unplanned maintenance, or uptime versus downtime.

When recording the data referred to in the first paragraph, including failure data and maintenance data, ISO 14224 standard Chapters 4, 5, 6 and 7 can provide guidance.

4.8 Specific Requirements for Monitoring of Structures

Condition monitoring should be carried out on safety critical structural components using proven testing methods.

The monitoring should be carried out in accordance with the maintenance programme as mentioned above.

In order to fulfil condition monitoring requirements, relevant national legislation and guidance can be used in relation to health, working environment and safety issues.

Corrosion means both external and internal corrosion. ISO 12482 provides guidance.

4.9 Specific Requirements for Monitoring of Moving/Rotating Parts

Moving and rotating parts should be monitored for signs of wear and tear specifically according to the manufacturer's specifications, but also with regard to any maintenance requirements that become apparent, which might not necessarily be in such specification. Where the maintenance programme can be improved, it is helpful if company operational procedures are established to define a method of recording the necessary data and feeding it back to the owners/operators and to the manufacturers, in order that appropriate improvements can be made.

During any inspection or examination, particular attention is required in respect of:

- particles in grease and lubricants samples;
- possible cracks, corrosion and wear in blocks and sheaves and ensuring that sheaves are rotating freely;
- leakages and contamination in hydraulic systems;
- wear, corrosion and damage to mechanical connectors;
- condition of prime movers;
- possible cracks, corrosion and wear in slew bearings;
- tensioning of bolted connections.

The owner should define levels of acceptability and rejection in respect of the above, based on information from manufacturer and own experience.

4.10 Specific Requirements for Monitoring of Control and Safety Systems

The manufacturer should develop maintenance and test programmes for control and safety systems based on, for example, the FMEA and the SIL analysis.

4.11 Specific Requirements for Monitoring of Wires and Ropes

Wire ropes should be visually examined for kinking and crushing, corrosion, adequacy of lubrication and any broken wires before use.

Where some parts of ropes are not easily inspected, a regular and appropriate inspection procedure should be established.

If the person inspecting a rope has any doubts about its fitness for use, the rope should not be used until it has been examined by a person competent to do so (a competent checker as defined in OMHEC G01 – *Competence and skills requirements for an enterprise of competence (EOC) of offshore crane*s), and found fit for service.

During any inspection or examination, particular attention should be made to:

a) the point of termination of both moving and stationary ropes, including end fittings;

b) the part of any rope which passes over drums or sheaves and

c) any other part of the rope that may be exposed to particular wear and tear, such as, for example, from exposure to environmental effects, or vibration or repetitive contact damage.

A plan for inspection and or replacement of wires and ropes should be stated in the maintenance programme. Replacement of wires and ropes should be based on a consideration of the environment in which they are used and the operation time.

The maintenance and discard criteria of steel wire ropes must be based on their use. Production standards may be used for reference purposes, and allowable deviations from these standards must be defined.

The following method can be used for defining discard criteria when no such criteria are available:

1. The production standard is the reference point.
2. The owner must specify maximum allowable deviations according to the intended use
3. The owner must determine the actual strength of the wire ropes by inspection and testing.

Note: More details on standards relating to steel wire ropes is given in Annex 1

4.12 Specific Requirements for Monitoring of Lifting Gear (Equipment)

Before being used (every time!), lifting gear should be visually examined to verify that it is undamaged and suitable for use, and that it has a valid marking (such as for example a colour coding or a tag such as 'suitable for man riding').

All items should be traceable, registered and documented with, for example:

- manufacturer's/supplier's documentation (certificate);
- updates on inspection and testing.

Competency of personnel is described in OMHEC G01 – *Competence and skills requirements for an enterprise of competence (EOC) of offshore cranes* – and in OMHEC G03 – *Training standard of crane operator, rigger and banksman offshore*.

Thorough inspection and testing should be carried out at intervals as per national regulations.

4.13 Other Loose Lifting Gear

Loose lifting gear, for example, chain hoists, lever hoists, trolleys, hooks, sheaves, snatch blocks, baskets, containers, etc. should have their maintenance specified by the owner. The programme for maintaining such equipment could be defined by the methods described in this document. International or national standards should be used where these exist and when applicable to the equipment.

4.14 Specific Requirements for Monitoring of Equipment for Lifting of Personnel

The lifting of personnel requires special attention due to the exposure to risk of personnel being lifted. The maintenance and inspection programme must include all critical components/parts included in carrying out a safe lifting operation, such as:

4.14.1 Winch Elements

- Limited maximum pull (counter balanced system for use on floating installations)
- Independent secondary braking system
- Slack line shut-off mechanism
- Control lever returns to neutral (STOP), push lever away = pay out (LOWER)
- Pull lever = heave in (RAISE)
- Crown block sheave and connection to platform structure designed for man riding in accordance with relevant standards
- Emergency stop facility (unobstructed)
- Emergency drive (if required)
- Wire rope termination to comply with current standards
- Spooling device
- Drum guard
- Upper and lower travel limit switches
- Emergency lowering facility
- Remote control devices for winches
- Heave compensation system

4.14.2 Harness Elements

- Harness free of any damage
- 'D' rings for carrying hand tools
- Rescue or fall arrest lanyard (see 5)
- Safe system for tools aloft (lanyards etc)

4.14.3 Connecting Devices

- Locking device
- Double locking with cotter pin on shackles
- Over hoist protection

4.14.4 Secondary Fall Arrest Equipment

- Similar checks should be carried out on any additional safety devices which are designed to be attached to a safe part of the harness (for example: fall arrester, inertia reel, line locker, pennant line).

4.14.5 Communication Equipment

- Communication equipment used between parties involved in the lifting operation.

All equipment as specified above should be checked immediately before use.

4.15 Specific Requirements for Normally Unmanned Installations

In principle, lifting equipment on normally unmanned installations should have the same maintenance objectives as for manned installations.

Lifting equipment on unmanned installations may not be subjected to the same maintenance as on manned installations, and it is therefore most important that specific considerations are taken into account before it is used.

Special consideration must be taken when inspections are carried out due to the fact that the equipment may have been out of service for long periods, and failure modes may entail danger to personnel, equipment etc. Due to equipment not being in use for periods longer than the normal or required maintenance intervals (as with manned platforms) safety precautions need to be taken in order to detect possible deterioration of the equipment.

4.16 Wire Rope Slings (wire rope forerunners, single stranded wire ropes)

The production standard is: EN 12385-4.

4.16.1 EN 12385-3/EN 12385-4 (steel wire rope slings/maintenance and use)

These standards specify the type of information (for use and maintenance of steel wire ropes) to be provided by the rope manufacturer.

4.16.2 EN 13414-2 and ISO 8792 (wire rope slings)

These standards provide safety criteria and inspection procedure for the use of wire rope slings.

The different types of steel wire ropes have to be examined and maintained with respect to the way they are used.

A rotation resistant crane wire rope cannot replace a non-rotation resistant single layer steel wire rope and vice versa. A rotation resistant wire rope is not to be used as a wire rope sling.

The standard for termination of wire rope slings (Standard EN 13411-3, ferrule secured eye and Flemish eye up to 60mm), only applies to new wire ropes.

Re-termination of used wire ropes must be followed up by documented examinations, or be tested by competent persons, ref. standards EN 13414-2 and ISO 8792.

Standard EN 13414-1, Steel wire rope for general purposes, is only valid for wire ropes from 0-60mm.

IMCA M 179 – *Guidance on the use of cable laid slings and grommets* – gives guidance for cable laid slings and grommets (above 60mm.)

Appendix 1

STEEL WIRE ROPES

General Requirements

The following typical standards are applicable to steel wire ropes:

Production Standards:

EN 12385-1 Steel wire ropes. General requirements
EN 12385-2 Steel wire ropes. Definitions, designation and classification
EN 12385-4 Steel wire ropes. Stranded ropes for general lifting appliances
EN 13414-2 Steel wire rope slings. Specification for use and maintenance
EN 10264-1 Steel wire for ropes. General requirements (Testing)
EN 10264-2 Steel wire for ropes (Tensile strength)
EN 10264-3 Steel wire and wire products. Cold drawn and cold shaped
EN 10244-2 Steel wire and wire products. Non ferrous metallic coatings

End Termination Standards:

EN 13411-1 Terminations for steel wire ropes. Thimbles for steel wire rope slings
EN 13411-2 Terminations for steel wire ropes. Splices eyes for wire rope slings
EN 13411-3 Terminations for steel wire ropes. Ferrule secured eyes
EN 13411-4 Terminations for steel wire ropes. Metal and resin socketing
EN 13411-5 Terminations for steel wire ropes. Wire rope grips for eyes. (U-bolt grip)
EN 13411-6 Terminations for steel wire ropes. Asymmetric wedge socket clevis
EN 13411-7 Terminations for steel wire ropes. Symmetric wedge socket clevis

Use and Discard Standards:

EN 12385-3 Steel wire ropes. Information for use and maintenance
ISO 4309 Wire rope for lifting appliances – Code of practice for examination and discard
ISO 16625: Cranes and hoists – Selection of wire ropes, drums and sheaves

Crane Wire Rope (single strand and multi stranded wire ropes)

The production standards are EN 10264-1-2-3, EN 12385-4 and ISO 2232.

Production standards for wires used in steel wire ropes gives requirements concerning number of reversed bends, torsions, tensile strength and galvanized coating requirements. This standard gives the nominal figures for production of new steel wire ropes.

Compact wire ropes cannot be analysed according to standard ISO 2232 due to the construction of the rope.

ISO 4309 and EN 12385-3

These standards give information on examination and discard of used crane wire ropes with respect to mechanical defects and how to evaluate the defects or combination of defects. ISO 4309 gives more details than EN 12385-3.

Destructive testing of wire ropes (tensile testing) will only give the end fittings efficiency.

Even very old wire ropes may give values above MBL of the wire rope. This may also be the case even if the wire ropes are discarded for other reasons.

When using sockets moulded with wire lock resin or metal, it is important to make a test length long enough (approximately 20-30 times wire rope lay length). One lay length is approximately wire diameter x 7.

Only 20% of a multi stranded wire rope is checked during a visual inspection. It is impossible to inspect the other 80% by use of the standard methods

Drill Lines (single stranded wire ropes)

The production standards are: EN 10264-1, EN 12385-4, ISO 2232 or API 9A.

There are no discard criteria in the referenced standards.

For drilling and production equipment, ISO/NP 13534 is the standard for inspection, maintenance, repair and remanufacturing of hoisting equipment.

Cut and slip are dependant of the tonne/miles, wear and tear, and the fatigue of the wire rope.

The maximum tonne/miles figure is based on examination and users' experience data.

Wire Ropes Used Subsea

Wire ropes and lifting gear used subsea (e.g. guidelines, ROV handling wires and diving bell wires) should be subjected to the same methodology as for all other equipment when defining the necessary maintenance programme.

For diving bell ropes see IMCA D 024 – *Diving Equipment Systems Inspection Guidance Note (DESIGN) for saturation (bell) diving systems*.

The lifting equipment should be fit for purpose, taking due consideration of the environment and conditions in which they are used. Salt water intrusion, galvanic corrosion on all fittings etc. should be considered specifically.

Lifting Equipment for Life Saving Equipment

Lifting equipment related to life saving equipment (e.g. lifeboats, daughter craft, MOBs and life rafts) should be subjected to the same methodology as for all other equipment when defining the necessary maintenance programme.

The relevant aspects of the current edition of International Convention for Safety of Life at Sea (SOLAS) Convention are essential ingredients for consideration and input into the maintenance programme.

Steel Wire Ropes for Lifting of Personnel

For the production standards, see the references for steel wire ropes.

The ropes must at all times be in good condition. Equipment must be certified for personnel lifting.

The wire ropes should be of rotation resistant construction.

Single layer wire rope produces torsion forces when loaded, and cannot be used together with a swivel.

Discard criteria may be found in the Standard ISO 4309.