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Survey and Examination of Ships'Lifting Appliances

Lloyd's Register

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Introduction

This presentation will focus on, deck cranes, derricks, engine room cranes, provision cranes, store cranes and life saving appliances davits.

A typical engine room crane

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Why are lifting appliances ‘thoroughly examined’

A typical rope luffed deck crane

A lifting appliance generally has no ‘redundancy’– so a single failure is enough to cause a major accident.

Lifting appliances are examined in accordance with two main legal frameworks, depending on the type of equipment and its purpose.

- Ships’ deck cranes, engine room cranes, and lifting equipment are examined in accordance with:
  - the Merchant Shipping Regulations
  - flag state requirements
  - International Labour Organization (ILO) Convention 152, where it applies.

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Why are lifting appliances ‘thoroughly examined’

Classification societies such as Lloyd’s Register offer two survey and examination services for lifting appliances (excluding LSA davits):

- certification
- classification

Classification is used in two situations:

- Mandatory – where the lifting appliance is the essential feature of a classed ship. This applies for example to a heavy lift crane on a heavy lift barge, or lifting arrangements for diving operations on diving support ships.
- Optional – when the owner requests classification, even though the lifting appliance may not be an essential feature of a classed ship.

An example of a lifting appliance being the essential feature of a ship

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Procedure for a thorough examination

Deck cranes	Derricks	Engine room cranes
Loose gear	Loose gear	Loose gear
Ropes	Ropes	Ropes
Protection and limitation devices	Protection and limitation devices	Protection and limitation devices
Winches, brakes and drums	Winches, brakes and drums	Winches, brakes and drums
Built-in sheave units	Deck fittings	Built-in sheave units
Hydraulic cylinders and pins (ram luffed cranes)	Derrick booms	Bridge structure supporting crab
Jibs	Mast fittings	Long travel trolleys/ saddles
Jib heel pins	Masts, derrick posts and guy posts	Traversing unit (crab)
Slewing columns and machinery deck	-	Wheels (traversing and longitudinal)
Slew bearings and bolts	-	-
Pedestal and foundations	-	-

Note
Functional testing may be required at the surveyors discretion.

Please note – the items listed above and over the page are not exhaustive and should be used for guidance purposes only.

A typical derrick assembly

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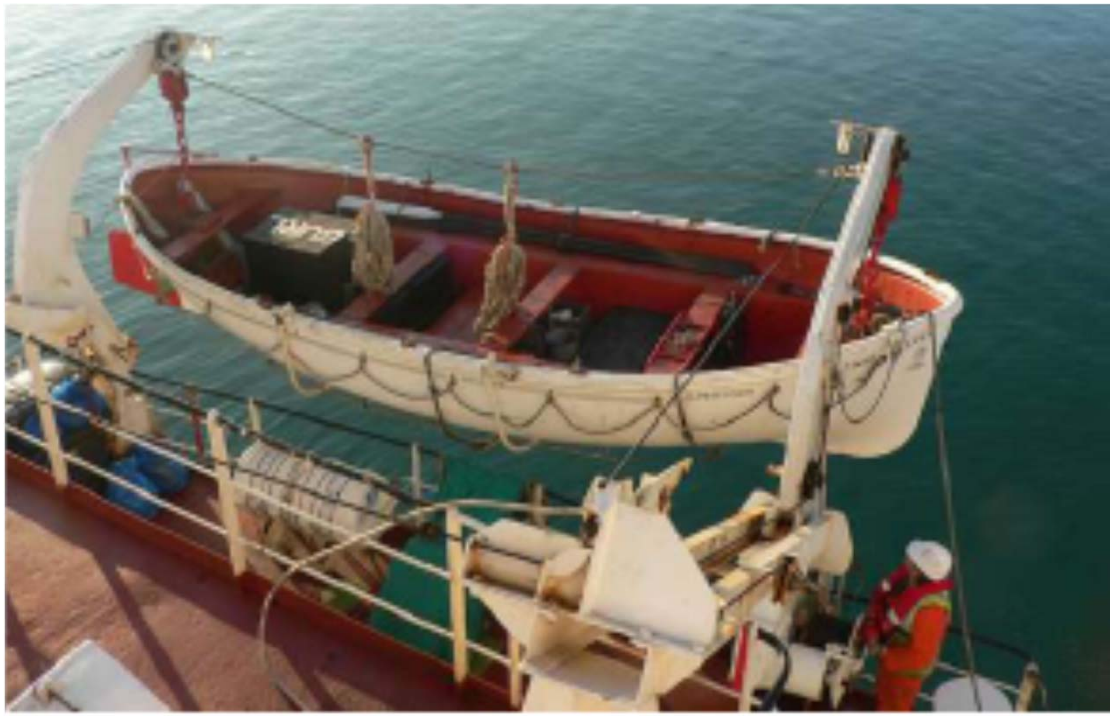
Procedure for a thorough examination

LSA davits	Loose gear
	Limit switches
	Ropes and strops
	Winches, brakes and drums
	'A'-frames, roller and guide tracks
	Built-in sheave units
	Davit arms
	Free-fall ramps and slewing columns
	Jib heel pins
	Release gear



A typical davit system

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Procedure for a thorough examination

3.3 Testing

Proof load testing is a legal requirement and is needed for Lloyd's Register certification for almost all lifting appliances and loose gear. It must be carried out:

- **before new equipment is taken into service**
- **at set periods as required by national regulations, typically every five years**
- **after structural modification and repair.**

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Procedure for a thorough examination

Testing of derricks and cranes	
SWL of derrick or crane, in tonnes	**Test load, in tonnes**
Up to 20 t	1,25 x SWL
Exceeding 20 t but not exceeding 50 t	SWL + 5
Exceeding 50 t	1,1 x SWL

Notes

1. Hand operated pulley blocks are to be proof tested to 1,5 x SWL.
2. For initial testing, the appliance is to hoist, luff and slew the test load, but not simultaneously. This is also recommended for subsequent re-testing.
3. As an alternative to test weights, certified water bags are permitted.

Overload test on a modified and upgraded sheerleg TAKLIFT 4.

The SWL after modification is 2200t which must be tested in accordance with the Code for Lifting Appliance in a Marine Environment Chapter 9 Section 1 table 9.1.5 as follows:

Exceeding 50t

1.1 x SWL

2200t x 1.1 = 2420t

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Procedure for a thorough examination

Proof loads for loose gear	
Item	**Proof load, in tonnes**
Single sheave block	4 x SWL
Multi-sheave blocks:	
SWL ≤ 25 t	2 x SWL
25 < SWL ≤ 160 t	(0,933 x SWL) + 27
160 < SWL	1,1 x SWL
Hooks, shackles, chains, rings, swivels, etc:	
SWL ≤ 25 t	2 x SWL
25 < SWL	(1,22 x SWL) + 20
Lifting beams, spreaders, frames:	
SWL ≤ 10 t	2 x SWL
10 < SWL ≤160 t	(1,04 x SWL) + 9,6
160 < SWL	1,1 x SWL

Notes

1. The safe working load (SWL) for a single sheave block including single sheave blocks with beckets is to be taken as one half of the resultant load on the head fitting.
2. The safe working load for a multi-sheave block is to be taken as the resultant load on the head fitting.
3. Where the item is to be used in diving operations, the proof load is to be 1,5 times the proof load value given above for the particular item.

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The test load is derived from the Code for Lifting Appliance in a Marine environment Chapter 9 Section 1 Table 9.1.1 as follows:

25<SWL (1.22xSWL) + 20

1.22 x 1600 + 20 = 1972t

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The importance of loose gear ?

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What happens if the lifting appliance does not pass

- Lifting equipment

If the surveyor finds defects and the lifting appliance does not meet the requirements, or there is insufficient preparation, the surveyor may:

- instruct that it is taken out of service, and endorse the LA Register accordingly
- impose conditions of class, or recommend withdrawal of class (if it is a classed item)
- restrict the use of the appliance, depending on the type of deficiency found.

Note: If there is insufficient preparation for the examination of the appliance, the surveyor may suspend the thorough examination.

- LSA equipment

If the surveyor is not satisfied with the condition of the davits or the associated equipment and remedial action is required, the surveyor may:

- contact the flag state and advise them of the deficiencies
- instruct the Master that the davit is to be taken out of service
- check that sufficient alternative survival equipment is provided before the ship sails

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Common problems during survey

- lack of documentation
- lack of adequate safe access
- wear of the slew bearing and loss of bolt integrity
- loose gear - identification , certification and maintenance
- wire ropes - identification, certification, maintenance and discard
- excessive corrosion
- lack of maintenance
- incorrect operation
- non-functioning safety devices.

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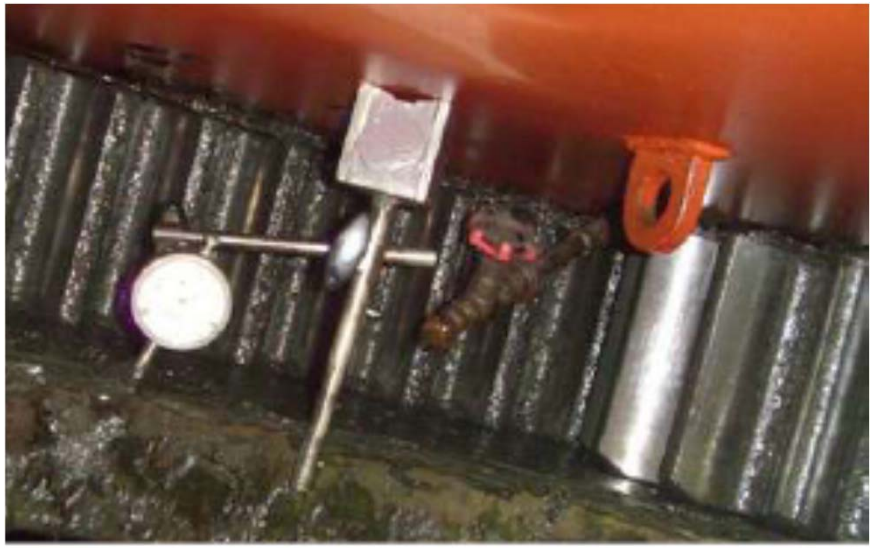
Common problems during survey

- **Wear of the slew bearing and loss of bolt integrity.**

Bolts should be checked for tightness using a torque wrench



Measuring wear of the slew bearing

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Common problems during survey

Loose gear is any item which attaches the load to the appliance or an interchangeable item in the load path, not permanently attached to the lifting appliance. Loose gear may also be known as lifting gear or lifting accessories. Loose gear items include:

- hooks, blocks, chains, shackles, swivels, rings, links, slings, grab buckets, spreaders, lifting beams and lifting frames

Fabric strops are also considered to be loose gear items.

Ramshorn hook assembly

Common problems include:

- lack of or obscured identification markings
- overloaded components
- poor maintenance
- missing documentation/certificates.

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Common problems during survey

Wire rope showing crushing damage

Identification, certification and maintenance.

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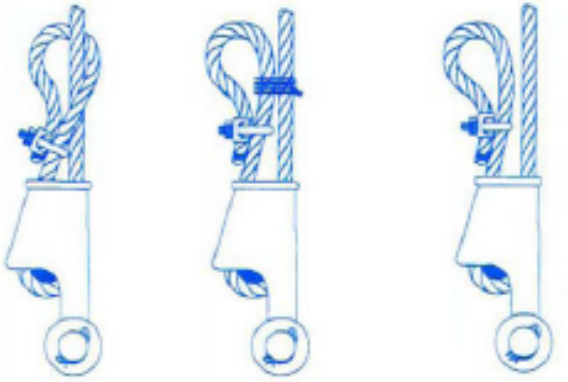
Common problems during survey

Unacceptable primary termination method



Correct termination of an asymmetric wedge socket

Attention: It is important to be aware that wire rope grips are not permitted to form a primary load bearing termination. If using asymmetric wedge sockets, the dead end must not be clamped to the live rope.

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Common problems during survey

Limits of weardown and corrosion		
Item	**Limits**	**Remarks**
Structural members	Reduction of 10% maximum at any point, based on the material thickness	
Loose gear	Reduction of 5% on any diameter Reduction of 2% on any diameter of a pin in a hole	
Wire ropes	5% of broken, worn or corroded wires in any length of 10 rope diameters Attention is also drawn to the detailed criteria given in ISO4309 Cranes – Wire ropes - Care and maintenance, inspection and discard	Item may not be able to sustain the proof load

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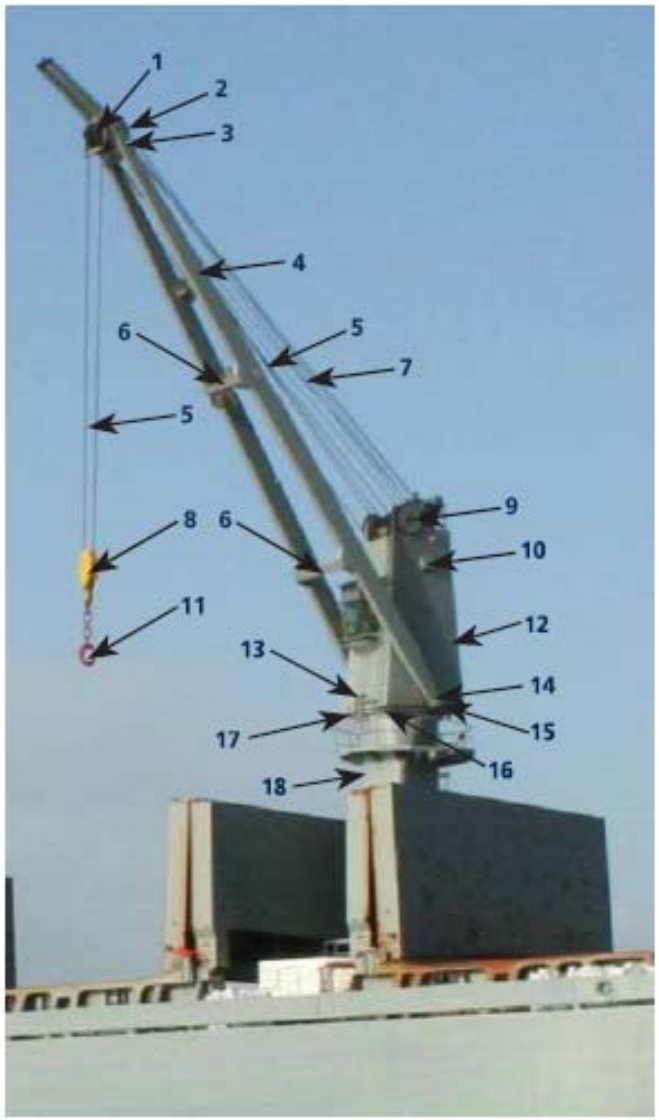
Common problems during survey



Typical rope luffed crane

1. Jib head
2. Jib head sheaves
3. Luffing sheaves
4. Main chords of jib
5. Cargo hoist ropes
6. Transverses or cross-members of jib
7. Luffing ropes
8. Hook block
9. Slew column head sheaves
10. Jib stop
11. Hook
12. Slewing column, upper post or housing
13. Machinery deck
14. Jib heel
15. Jib heel pin
16. Slew ring bearing
17. Slew ring bolts
18. Pedestal

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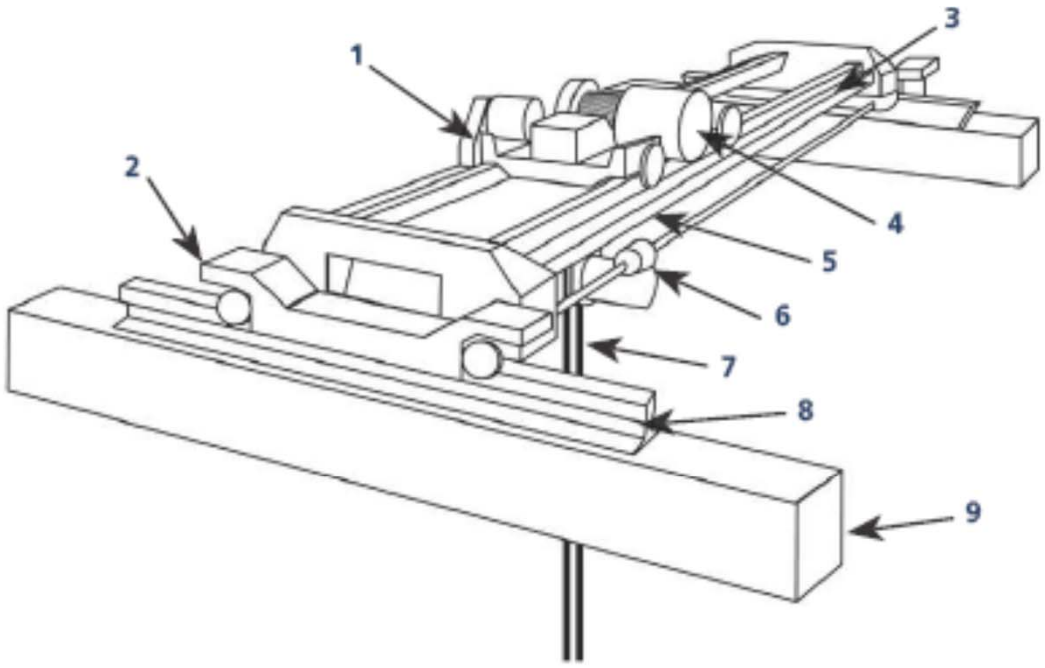
Common problems during survey



Typical engine room crane

1. Crab or trolley
2. End truck, trolley or saddle
3. Traverse/crab rail
4. Hoist unit
5. Long travel drive
6. Bridge drive
7. Hoist rope
8. Long travel rail
9. Longitudinal girder

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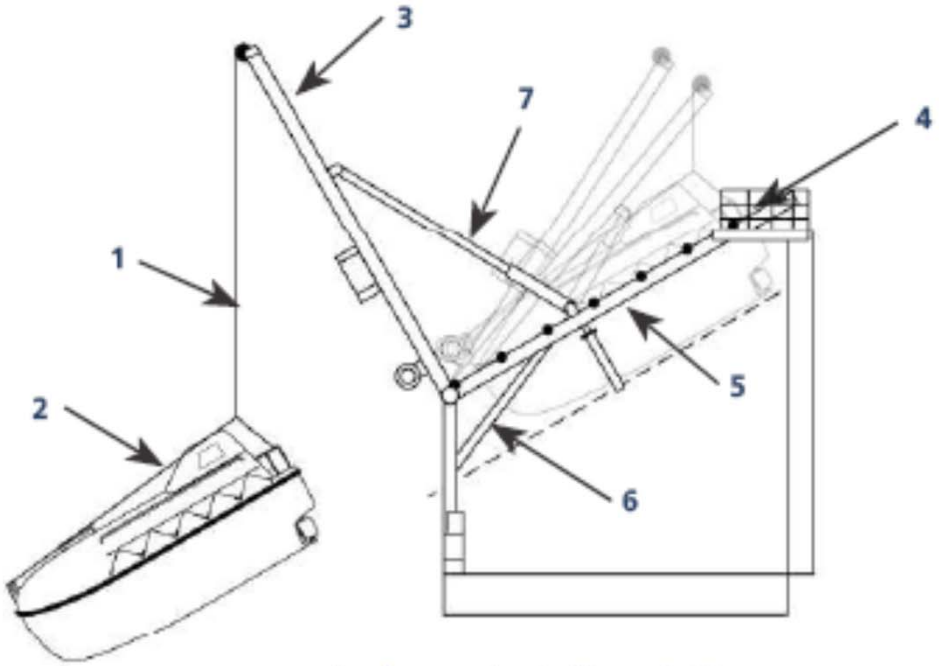
Common problems during survey



Typical LSA davit (free fall)

1. Main fall
2. Strops
3. Controlled launch and recovery gantry or arm
4. Release hook
5. Free fall ramp
6. Corner brace
7. Hydraulic cylinder

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Monitoring slew bearing wear

Consequences of failing to maintain a slew bearing can be far-reaching

It is important that any rocking test is carried out in accordance with the crane manufacturer's recommendations. Measurements are typically taken in four positions on the slew bearing, with the jib pointing:

- forward to the ship
- starboard
- aft
- port side.

Neither a load nor any cargo handling equipment should be attached to the hook.

It is important for the same positions to be marked as a datum reference for future measurements.

If there is a machined surface, this shall be used as a reference point. In other cases a reference point must be marked.

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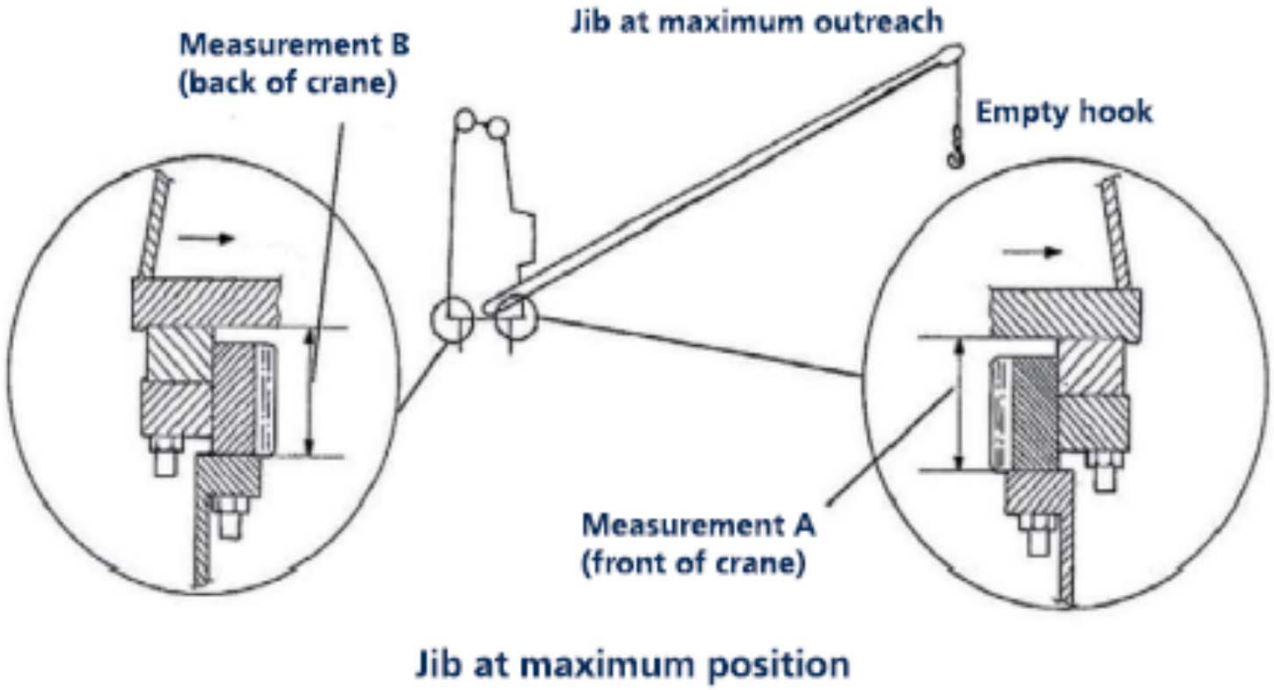
Monitoring slew bearing wear



Jib at maximum position

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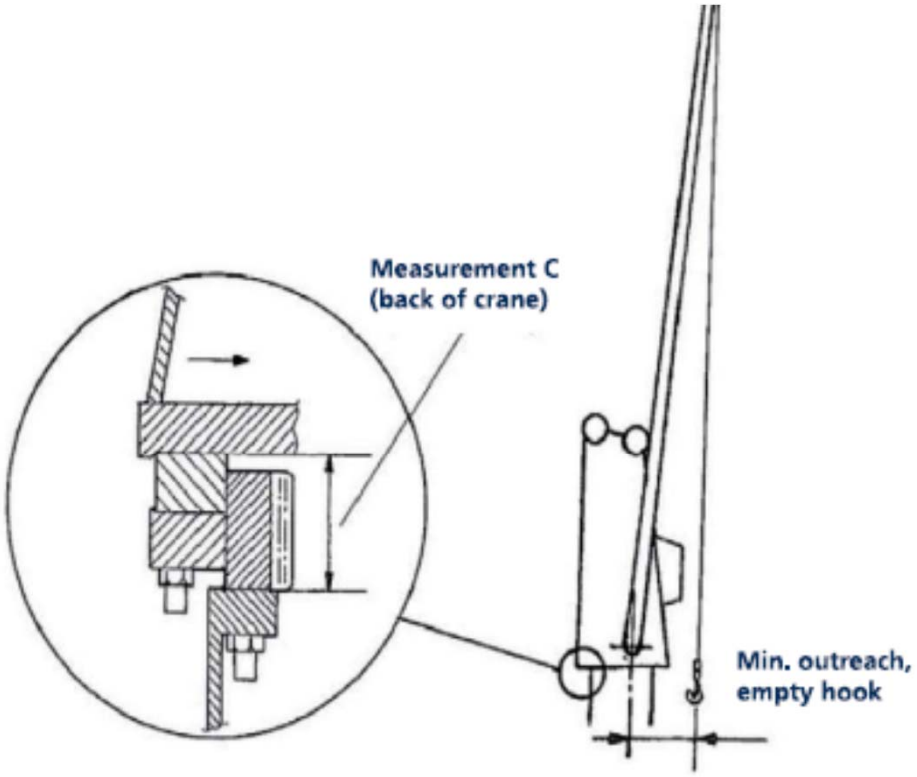
Monitoring slew bearing wear



Jib at minimum outreach

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5000T Heavy Lift Mast Crane build in accordance with the Lloyd's Register Code for Lifting Appliances in a marine.

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What regulations!

- Specific regulations should be complied with if a vessel with lifting appliances operates in international waters.

- When the lifting appliances is found suitable for man riding operations also specific requirements / regulations must be complied with.

- On the next slides some examples of above requirements

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What regulations!

- For working in international waters the following regulations come in force.
- For the Norwegian waters
- NMD Reg offshore cranes.pdf

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What regulations!

- For working in international waters the following regulations come in force.
- For the north sea in Great Britannia
- UKOOA

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What regulations!

- Specific requirements for man riding operations.

DEUTSCHE NORM | October 2004

DIN EN 13852-1 | DIN

ICS 47.020.01; 53.020.20

Cranes
Offshore cranes
Part 1: General-purpose offshore cranes
English version of DIN EN 13852-1

Krane – Offshore-Krane – Teil 1: Offshore-Krane für allgemeine Verwendung

European Standard EN 13852-1 : 2004 has the status of a DIN Standard.

A comma is used as the decimal marker.

This standard includes safety requirements within the meaning of the EU Machinery Directive (98/37/EEC).

National foreword

This standard has been prepared by CEN/TC 147 'Cranes – Safety' (Secretariat: United Kingdom).
The responsible German body involved in its preparation was the *Normenausschuss Maschinenbau* (Mechanical Engineering Standards Committee).

Document comprises 77 pages.

English price group 23
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What regulations!

- Specific requirements for man riding operations.

HSE

Health and Safety Executive

Simple guide to the Lifting Operations and Lifting Equipment Regulations 1998

This is a web-friendly version of leaflet INDG290

Introduction

This guide provides information about the legal requirements of the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) which came into force on 5 December 1998.

It gives a general indication of some of the main requirements of the Regulations. However, it is important that you refer to the Regulations and accompanying Approved Code of Practice to familiarise yourself fully with your duties (see Further information at the back of the document).

What is LOLER?

In the main, LOLER replaced existing legal requirements relating to the use of lifting equipment, for example the Construction (Lifting Operations) Regulations 1961, the Docks Regulations 1988 and the Lifting Plant and Equipment (Records of Test and Examination etc) Regulations 1992. Many aspects of LOLER should therefore be familiar to you.

The Regulations aim to reduce risks to people's health and safety from lifting equipment provided for use at work. In addition to the requirements of LOLER, lifting equipment is also subject to the requirements of the Provision and Use of Work Equipment Regulations 1998 (PUWER), see Further information.

What does LOLER do?

Generally, the Regulations require that lifting equipment provided for use at work is:

- strong and stable enough for the particular use and marked to indicate safe working loads;
- positioned and installed to minimise any risks;
- used safely, ie the work is planned, organised and performed by competent people; and
- subject to ongoing thorough examination and, where appropriate, inspection by competent people.

What equipment is covered by the Regulations?

Lifting equipment includes any equipment used at work for lifting or lowering loads, including attachments used for anchoring, fixing or supporting it. The Regulations cover a wide range of equipment including, cranes, fork-lift trucks, lifts, hoists, mobile elevating work platforms, and vehicle inspection platform hoists. The

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What regulations!

- Specific requirements for man riding operations.

HSE Health and Safety Executive

LOLER 1998

Lifting Operations and Lifting Equipment Regulations (LOLER) 1998: Open learning guidance

This is a free-to-download, web-friendly version of ISBN 978 0 7176 2464 5 (First edition, published 1999). This version has been adapted for online use from HSE's current printed version.

You can buy the book at www.hsebooks.co.uk and most good bookshops.

ISBN 978 0 7176 2464 5
Price £15.95

This guidance explains the Lifting Operations and Lifting Equipment Regulations (LOLER) 1998. The LOLER Regulations aim to make life safer for everyone using and coming into contact with lifting equipment.

The book describes each regulation in turn. It contains text from the regulations, as well as case studies, key terms, activities and self-assessment questions.

You should use this book if you are a local authority health and safety inspector, local authority enforcement officer, health and safety professional, HSE inspector or legal professional. Anyone who wants to know more about LOLER 1998 will also find this guidance useful.

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Questions?

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