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Petroleum Development Oman L.L.C.

Lifting and Hoisting

Procedure

PR-1708

Part 1 Framework

Part 2 Inspection, Testing and Certification

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Keywords: Lifting equipment, inspection, testing, certification

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i Document Authorisation

Authorised For Issue

Document Authorisation		
Document Authority	**Document Custodian**	**Document Controller**
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ii Revision History

The following is a brief summary of the 4 most recent revisions to this document. Details of all revisions prior to these are held on file by the issuing department.

Version No.	Date	Author	Scope / Remarks
Version 0	1.9.07	Hugo den Boogert, UEC/14	New Procedure – Initial Issue
Version 1	1.9.11	Hugo den Boogert UEQ/3	Update to reflect user's comments

iii Related Business Processes

Code	Business Process (EPBM 4.0)

iv Related Corporate Management Frame Work (CMF) Documents

The related CMF Documents can be retrieved from the Corporate Business Control Documentation Register *TAXI*.

Design: CP117 Project engineering

Procurement: CP129 Contracting and Procurement CoP

PR1233 Contracting and Procurement Procedures

Lifting and Hoisting: PR1709 Lift Planning/-Execution

Maintenance: CP114 Maintenance Code of Practice

HSE: PL04 HSE Policy

CP122 HSE Management System

SP2000 Road Transport

SP1143 Specification for Earthmoving and Construction Equipment

SP1257 HSE Specification - Scaffolding, Working at Heights or Over Water, Lifting Operations and Earthworks

Well Engineering: PR1312 Equipment Inspection and Certification Procedure

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1 Introduction

1.1 Background

Following a lifting equipment review in October 2005 it was decided to review the procedures and specifications and bring them in line with the documents of the Corporate Management Framework, PDO's HSE policy and EP2005-0264 documents.

Now after 4 years it is necessary to have a review again and to incorporate various suggestions as received from users. As requested by MSE CP-189 is incorporated in PR-1708 under Part1.

It is intended to provide the requirements for the design, procurement, operation, maintenance, testing, inspection and certification, registration and storage of lifting equipment, resulting in enhanced safety and demonstrable integrity.

1.2 Purpose

The purpose of this document is to describe the framework and means to achieve safe and efficient lifting operations (Part 1). Incidents related to these activities have resulted in loss of life and damage to assets.

It specifies the mandatory requirements for lifting and hoisting operations and lifting equipment used by PDO and its contractors.

Inspection, testing and certification requirements are detailed in Part 2 and should ensure an uniform approach.

It is also intended to provide a link between the various policies and the individual Procedures, Specifications and Guidelines that specify how the various activities should be carried out.

1.3 Target Audience

The target audience of this Document is anyone (PDO and contractors) involved in lifting equipment and lifting operations.

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2 Scope & Objectives

2.1 Scope

Part 1 covers all activities required to achieve safe and efficient lifting operations within PDO.

It applies to all aspects of lifting and hoisting operations, using on-/offshore pedestal cranes, mobile cranes, overhead and gantry cranes, A-frames, jib cranes, derricks, hoists, winches, special hoist-supported personnel lifting devices, hooks, slings and rigging, lifting points, mobile aerial platforms, powered industrial trucks (forklifts), jacks, containers, cargo baskets, skids and pallets, personnel and goods lifts etc.

Excluded are activities, involving diving personnel operations, helicopter lifting, tensioners, (marine) towing, manual handling and well operations, involving the crown block, the travelling block and top drive systems.

They are covered by other documents, for example PR-1312 for well operations.

Part 2 of this procedure covers all lifting equipment owned by PDO and lifting equipment used by PDO's contractors at PDO's facilities. It presents the minimum requirements of inspection; testing and certification of all Lifting Equipment owned and operated by PDO and its contractors.

2.2 Aims & Objectives

The Procedure describes how the various processes are applied in PDO lifting operations and provides a link between Corporate Policies and the Procedures, Specifications and Guidelines required to support these processes.

Safe and efficient lifting by controlling risks is the aim of this Procedure.

2.3 Fundamentals

The guiding principle upon which the Procedures are based is Omani Law, Ministerial Decree 286/2008, issued 22/6/2008 and effective as of 1/7/2008, Chapter 4, Section 3, Article 34. It takes precedence over all other documents.

The documents which specifically relate to this Procedure in the standards hierarchy are presented below:

Applicable Law
Policies
Code of Practice
Procedures
Specifications
Guidelines
International Standards
Industry accepted Best Practices

2.4 Review and Improvement

This Procedure and other related lifting equipment documents shall be reviewed and updated on a three yearly basis, or sooner if needed, in order to ensure that the document reflects the current position with regard to applicable Law, Corporate Policies, Management Systems, Procedures, Specifications, Guidelines, International Standards and industry accepted Best Practices.

The Document Controller is responsible for the content and upkeep of this document. Feedback is welcome at any time and should be addressed to the Document Controller in writing. Such feedback will be reviewed by the relevant parties as necessary and a decision communicated back to the originator. Enhancements originating from feedback or otherwise shall be incorporated as and when required.

2.5 Performance indicator

Number of incidents related to lifting and hoisting.

Key Performance Indicators (KPI) are used to continuously monitor and assess the performance of activities against set goals.

This performance indicator may provide different learning points eg:

- Implementation of the lifting equipment system
- Effectiveness and efficiency of the system
- Awareness of the users

This information is input for the annual lifting management system review.

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3 Roles & Responsibilities & Competence Assurance

A summary of the roles and related responsibilities that are required to both implement and manage the Procedure and its associated documents is given in App.3a.

Roles and responsibilities in the maintenance and inspection process are detailed in a flow chart in App.3b.

Requirements for training and competency are shown in App.4.

Note:

Additional support and/or supervision is to be provided for temporary workers, new personnel and short service employees, as they are likely to have less knowledge, experience and awareness of the requirements of the job and the associated hazards.

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PART 1 FRAMEWORK

4 Practices To Be Followed

4.1 Design

The project (engineering) department ensures that lifting equipment is fit for purpose and designed or modified in accordance with (inter)national recognised standards and/or manufacturer's recommendations. An overview of design requirements is provided in App. 2 and 5.

The management by PDO of the design process is described in various documents, which are part of the CMF. See iv.

The following is to be noted:

- All engineered lifting points shall be certified by PDO or an external inspection/certification company.
- Any Lifted Equipment units not certified to an accepted code shall be structurally verified by a qualified engineer (PDO or external engineering company) and load tested.

The project department should liaise with the lifting engineer for possible input.

Note: Information on approved companies, such as inspection of lifting equipment, training on lifting, engineering companies and so on is available with FPS/12 and/or PDO's lifting engineers.

4.2 Procurement

It is the procurement department's responsibility to ensure that selected companies provide lifting equipment with appropriate certification and provide services with properly certified equipment and qualified personnel.

All lifting equipment shall be ordered / provided, taking into account the requirements as mentioned hereafter and in consultation with the project department and/or PDO's lifting engineers. See also App.2 and 5.

All lifting equipment shall be supplied with a certificate issued by the manufacturer, min. as per ISO 10474 3.1B or an approved certification body.

Lifting Appliances

The manufacturer has to provide all lifting appliances with documentation stating as a minimum, permissible operating conditions, design criteria, testing documentation, maintenance requirements and examination and inspection requirements.

Lifting Accessories

All Lifting Accessories shall comply with applicable international standards and industry- accepted codes of practice as per App.2 and 5 and be provided with the appropriate test certificates.

Lifted Equipment

All Lifted Equipment shall be designed, manufactured, inspected, tested, and certified in accordance with applicable international standards and industry-accepted codes of practice as per App. 2 and 5.

Any Lifted Equipment units not certified to an accepted code shall be structurally verified by a qualified engineer (PDO or external engineering company) and load tested.

How the purchase of lifting equipment and services is managed by PDO is described in various documents. See also iv.

4.3 Lifting Equipment

Lifting Equipment comprises Lifting Appliances (equipment performing the lifting), Lifting Accessories, also known as lifting tackle or lifting gear (devices which connect the load to the Lifting Appliance) and Lifted Equipment. The diagram below includes the main categories but is not comprehensive.
All forklift trucks, self-loading and mobile cranes must be checked and certified by an approved 3rd party.

Lifting equipment such as trucks with self-loading crane, forklifts and mobile cranes used at PDO worksites is often provided by contracting companies, but its operation is under the control of the various departments. All equipment provided by these companies must also comply with the requirements included in the Road transport specification SP2000.

For a glossary of definitions, terms and abbreviations see also Appendix 1.

Lifting Equipment

Lifting Appliances	Lifting Accessories	Lifted Equipment
Cranes (including): (Offshore) pedestal crane Mobile cranes, Portal cranes A-frames & derricks Tower cranes, Overhead/gantry crane, Self-loading arms/ HIAB's Fixed lifting beams & monorails Jacks Mobile Aerial Platforms Hoists: - Manual lever - Tirfors / comealong - Powered overhead - Manual overhead - Chain block Pad eyes (fixed structural) Winches (incl. Man-riding) Forklifts Side booms Beam trolleys Sheave blocks	Wire rope slings Chains and chain slings Man-made fibre slings Shackles Beam- and Plate clamps Eye bolts & swivel rings Hoist rings Turnbuckles Wedge sockets Lifting harnesses Drill pipe elevators Casing elevators Bail arms Spreader beams Hooks Load cells Pad eyes and bolts Rigging screw Pallet hook	(Offshore) Containers Skids Skips Drum racks Gas cylinder racks Frames Netting Baskets Pipe racks Big bags Pallets

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4.4 Lifting operations

Lifting operations are potentially dangerous and therefore have to be controlled. Prior to execution the activity has to be carefully planned.

Following steps are taken:

Planning:

Risk Assessment
The Hazards and Effects Management Process (HEMP), for which the risk matrix and a Job Hazard Analysis is the basis, is applied to all lifting operations, which may be a Routine Lift, or a Non-Routine Lift, and shall address:

- Planning the lift
- Identifying the hazards and restricted areas
- Selecting competent personnel
- Specifying the minimum number of people to conduct the lifting operation
- Selecting Lifting Equipment
- Communicating lift requirements and hazards
- Procedures for changing the Lift Plan
- Emergency, recovery and contingency plans

Work Environment Conditions
Environment conditions specific to the work location are identified and accounted for in the planning and execution of all lifting operations. Whenever there is a reasonable chance of changes in environmental conditions, then contingency plans and procedures will be developed as part of the work planning.
Parameters addressed may include weather, visibility, noise, communications, terrain stability or slope, surrounding operations and installations, and site access and egress.
Simultaneous nearby operations and their work environment conditions that could impact or be impacted by the lift are identified and addressed in the risk assessment. Controls are established, including criteria for suspending operations, and communicated to all relevant personnel.

Categorization of Lifting Operations
Lifts are categorized and controlled according to complexity and risk. Details on categorization and associated controls are provided in Procedure PR-1709 Lift Planning/-Execution.

Lift Plan
For all lifts a Job Hazard Analysis (JHA) and a Lift Plan shall be prepared and documented.
Details on preparation of a Lift Plan are provided in PR-1709 Lift Planning / -Execution.
Lift Plans specify conditions under which work shall not be continued, including unplanned loss of communications, and the associated contingency plans for ensuring a safe situation is created if the lift is stopped.
For Routine Lifts, the JHA and Lift Plan may be generic. Generic JHA's and Lift Plans specify each type and location(s) of lift they cover.
For Non-Routine Lifts, specific Lift Plans and JHA's are required. They must be reviewed and approved by PDO's lifting engineer before they are implemented.

Execution:
A Toolbox Talk shall be held to ensure that all personnel involved in the lift fully understand the JHA and Lift Plan. Prior to all lifts (Routine Lifts and Non-Routine Lifts) the person in charge of the lift (PIC) ensures that the following '10 questions for a safe lift' have all been addressed.

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10 Questions for a Safe Lift

1. Is everyone aware of and do they fully understand the lifting and hoisting procedures applicable to the lift?
2. Has everyone attended the toolbox talk?
3. Has a pre-use inspection of the Lifting Equipment been carried out and are the Lifting Accessories tagged or marked with:
- Safe Working Load
- A unique identification number
- A valid certification date
4. Are all safety devices working?
5. Does everyone know the Person-in-Charge of the lift?
6. Is everyone competent and aware of his or her tasks?
7. Is there a current Lift Plan and JHA and does everybody understand the job and precautions?
8. Does everyone know the environmental limits (e.g. maximum permissible wind speed) for the lift?
9. Is the lift area controlled and is everyone clear if the load falls or swings?
10. Are signaling methods and communication agreed and clear to you?

Controlling Access to the Lift Area
Access to the work area(s) and to the lifting equipment shall be appropriately controlled, which includes the use of security measures and barriers.
No personnel are allowed under a load.

Each asset team is responsible for the operation of lifting equipment under their control. The Competent Authorized Person at each location is responsible for ensuring lifting activities do not take place unless the equipment and procedures meet PDO's requirements.

4.5 Personnel Lifting

Personnel lifting operations should not be allowed, unless specifically designed and certified equipment is used (aerial platforms, stabbing board).
Should it be necessary to deviate from this, then personnel lifting operations shall only be performed when the risks are ALARP (As Low As Reasonably Practible).
These personnel lifting operations shall be:

- Categorized as Non-Routine Critical Lifts
- Authorized in writing by the Site Manager

NB: On the drill floor "Best practice guide to man riding safety" (*http://info.ogp.org.uk/liftingandhoisting/RPR/StepChangeManriding.pdf*) shall be followed, which includes use of secondary fall arrest equipment.

4.6 Maintenance and Repairs

To ensure equipment reliability, a maintenance management system (PDO and contractors) shall be established for all lifting appliances. The system is to be based on manufacturer's recommendations, operating experience and integration of preventative and predictive maintenance techniques. PDO has implemented SAP.
The system ensures the provision of adequate spare parts, qualified maintenance technicians, maintenance procedures and manufacturer manuals.
A maintenance plan shall be available for every lifting appliance.
The maintenance quality with the contractors is verified by PDO by monitoring equipment performance, as well as through audits.

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The maintenance database system of PDO (SAP) contains information on all lifting appliances owned by PDO. The system produces work orders for the equipment according to defined schedules. The contractor shall operate a similar system.
Proposals to change maintenance schedules should be reviewed and approved by the lifting engineer before they are implemented.

Repairs are permitted, but no welding repairs shall be made to critical components, such as booms and swing assemblies, without specific repair procedures and recommendations from the original Crane Manufacturer. All major replacement parts have to be equal or exceed the original equipment manufacturer's recommendations. Written reports have to be maintained by the Crane Owner, confirming the adequacy of major repairs or alterations as implemented.

4.7 Inspection, Testing and Certification

All cranes and other lifting equipment, new and existing, used within PDO shall undergo testing, inspection, and certification. It helps ensure its integrity and hence continued safe operation of the equipment.
Inspection, testing and certification shall be carried out by qualified personnel (see App.1 and 4) and shall comply with the requirements of PR-1708 Part 2 Inspection, Testing and Certification regarding frequency and acceptance/rejection criteria. See also App.5. This list is not comprehensive.

PDO's lifting engineer verifies that the inspection and certification requirements are met for all lifting equipment operated within PDO by means of auditing.

All new lifting equipment shall be proof load tested/inspected prior to its first use, and provided with correct certification. Proof load testing shall comply with the requirements as mentioned in App.5 and shall be witnessed either by PDO and/or an approved Inspection Company.
Prior to testing/inspection the risks are assessed and controlled.

Where existing lifting equipment is significantly altered or a major repair to components in the load path is carried out, a proof load test shall be conducted and witnessed by PDO and/or an approved Inspection Company.
Deviation from this requirement must be approved by PDO's lifting engineer and documented in the equipment records.

A proper test rig must be used for proof testing of lifting accessories.

All existing lifting equipment shall be subjected to periodic inspection / function testing (if applicable) to verify operability and includes safety systems and equipment (e.g. alarms and cut-outs).
Intervals shall not exceed those listed in App.5. See also PR-1708 Part 2.

Lifting accessories/-appliances, having passed the 6 monthly inspections, shall be coded with the applicable color.
Inspections shall also be conducted if the integrity of the equipment may have been affected due to:

- Involvement in an incident
- Exposure to overloads
- Modification or repair
- Change in condition of use e.g. environmental

Prior to each use all lifting equipment shall also be visually inspected / function tested by / under the supervision of the person in charge (PIC) to ensure, so far as is practible, it is in a good state of repair and safe to be used.
Certification services shall be provided by an independent authority. They shall record the results of their activities and the certificate shall clearly state safe or not safe for use.

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The details of all existing and new lifting equipment shall be recorded in a lifting equipment register established for each location. The Competent Authorized Person (CAP) is responsible for maintaining the register at each location. All PDO lifting appliances are also included in a master asset register in SAP and controlled by CAP. The contractors shall maintain a similar system. The following information shall be recorded in the registers:

- Manufacturer and description
- Identification number
- SWL
- Date when the equipment was first taken in use
- Particulars of defects and steps taken to remedy them
- Dates and numbers of certificates of tests, inspections, and examinations, and name of the person who performed these
- Due dates for previous and next periodic inspection or periodicity of inspections
- Maintenance particulars

All lifting equipment owned or contracted by PDO has a unique identification number (ETN Equipment Tag Number) to allow it to be identified throughout its life cycle***. This shall be clearly and permanently marked on the equipment, along with the Safe Working Load and the next certification date.*** The issue of the unique number is controlled by the Competent Authorized Person. Contracted equipment is identified by the unique number assigned to it by its manufacturer or owner. These identification numbers are used on all documents and records related to the specific equipment.

Notes:
1. Special attention shall be given to second hand cranes. Prior to use on PDO's premises, the cranes and its full documentation, including certificates of load- and function tests, must be checked and approved by the lifting engineer. Experience has learned that certificates provided with second hand cranes are not always reliable. Therefore load- and function tests have to be (re)performed locally and witnessed/certified by an independent Certification Authority.
2. Over the years several mobile cranes were involved in (sometimes fatal) accidents, whereby the cranes failed whilst operating within their safe working load limit. Subsequent investigations revealed that they failed due to fatigue stresses as a result of prolonged years of service. Therefore mobile cranes shall not be used after exceeding their life time limit. For details see PR-1708.

4.8 Competence, Training, Qualifications and Certification

To ensure that tasks are performed adequately, personnel (PDO and contractors) involved in lifting operations / lifting equipment shall be qualified.
The Qualification process shall comprise requirements on:

- the physical condition of the person (3 yearly medical check)
- the level of competency
- specific PDO approved training courses and assessments. (trainer and assessor shall be different persons)

This process shall be documented and the records be available for review.

Upon satisfactory completion of the qualification process the personnel will be provided with a certificate/permit. The duration of the certification shall not exceed 3 years, and has to be followed by a refresher course / re-assessment.

See also App. 4

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4.9 Storage

It is the responsibility of the asset custodian or the contractor to store loose lifting equipment in such a manner as to avoid mechanical damage, corrosion, chemical exposure, etc.
It shall be a dedicated permanent store or a transportable container with racks and bins. It shall contain a secure quarantine area to prevent use of rejected items.
The issue and return of the loose lifting equipment shall be controlled. A register shall be kept to ensure traceability.

4.10 Document Retention

All new lifting equipment or equipment having undergone major repairs have to be accompanied by manufacturing records, certificate of conformity, 3rd party certificate etc. depending on the type of equipment. All these records have to be retained during the life span of the equipment.
Records of periodic inspection have to be retained for a minimum of 4 years.

4.10 Auditing and Review

Auditing is an important activity to verify implementation of PDO's requirements and to be able to identify areas for improvement.
Audits shall be carried out at random on lifting activities within PDO's operations during the year. The activities of contracting companies shall be audited as well (It does not discharge the contractors of their task to carry out their own internal audits).
An annual audit plan for lifting equipment is prepared for the start of each year by PDO's lifting engineer. The plan takes into account the status and importance of the activities to be audited. The results of previous audits are taken into account during the planning.
Remedial actions identified during the audit are recorded in the audit report. The report is sent to the person responsible for the activity. All remedial action items arising from the report are also recorded on a non-conformance report (NCR) or opportunity for improvement (OFI) report form and will be stored in a tracking system.
It records the details of the remedial action, along with the person responsible for completing the action and a target completion date.
The information obtained from the audits serves as input for the annual review of the lifting management documents.

4.11 Annual Lifting Management Review

An annual review shall be carried out to assess the effectiveness of the management of lifting equipment/-operations within PDO. The review is coordinated / chaired by UEQ/3.

The review can also be called in response to a major non-conformity, an unsatisfactory audit result or a major incident involving lifting equipment. The review will include the following:

- The results of internal quality audits and asset integrity reviews
- Outstanding issues from the previous management review
- Implemented corrective actions
- Requests for improvements
- Overall HSE performance related to lifting equipment

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PART 2 INSPECTION,TESTING AND CERTIFICATION

5 Inspection of Lifting Accessories

5.1 Definition

Any item whatsoever which is used or designed to be used directly or indirectly to connect a load to a lifting appliance or lifted equipment (e.g. a crane, chain block, spreader bar) and which does not form part of the load, but which is not itself able to lift, or lower a load e.g.

SLINGS	LIFTING COMPONENTS
Wire rope slings	Eyebolts
Chains slings	Hooks
Flat synthetic slings	Lifting Caps and Stubs
Webbing slings	Master Links
Polyester round slings	Plate Clamps
Fibre rope slings	Rings
Other types of sling	Shackles
	Swivels
	Hammerlocks
	Beam Clamps
	Other types of components

Exclusions

The following items are specifically excluded from the definition of this procedure:

- Mooring lines of floating units such as barges, boats, ships, and dedicated associated items used on mooring devices or buoys
- Guying and stay wires and other items subject to static loading conditions only.
- Wire ropes and wire rope arrangements used for pulling.

5.2 Inspection Frequency

5.2.1 Inspection Frequency

All lifting accessories shall be thoroughly inspected in accordance with this procedure at time intervals not exceeding 6 months.

At time of initial inspection, the Manufacturer's Test Certificate shall be produced by the asset custodian / owner for review by the Lifting Inspector to verify equipment details. Failure to provide the original Manufacturer's Test Certificates will result in the equipment being rejected.

5.2.2 Thorough Inspection at 6 Monthly Intervals

All items of lifting accessories shall be subject to a thorough inspection giving critical appraisal of the item in question, in accordance with this procedure. All inspections of lifting accessories shall be undertaken by a Lifting Inspector, who shall assess the fitness for its intended use in accordance with the relevant item, as per 5.6 of this section. This is the minimum level of inspection required.

Any defects found that result in the item being unserviceable and not repairable, shall be painted red, placed in a segregated area, and disposed of immediately after the inspection has been completed. If to be repaired it shall be painted black.

5.3 Repairs

All items that are found unserviceable, but considered repairable shall be placed in a quarantine area designated by the C.A.P. and a tag tied to the item giving details of the repairs required. No colour coding shall be applied to the item.

All proposed repairs to damaged items of lifting accessories must have the approval of the Lifting Engineer.

Items of lifting tackle that have been repaired shall be proof load tested before being taken back into service.

Note: No repairs shall be carried out on any sling, shackle, ring or eyebolt. These types of defective lifting items MUST be destroyed.

5.4 Service Life of Lifting Accessories

No maximum service life is specified for any item of lifting tackle, serviceability is determined by the findings of the six monthly inspections.

5.5 Marking and Colour Coding of Lifting Accessories

Ensure that all hard stamping of lifting items is carried out using low stress stamps. Ensure that no damage to the item has occurred due to the hard stamping. All lifting accessories, which have been inspected and found fit for purpose for a maximum six months, shall be colour coded. For details of PDO's colour coding refer to Paragraph12. All items shall have as a minimum the unique number and the safe working load (SWL).

• Chain Slings

The information and other markings shall be stamped on either a metal tag firmly attached to the sling or stamped on the master link using low stress stamps.

• Wire Rope Slings

The identification and other markings shall be stamped on the ferrule using low stress stamps. For slings without ferrules, the information shall be stamped on a metal tag firmly attached to the sling.

• Natural and Synthetic Fibre Slings

No direct marking shall be done on the slings themselves. All marking shall either be on a tag attached to the eye of the sling or on a sleeve fastened round the sling body itself.

• Lifting Beams/Frames and Spreader Bars

Lifting Beams/Frames and Spreader Bars and other welded or fabricated items shall be marked in characters of a contrasting colour not less than 75mm high, where item size restricts, the largest lettering practicable shall be used.

• All Other Lifting Accessories Items

All stamping shall be on areas, which are subject to the lowest stress. For hooks all stamping shall be done on Zone “A” of the hook, refer to Appendix 6.

5.6 Inspection

5.6.1 Inspection Criteria for Chains and Chain Slings

a. Ensure the Sling has the Identification Number and Safe Working Load clearly and legibly marked, and corresponds with the manufacturer’s certificate.

b. Match up the legs and check for stretch in the individual legs.

c. Inspect each individual leg along its entire length for distortion of links e.g. bends, twists, corrosion, elongation and nicks.

d. Check for wear between chain links and load pins.

e. Check for heat or chemical attack.

f. Inspect end terminations fitted e.g. hooks, connectors etc in accordance with the appropriate paragraph of this procedure.

g. Ensure all coupling components are free from distortion, cracking and the securing/ load pins are secure.

REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
Wear on the link diameter in excess of 5%.
Stretch of more than 3% measured over 10-20 links.
Any severe pitting corrosion or general corrosion in excess of 5%.
Twist in excess of half a turn in 4 metres (or equivalent).
Any chain or fitting made of Wrought iron
"T" grade slings used in an Hydrogen enriched atmosphere
Hard stamping with low stress stamps

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5.6.2 Inspection Criteria for Flat Synthetic Web Sling

a. Ensure the Sling has the Equipment Tag Number and Safe Working Load clearly and legibly marked, and corresponds with the manufacturer's certificate.

b. Inspect along its entire length for cuts, tears, chafing, chemical damage or heat damage and long term U.V. exposure.

c. Inspect the fibres for the ingress of foreign bodies.

d. Inspect for any paint on the sling.

e. Inspect the point of change in section, from 1 to 2, 2 to 3 layers, as these are high stress areas.

f. Inspect metal eyes fitted for wear, stretch and distortion, corrosion and cracking.

g. Inspect end terminations e.g. hooks, connectors etc in accordance with the appropriate paragraph of this procedure.

REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges, etc.
Any breakage of the stitches on the body or the eye
Any worn stitching in load bearing areas
Any burn marks i.e. melting, charring etc
Any sign of chemical damage
Any friction damage or badly abraded spots
Knotted slings
Any fibre brittleness or extruding fine dust due to extended UV exposure
Any paint or felt tip pen markings on the sling

5.6.3 Inspection Criteria for Round Sling

a. Ensure the Sling has the Equipment Tag Number and Safe Working Load clearly and legibly marked, and corresponds with the manufacturer's certificate.

b. Inspect along its entire length for cuts, tears, chafing, chemical damage, heat damage and damage due to UV exposure.

c. Inspect the fibres for the ingress of foreign bodies.

d. Inspect for any paint on the sling.

e. Inspect end terminations e.g. hooks, connectors etc in accordance with the appropriate paragraph of this procedure.

REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
Any breakage of the stitching
Any worn stitching in load bearing areas
Any burn marks i.e. melting, charring etc
Any sign of chemical damage
Any friction damage or badly abraded spots
Cuts in the outer protective cover, exposing the inner fibres.
The core of round sling is displaced or exposed.
Knotted slings
Any paint or felt tip pen markings on the sling

5.6.4 Inspection Criteria for Wire Ropes and Wire Rope Slings

a. Ensure the Sling has the Equipment Tag Number and Safe Working Load clearly and legibly marked, and corresponds with the manufacturer's certificate.

b. Inspect each individual leg along its entire length for wear, corrosion, abrasion, mechanical damage, and discolouration due to heat or chemical damage, evidence of shock loading and broken wires.

c. Inspect each ferrule and ensure the correct size of ferrule has been fitted.

d. Check that the end of the loop does not terminate inside the ferrule unless the ferrule is of the long tapered design, which has an internal step. I.e. Flemish eye.

e. Ensure the ferrule is free from cracks and other deformities.

f. Inspect each thimble, if fitted, for correct fitting, snagging damage and elongation. (Stretched thimbles/eyes could indicate possible overload).

g. Inspect wire rope around thimbles as it is often to be found abraded due to the sling being dragged over rough surfaces.

h. Inspect end terminations e.g. hooks, connectors etc in accordance with the appropriate paragraph of this procedure.

REJECTION CRITERIA	
Condition	Discard Criteria
Information	Missing or illegible Identification Number or Safe Working Load
Mechanical Damage	Nicks, cuts, gouges etc.
Wire Breaks	If the number of wires in the sling are known: a) 5% of the wires in 10 diameters b) 3 or more closely grouped wires
Wire Breaks	If the number of wires in the sling is not known:

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	a) 5 wires in any 6 diameters b) 3 or more closely grouped wires
Wear	Any wear resulting in a flat on the outer wires of more than 3/4 of the original wire diameter
Loss of Diameter	When the diameter of the rope has decreased by a value of 7% or more, compared to the original rope diameter.
Distortion	Due to a) kinking b) crushing c) core collapse d) knotting
Heat Damage	Discolouration of the wires, weld spatter etc
Damaged Ferrules and eyes	a) Cracks in the ferrule b) Severe crushing or abrasion c) Pulling out of the ferrule d) Concentration of broken wires near to the ferrule e) Fractured wires on the outside surface of the eye f) Closing of the thimble
Wire Rope Core	Fibre cored wire rope
Number Stamps	Hard stamping with low stress stamps

NOTE: -

1. Hand Splice. The only method of hand splicing shall be the "Cross Tuck" or "Admiralty" splice which complies with Regulation 20 (d) of the Docks Regulation 1934.

2. Hand spliced slings terminated using any other type splice shall be rejected.

5.6.5 Inspection Criteria for Eyebolts

a. Ensure the Eyebolt has the Equipment Tag Number and Safe Working Load clearly and legibly marked, and corresponds with the manufacturer's certificate.

b. Inspect threads for wear, stretch or impact damage. The threads must be complete (no broken threads) and full (i.e. no flats on top).

c. The threads should be concentric and fit neatly in a standard nut.

d. Inspect the eye of the bolt for wear, stretch and distortion.

e. Inspect the eye of the bolt for cracking at the crown of the ring (This also applies to any link if fitted) and cracking.

f. Check squareness of shank against shoulder.

g. The complete Eyebolt shall be subjected to non-destructive testing at a period not exceeding 1 year.

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REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
Any wear or corrosion in excess of 5% of the original dimension
Any distortion or stretch
Cracking
No hard stamping/cast markings of thread type
Any thermal damage or evidence of welding on the eyebolt i.e. nuts welded on
All "Dynamo" type eye bolts (parallel shank no collar)
Any modification to the eye bolt i.e. thread shortening, lengthening etc.
Hard stamping with low stress stamps

5.6.6 Inspection Criteria for Shackles

a. Ensure the Shackle has the Equipment Tag Number and Safe Working Load clearly and legibly marked, and corresponds with the manufacturer's certificate.

b. Ensure that all stamping is done using low stress stamps in the position recommended in BS 3551.

c. Remove the shackle pin and inspect for wear deformation and cracking.

d. Ensure it is the correct pin for the shackle.

e. Inspect pin threads for wear/deformation.

f. Inspect shackle body for deformation and cracking and check for wear in the crown and pin hole.

g. Check alignment of pinhole and ensure the pin fits correctly.

h. In case of safety pin shackles, ensure split pins are fitted.

i. The complete shackle shall be subjected to non-destructive testing at a period not exceeding 1 year.

REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
Excessive movement between the shackle pin and the shackle threaded hole
Any wear or corrosion in excess of 5% of the original dimension
Any thermal damage or evidence of welding on the shackle
Any cracks
Stamping out with the recommended positions shown in BS 3551
No split pin fitted in safety or bolt type shackles
Hard stamping with low stress stamps

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5.6.7 Inspection Criteria for Hooks

a. Ensure the Hook has the Equipment Tag Number and Safe Working Load clearly and legibly marked, and corresponds with the manufacturer's certificate.

b. Inspect the hook body for wear, distortion and corrosion.

c. Inspect the hook body for cracking at the crown of the hook.

d. Ensure safety catch is fitted and operational.

e. Any stamping is done only in zone "A"

There are three main types of hooks

f. Eye Hooks

1) Inspect the eye of the bolt for wear, stretch and distortion.

2) Inspect the eye of the bolt for cracking at the crown of the ring (This also applies to any link if fitted).

g. Shank Hook

1) Inspect threads for wear, stretch or impact damage. The threads must be complete (no broken threads) and full (i.e. no flats on top).

2) The threads should be concentric and fit neatly in a standard nut, zone D

3) Wear on the shank more than 8% of original diameter.

4) Check squareness of shank against shoulder.

5) Additional holes drilled in the shank

h. Swivel Hook

1) Inspect swivel part of the hook in accordance with paragraph 5.6.8

i. The complete hook shall be dismantled for inspection and NDT survey at a period not exceeding 4 years. At the discretion of the Lifting engineer, the dismantling and NDT survey frequency may be changed.

REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
For zone A (see sketch, appendix 1) worn more than 15% of original thickness.
For zone B (see sketch, appendix 1) worn more than 10% of original thickness.
For zone C (see sketch, appendix 1) worn more than 5% loss of original thickness.
For zone D (see sketch, appendix 1) minimum thread size and/or 8% loss of original diameter
Increase in throat opening distance in excess of 15%
Threads that are corroded more than 20% of the nut engaged length.
Any thermal damage or evidence of welding on the hook i.e. nuts welded to hook shanks
Any cracking or stretch
Hard stamping with low stress stamps or hard stamping in Zones "B", "C" or "D"

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5.6.8 Inspection Criteria for Swivels

a. Ensure the Swivel has the Equipment Tag Number and Safe Working Load clearly and legibly marked, and corresponds with the Manufacturer's Certificate.

b. Inspect the swivel body for wear, distortion and corrosion.

c. Inspect the eyes of the swivel for wear, stretch and distortion.

d. Inspect the eye of the swivel for cracking at the crown of the ring.

e. Remove the jaw pin and inspect for wear deformation and cracking.

f. Ensure it is the correct pin for the swivel.

g. All dimensions must be within 5% of original dimensions

h. Ensure the swivel rotates freely.

i. The component parts of the swivel assembly shall be subjected to non-destructive testing at a period not exceeding 2 years.

REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
Any wear resulting in a loss of more than 5% of the original dimension
Any wear or corrosion in excess of 5% of the original dimension
Any stretch, distortion or cracking
Hard stamping with low stress stamps

5.6.9 Inspection Criteria for Horizontal and Vertical Plate Clamps

Horizontal Plate Clamp

a. Ensure the Plate Clamp has the Equipment Tag Number and Safe Working Load clearly and legibly marked, and corresponds with the Manufacturer's Certificate.

b. Inspect the suspension ring for wear, distortion, corrosion and cracking in the crown of the ring.

c. Check lateral movement of hook ring on load bolt connection to serrated jaws/rocker arms, excessive movement indicates wear/distortion.

d. Check lateral movement of serrated jaws/rocker arms on load bolt connection to main body, excessive movement indicates wear/distortion.

e. Where a toe is fitted, check for lateral movement of swivel toe on load bolt connection to rocker arms, excessive movement indicates wear/distortion

f. Where swivel jaws are fitted, ensure they rotate freely.

g. The complete Plate Clamp shall be subjected to non-destructive testing at a period not exceeding 2 years.

Vertical Plate Clamp

a. Ensure the Plate Clamp has the Equipment Tag Number and Safe Working Load and Plate size clearly and legibly marked, and corresponds with the Manufacturer's Certificate.

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b. Inspect the suspension ring for wear, distortion, corrosion and cracking in the crown of the ring.

c. Ensure the ring does not have excessive movement in the clamp.

d. Inspect jaw pin and nut and ensure it is secure and not deformed.

e. Check operation of cam-assembly locking lever/jaw spring.

f. Check lateral movement of hook ring on load bolt connection to serrated jaws/rocker arms, excessive movement indicates wear/distortion.

g. Inspect serrated jaw and serrated pad for wear/deformation.

h. Inspect main body shell and check for wear, cracks or deformation, which may affect the operation of the internal components.

i. The complete Plate Clamp shall be subjected to non-destructive testing at a period not exceeding 2 years.

REJECTION CRITERIA (for both Horizontal & Vertical)
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
Any wear resulting in a loss of more than 5% of the original dimension
Any stretch, distortion or cracking
Hard stamping with low stress stamps

5.6.10 Inspection Criteria for Fixed and Adjustable Beam Clamps

a. Ensure the Beam Clamp has the Equipment Tag Number and Safe Working Load and beam size clearly and legibly marked, and corresponds with the manufacturer's certificate.

b. Inspect the suspension shackle for wear, distortion, corrosion and cracking.

c. Inspect the load bar for wear, stretch, distortion and cracking.

d. Inspect inner and outer clamp for wear, distortion and cracking. Check jaws for deformation.

e. Inspect adjusting bar for straightness and function. Check threads for wear and stretch.

f. Inspect female screwed spigots (in each clamp half) and ensure they are not deformed due to over/under tightening.

g. Inspect "tommy bar" handle and ensure it is not bent or damaged.

h. Where swivel jaws are fitted, ensure they rotate freely.

i. The complete Beam Clamp shall be subjected to non-destructive testing at a period not exceeding 2 years.

REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
Any wear or corrosion resulting in a loss of more than 5% of the original dimension
Any stretch, distortion or cracking
Hard stamping with low stress stamps

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5.6.11 Inspection Criteria for Lifting Caps and Stubs

a. Ensure the Lifting Cap or Stub has the Identification Number and Safe Working Load clearly and legibly marked, and corresponds with the Manufacturer's Certificate.

b. Inspect threads for wear, stretch or impact damage. The threads must be complete (no broken threads) and full in form.

c. Inspect the eye of the Lifting Cap or Stub for wear, stretch and distortion.

d. Inspect the eye of the Lifting Cap or Stub for cracking at the crown of the ring (This also applies to any link if fitted).

e. The complete Lifting Cap or Stub shall be subjected to non-destructive testing at a period not exceeding 1 year.

REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
Any wear in excess of 5% of the original dimension
Any corrosion, which is comparable with the loss due to wear. (i.e. > 5% of the original dimension)
Any stretch, distortion or cracking
Hard stamping with low stress stamps

5.6.12 Inspection Criteria for Rigging Screws/Turnbuckles

a. Ensure the rigging screw has the Identification Number and Safe Working Load clearly and legibly marked, and corresponds with the Manufacturer's Certificate.

b. Inspect threads for wear/deformation.

c. Inspect rigging screw body for deformation and cracking and check for wear in the eyes.

d. Inspect threads for wear, stretch or impact damage. The threads must be complete (no broken threads) and full in form.

e. Inspect the eye of the bolt for cracking at the crown.

f. Check the squareness of screw against the body.

g. The complete Rigging screw shall be subjected to non-destructive testing at a period not exceeding 1 year.

REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
Any wear or corrosion in excess of 5% of the original dimension
Any Shank distortion
Any thermal damage or evidence of welding on the rigging screw
Any modification to the rigging screw
Any stretch, distortion or cracking

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Hard stamping with low stress stamps

5.6.13 Inspection Criteria for Master Links and other Rings

a. Ensure the Link or Ring has the Equipment Tag Number and Safe Working Load clearly and legibly marked, and corresponds with the Manufacturer's Certificate.

b. Inspect the Link or Ring body for wear, distortion, corrosion, stretch and cracking.

c. Inspect the central pin of snap or hammerlock joints, both laterally and transversely for excessive wear.

d. The complete Link or Ring shall be subjected to non-destructive testing at a period not exceeding 1 year.

REJECTION CRITERIA
Missing or illegible Identification Number or Safe Working Load
Any mechanical damage i.e. nicks, cuts, gouges etc.
Any wear or corrosion in excess of 5% of original dimension
Any wear or corrosion in excess of 5% of original central pin dimension
Any thermal damage or welding of the Link or Ring
Any stretch, distortion or cracking
Hard stamping with low stress stamps

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6 INSPECTION AND LOAD TESTING OF CRANES

6.1 Definition

Any machine used for hoisting and lowering loads e.g.

Crane, Powered Mobile Crawler Jib

Crane, Powered Mobile Wheeled Jib

Crane, Powered Truck Loading

Crane, Powered Truck Mounted

Crane, Mounted, Piling Rig, Powered

Crane, Powered Overhead Travelling

Crane, Manual Overhead Travelling

Crane, Manual Overhead Travelling Structure

Crane, Portable Jib (Garage)

Crane, Pillar Swing Jib

Crane, Wall Mounted Swing Jib

Crane, Cantilever

Crane, Fixed Gantry

Crane, Mobile Gantry

6.2 Inspection and Load Test of Cranes in Table 1

CRANE TYPES	12 MONTHLY INSPECTION	48 MONTHLY INSPECTION AND LOAD TEST
Crane, Pedestal Jib	YES	YES
Crane, Free Standing Pillar Jib	YES	YES
Crane, Portable Jib	YES	YES
Crane, Pillar Swing Jib	YES	YES
Crane, Wall Mounted Swing Jib	YES	YES
Crane, Cantilever	YES	YES
Crane, Fixed Gantry	YES	YES
Crane, Portable Gantry	YES	YES

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6.2.1 Frequency of Inspection

All cranes listed in Table 1 shall be thoroughly inspected and load tested in accordance with this procedure at time intervals detailed in table 1.

At time of initial inspection, the Manufacturer's Test Certificate shall be produced by the asset custodian / owner for review by the Lifting Engineer to verify appliance details.

6.2.2 Thorough Inspection

The Lifting Engineer shall carry out a thorough inspection of the crane in accordance with this section. This is the minimum level of inspection required.

Due to the many varying designs of cranes, not all aspects of the inspection will apply to every crane.

Pre-Inspection Function Test

During any thorough examination, it is necessary to carry out an operational function test without load to prove the operation of the crane and the function of its safety devices. The crane must be operated by a fully qualified crane operator under the control of the Lifting Engineer. Prior to the test, the Lifting Engineer shall establish,

- That all controls operate correctly and smoothly, and are free from wear and other damage.
- That the crane driver is certified, and has adequate experience.
- That any limitation of crane operations in accordance with operating site safety requirements, i.e. weather conditions, etc. are observed.
- The crane is provided with a valid RAS (Roadworthiness Assurance Standards) sticker.
- The crane is fit to perform the required movements.
- Equiped with sufficient falls of wire rope for the test load.

The operational function test shall cover the items listed below. If any defects are found which adversely affect the safe operation of the crane during the thorough inspection, then they shall be corrected before proceeding further:

- Main and auxiliary load hoisting and lowering mechanism.
- Boom hoisting and lowering mechanism.
- Slewing mechanism.
- Boom hoist and load limits.
- All brakes and clutches.
- Boom angle (mechanical or electronically) and safe load indicators.

Safe Working Load and Identification Number

- Ensure durable legible manufacturer's rating chart(s), with text in English and/or Arabic are provided in the operators cab or primary control station. The charts shall be for the crane model under inspection and cover all possible configurations of the crane including manual extensions and fly jibs, if applicable.
- Ensure the correct load-rating charts for the crane configuration in use, is accessible to the operator.

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- On cranes with a single load rating, ensure that the SWL is legibly marked in characters of a contrasting colour not less than 75mm high, on the boom or structure of the crane.
- Ensure the unique identification number is legibly marked in characters of a contrasting colour not less than 75mm high, on the boom or structure of the crane.

Hydraulics

- Ensure all fluid levels are correct.
- Inspect the hydraulic system pipes, rotary coupling, rubber hoses for leaks, corrosion, wall section loss and mechanical damage
- ensure that only crimped end connections have been used.
- Inspect all hydraulic cylinders for leakage, corrosion on the rods and alignment.Visually check end fixings for wear, security and lubrication.
- Ensure that the reinforcing steel braiding of the rubber hoses is not exposed.
- Ensure that no part of the hydraulic hoses has been painted.
- Inspect all check/holding valves for leaks, corrosion and mechanical damage.
- Ensure that the stroke length of hydraulic cylinders working in tandem are equal.

Structure Including the Crane Pedestal

- Inspect the crane structure for corrosion, mechanical damage, fatigue stress etc.
- Inspect all accessible load-bearing welds to ensure freedom from defects.
- Ensure all bolts, and fastenings are checked for tightness and condition. At the discretion of the lifting engineer, sample bolts may be removed to enable a thorough inspection and/or NDT.
- Check all anchorage and pivot pins/bushes for security.
- The thickness of any part of the structure may be checked using an appropriate NDT method; this will be at the discretion of the lifting engineer. The permissible levels of wear, erosion and/or corrosion are given in Table A
- At intervals at the discretion of the Lifting Engineer, if applicable, the critical load bearing parts such as the boom section and areas that are not accessible during the routine inspections shall be dismantled to facilitate inspection. Critical load bearing parts shall be visually inspected and NDT'd using an appropriate testing method to ascertain their integrity. Load bearing parts to be considered:
    - Main Jib/Boom
    - Fly Jib and / or attachments
    - Slew rings
    - Hook blocks etc

The Lifting Engineer may specify other parts of the crane to be tested if he has reason to believe that there are possible defects, which can only be detected by NDT.

Telescopic and Lattice Booms

- Check the operation of the telescopic boom; ensure the boom length markings are clearly legible. During operation, check if the telescopic motion is through direct or indirect ram operation.

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- In the case of indirect ram operation inspect the extending/retracting chains/ropes for corrosion, mechanical damage etc, refer to Table A for limits.
- Any telescopic boom's extending/retracting chains/ropes and any internal hydraulic cylinders may, at the discretion of the Lifting Engineer, be required to be removed to facilitate a thorough inspection. During the chains/ropes removal, the boom shall be given a thorough internal inspection.
- Inspect the telescopic boom end stops, and the guides for security and wear.
- Inspect the entire length of the boom, including manual extension and fly jib, if fitted, or mechanical damage, loss of section and corrosion, fatigue stress, pay particular attention to the boom section end connections.
- Inspect the boom heel pins and luffing cylinder, top and bottom anchorages for excessive wear.
- For lattice jibs, inspect each section of the jib for mechanical damage and/or corrosion, loss of section to the cords and bracings ensure no bracings are missing.
- Inspect the lattice jib section joint pins and bushes for wear.
- Ensure that a boom angle indicator is fitted and operational (electronical or mechanical).
- The thickness of any part of the boom/jib may be checked using an appropriate NDT method; this will be at the discretion of the Lifting Engineer. The permissible levels of wear, shall be as advised by the crane manufacturer.

Table A gives the maximum thickness reduction permissible due to wear, corrosion etc.

Table A

ITEM	LIMIT
MATERIAL LOSS on BOOM, JIB and STRUCTURAL MEMBERS	As defined by the crane manufacturer. Where no maximum material loss limit has been defined a maximum of 10% at any point, shall be the used.
LOOSE GEAR	5% on any diameter 3% on any pin/shaft or hole
WIRE ROPE	5 wires in any 6 diameters, 3 or more closely grouped wires. When the diameter of the rope has decreased by a value of more than 7% compared to the original rope diameter. Mechanical damage etc, full rejection criteria is contained within ISO 4309. Discolouration of the wires indicating internal corrosion.
CHAINS	Cracked or missing link plates Loose, worn pins with damaged heads, pins rotating in the outer plate. Loss of free movement (Seized chain). Wear, damage and corrosion of chain, anchor pin and anchor (including integral anchors). Wear between the pin and the plate (elongation) The load chains shall be of equal tension. Measurement of elongation must be made over a minimum of ten pitches, the rejection criteria based

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	on elongation alone is: Leaf Chains 3% Roller Chains 3%

Ropes, Hook Block Assemblies and Sheaves

- Thoroughly inspect the entire length of all wire ropes fitted, including rope anchorage for wear, splintering, corrosion and mechanical damage etc. Special attention should be given to the section of rope on standing or equalising pulleys. Wire rope rejection limits are given in Table A.
- Inspect all rope end terminations, splices etc for damage and wear with particular attention being paid to broken wires at ferrule connections.
- Inspect the wedge and socket, ensure the correct size of wedge and socket is fitted, and there is no miss-match between the wedge and socket.
- Ensure the rope fitted is of the correct size and construction for the crane.
- Inspect all sheaves for wear, cracking and rope path alignment and bearing condition.
- Ensure that at least five (5) full turns of wire rope remain on the drum at any time.
- Inspect crane hook in accordance with paragraph 5.6.7.
- Irrespective of the results of the inspections, all ropes shall be replaced after a period not exceeding 6 years.
- At intervals not exceeding four (4) years, all crane hook assemblies shall be dismantled for visual inspection and NDT survey of all load-bearing components. At the Lifting Engineer's discretion, this routine may be requested during the time of annual inspection.

Rope Drums

- Inspect all rope drums for cracks and for defects liable to damage the rope.
- Inspect all rope drums for security.
- Inspect rope anchorage for security and efficiency.
- Any fleeting device fitted to the drum requires to be checked for effective operation.
- At the Lifting Engineer's discretion, all the hoist units (main, auxiliary) may be removed to allow a thorough inspection of all enclosed parts i.e. gearbox shafts, bearings etc.

Slew Ring

- Slew ring rocking clearances shall be taken and recorded annually by the Owner. The clearances shall be compared against the maximum allowable, specified by the crane manufacturer. A log shall be kept showing the rocking clearances trend against the allowable rocking clearance limit, the log shall be kept for a minimum of 6 years.
- The backlash of the slew ring shall be taken and recorded annually. The backlash clearance shall be compared against the maximum allowable, specified by the crane manufacturer. A log shall be kept showing the back lash clearance trend against the allowable back lash clearance limit, the log shall be kept for a minimum of 6 years.
- Inspect the slew ring gearing and the slew drive motor gear for wear and damage.
- Check the slew ring and slew motor holding down bolts for tightness.

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- Ensure that on multi drive units they are synchronised.

Brakes and Clutches

- Inspect the condition of all drive belts, gearing, shafts etc.
- Inspect the condition of the clutch and brake drum condition and lining for wear.
- Check the linings are properly secured.
- Ensure that all brakes and clutches function correctly.
- Check the operating linkage for excessive wear and maladjustment, which may interfere with proper operation
- Ensure that any pawls fitted to hoist units are functioning correctly.

Power Source

- Check the power source for proper performance and compliance with regard to safety requirements.
- If applicable, inspect the engine fuel lines and fuel tanks for leaks. Similarly, the exhaust system requires to be checked for security and leaks. The power source holding down bolts must be in place and secure.
- If applicable, check the engine oil, hydraulic fluid and water are at the correct level.
- Check for leakage of engine oil, hydraulic fluid and water.
- Ensure if fitted, the hydraulic start system is operational.

Control Station, Cab and Controls

- Inspect the cab/control structure for security and mechanical damage.
- Inspect all means of access (i.e. steps, ladders) for damage and security. Ensure adequate means of escape is provided. For mobile cranes it has to comply with EN13000.
- Ensure all controls are legibly marked with their mode of operation in bilingual notation. Where bilingual notation marking is not practical then a suitable control diagram shall be provided
- Inspect all control levers for excessive wear and maladjustment, which may interfere with proper operation
- Ensure the warning horn and engine stop control operates correctly.
- Ensure that all lighting fitted is functioning.
- If fitted with a free fall function, ensure that it has been disabled. (Piling rig excluded)

Safety Systems and Function Test

- Carry out a full function test (without load attached). I.e. telescoping, luffing, slewing and hoisting ensuring that the upperhoist/overlower, slewing, maximum and minimum radius limits etc. fitted are functioning correctly.
- Check the condition of hoses, piping and or electric cables.
- Ensure that the emergency load lowering is system is operational and clearly marked.

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- Ensure the crane's audible and visual warning devices for damage, security and integrity, and functionally test the warning devices for correct operation.
- Ensure that a fire extinguisher is fitted and has a current inspection tag attached.
- Ensure that the crane is fitted with an overload protection device, inspect and functionally check the unit to ensure its correct operation. The accuracy of the device requires to be verified at the time of load testing. The accuracy of the device fitted shall be ± 5%. The overload protection device shall be calibrated when it exceeds the accuracy of ± 5% or every 6 years, whichever is sooner. The calibration certificate shall be made available to the Lifting Engineer.

Note:

1. Care should be exercised to prevent damage to the crane when function testing the safety limits.

2. A manual powered crane shall not be fitted with an overload protection device.

Electrical

- Copies of the crane electrical maintenance schedules and maintenance records shall be made available for scrutiny.
- Ensure that the isolating and emergency stops are clearly marked and are operational.
- Ensure that the isolating switch operating handle is in sound condition and can be locked off.
- Check that all lights fitted are fully working.

Documentation

- Crane manuals and copies of the crane maintenance schedules and maintenance records, NDT reports and previous certificates of inspections shall be provided to the third party Certifying Lifting Engineer by the crane owner, for inspection.
- Copies of the manufacturer's certificate of test for replacement parts i.e. luffing cylinders, winches etc. shall be provided to the third party Certifying Lifting Engineer following their replacement.
- Copies of the manufacturer's certificate of tests stating specified and actual breaking load and the rope construction shall be provided to the third party Certifying Lifting Engineer following any rope renewal, for inspection.
- Details of the certificate/s for the wire rope/s and/or chains to be checked, and entered on the crane Certificate/Report.

6.2.3 Load Testing

The purpose of load testing a crane is to demonstrate that it is structurally sound and fit for the use for which it was designed. Any disturbance, (disassembly and re-assembly) or repair to any load bearing part or re-roping or cropping of the hoist or derricking ropes shall require the crane to be subjected to a load test.The Lifting Engineer from the third party Certifying Company shall witness all load tests.

The test loads shall be as per the manufacturer's recommendations, where the manufacturer's test load information is not available the test load shall be 125% of the SWL.

Prior to any load test of a crane, a thorough inspection of the crane in accordance with section 6.2.2 shall be undertaken by the Lifting Engineer.

Wherever practicable to do so, verified test weights should be used to conduct the loadtest however, if this is not feasible, a calibrated load cell may be used to conduct the load test. The

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test loads may be changed at the discretion of the Lifting Engineer. The load test shall be conducted so that each load-bearing part of the crane is given one overload (i.e. each crane motion shall be tested to prove the integrity of brakes, clutches, gearing, load bearing structure etc.) During load testing, all operations shall be carried out with extreme care and every permissible crane motion carried out singly at the slowest possible speed. It is preferred that overloads are not raised above 200mm to allow them to pass over obstructions. Where this is not possible the lifting engineer shall consider an alternative test to prove the crane. When no alternative test is possible and the surveyor is not satisfied that all the crane duties have been adequately tested, the use of the crane shall be restricted to the tested duties and both the release note and the certificate of test shall clearly state the restrictions.

Levelling

All testing shall be carried out on firm level ground, with a slope no greater than ±0.5%.

Load Test Procedure Using Verified Test Weight

Cranes shall be tested at three different radii, if applicable, Maximum, Intermediate, and Minimum radius at the safe working load and then at the overload. The crane shall be operated through its full operating arc.

Method of Test at SWL at Maximum Radius.

a. At maximum radius and minimum allowable angle, lift a load equivalent to the SWL of the crane's configuration. The load is to be lifted clear of the ground and the brakes applied by returning the control lever to neutral. No fall back or creeping should be seen. The load is then hoisted another small amount and the brake reapplied to check the ability to re-hoist. The load is then lowered, still clear of the ground, and the control returned to neutral to check the brakes are holding correctly. There must be no overrun or creeping seen.

b. The crane shall then be slewed 360º or as far as is practical.

c. The crane boom shall be luffed in to minimum radius keeping the load approximately 100mm to 200mm above the ground and slewed as in "b" above.

d. The boom to be luffed out to the original radius and the load lowered.

Method of Test at Overload at Maximum Radius.

a. At a safe radius lift the test load; luff the boom to maximum radius and minimum allowable angle. The load shall be lifted to a sufficient height to ensure that every tooth in the train of the hoist gear is subjected to the overload. The load shall be then lowered to 100mm to 200mm above the ground and held for 10 minutes. The creep or overrun rate measured shall not exceed 0.5% of the boom length.

b. The crane shall then be slewed 360º or as far as is practical.

c. The crane boom shall be luffed in to minimum radius keeping the load approximately 100mm to 200mm above the ground and slewed as in "b" above.

d. The boom shall be luffed out to the original radius and the load lowered.

Method of Test at SWL at Intermediate Radius.

a. At an intermediate radius and at a suitable allowable angle, lift a load equivalent to the SWL of the crane's configuration. The load is to be lifted clear of the ground and the brakes applied by returning the control lever to neutral. No fall back or creeping should be seen. The load is then hoisted another small amount and the brake reapplied to check the ability to re-hoist. The load is

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then lowered, still clear of the ground, and the control returned to neutral to check the brakes are holding correctly. There must be no overrun or creeping seen.

b. The crane will then be slewed 360º or as far as is practical.

c. The crane boom to be luffed in to minimum radius keeping the load approximately 100mm to 200mm above the ground and slewed as in “b” above.

d. The boom to be luffed out to the original radius and the load lowered.

Method of Test at Overload at Intermediate Radius.

a. At a safe radius lift the test load; luff the boom to an intermediate radius and at a suitable allowable angle. The load shall be lifted to a sufficient height to ensure that every tooth in the train of the hoist gear is subjected to the overload. The load shall be then lowered to 100mm to 200mm above the ground and held for 10 minutes. The creep or overrun rate measured shall not exceed 0.5% of the boom length.

b. The crane shall then be slewed 360º or as far as is practical.

c. The crane boom shall luffed in to minimum radius keeping the load approximately

100mm to 200mm above the ground and slewed as in “b” above.

d. The boom shall be luffed out to the original radius and the load lowered.

Method of Test at SWL at Minimum Radius.

a. At minimum Radius at the maximum allowable angle, lift a load equivalent to the SWL of the crane’s configuration. The load is to be lifted clear of the ground and the brakes applied by returning the control lever to neutral. No fall back or creeping should be seen. The load is then hoisted another small amount and the brake reapplied to check the ability to re-hoist. The load is then lowered, still clear of the ground, and the control returned to neutral to check the brakes are holding correctly. There must be no overrun or creeping seen.

b. The crane will then be slewed 360º or as far as is practical. The load is then lowered

Method of Test at Overload at Minimum Radius.

a. At minimum Radius at the maximum allowable angle, lift the test load. The load shall be lifted to a sufficient height to ensure that every tooth in the train of the hoist gear is subjected to the overload. The load is then lowered to 100mm to 200mm above the ground and held for 10 minutes. The creep or overrun rate measured shall not exceed 0.5% of the boom length.

b. The crane will then be slewed 360º or as far as is practical. The load is then lowered.

The above method of testing must be repeated for all boom configurations, jib extensions, and for the main and auxiliary hoists that the crane will use.

Deflection Test for Gantries

With the SWL at the central position on the gantry measure the deflection; the deflection shall be compared against the maximum allowable, specified by BS 7121-2.

Load Test Procedure Using a Calibrated Load Cell

Static Load Test

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- The test load shall be sustained for 10 minute's. No overrun or creep should be discernible; a loss of more than 5% of the original test load pulled during the 10 minutes shall be cause for rejection.

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Dynamic Load Test

- No dynamic load testing is possible.

Note:

Load cells require to be calibrated annually. The accuracy shall be ± 2.5%. The current calibration certificate shall be made available for scrutiny.

6.2.4 Thorough Inspection Following Load Test

Following the load test of a crane, the Lifting engineer shall carry out a thorough inspection of the crane in accordance with section 6.2.2.

6.3 Inspection and Load Test of Cranes in Table 2

6.3.1 Frequency of Inspection

All cranes listed in Table 2 shall be thoroughly inspected and load tested in accordance with this procedure at time intervals detailed in table 2

At time of initial inspection, the Manufacturer's Certificate of Test shall be produced by the asset custodian / owner for review by the Lifting Engineer to verify appliance details.

TABLE 2

CRANE TYPES	12 MONTHLY INSPECTION	48 MONTHLY INSPECTION AND LOAD TEST
Crane, Crawler Mounted Lattice & Telescopic	YES	YES
Crane, Carrier Mounted Lattice & Telescopic	YES	YES
Crane, Rough Terrain	YES	YES
Crane, Truck Loading or Articulating	YES	YES
Crane, Side Boom Pipelayers	YES	YES
Crane Mounted, Piling Rig	YES	NO

6.3.2 Thorough Inspection

The Lifting Engineer shall carry out a thorough inspection of the crane in accordance with section 6.2.2. This is the minimum level of inspection required. Due to the many varying designs of cranes, not all aspects of the inspection will apply to every crane.

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Note: Side boom tractors are prone to cracking of the hinges between the A-frame and the carriage. If cracks are suspected the machine must be taken out of service for further examination.

Crawler Tracks etc

- Inspect the crawler plates, attachment links, drive sprockets and chains for cracking, wear and mechanical damage.
- Inspect the top and bottom guide rollers for cracking and lubrication failure.

Car Body, Chassis and Outriggers and Steering

- Inspect the car body and chassis of the crane for corrosion, cracks and mechanical damage.
- Check the condition and operation of any travel axle blocking devices.
- Inspect the outriggers and outrigger pads for security, damage to structure and pipe work, and leaking oil seals.
- Check the condition of the outrigger extension rams and fittings.
- Ensure the correct tail weights are fitted to the crane for the configuration of the crane at time of inspection.
- Ensure that the slew locks and tail weights, if fitted, are fully functioning.
- Ensure the outrigger indication lights and interlocks, if fitted, are functioning.
- Ensure that a crane-levelling indicator is fitted and functioning.
- Inspect the steering assembly for excessive play.
- Ensure an amber warning light is fitted and functioning.

Tyres and Brakes

- Inspect the pneumatic tyres for deterioration through wear or damage. All tyres including any spare must comply with the ROP Regulations. Any cuts in the walls of tyres shall be a cause for rejection.
- Check the tyre is inflated to the correct pressure and the correct tyre inflation pressure is clearly marked adjacent to each tyre.
- Check the operation of both the travel and park brakes.

Hook and Roller Slew

- Check the integrity of hook roller assembly brackets.
- Inspect the hook roller assemblies, rollers, pins, shafts and connecting links for wear, mechanical damage and cracking.
- The clearance between the rollers and the slew pathway shall be taken and recorded annually. The clearance shall be compared against the maximum allowable, specified by the crane manufacturer. A log shall be kept showing the clearance trend against the allowable clearance limit, the log shall be kept for a minimum of 6 years.
- Check the slew pathway segments joining and holding down bolts for tightness.
- Check condition of the slew pathway for wear or damage.

- Check the king post or centre pin and bushes for wear, security and lubrication

Travelling

- Travel the crane forwards and backwards and listen for any unusual noises.
- Check the operation of the reversing alarm / - lights.
- Check the operation of the travel and parking brakes and the brake lights.
- Check that all lights fitted are fully working.

Documentation

- Copies of the crane maintenance schedules and maintenance records, NDT reports and previous certificates of inspections shall be provided to the third party Certifying Lifting Engineer by the crane owner, for inspection.
- Copies of the Manufacturer's Certificate of tests stating specified and actual breaking load and the rope construction shall be provided to the third party Certifying Lifting Engineer following any rope renewal, for inspection.
- Details of the certificate/s for the wire rope/s and/or chains to be checked, and entered on the crane Certificate/Report.
- The crane log of daily, weekly and monthly inspections and crane manuals shall be provided to the third party Certifying Lifting Engineer by the crane owner, for inspection.

Automatic Safe Load Indicator

- Every model of crane shown in table 2 with a safe working load of 10 tonnes or more shall be fitted with a Rated Capacity Indicator/Rated Load Limiter (RCI/RLL), also known as Automatic Safe Load Indicator, which conforms to BS 7262 or an equivalent international standard.
- Inspect and functionally check the Automatic Safe Load Indicator to ensure its correct operation. Verification of the ASLI must be carried out annually. The accuracy of Automatic Safe Load Indicator shall be ± 5%. The Automatic Safe Load Indicator shall be calibrated by a third party when it exceeds the accuracy of ± 5% or every 6 years, whichever is sooner. The calibration certificate shall be made available to the Lifting Engineer.

Note: -

1. Care should be exercised to prevent damage to the crane when function testing the safety limits.

2. Truck loading cranes shall be fitted with an overload warning device.

Age

The cranes listed in table 2, (except Truck Loading or Articulating cranes) shall not be approved fit for service if they exceed the maximum allowable lifetime limits from its date of manufacture without the written approval of PDO's lifting engineer. The lifetime time limits are:

Capacity of crane	Maximum age of crane
Under 50 tonnes	20 years
50 tonnes to 100 tonnes	25 years
Over 100 tonnes	30 years

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Service Age Extension Criteria

The PDO lifting engineer may grant an extension for cranes to be used beyond the maximum allowable years of service if they are satisfied that the crane may be used safely beyond the stipulated maximum allowable years of service. The extension criteria for the service of a mobile crane are detailed in Appendix 8.

6.3.3 Load Testing

The purpose of load testing a crane is to demonstrate that it is structurally sound and fit for the use for which it was designed. Any disturbance, (dis-assembly and re-assembly) or repair to any load bearing part or re-roping or cropping of the hoist or derricking ropes shall require the crane to be subjected to a load test. The Lifting Engineer from the third party Certifying Company shall witness all load tests.

Prior to any load test of the crane, a thorough inspection of the crane in accordance with section 6.3.2 shall be undertaken by the Lifting Engineer.

The crane shall be subjected to static and dynamic load testing using verified test weights, test loads shall be as per the manufacturer's recommendations, where the manufacturer's test load information is not available the test load shall be 110% of the SWL. The test load may be changed at the Lifting Engineer's discretion. The load test shall be conducted so that each load-bearing part of the crane is given one overload (i.e. each crane motion shall be tested to prove the integrity of brakes, clutches, gearing, outriggers, load bearing structure etc.)

During load testing all operations shall be carried out with extreme care and every permissible crane motion carried out singly at the slowest possible speed. It is preferred that overloads are not raised above 200mm to allow them to pass over obstructions. Where this is not possible the Lifting Engineer shall consider an alternative test to prove the crane. When no alternative test is possible and the Lifting Engineer is not satisfied that all the crane duties have been adequately tested, the use of the crane shall be restricted to the tested duties and both the release note and the certificate of test shall clearly state the restrictions.

Levelling

All testing shall be carried out on firm level ground, with a slope no greater than ±0.5%.

Load test Procedure

Cranes shall be tested at three different radii, if applicable, Maximum, Intermediate, and Minimum radius at the safe working load and then at 110% overload. The crane shall be operated through its full operating arc.

Method of Test at SWL at Maximum Radius.

a. At maximum radius and minimum allowable angle, lift a load equivalent to the SWL of the crane's configuration. The load is to be lifted clear of the ground and the brakes applied by returning the control lever to neutral. No fall back or creeping should be seen. The load is then hoisted another small amount and the brake reapplied to check the ability to re-hoist. The load is then lowered, still clear of the ground, and the control returned to neutral to check the brakes are holding correctly. There must be no overrun or creeping seen.

b. The crane shall then be slewed 360º or as far as is practical.

c. The crane boom shall be luffed in to minimum radius keeping the load approximately 100mm to 200mm above the ground and slewed as in "b" above.

d. The boom to be luffed out to the original radius and the load lowered.

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Method of Test at Overload at Maximum Radius.

a. At a safe radius lift the test load; luff the boom to maximum radius and minimum allowable angle. The load shall be lifted to a sufficient height to ensure that every tooth in the train of the hoist gear is subjected to the overload. The load shall be then lowered to 100mm to 200mm above the ground and held for 10 minutes. The creep or overrun rate measured shall not exceed 0.5% of the boom length.

b. The crane shall then be slewed 360º or as far as is practical.

c. The crane boom shall be luffed in to minimum radius keeping the load approximately 100mm to 200mm above the ground and slewed as in “b” above.

d. The boom shall be luffed out to the original radius and the load lowered.

Method of Test at SWL at Intermediate Radius.

a. At an intermediate radius and at a suitable allowable angle, lift a load equivalent to the SWL of the crane’s configuration. The load is to be lifted clear of the ground and the brakes applied by returning the control lever to neutral. No fall back or creeping should be seen. The load is then hoisted another small amount and the brake reapplied to check the ability to re-hoist. The load is then lowered, still clear of the ground, and the control returned to neutral to check the brakes are holding correctly. There must be no overrun or creeping seen.

b. The crane will then be slewed 360º or as far as is practical.

c. The crane boom to be luffed in to minimum radius keeping the load approximately 100mm to 200mm above the ground and slewed as in “b” above.

d. The boom to be luffed out to the original radius and the load lowered.

Method of Test at Overload at Intermediate Radius.

a. At a safe radius lift the test load; luff the boom to an intermediate radius and at a suitable allowable angle. The load shall be lifted to a sufficient height to ensure that every tooth in the train of the hoist gear is subjected to the overload. The load shall be then lowered to 100mm to 200mm above the ground and held for 10 minutes. The creep or overrun rate measured shall not exceed 0.5% of the boom length.

b. The crane shall then be slewed 360º or as far as is practical.

c. The crane boom shall luffed in to minimum radius keeping the load approximately 100mm to 200mm above the ground and slewed as in “b” above.

d. The boom shall be luffed out to the original radius and the load lowered.

Method of Test at SWL at Minimum Radius.

a. At minimum Radius at the maximum allowable angle, lift a load equivalent to the SWL of the crane’s configuration. The load is to be lifted clear of the ground and the brakes applied by returning the control lever to neutral. No fall back or creeping should be seen. The load is then hoisted another small amount and the brake reapplied to check the ability to re-hoist. The load is then lowered, still clear of the ground, and the control returned to neutral to check the brakes are holding correctly. There must be no overrun or creeping seen.

b. The crane will then be slewed 360º or as far as is practical. The load is then lowered

Method of Test at Overload at Minimum Radius.

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a. At minimum Radius at the maximum allowable angle, lift the test load. The load shall be lifted to a sufficient height to ensure that every tooth in the train of the hoist gear is subjected to the overload. The load is then lowered to 100mm to 200mm above the ground and held for 10 minutes. The creep or overrun rate measured shall not exceed 0.5% of the boom length.

b. The crane will then be slewed 360º or as far as is practical. The load is then lowered.

The above method of testing must be repeated for all boom configurations, jib extensions, and for the main and auxiliary hoists that the crane will use. Where the crane has duties on outriggers, free on wheels, crawler tracks, lift and travel, then the test must be repeated for each permitted condition.

6.3.4 Thorough Inspection Following Load Test

Following the load test of the crane, the Lifting Engineer shall carry out a thorough inspection of the crane in accordance with section 6.3.2.

6.4 Inspection and Load Test of Cranes in Table 3

6.4.1 Frequency of Inspection

All the cranes in table 3 shall be thoroughly inspected and load tested in accordance with this procedure at time intervals detailed in table 3

At time of initial inspection, the Manufacturer's Test Certificate shall be produced by the asset custodian / owner for review by the Lifting Engineer to verify appliance details.

TABLE 3

CRANE TYPES	12 MONTHLY INSPECTION	48 MONTHLY INSPECTION AND LOAD TEST
Crane, Powered Overhead Travelling	Yes	Yes
Crane, Manual Overhead Travelling	Yes	Yes
Crane, Manual Overhead Travelling Structure	Yes	Yes

6.4.2 Thorough Inspection

The Lifting Engineer shall carry out a thorough inspection of the crane in accordance with this section. This is the minimum level of inspection required. Due to the many varying designs of cranes, not all aspects of the inspection will apply to every crane.

Pre-Inspection Function Test

During any thorough examination, it is necessary to carry out an operational function test without load to prove the operation of the crane and the function of its safety devices. The crane must be operated by a fully qualified crane operator under the control of the Lifting Engineer. Prior to the test, the Lifting Engineer will establish.

- That the crane operator is certified, and has adequate experience.
- That any limitation of crane operations are observed.
- The crane is fit to perform the required movements.

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The operational function test shall cover the items listed below. If any defects are found which adversely affect the safe operation of the crane during the thorough inspection, then they shall be corrected before proceeding further:

- Main and auxiliary load hoisting and lowering mechanism.
- Hoist upper and lower limits.
- All brakes and clutches.
- Safe load indicators.

Safe Working Load and Identification Number

Ensure the SWL and Identification number are legibly marked in characters of a contrasting colour not less than 75mm high on the bridge of the crane.

Structure

- Inspect the crane structure for corrosion and mechanical damage etc.
- Inspect all load-bearing welds to ensure freedom from defects.
- Ensure all bolts, and fastenings are checked for tightness and condition. At the discretion of the lifting engineer, sample bolts may be removed to enable a thorough inspection and/or NDT.
- Inspect all long and cross travel rail wheels for wear and security, ensure the wheel flange to rail clearance is not excessive.
- If fitted, inspect the anti derailment brackets for corrosion and mechanical damage.
- Inspect the entire length of the long travel beam, rails and support structure as well as the cross travel beams and crab unit for cracks, weld deformation and corrosion. The levels for rejection due to wear and corrosion are given in Table A.
- Check the beams to ensure that they are level and parallel. At the Lifting Engineer discretion additional checks may be carried out in accordance with BS 466.
- At the discretion of the Lifting Engineer, the thickness of any part of the structure may be checked using an appropriate NDT method. The permissible levels of wear, erosion and/or corrosion are given in Table A.

Ropes and Hook Block Assemblies

- Thoroughly inspect the entire length of all wire ropes fitted, including rope anchorage for wear, splintering, corrosion and mechanical damage etc. Special attention should be given to the section of rope on standing or equalising pulleys. Wire rope rejection limits are given in Table A.
- Ensure the rope fitted is of the correct size and construction for the crane.
- All rope end terminations, splices etc shall be inspected with particular attention being paid to rope anchorage.
- Ensure that at least five full turns of wire rope remain on the drum when the bottom limit is activated.
- All sheaves shall be inspected for wear, cracks and rope path alignment and bearing condition.
- Inspect crane hook in accordance with Paragraph 5.6.7.

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- At intervals not exceeding four (4) years, the crane hook assemblies shall be dismantled for visual inspection and NDT survey of all load-bearing components. At the Lifting Engineer s discretion, this routine may be requested during the time of annual inspection.

Rope Drums

- Inspect all rope drums for cracks and for defects liable to damage the rope.
- Inspect all rope drums for security.
- Inspect rope anchorage for security and efficiency.
- Check the rope guide for wear, cracking and damage.

Pendant Control

- Ensure the pendant control buttons are legibly marked with their mode of operation in bilingual notation. Where bilingual notation marking is not practical then the control buttons require to be clearly marked using arrows.
- Check the emergency stop switch for correct operation.

Electrical

- Copies of the crane electrical maintenance schedules and maintenance records shall be made available for scrutiny.
- Ensure that all isolating and emergency stops are clearly marked, visible and operational.
- If fitted with two long travel drive motors ensure they are synchronised for start, drive and stop functions.

Function Test

- Carry out a full function test (without load attached). i.e. long travel, cross travel and hoisting ensuring that the upper and lower hoist, long and cross travel limits fitted are functioning correctly.
- Ensure the crane's audible and visual warning devices for damage, security and integrity, and functionally test the warning devices for correct operation.

Note:

Care should be exercised to prevent damage to the crane when function testing the limits.

Documentation

- Copies of the crane maintenance schedules and maintenance records, NDT reports and previous certificates of inspections shall be provided to the third party Certifying Lifting Engineer by the crane owner, for inspection.
- Copies of the manufacturer's certificate of tests stating specified and actual breaking load and the rope construction shall be provided to the third party Certifying Lifting Engineer following any rope renewal, for inspection.
- Details of the certificate/s for the wire rope/s and/or chains to be checked, and entered on the crane Certificate/Report.

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6.4.3 Load Testing

The purpose of load testing a crane is to demonstrate that it is structurally sound and fit for the use for which it was designed. Any disturbance, (dis-assembly and re-assembly) or repair to any load bearing part, re-roping, or cropping of the hoist rope shall require the crane to be subjected to a load test. The Lifting Engineer from the third Party Certifying Company shall witness all load tests.

Prior to any load test of the crane, a thorough inspection of the crane in accordance with section 6.4.2 shall be undertaken by the lifting engineer.

The crane shall be subjected to a load test of not more than 125% of SWL. The load test shall be conducted using verified test weights. The test load may be changed at the lifting engineer's discretion.

Where practicable each load bearing part of the crane should be given one overload (i.e. each crane motion shall be tested to prove the integrity of brakes, gearing, load bearing structure etc.) During load testing all operations shall be carried out with extreme care and every permissible crane motion carried out singly at the slowest possible speed. It is preferred that overloads are not raised above 200mm to allow them to pass over obstructions. Where this is not possible the Lifting Engineer shall consider an alternative test to prove the crane. When no alternative test is possible and the Lifting Engineer is not satisfied that all the crane duties have been adequately tested, the use of the crane shall be restricted to the tested duties and the certificate of test shall clearly state the restrictions.

Static Load Test

- With the crab unit in the centre of the bridge raise the test weight to between 100mm and 200mm above the ground and held there for 10 minute's. No overrun or creep should be discernible.

Dynamic Load Test

- The test weight shall be raised off the ground by rotating the hoist drum at least one full revolution and the hoist brake applied, the test load shall be lowered (approx 50-100mm) and the hoist brake reapplied, ensure the clearance between the load and ground is maintained. No overrun or creep should be discernible.
- Transport the test load by means of the crab unit for the full span of the bridge.
- Transport the test load one direction, by means of the long travel for the full length of the runway with the crab unit close to the extreme right-hand end of the crane as practical. Transport the test load in the other direction with the crab unit close to the extreme left-hand end of the crane as practical.

Deflection Test

With the SWL suspended at the central position on the crane bridge measure the deflection; the deflection shall be compared against the maximum allowable, specified by BS 7121-2.

6.4.4 Thorough Inspection Following Load Test

Following the load test of the crane, the Lifting Engineer shall carry out a thorough inspection of the crane in accordance with section 6.4.2.

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6.5 Additional tests

If the condition of any crane is such, that an assessment of its condition is open to uncertainty, the Lifting engineer, at his discretion, may request additional inspection or testing. The Lifting Engineer may request any additional information he considers pertinent in order to verify the safe condition of the crane for further use.

If any part of a crane or its support structure is suspect, the Lifting Engineer may at his discretion request a report from a structural or civil engineer.

6.6 Identification / Marking

All appliances shall be clearly marked with the following information:

a) ETN Number

b) Safe Working Load (S.W.L.)

c) Date of Inspection

d) Next Due Date (of Inspection)

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7 Inspection/Loadtesting of Lifting Appliances

7.1 Definition

Chain Block, Manual

Chain Block, Powered

Ratchet Lever Block

Sheave Block

Snatch Block

Trolley, Manual

Trolley, Powered

Gin Wheel

Jack, Hydraulic (Lifting Jacks may be static or mobile {wheeled} units)

Jack, Pneumatic

Jack, Mechanical

Monorails/Runway Beams

Padeyes

Pulling Appliances

Tirfor

Winch, powered

Winch, Manual

Winch, Man-Riding

7.2 Inspection, Load Test and Overhaul Frequency

7.2.1 Inspection

The frequency of inspection of (loose) appliances shall be at intervals not exceeding 6 months, following initial registration. All inspections shall be carried out by a Lifting Engineer.

Where required, accurate dimensional checks of components shall be conducted for verification to appropriate design standards and as datum's for future comparison purposes i.e. hook throat.

At time of initial inspection, the Manufacturer's Test Certificate shall be produced by the asset custodian / owner for review by the Lifting Engineer to verify appliance details. Failure to provide the original Manufacturer's Test Certificates will result in the equipment being rejected.

Note: The inspection frequency of complete systems, eg monorails, trolley and chainblock, shall be subjected to annual thorough examination and 4 yearly load test.

7.2.2 Identification / Marking

All appliances shall be clearly marked with the following information:

a) Equipment Tag Number (ETN)

b) Safe Working Load (S.W.L.)

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c) Date of Inspection

d) Next Due Date (of Inspection)

7.2.3 Overhaul Frequency

At intervals not exceeding four (4) years, all appliances require to be dismantled for inspection and NDT survey of all load-bearing components i.e. hooks, ratchet and pawls, baseplate etc, prior to being presented for a thorough inspection and load test. The Lifting Engineer shall inspect all load-bearing parts after NDT has been carried out and before reassembly.

At the Lifting Engineer's discretion, the load testing and overhaul frequency may be changed.

All lifting appliances, which have been inspected and certified as being fit for purpose for a maximum six months, shall be colour coded in accordance with Paragraph 12.

7.3 Chain Block and Ratchet Lever Block

7.3.1 Inspection

The Lifting Engineer shall conduct a thorough inspection of the block in its assembled condition. Any of the following defects found during inspection shall be cause for rejection:

COMPONENT	DEFECT TYPE	REJECTION CRITERIA
Load Chain (Round Link)	a) Wear b) Damage c) Corrosion d) Reeving e) Gauge Length	a) Wear in excess of 5% of original link dimensions. b) Cracks, heat damage, severe nicks, gouges or distortion of links c) Excessive corrosion, pitting or any chemical attack. d) Load chain reeving incorrect. e) Load chain gauge length increase greater than 3%.
Load Chain (Plate Link)	a) Wear b) Damage c) Corrosion d).Gauge Length	a) Wear in excess of 5% of original link or pin dimensions. b) Cracks, heat damage, severe nicks, gouges or distortion of links c) Excessive corrosion, pitting or any chemical attack. d) Load chain gauge length increase greater than 3%.
Chain Anchorage	a) Wear b) Damage c) Corrosion	a) Wear in excess of 5% of original diameter. b) Any cracks or distortion. c) Excessive corrosion, pitting or any chemical attack.
Hooks	As per Chapter 3	As per Ch 5 Paragraph 5.6.7
Block Body	a) Damage	a) Any mechanical damage or loose covers.
Powered Drive (where fitted)	a) Wear b) Operation	a) Excessive wear on drive mechanism. b) Incorrect or laboured drive operation.
Manual Drive (where fitted)	a) Chain b) Drive sprocket	a) Broken or distorted links. b) Any cracks, excessive wear or distortion.
Ratchet Lever	a) Damage	a) Cracked or broken operating lever

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	b) Operation	b) Incorrect or laboured drive operation.

7.4 Sheave Block and Snatch Block

7.4.1 Inspection

The Lifting Engineer shall conduct a thorough inspection of the block in its assembled condition. Any of the following defects found during inspection shall be cause for rejection:

COMPONENT	DEFECT TYPE	REJECTION CRITERIA
Sheaves (where fitted)	a) Wear b) Damage c) Corrosion	a) Wear of rope groove in excess of gauge depth. b) Severe nicks, cuts or gouges. c) Excessive corrosion, pitting or chemical attack on steel sheaves.
Sprockets (where fitted)	a) Wear b) Damage c) Corrosion	a) Excessive wear of chain guide. b) Cracks, heat damage, severe nicks or gouges. c) Excessive corrosion, pitting or any chemical attack.
Cheek Plates	a) Damage b) Corrosion	a) Cracks, severe cuts, gouges or distortion. b) Excessive corrosion, pitting or any chemical attack.
Pins	a) Wear	a) Any wear in excess of 10% of original diameter.
Attachment Point	a) Wear b) Damage c) Corrosion	a) Any wear in excess of 5% of original dimensions. b) Any cracks, cuts or distortion. c) Excessive corrosion, pitting or chemical attack.

7.5 Trolley

7.5.1 Inspection

The Lifting Engineer shall conduct a thorough inspection of the trolley in its assembled condition. Any of the following defects found during inspection shall be cause for rejection:

COMPONENT	DEFECT TYPE	REJECTION CRITERIA
Wheels and Gears	a) Wear b) Damage c) Corrosion	a) Excessive wear on wheels, gears and bearings. b) Gear teeth broken or sheared, bearing collapse. c) Excessive corrosion, pitting or chemical attack.
Pins	a) Wear	a) Any wear in excess of 10% of original diameter.
Cheek Plates	a) Damage b) Corrosion	a) Cracks, severe cuts, gouges or distortion. b) Excessive corrosion, pitting or any chemical attack.
Load Attachment Point	a) Wear b) Damage	a) Any wear in excess of 5% of original dimensions. b) Any cracks, cuts or distortion.

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	c) Corrosion	c) Excessive corrosion, pitting or chemical attack
Powered Drive (where fitted)	a) Wear b) Operation	a) Excessive wear on drive mechanism. b) Incorrect or laboured drive operation.
Manual Drive (where fitted)	a) Chain b) Drive sprocket	a) Broken or distorted links. b) Any cracks, excessive wear or distortion.

Note:

Any block and /or trolley forming part of a crane configuration shall be subject to inspection intervals as detailed in Chapter 6 (Inspection and Load Testing of Cranes).

7.6 Jack (Hydraulic or Pneumatic or Mechanical)

7.6.1 Inspection

The Lifting Engineer shall conduct a thorough inspection of the jack in its assembled condition. Due to the many varying designs of jacks, i.e. standing or trolley mounted etc., not all aspects of the inspection will apply to each unit. Where applicable, any of the following defects found during inspection shall be cause for rejection:

COMPONENT	DEFECT TYPE	REJECTION CRITERIA
Cylinder	a) Damage b) Corrosion	a) Any cracks b) Excessive corrosion, pitting or any chemical attack.
Ram (piston)	a) Damage b) Corrosion	a) Severe gouging or distortion. b) Excessive corrosion, pitting or any chemical attack.
Ram (piston) Seal	a) Damage	a) Any visible signs of leakage on ram seal.
Pins	a) Wear	a) Any wear in excess of 10% of original diameter.
Linkage	a) Wear b) Damage c) Corrosion	a) Any wear in excess of 5% of original dimensions. b) Any cracks, cuts or distortion. c) Excessive corrosion, pitting or chemical attack.
Controls or Operating Lever	a) Wear b) Operation	a) Excessive wear on operating mechanism. b) Incorrect or laboured operation.

7.7 Tirfor

7.7.1 Inspection

The Lifting Engineer shall conduct a thorough inspection of the Tirfor in its assembled condition. Any of the following defects found during inspection shall be cause for rejection:

COMPONENT	DEFECT TYPE	REJECTION CRITERIA
Housing	a) Damage	a) Any cracks or loose bolting. b) Excessive corrosion, pitting or any chemical

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	b) Corrosion	attack.
Anchorage Point	a) Damage b) Corrosion	a) Any cracks or distortion. b) Excessive corrosion, pitting or any chemical attack.
Ratchet Lever	a) Damage b) Operation	a) Cracked or broken operating lever b) Incorrect or laboured drive operation.
Pins	a) Wear	a) Any wear in excess of 10% of original diameter.
Wire Rope	a) Wear, Damage or Corrosion	a) 5% of wires broken, worn or corroded measured over a length of ten rope diameters as given by BS 302 Part 1. Further rejection criteria, if required are obtainable from ISO 4309.
Hook	As per Chapter 5	As per Ch. 5 Paragraph 5.6.7

7.8 Winch (Powered, Manual or Man-Riding)

7.8.1 Inspection

The Lifting Engineer shall conduct a thorough inspection of the winch in its assembled condition. Any of the following defects found during inspection shall be cause for rejection:-

COMPONENT	DEFECT TYPE	REJECTION CRITERIA
Powered Drive (where fitted)	a) Wear b) Operation	a) Excessive wear on drive mechanism. b) Incorrect or laboured drive operation.
Manual Drive (where fitted)	a) Wear	a) Any cracks, excessive wear or distortion.
Winch Housing	a) Damage b) Corrosion	a) Any cracks, loose bolting or covers. b) Excessive corrosion, pitting or any chemical attack.
Rope Drum	a) Wear b) Damage	a) Excessive wear on wire rope anchorage. b) Any cracks or defects liable to damage the wire rope.
Wire Rope	a) Wear, Damage or Corrosion	a) 5% of wires broken, worn or corroded measured over a length of ten rope diameters as given by BS 302 Part 1. Further rejection criteria, if required are obtainable from ISO 4309.
Hook	As per Chapter 5	As per Ch. 5 Paragraph 5.6.7

Inspect the structure on which the winch is installed for corrosion and mechanical damage. The winch base bolting shall be checked for security (NOTE: Only grade 8 bolts and nuts, or higher, to be used)

NB: Additional requirements for Man-Riding Winches (only approved and types marked as such shall be used):

- Base mountings to be checked by MPI annually
- Loadtesting to be performed annually at a proofload of 1.1x SWL
- Primary and secondary brakesystems to be verified

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- Emergency lowering system to be verified in case of loss of power
- All safety devices to be checked, e.g. overhoisting, overlowering, slack wire etc.
- Emergency stop to be verified, if fitted

7.9 Monorails/Runway Beams and Padeyes

- Inspect the monorail/runway beam or padeye for corrosion, mechanical damage, deformation and cracks.
- Inspect all load bearing welds for cracking. At the discretion of the lifting engineer, the integrity of welds may be checked using an appropriate NDT method.
- Inspect for wear in the pad eye hole i.e. elongation.

At the discretion of the Lifting Engineer, the thickness of any part of the monorail/runway beam or padeye may be checked using an appropriate NDT method. The permissible levels of wear, erosion and/or corrosion are given in Table A

REJECTION CRITERIA
Any wear or corrosion in excess of 5% of the original dimension
Any cracking at weld areas
Any distortion or cracking

7.10 Function Test

On completion of a satisfactory inspection, the appliance shall be operated throughout its full working height to check for correct function, freedom of movement and / or excessive noise, if applicable.

7.11 Documentation

- Copies of the crane maintenance schedules and maintenance records, NDT reports and previous certificates of inspections shall be provided to the third party Certifying Lifting Engineer by the crane owner, for inspection.
- Copies of the manufacturer's certificate of test for replacement parts i.e. hoist cylinders, hoist chains etc. shall be provided to the third party Certifying Lifting Engineer following their replacement, for inspection.
- Details of the certificate/s for the wire rope/s and/or chains to be checked, and entered on the Certificate/Report.

7.12 Light Load Test (Chain and Lever Blocks only)

The purpose of the light load test is to verify that the brake will sustain the minimum required load. A load of 2% - 4% of the SWL shall be applied; the load should be raised and lowered through a height of between 250mm and 500mm. To be acceptable, when the hand chain or lever is released at any point during the raising and lowering, the brake should hold the load.

Note:

Blocks, which are fitted with seals, may appear to hold the load by the brake, when in fact it is being held by seal friction only. This condition does not meet the acceptance criteria.

7.13 Load Test

Prior to any load test of a lifting appliance, a thorough inspection of the lifting appliance shall be undertaken by the Lifting Engineer.

The purpose of load testing a lifting appliance is to demonstrate that it is fit for the use for which it was designed. At intervals not exceeding four (4) years, all appliances shall be load tested. A load equal to 1.25 times the Safe Working Load (SWL) of the appliance shall be applied. The load should be raised and lowered through such a height as will ensure that every part of the appliance mechanism and each tooth of the gearing comes under load. To be acceptable the test load must be held by the appliance for a minimum duration of 10 minutes, no lowering shall be discernable. While the appliance is operated under load, the appliance should operate smoothly without excessive noise.

Any disturbance, (dis-assembly and re-assembly) or repair to any load bearing part shall require the lifting appliance to be subjected to a load test. The Lifting Engineer from the third party Certifying Company shall witness all load tests.

Nb: Load testing for man-riding winches see par. 7.8.1
For an overview of loads for other appliances see proof load tables in Appendix 7

7.14 Thorough Inspection Following Load Test

Following the load test of a lifting appliance, the Lifting Engineer shall carry out a thorough inspection of the lifting appliance.

7.15 Additional Tests

If the condition of any appliance is such that assessment of its condition is open to uncertainty, the Lifting engineer at his discretion may request additional inspection or testing. The Lifting Engineer may request any additional information he considers pertinent in order to verify the condition of the unit for further safe use.

7.16 Identification / Marking

All appliances shall be clearly marked with the following information:

a) Equipment Tag Number (ETN)

b) Safe Working Load (S.W.L.)

c) Date of Inspection

d) Next Due Date (of Inspection)

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8 Inspection/Loadtesting of Mechanical Handling Equipment

8.1 Definition

Excavator, Crawler, Powered

Excavator, Wheeled, Powered

Excavator/Loading Shovel, Combined, Powered

Loading Shovel, Powered

Piling Rig, Excavator Mounted, Powered

Fork Lift Truck, Counter Balanced, Powered

Fork Lift Truck, Manual

Fork Lift Truck, Reach, Powered

Fork Lift Truck, Rough Terrain, Powered

Fork Lift Truck, Side loading, Powered

Telescopic Handler, Powered

Fork Lift Truck, Attachment

Tail Lift, Powered

Skip Loader, Powered

Motor Vehicle Lifting Device, Powered

Work Platform, Mobile, Elevating, Powered

Work Platform, Mobile, Elevating

Work Platform, Mobile

Pallet Truck, Manual

Stacking Truck, Manual

8.2 Inspection of Mechanical Handling Equipment in Table 1

8.2.1 Frequency of Inspection

All items of mechanical handling equipment listed in table 1 shall be thoroughly inspected in accordance with this procedure at time intervals detailed in table 1

At time of initial inspection, the Manufacturer's Certificate of Test shall be produced by the asset custodian / owner for review by the Lifting Engineer to verify appliance details.

TABLE 1

MECHANICAL HANDLING MACHINE	6 MONTHLY INSPECTION	LOAD TEST
Excavator, Crawler, Powered	YES	NO
Excavator, Wheeled, Powered	YES	NO
Excavator/Loading Shovel, Combined, Powered	YES	NO

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Loading Shovel, Powered	YES	NO
Piling Rig, Excavator Mounted, Powered	YES	NO

8.2.2 Thorough Inspection

The Lifting Engineer shall carry out a thorough inspection of the mechanical handling equipment in accordance with this section. This is the minimum level of inspection required.

Due to the many varying designs of mechanical handling equipment, not all aspects of the inspection will apply to each unit.

Pre-Inspection Function Test

During any thorough examination, it is necessary to carry out an operational function test without load to prove the operation of the mechanical handling equipment and the function of its safety devices. The mechanical handling equipment must be operated by a fully qualified operator under the control of the lifting engineer. Prior to the test, the Lifting Engineer will establish:

- That the operator is certified, and has adequate experience.
- That any limitation of the mechanical handling equipment operations are observed.
- The equipment is provided with a valid RAS (Roadworthiness Assurance Standards) sticker.
- The mechanical handling equipment is fit to perform the required movements.

The operational function test shall cover the items listed below. If any defects are found which adversely affect the safe operation of the mechanical handling equipment during the thorough inspection, then they shall be corrected before proceeding further:

- Load hoisting and lowering mechanism.
- All brakes.
- Safe load indicators.

Safe Working Load

- Ensure durable legible manufactures rating chart(s), with text in English and Arabic are provided in the operators cab. The charts shall be applicable to the mechanical handling machine model under inspection.
- On mechanical handling machines with a single load rating, ensure the SWL is legibly marked in characters of a contrasting colour not less than 75mm high.
- Ensure the unique identification number is legibly marked.
- Any hook fitted to the bucket shall have the SWL legibly marked in characters of a contrasting colour not less than 75mm high.

Hydraulics

- Ensure all fluid levels are correct.
- Inspect the hydraulic system pipes, rotary coupling, and rubber hoses for leaks, corrosion, wall section loss and mechanical damage. Ensure that only crimped end connections have been used.

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- Ensure that the reinforcing steel braiding of the rubber hoses is not exposed.
- Ensure that no part of the hydraulic hoses have been painted.
- Inspect all check/holding valves for leaks, corrosion and mechanical damage.
- Ensure that the stroke length of hydraulic cylinders working in tandem are equal.
- Ensure all hydraulic lifting cylinders are fitted with check/holding valves.

Structure

- Inspect the chassis of the unit for corrosion, cracks and mechanical damage.
- Inspect load-bearing welds to ensure freedom from defect.
- Inspect for loose, missing and corroded fixings. Sample bolts may be removed to
- enable a thorough inspection and/or NDT at the discretion of the Lifting Engineer.
- Inspect all anchorages and pivot pins/bushes for wear and security.
- At the discretion of the Lifting Engineer, the thickness of any part of the structure may be checked using an appropriate NDT method. The permissible levels of wear, erosion and/or corrosion are given in Table A
- Inspect the mechanical handling machine load arms for cracks, weld deformation and corrosion.
- If fitted with a sliding boom, inspect the end stops and the guides for security and wear.

Slew Ring

- Slew ring rocking clearances shall be taken and recorded annually by the Owner. The clearances shall be compared against the maximum allowable, specified by the manufacturer. A log shall be kept showing the rocking clearances trend against the allowable rocking clearance limit, the log shall be kept for a minimum of 6 years.
- The back lash of the slew ring shall be taken and recorded annually. The back lash clearance shall be compared against the maximum allowable, specified by the equipment manufacturer. A log shall be kept showing the back lash clearance trend against the allowable back lash clearance limit, the log shall be kept for a minimum of 6 years
- Inspect the slew ring gearing and the slew drive motor gear for wear and damage.
- Check the slew ring and slew motor holding down bolts for tightness.
- Ensure that on multi drive units they are synchronised.

Brakes and Clutches

- Inspect the condition of all drive belts, gearing, shafts etc.
- Inspect the condition of the clutch and brake drum condition and lining for wear.
- Ensure that all brakes and clutches function correctly.
- Ensure that any pawls fitted to hoist units are functioning correctly.

Power Source

- Check the power source for proper performance and compliance with regard to safety requirements.

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- Inspect the engine fuel lines and fuel tanks for leaks. The power source holding down bolts must be in place and secure.
- Check battery electrolyte level

Cab and Controls

- Inspect the cab for security and mechanical damage.
- Inspect all means of access (i.e. steps, ladders) for damage and security. Ensure adequate means of escape is provided.
- Ensure all controls are legibly marked with their mode of operation in bilingual notation. Where bilingual notation marking is not practical then a suitable control diagram shall be provided
- Inspect all control levers for excessive wear and maladjustment, which may interfere with proper operation
- Ensure the warning horn and engine stop operate correctly.
- Ensure that all lighting fitted is functioning.

Safety Systems and Function Test

- Carry out a full function test (without load attached). I.e. telescoping, luffing and slewing ensuring that any limit switches fitted are functioning correctly.
- If fitted, ensure the equipment "movement warning" alarm/horn/light is functioning.
- Ensure that a fire extinguisher is fitted and has a current inspection tag attached.
- If fitted, the Load Indicator shall be visually inspected and functionally checked to ensure correct operation. Verification of the LI must be carried out annually. The accuracy of Load Indicator shall be ± 5%. Load Indicator shall be calibrated every 6 years. The calibration certificate shall be made available to the Lifting Engineer.

Crawler Tracks etc

- Inspect the crawler plates, attachment links; drive sprockets and chains for cracking, wear and mechanical damage.
- Inspect the top and bottom guide rollers for cracking and lubrication failure.

Car Body, Chassis and Outriggers and Steering

- Inspect the car body and chassis of the crane for corrosion, cracks and mechanical damage.
- Check the condition and operation of any travel axle blocking devices.
- Inspect the outriggers and outrigger pads for damage to structure and pipe work, and leaking oil seals.
- Ensure that the slew locks and tail weights, if fitted, are fully functioning.
- Ensure the outrigger indication lights and interlocks, if fitted, are functioning.
- Ensure that levelling indicator is fitted and functioning.
- Inspect the steering assembly for excessive play.

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Tyres and Brakes

- Inspect the pneumatic tyres for deterioration through wear or damage. All tyres including any spare must comply with the Royal Oman Police Land Transport Regulations.
- Any cuts in the walls of tyres shall be a cause for rejection.
- The correct tyre inflation pressure for each tyre shall be clearly marked adjacent to it.
- Check the operation of both the travel and park brakes.

Documentation

- Copies of the maintenance schedules and maintenance records, NDT reports and previous certificates of inspections shall be provided to the third party Certifying Lifting Engineer by the owner, for inspection.
- Copies of the manufacturer's certificate of tests stating specified and actual breaking load and the rope construction shall be provided to the third party Certifying Lifting Engineer following any rope renewal, for inspection.
- Details of the certificate/s for the wire rope/s and/or chains to be checked, and entered on the Certificate/Report.
- The log of daily, weekly and monthly inspections shall be provided to the third party Certifying Lifting Engineer by the equipment owner, for inspection.

Age

No maximum service life is specified, serviceability is determined by the findings of the inspections.

8.3 Inspection and Load Test of Equipment in Table 2

8.3.1 Frequency of Inspection

All mechanical handling machines listed in table 2 shall be thoroughly inspected and load tested in accordance with this procedure at time intervals detailed in table 2.

At time of initial inspection, the Manufacture’rs Certificate of Test shall be produced by the asset custodian / owner for review by the Lifting Engineer to verify appliance details.

TABLE 2

MECHANICAL HANDLING EQUIPMENT	6 MONTHLY INSPECTION	48 MONTHLY INSPECTION & LOAD TEST
Fork Lift Truck, Counterbalanced	YES	YES
Balanced, Powered	YES	YES
Fork Lift Truck, Manual	YES	YES
Fork Lift Truck, Reach, Powered	YES	YES
Fork Lift Truck, Rough Terrain, Powered	YES	YES

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Fork Lift Truck, Side loading, Powered	YES	YES
Telescopic Handler, Powered	YES	YES
Fork Lift Truck, Attachment	YES	YES
Pallet Truck, Manual	YES	YES
Stacking Truck, Manual	YES	YES

8.3.2 Thorough Inspection

The Lifting Engineer shall carry out a thorough inspection of the mechanical handling equipment in accordance with this section. This is the minimum level of inspection required.

Due to the many varying designs of mechanical handling equipment, not all aspects of the inspection will apply to each unit.

Pre-Inspection Function Test

During any thorough examination, it is necessary to carry out an operational function test without load to prove the operation of the mechanical handling equipment and the function of its safety devices. The mechanical handling equipment must be operated by a fully qualified operator under the control of the Lifting Engineer. Prior to the test, the Lifting Engineer will establish:

- That the operator is certified, and has adequate experience.
- That any limitation of the mechanical handling equipment operations are observed.
- The mechanical handling equipment is fit to perform the required movements.

The operational function test shall cover the items listed below. If any defects are found which adversely affect the safe operation of the mechanical handling equipment during the thorough inspection, then they shall be corrected before proceeding further:

- Load hoisting and lowering mechanism.
- All brakes.
- Safe load indicators.

Safe Working Load

- Ensure durable legible manufactures rating chart(s), with text in English and Arabic are provided in the operator's cab. The charts shall be applicable to mechanical handling machine model under inspection.
- On mechanical handling machines with a single load rating, ensure the SWL is legibly marked in characters of a contrasting colour not less than 75mm high.
- Ensure the unique identification number is legibly marked.

Hydraulics

- Ensure all fluid levels are correct.
- Inspect the hydraulic system pipes, rotary coupling, and rubber hoses for leaks, corrosion, wall section loss and mechanical damage. Ensure that only crimped end connections have been used.
- Ensure that the reinforcing steel braiding of the rubber hoses is not exposed.

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- Ensure that no part of the hydraulic hoses have been painted.
- Inspect all check/holding valves for leaks, corrosion and mechanical damage.
- Ensure that the stroke length of hydraulic cylinders working in tandem are equal.
- Ensure all hydraulic lifting cylinders are fitted with check/holding valves.

Structure

- Inspect the chassis of the unit for corrosion, cracks and mechanical damage.
- Inspect all load-bearing welds to ensure freedom from defect.
- Inspect for loose, missing and corroded fixings. At the discretion of the lifting engineer sample bolts may be removed to enable a thorough inspection and/or NDT.
- Inspect all anchorages and pivot pins/bushes for wear and security.
- At the discretion of the Lifting Engineer, the thickness of any part of the structure and the integrity of welds may be checked using an appropriate NDT method. The permissible levels of wear, erosion and/or corrosion are given in Table A
- Inspect the mechanical handling machine load arms for cracks, welds deformation and corrosion. At the discretion of the Lifting Engineer, the integrity of welds may be checked using an appropriate NDT method.
- If fitted with a sliding boom, inspect the end stops and the guides for security and wear.

Mast and Fork Carriage Assembly

- Inspect the mechanical handling machine mast assembly for wear, cracks, welds deformation and corrosion
- Check the mast pivots for excessive wear.
- Check the hydraulic tilt cylinders anchorage's for excessive wear.
- At a period not exceeding 48 months, the mast assembly shall be dismantled to allow for a thorough inspection of the guide rollers and internal chains and inaccessible welds.
- At the discretion of the Lifting Engineer, the mast may be subjected to non-destructive testing.

Load Chains

- Inspect the entire length of all chains fitted, the rejection criteria is listed in Table A
- Irrespective of the results of the inspection, chains, removable anchors and anchor pins shall be replaced after a period not exceeding 6000 operating hours or 3 years, which ever is the shorter.

Load Forks

- Inspect the load forks for cracking; particular attention should be given to the heel and top and bottom hooks including their attachment to the shank.
- Heel, top and bottom hooks to be subjected to NDT annually.
- Check for straightness between the upper face of the blade and the front of the shank.
- Check the fork angle between the upper face of the blade and front face of the shank.

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- Check the fork tip height differences when mounted on the carriage.
- Check for blade for wear; pay particular attention to the heel.
- Check the fork position lock is in good condition and is working correctly.

Note:

Under no circumstances must load forks be repaired.

Table A

REJECTION CRITERIA	
Straightness	Deviation not to exceed 0.5% of the length of the blade
Fork Angle	Not to exceed 93 degrees
Fork Tip Height Differences	Not to exceed 3% of the length of the blade
Blade wear	Heel shall not be less than 90% of original thickness i.e. 10% wear
Welding	Any welding or flame cutting carried out on any part of the fork

Brakes and Clutches

- Inspect the condition of gearing, shafts etc.
- Inspect the condition of the clutch and brake drum condition and lining for wear.
- Ensure that all brakes and clutches function correctly.

Engine

- Check the engine for proper performance and compliance with regard to safety requirements.
- Inspect the engine fuel lines and fuel tanks for leaks. The engine holding down bolts must be in place and secure.
- Check battery electrolyte level

Cab and Controls

- Inspect the cab for security and mechanical damage.
- Inspect all means of access (i.e. steps, ladders) for damage and security.
- Ensure all controls are legibly marked with their mode of operation in bilingual notation. Where bilingual notation marking is not practical then a suitable control diagram shall be provided
- Inspect all control levers for excessive wear and maladjustment, which may interfere with proper operation
- Ensure the warning horn and engine stop operate correctly.
- Ensure that all lighting fitted is functioning.

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Safety Systems and Function Test

- Carry out a full function test (without load attached). I.e. telescoping, hoisting and lowering ensuring that any limit switches fitted are functioning correctly.
- If fitted, ensure the equipment "movement warning" alarm/horn is functioning.
- Ensure that a fire extinguisher is fitted and has a current inspection tag attached.
- Ensure that an amber warning light is fitted and functioning.
- If fitted, the Load Indicator shall be visually inspected and functionally checked to ensure correct operation. Verification of the LI must be carried out annually. The accuracy of Load Indicator shall be ± 5%. Load Indicator shall be calibrated every 6 years. The calibration certificate shall be made available to the Lifting Engineer.

Car Body, Chassis and Outriggers and Steering

- Inspect the car body and chassis for corrosion, cracks and mechanical damage.
- Inspect the outriggers and outrigger pads for damage to structure and pipe work, and leaking oil seals.
- Ensure the outrigger indication lights and interlocks, if fitted, are functioning.
- Inspect the steering assembly for excessive play.

Tyres and Brakes

- Inspect the pneumatic tyres for deterioration through wear or damage. All tyres including any spare must comply with the Oman Road Transport Regulations.
- Any cuts in the walls of tyres shall be a cause for rejection.
- The correct tyre inflation pressure for each tyre shall be clearly marked adjacent to it.
- Check the operation of both the travel and park brakes.

Documentation

- Copies of the maintenance schedules and maintenance records, NDT reports and previous certificates of inspections shall be provided to the third party Certifying Lifting Engineer by the owner, for inspection.
- Copies of the manufacturer's certificate of tests stating specified and actual breaking load and the rope construction shall be provided to the third party Certifying Lifting Engineer following any rope renewal, for inspection.
- Details of the certificate/s for the wire rope/s and/or chains to be checked, and entered on the Certificate/Report.
- The log of daily, weekly and monthly inspections shall be provided to the third party Certifying Lifting Engineer by the equipment owner, for inspection.

Age

No maximum service life is specified, serviceability is determined by the findings of the inspections.

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8.3.3 Load Testing

The objective of testing a mechanical handling machine is to demonstrate that it is structurally sound and fit for the use for which it was designed.

Any disturbance, (dis-assembly and re-assembly) or repair to any load bearing part or replacement of the hoist chains shall require the mechanical handling machine to be subjected to a load test. The Lifting Engineer from the third party Certifying Company shall witness all load tests.

Prior to any load test of the mechanical handling machine, a thorough inspection of the mechanical handling machine in accordance with section 8.3.2 shall be undertaken by the Lifting Engineer. During load testing all operations shall be carried out with extreme care and every permissible motion carried out singly at the slowest possible speed.

Load Test

The mechanical handling machine shall be subjected to a load test of 110% of SWL using, verified test weights. The test load may be changed at the Lifting Engineer's discretion. Where practicable each load bearing part of the mechanical handling machine is to be given one overload (i.e. each mechanical handling machine motion shall be tested to prove the integrity of load forks, chains, load bearing structure etc.).

Static Load Test Hoist Ram(s)

The test weight shall be raised to between 100mm and 200mm above the ground with the mast vertical. The maximum drop is 50mm in 10minutes.

Static Load Test Tilt Ram(s)

The test weight shall be raised to between 100mm and 200mm above the ground with the mast vertical. The maximum fall back is 10mm in 10minutes.

Thorough Inspection following a Load Test

Following the load test, the Lifting Engineer shall carry out a thorough inspection of the mechanical handling machine in accordance with section 8.3.2.

8.4 Inspection and Load Test of Equipment in Table 3

8.4.1 Frequency of Inspection

All the mechanical handling machines listed in table 3 shall be thoroughly inspected and load tested in accordance with this procedure at time intervals detailed in table 3.

At time of initial inspection, the Manufacturer's Certificate of Test shall be produced by the asset custodian / owner for review by the Lifting Engineer to verify appliance details.

TABLE 3

MECHANICAL HANDLING EQUIPMENT	6 MONTHLY INSPECTION	48 MONTHLY INSPECTION & LOAD TEST
Tail Lift, Powered	YES	YES
Skip Loader, Powered	YES	YES
Motor Vehicle Lifting Device, Powered	YES	YES

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Work Platform, Mobile, Elevating, Powered	YES	YES, **but annually**

8.4.2 Thorough Inspection

The Lifting Engineer shall carry out a thorough inspection of the mechanical handling equipment in accordance with this section.

Pre-Inspection Function Test

During any thorough examination, it is necessary to carry out an operational function test without load to prove the operation of the mechanical handling equipment and the function of its safety devices. The mechanical handling equipment must be operated by a fully qualified operator under the control of the Lifting Engineer. Prior to the test, the Lifting Engineer will establish:

- That the operator is certified, and has adequate experience.
- That any limitation of the mechanical handling equipment operations are observed.
- The mechanical handling equipment is fit to perform the required movements.

The operational function test shall cover the items listed below. If any defects are found which adversely affect the safe operation of the mechanical handling equipment during the thorough inspection, then they shall be corrected before proceeding further:

- Load hoisting and lowering mechanism.
- All brakes.
- Safe load indicators.

Safe Working Load and Identification Number

- On mechanical handling machines with a single load rating, ensure the SWL is legibly marked in characters of a contrasting colour not less than 75mm high.
- Ensure the unique identification number is legibly marked.

Hydraulics

- Ensure all fluid levels are correct.
- Inspect the hydraulic system pipes, rotary coupling, and rubber hoses for leaks, corrosion, wall section loss and mechanical damage. Ensure that only crimped end connections have been used.
- Ensure that the reinforcing steel braiding of the rubber hoses is not exposed.
- Ensure that no part of the hydraulic hoses have been painted.
- Inspect all check/holding valves for leaks, corrosion and mechanical damage.
- Ensure that the stroke length of hydraulic cylinders working in tandem are equal.
- Ensure all hydraulic lifting cylinders are fitted with check/holding valves.
- Ensure that the emergency load lowering is system is operational and clearly marked.

Structure

- Inspect the chassis of the unit for corrosion, cracks and mechanical damage.

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- Inspect all load-bearing welds to ensure freedom from defect.
- Inspect for loose, missing and corroded fixings. At the discretion of the Lifting Engineer sample bolts may be removed to enable a thorough inspection and/or NDT.
- Inspect all anchorages and pivot pins/bushes for wear and security.
- At the discretion of the Lifting Engineer, the thickness of any part of the structure may be checked using an appropriate NDT method. The permissible levels of wear, erosion and/or corrosion are given in Table A
- Inspect the mechanical handling machine load arms for cracks, welds deformation and corrosion.
- If fitted with a sliding boom, inspect the end stops and the guides for security and wear.
- Check the articulating arms pivots for excessive wear.
- Drive nuts to be checked for wear.

Ropes

- Thoroughly inspect the entire length of all wire ropes fitted, including rope anchorage for wear, splintering, corrosion and mechanical damage etc. Special attention should be given to the section of rope on standing or equalising pulleys. Wire rope rejection limits are given in Table A
- Inspect all rope end terminations, splices etc for damage and wear with particular attention being paid to broken wires at ferrule connections.
- Ensure the rope fitted is of the correct size and construction for the machine.
- Inspect all sheaves for wear, cracking and rope path alignment and bearing condition.
- Irrespective of the results of the inspections, all ropes shall be replaced after a period not exceeding 6 years.
- Any re-roping of the rope(s) shall require the mechanical handling machine to be subjected to a suitable load test. The load test shall be witnessed by the Lifting Engineer from the third party Certifying.Company.

Load Chains

- Inspect the entire length of all chains fitted, the rejection criteria is listed in Table A,
- Irrespective of the results of the inspection, chains, removable anchors and anchor pins shall be replaced after a period not exceeding 6000 operating hours or 6 years, which ever is the shorter.

Engine

- Check for proper performance and compliance with regard to safety requirements.
- Inspect the engine fuel lines and fuel tanks for leaks. The power source holding down bolts must be in place and secure.
- Check battery electrolyte level

Cab and Controls

- Inspect the cab for security and mechanical damage.

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- Inspect all means of access (i.e. steps, ladders) for damage and security.
- Ensure all controls are legibly marked with their mode of operation in bilingual notation. Where bilingual notation marking is not practical then a suitable control diagram shall be provided
- Inspect all control levers for excessive wear and maladjustment, which may interfere with proper operation
- Ensure the warning horn and engine stop operate correctly.
- Ensure that all lighting fitted is functioning.

Safety Systems and Function Test

- Carry out a full function test (without load attached). I.e. telescoping, hoisting, lowering and slewing, ensuring that any limit switches fitted are functioning correctly.
- If fitted, ensure the equipment "movement warning" alarm/horn is functioning.
- Ensure that a fire extinguisher is fitted and has a current inspection tag attached.
- Ensure that an amber warning light is fitted and functioning.

Car Body, Chassis and Outriggers and Steering

- Inspect the car body and chassis for corrosion, cracks and mechanical damage.
- Inspect the outriggers and outrigger pads for damage to structure and pipe work, and leaking oil seals.
- Ensure the outrigger indication lights and interlocks, if fitted, are functioning.
- Inspect the steering assembly for excessive play.

Tyres and Brakes

- Inspect the pneumatic tyres for deterioration through wear or damage. All tyres including any spare must comply with the Oman Road Transport Regulations.
- Any cuts in the walls of tyres shall be a cause for rejection.
- The correct tyre inflation pressure for each tyre shall be clearly marked adjacent to it.
- Check the operation of both the travel and park brakes.

Documentation

- Copies of the maintenance schedules and maintenance records, NDT reports and previous certificates of inspections shall be provided to the third party Certifying Lifting Engineer by the owner, for inspection.
- Copies of the manufacturer's certificate of tests stating specified and actual breaking load and the rope construction shall be provided to the third party Certifying Lifting Engineer following any rope renewal, for inspection.
- Details of the certificate/s for the wire rope/s and/or chains to be checked, and entered on the Certificate/Report.
- The log of daily, weekly and monthly inspections shall be provided to the third party Certifying Lifting Engineer by the equipment owner, for inspection.

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Age

No maximum service life is specified, serviceability is determined by the findings of the inspections.

8.4.3 Load Testing

The objective of testing a mechanical handling machine is to demonstrate that it is structurally sound and fit for the use for which it was designed. Any disturbance, (dis-assembly and re-assembly) or repair to any load bearing part or replacement of the hoist chains shall require the mechanical handling machine to be subjected to a load test. The Lifting Engineer from the third party Certifying Company shall witness all load tests.

Prior to any load test of the mechanical handling machine, a thorough inspection of the mechanical handling machine in accordance with section 8.4.2 shall be undertaken by the Lifting Engineer. During load testing all operations shall be carried out with extreme care and every permissible motion carried out singly at the slowest possible speed.

Load Test

The mechanical handling machine shall be subjected to a load test of 110% of SWL using, verified test weights. The test load may be changed at the Lifting Engineer's discretion. Where practicable each load bearing part of the mechanical handling machine is to be given one overload (i.e. each mechanical handling machine motion shall be tested to prove the integrity of load forks, chains, load bearing structure etc.)

Static Load Test

The test weight shall be raised to between 100mm and 200mm above the ground with the mast vertical. The maximum drop is 50mm in 10minutes.

Thorough Inspection following a Load Test

Following the load test, the Lifting Engineer shall carry out a thorough inspection of the mechanical handling machine in accordance with section 8.4.2.

8.5 Additional tests

If the condition of any mechanical handling machine is such, that assessment of its condition is open to uncertainty, the Lifting Engineer, at his discretion, may request additional inspection or testing. The Lifting Engineer may request any additional information he considers pertinent in order to verify the safe condition of the unit for further use.

8.6 Identification / Marking

All appliances shall be clearly marked with the following information:

a) Equipment Tag Number (ETN)

b) Safe Working Load (S.W.L.)

c) Date of Inspection

d) Next Due Date (of Inspection)

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9 Inspection/Load Testing of Passenger and Goods Lifts

9.1 Definition

Passenger and Goods Lifts are defined as lifting machines or appliances, which have a travelling platform or cage. The directional movement of which is restricted by guides, which are used for transporting people or materials from one level to another.

9.2 Inspection Frequency

Each passenger or goods lift shall be inspected at periods not exceeding 6 months and load tested at periods not exceeding 60 months (5 years).

At time of initial inspection, the Manufacturer's Certificate of Test and commissioning tests shall be produced by asset custodian / owner for review by the Lifting Engineer to verify appliance details.

9.3 Thorough Inspection

The Lifting Engineer shall carry out a thorough inspection of the equipment in accordance with sections 9.3.1 to 9.3.10. This is the minimum level of inspection required.

9.3.1 Motor Room

- Ensure that no unauthorised access can be made into the motor room.
- Check all machinery holding down arrangements to ensure they are secure and that any supporting structures are satisfactory.
- Inspect the lift motor, gearbox, sheaves, shafts, clutches and brakes ensuring they are in a satisfactory condition and in good working order.
- At the time of load testing the emergency brake release and hand winding device shall be demonstrated. It must be ensured that the brake fully engages immediately the emergency brake is released.

9.3.2 Gearbox

- At intervals not exceeding 10 years and most conveniently when re-roping is being carried out, the top cover of the gear case shall be removed to allow a thorough inspection of all enclosed parts i.e. gearbox shafts, bearings etc.
- Particular attention should be given to shafts having changes in diameter, which are likely to result in points of high stress concentration.

9.3.3 Car Top

- Ensure the lift car top is fitted with a car top control and an emergency stop switch (stop switch to be of mushroom head type).
- Ensure the stop switch and inspection change over switch are functioning correctly prior to riding on top of the lift.
- Ensure the inspection change over switch is shrouded to prevent accidental change over.

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9.3.4 Lift Shaft

- Check the lift shaft to ensure that it is clear of any obstruction that could affect the safe operation of the lift.
- Inspect the guide rails, support brackets and fixings for tightness and condition.
- Check the operation of all upper and lower limit switches plus all floor level switches.
- In the event that the lift safety gear has been operated, due to the high forces generated by the actuation of the safety gear, a detailed inspection of the guide rails, guide rail supports and fixings shall be made to check their condition.

9.3.5 Landing Gates or Doors

- Check the electro mechanical interlocks of all the landing doors for correct operation and function.
- Check the engagement of the mechanical interlock is adequate.
- A thorough internal inspection of the interlocks, including enclosed parts, shall be made to confirm the condition of the mechanical locking mechanism and electrical contacts at periods not exceeding 1 year.
- Ensure that it is not possible to open a landing door unless the lift is at the landing.

9.3.6 Suspension Ropes and Safety Gear Rope

- Thoroughly inspect the entire length of the suspension and safety gear ropes, including rope anchorage for wear, splintering, corrosion and mechanical damage etc. The ropes shall be replaced if the number of broken or corroded wires exceeds 5% in any 10 rope diameters or mechanical damage, which approaches or exceeds the discard criteria set out in ISO 4344.
- Inspect all rope end terminations, splices etc for damage and wear with particular attention being paid to broken wires at ferrule connections.
- Inspect the wedge and socket, if fitted, to ensure the correct size of wedge and socket is fitted, and there is no miss-match between the wedge and socket.
- Ensure the rope fitted is of the correct size and construction for the lift.
- Inspect all sheaves for wear, cracking and rope path alignment and bearing condition.
- Irrespective of the results of the inspections, all ropes shall be replaced after a period not exceeding 10 years.
- If a slack rope trigger switch is fitted to the suspension rope, its operation shall be verified

9.3.7 Lift Pit

- Check the lift pit to ensure that it is clear of any obstruction that could affect the safe operation of the lift.
- Ensure there is adequate clearance between the bottom of the counterweight and the top the buffer when the lift car is at the top floor.
- Ensure that the counterweight guards are fitted and check for correct positioning.
- Check the lift car and counterweight buffer's electrical cut out switches to ensure correct operation.
- Checks shall be made to ensure that the buffers are in place and are correctly positioned to engage the car and counterweight striking plates.

- Ensure the lift pit is free from debris and water.

9.3.8 Lift Car

- Ensure the lift serial/capacity plate is in position and showing the correct capacity for the lift.
- Check the operation of the lift floor selector panel for correct operation over the full travel of the lift.
- Check the alignment of the lift car floor and the landing floor level and smoothness of travel.
- Passenger carrying lifts shall be inspected as detailed above in addition the following car emergency devices shall also be tested.

9.3.9 Emergency and Safety Equipment

- Audible alarm (to be audible outside the lift).
- Emergency Telephone (if fitted).
- Emergency Stop Button.
- Emergency roof escape with electric switch fitted to the escape panel.
- Emergency Lighting.

9.3.10 Over Speed Governor and Safety Gear

- Inspect the over speed governor frame holding down arrangements for security.
- Check the over speed governor operating mechanism tripping action is free.
- Check the safety gear to ensure that the jaw or wedge running clearances are as recommended by the manufacturer.
- Operate the safety gear by hand while at rest to check freedom of movement and engagement of jaws or wedges with the guide rails.
- The over speed governor shall be tested every 5 years and on every occasion when the over speed governor has been subject to any repairs which may affect its operation, or the governor rope has been renewed. The test shall ensure correct tripping operation and tripping speed,
- The safety gear shall be tested every 5 years and on every occasion when the safety gear has been subject to any repairs, which may affect its operation, or the safety gear, rope has been renewed to ensure correct operation.
- Where an overload detection device is fitted, a full load calibration test shall be carried out at time of load test.

9.3.11 Documentation

- Copies of the lift maintenance schedules and maintenance records, NDT reports and previous certificates of inspections shall be provided to the third party Certifying Lifting Engineer by the owner, for inspection.
- Copies of the crane electrical maintenance schedules and maintenance records shall be made available, for inspection.

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- Copies of the rope manufacturer's certificate of tests stating specified and actual breaking load and the rope construction shall be provided to the third party Certifying Lifting Engineer following any rope renewal, for inspection.
- Details of the certificate for the wire ropes to be checked, and entered on the Certificate/Report.

9.4 Load testing

The objective of testing a lift is to demonstrate that it is structurally sound and fit for the use for which it was designed.

Any disturbance, or repair to any load bearing part or replacement of the suspension, over speed governor ropes shall require the lift to be subjected to a load test. The Lifting Engineer from the third party Certifying Company shall witness all load tests.

Prior to any load test of the lift, the lifting engineer shall undertake a thorough inspection of the lift in accordance with section 9.3.

9.4.1 Load Test

The lift shall be operated in both directions at its full rated capacity.

The lift shall be subjected to a static and dynamic load test of 110% of the displayed capacity of the lift using verified test weights. The load shall be sustained for 10 minutes. No overrun or creep should be discernible. On hydraulic lifts, ensure that during the static loadtest that the automatic levelling functions fully.

9.4.2 Thorough Inspection Following a Load Test

The Lifting Engineer shall carry out a thorough inspection of the lift in accordance with section 9.2.2. This is the minimum level of inspection required.

9.5 Additional tests

If the condition of the lift gives rise to doubt, the Lifting Engineer at his discretion, may request additional inspection/testing or request additional information he considers pertinent to verify the safe condition of the lift for further use.

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10 Inspection/Load testing of Lifted Equipment

10.1 Definition

Any item of lifted equipment (**e.g. container, spreader bar, man basket, mud tanks, office skids, engine skids etc.**), which forms part of the load.

Note: Man riding baskets are covered by this Chapter except that basis for design is BS EN 14502-1 and thorough examination has to be carried out 6 monthly and load testing annually at 1.5x rated capacity.

10.2 Inspection Frequency

All lifted equipment shall be inspected in accordance with this procedure at the intervals detailed table 1.

At time of initial inspection, the Manufacturer's Certificate of Test and design calculations shall be produced by asset custodian / owner for review by the Lifting Engineer. At time of initial inspection, the Manufacturer's Certificate of Test and commissioning tests shall be produced by asset custodian / owner for review by the Lifting Engineer to verify appliance details.

TABLE 1

SCHEDULE OF TEST / INSPECTIONS FOR CONTAINERS,

LIFTING BEAMS/FRAMES AND SPREADER BARS etc.

TIME OR INTERVAL	TEST/INSPECTION			
	Loadtest (T)	Non-destructive Testing (NDT) (N)	Thorough visual inspection (V)	Marking Suffix
Initial Certification or when taken into use for the first time	YES	YES	YES	T
At intervals not exceeding 12 months	NO	YES	YES	VN
At intervals not exceeding 48 months	YES	YES	YES	T
After substantial repair/modification	YES	YES	YES	T

Note:

A substantial repair or alteration means any repair and/or alteration carried out, which in the opinion of an inspection body affect the primary elements of the lifting beams/frames, spreader bars and container, or elements, which contribute directly to the structural integrity.

10.3 Lifted Equipment Inspection Schedule

Suffix	ACTIVITY	FUNCTION
T	Load Test, Visual + MPI	LIFT. ENG. & NDT INSPECTOR
VN	Visual or MPI	LIFT. ENG. & NDT INSPECTOR

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10.4 Colour coding of permanently attached lifting sets

All permanently attached lifting sets, which have been inspected and found fit for purpose for a maximum six months, shall be colour coded as per paragraph 12. In addition to indicate that the liftingset is permanently attached, it shall be colour coded purple.

10.5 Thorough Inspection

The Lifting Engineer shall carry out a thorough inspection of the lifted equipment in accordance with sections 10.5.1 to 10.5.6. This is the minimum level of inspection required. Ensure that a safe and suitable means of supporting the container to facilitate the inspection of the underside is provided.

10.5.1 Welds

Inspect all load-bearing welds i.e. on padeyes and adjoining structure etc, to ensure freedom from defects.

10.5.2 Structure

Inspect the structure for corrosion and mechanical damage.

10.5.3 Lifting Points

Inspect all lifting points for distortion, mechanical damage or any other signs of distress

10.5.4 Lifting Set

- Inspect the lifting set attached to the lifted equipment in accordance with, and at the time intervals stated in Chapter 5 of this procedure.
- Ensure that the shackles fitted are of the bolt type anchor shackle complete with nut and cotter pin.

10.5.5 Information Markings

- Ensure the Safe Working Load (SWL) in kilograms is legibly marked in characters of a contrasting colour not less than 75mm high.
- Ensure the Date Inspected and Next Due Date are clearly and legibly marked in characters of a contrasting colour not less than 50mm high.
- Ensure the unique identification number is legibly welded on to the container. The characters shall be not less than 75mm high.

10.5.6 Container Specific

Structure

- Inspect the exterior and interior of the container for corrosion and mechanical damage. Inspect all tie down points for distortion, mechanical damage or any other signs of distress or overload.

- Where a container is fitted with fork pockets designed for handling the container when empty, ensure that it is clearly marked "empty lift only" adjacent to each pocket, in a contrasting colour, in characters not less than 50mm high.

Doors

- Inspect doors, frames, seals, hinges, locks etc for distortion, mechanical damage or any other signs of distress.
- Functionally check door hinges and locking mechanism to ensure they operate in a satisfactory manner without undue force being required.

Floor

- Inspect the floor for corrosion, flatness and mechanical damage.
- Inspect drainage facilities, if fitted to ensure they are free of debris and obstruction.

Fastening Devices

Where a container or tool tray is specifically designed for tools, which are to be securely fastened, inspect the suitability of the fastening devices for fitness of purpose.

Information Markings

- Ensure a matt black square not less than 400 X 400mm is provided for information markings.
- Ensure the maximum gross weight (MGW), Tare weight and the Payload (all in kilograms) are legibly marked in characters of a contrasting colour not less than 75mm high.

10.6 Load Testing of Containers

The objective of testing a container is to demonstrate that it is structurally sound and fit for the use for which it was designed.

Any, repair to any load bearing part shall require the container to be subjected to a load test. The Lifting Engineer from the third party Certifying Company shall witness all load tests.

Prior to any load test of the container, the lifting engineer shall undertake a thorough inspection of the container in accordance with section 10.5.

10.6.1 Load Test

The force shall be applied using calibrated test weights

- The container shall be loaded to a total gross weight of 2.5 MGW and lifted using all the pad eyes.
- A sling set with an angle to the vertical equal to the design angle shall lift the container. The sling set used for test purposes shall have a minimum safe working load rating of 1.3 times the load subjected to the container.
- The container shall be carefully lifted in such a way that no significant acceleration forces occur. It shall be held for 5 minutes before measurements are taken.
- No deflections during testing shall be greater than 1/300 of the span of the member. The container shall show no significant permanent deformation or other damage after the completion of the test.
- A Lifting Engineer from an independent third party Certification Company shall witness all load tests (T).

Note:

a. If a container is normally fitted with a sling set, this sling set must not be used for the load test.

b. The test load is obtained by putting in or suspending a test mass of 2.5MGW-T

10.6.2 Thorough Inspection following a Load Test

Following the load test, the Lifting Engineer shall carry out a thorough inspection of the lifted equipment in accordance with section 10.5.

10.7 Inspection and Load Test of Lifting Beams, Frames and Spreader Bars

10.7.1 Thorough Inspection

- Ensure the Lifting Beam, Frame or Spreader Bar has the Identification Number and Safe Working Load clearly and legibly marked.
- Inspect the Lifting Beam, Frame or Spreader Bar for wear, deformation, distortion, and corrosion.
- Inspect welds for cracking.
- Where manufacture is by means other than welding these require to be inspected for deformation, distortion, corrosion and tightness.
- Check the lifting set attached is as per the original design requirements; any changes to the lifting set with dissimilar parts will require approval from the designer.
- The lifting set fitted to the Lifting Beam, Frame or Spreader Bar shall be visually inspected in accordance with Chapter 5 of this procedure. As this lifting set will normally be permanently attached to the Lifting Beam, Frame or Spreader Bar they shall be inspected at the same frequency as the Lifting Beam, Frame or Spreader Bar.
- All pad eyes shall be subjected to non-destructive inspection at a period not exceeding 1 year.

Table N° B

ITEM	MATERIAL LOSS LIMIT
STRUCTURAL MEMBERS	As defined by the lifting beam, frame or spreader bar designer. Where no maximum limit has been defined a maximum of 10% at any point, shall be the used.

10.7.2 Load Test of Lifting Beams/Frames and Spreader Bars

- Lifting Beams /Frames and Spreader Bars with a safe working load up to 10 tons, the load shall be twice the marked safe working load.
- Lifting Beams /Frames and Spreader Bars with a safe working load greater than 10 tons but less than 160 tons, the load shall be 1.04 times the marked safe working load plus 9.6 ton. (i.e. 1.04 X SWL + 9.6 ton).
- Lifting Beams /Frames and Spreader Bars with a safe working load over 160 tons; the load shall be 1.1 times the marked safe working load.
- The load shall be sustained for a minimum of 2 minutes.

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10.7.3 Load Test of Lifting Beams/Frames and Spreader Bars with Capacities over 50 Tonnes

For lifting beams/frames and spreader bars with capacities over 50 tonnes, load testing may be waived. This waiver shall be approved by PDO's lifting engineer on condition that the following are fully adhered to:

Structural calculations require to be performed and provided on the lifting beam/frame or spreader bar with padeyes/padears/trunnions, that demonstrates the lifting beam/frame or spreader bar adheres to the safety factors and calculations detailed in accepted code of practice for lifting i.e. API RP2A

The design of the lifting beam/frame or spreader bar shall be such that through thickness loading of materials is avoided.

Padeyes and any materials that transmit tension loading, have through thickness properties, 'Z' spec, - or are fully tested for laminations.

A thorough inspection of the structure and welds require to be carried out. All welds require to be subject to MPI and all full penetration welds require to also be ultra sonically inspected prior to the lift program starting. A dimensional check of the lifting beam/frame or spreader bar shall be undertaken to ensure conformance with material and dimension tolerances.

The lift programme to be executed using the lifting beam/frame or spreader bar is clearly defined, and shall be of a restricted nature.

The design of the lifting beam/frame or spreader bar in conjunction with the lift that it is intended to be used for and lift plan shall be assessed and approved by a recognised lifting engineer.

If a lifting beam/frame or a spreader bar is required to be re-used for a new separate lift plan, then the lifting beam/frame or spreader bar shall be subjected to a repeat of this paragraph.

Additional NDT techniques maybe utilised if deemed necessary by the lifting engineer/inspector i.e. UT thickness checks.

If the lifting beam/frame or spreader bar requires modification prior to being re-used then the lifting beam/frame or spreader bar shall be subject to a repeat of this paragraph.

10.8 Additional Inspections and Tests

The design of the lifting beams/frames, spreader bars and containers within PDO are many and varied. At the Lifting Engineer's discretion, additional inspection and tests may be deemed necessary i.e. ultrasonic wall thickness tests, hammer tests, etc.

10.9 Identification / Marking

All appliances shall be clearly marked with the following information:

a) Equipment Tag Number (ETN)

b) Safe Working Load (S.W.L.)

c) Date of Inspection

d) Next Due Date (of Inspection)

11 Inspection/Weight Verification of Test Weights

11.1 Inspection Frequency

Test weights require to be NDT and the weight verified in accordance with this procedure at the intervals detailed below:

TABLE 1 SCHEDULE OF NDT AND VERIFICATION

TIME/INTERVAL	TEST WEIGHT VERIFICATION	VISUAL + NDT (TEST WEIGHT)
BEFORE BEING USED FOR THE FIRST TIME	YES	YES
NOT EXCEEDING 12 MONTHS	NO	YES
NOT EXCEEDING 60 MONTHS	YES	YES

11.2 Thorough Inspection

The Lifting Engineer shall carry out a thorough inspection of the test weight in accordance with sections 11.2.1 to 11.2.3. This is the minimum level of inspection required.

11.2.1 Welds

Inspect all load-bearing welds i.e. on padeyes to ensure freedom from defects. At the discretion of the Lifting Engineer, the integrity of welds may be checked using an appropriate NDT method.

11.2.2 Lifting Points

Inspect all lifting points for distortion, mechanical damage or any other signs of distress

11.2.3 Information Markings

- Ensure the weight in kilograms is legibly marked in characters of a contrasting colour not less than 75mm high.
- Ensure the Date Inspected and Next Due Dates are clearly and legibly marked in characters of a contrasting colour not less than 50mm high.
- Ensure the unique identification number is legibly welded on to the test weight. The characters shall be not less than 75mm high.

11.3 Test Weight Verification

- The Inspector shall submit NDT reports to the Lifting Engineer prior to the weight verification
- The weight shall be verified using a calibrated load cell
- The Lifting Engineer from the third party Certification Authority shall witness all test weight verifications.

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12 Colour Coding

All lifting accessories and lifting appliances, owned by PDO, as per table 5.1 and 7.1 shall be thoroughly inspected at 6 monthly intervals.

Upon satisfactory results of the thorough examination, the Colour Code shall be painted on every piece of lifting gear. The colour indicates to the user that a thorough examination has been performed within the prescribed period.

In case of unsatisfactory results the equipment shall be quarantined, coloured red if to be disposed, if repairable to be coloured black and locked away to prevent unintended use. If the equipment cannot be repaired it shall be rendered useless.

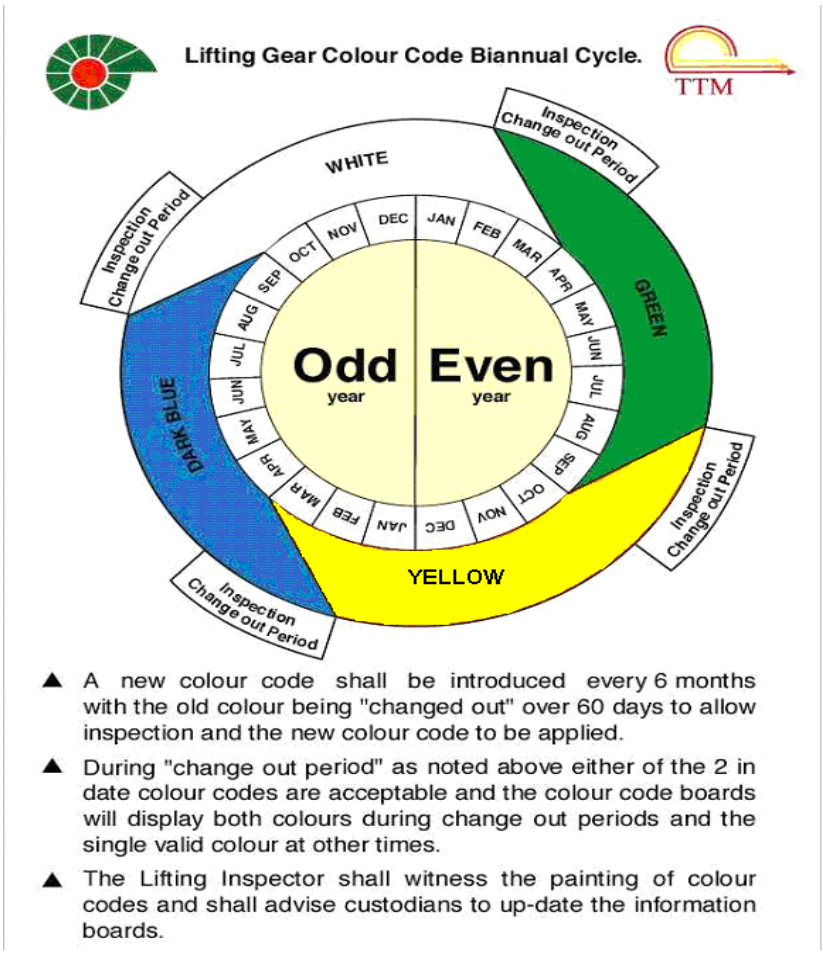
A new colour shall be introduced every six months and each colour shall be current for a period of 8 months. The two months overlap is to ensure lifting gear is available for use at all times. There are four colours in the sequence and the cycle is repeated every 2 years (see figure 12.1).

Company practice is to have all available lifting accessories/appliances examined and colour coded twice per year in February/March and August/September.

Any lifting gear that does not have a visible colour band or where the colour is out of date, shall not be used. It shall be returned to the rigging store. Such equipment shall not be re-issued or used until after satisfactory thorough examination by a lifting equipment Inspector.

Painting of the colour codes shall be the responsibility of the asset custodian or his nominee and shall be witnessed by the lifting equipment Inspector.

Figure 12.1 – Lifting Gear Colour Code Biannual cycle



All main work sites shall have a lifting gear Colour Code Identity Board with the current colour codes displayed .

The board shall display both valid colours during “change out period” and the single valid colour at other times.

Fig 12.2 Example of a Colour Code Board

Picture of Fahud board as an example

13 Application & Step-Out Approval

13.1 Application

This Code of Practice is applicable to all lifting operations / lifting equipment in PDO. As such, the CoP and associated Procedures, Specifications and Guidelines are mandatory and shall be adhered to by all relevant parties.

13.2 Step-out and Approval

Any step-out from this Code of Practice shall be addressed to the lifting equipment engineer in writing. He will review and authorise the deviation in exceptional circumstances.

Appendix 1: Glossary of Definitions, Terms and Abbreviations

Alpha/numeric	A combination of letters and/or numbers used for identification.
Anemometer	Instrument (used on some cranes) for measuring wind speed.
Angle Indicator	A device that shows the angle at which the crane boom is operating and the corresponding rated capacity.
Asset Owner	Entity that owns lifting equipment. Either PDO or Contractor.
Automatic Safe Load Indicator (ASLI) or Rated Capacity Indicator	A device that automatically provides, with a specified tolerance, warning the load is approaching rated capacity, another warning when capacity is exceeded.
Auxiliary Hoist	A second (ary) lifting system usually fitted to cranes, operating from a separate winch drum from the main hoist rope. Usually used on cranes to lift light loads, relative to the crane's capacity, faster than is possible on the main hoist system.
Banksman	A person who controls the lifting operation, and ensures that it is carried out in accordance with the lift plan. He is also responsible for directing the crane driver, via hand signals or hand-held radio, to ensure the safe movement of the crane and load. The banksman shall be easily identified by a brightly coloured banksman's jacket.
Bilingual Text	English and Arabic
Blind Lift	A lift where at any point in time during the lifting operation the crane operator cannot directly see the load.
Block	A hook sheave and frame assembly attached to a rope used for raising and lowering loads.
Boom	A steel lattice, or steel box section structure that forms a lifting mast.
Booming/Luffing	The movement of a crane boom from one angle to another in the vertical plane.
Cantilever Beam	Section of beam supported at one end only.
CAP	Competent Authorised Person is a person who is appointed by the production co-ordinator or site-manager and who controls the lifting equipment at relevant location.
Centre of Gravity	Point at which the total mass of a body may be regarded as being concentrated, or about which the parts of the body exactly balance each other.
Certificate of Test and or Examination	A Test Certificate is issued by the third party certification lifting engineer on completion of a satisfactory survey. A new Test Certificate will require to be issued if the equipment is subject to repair or modification. Where a Test certificate states that it is also a report of thorough inspection/examination it must contain all of the information as required by LOLER 98, Schedule 1.
Certificate of Compliance	A document in which the manufacturer certifies that the products supplied comply with the requirements of the purchase order, without mention of any test results.
Certification Company third party	Independent body providing inspection services, upon satisfactory results of which, certificates are issued and conforming to the

	requirements of BS EN ISO/IEC 17020.
Colour Code	A method of marking equipment (normally with paint or plastic cable ties) to give a visual indication of its certification/inspection status. This 'coded' colour is changed every six months.
Container	Any form of unit or device used for the transportation of cargo.
Crane Operator or Driver	The person who is operating the crane for the purpose of position loads.
Crane, Truck Loading or Articulating Crane	A crane mounted on a commercial truck chassis that has been specially strengthened to accept the crane.
Crane, Carrier-Mounted or Mobile or Truck Crane	Truck type crane that has been specially designed for crane service and the heavy loads the crane are required to carry.
Crane, Crawler-Mounted	Except for the base these cranes are identical to the Carrier-Mounted
Crane, Rough Terrain	Short wheel based cranes with crab steering, and fitted with oversized tyres to facilitate travel across rough terrain.
Cross Hauling	Process of moving a load in a direction other than vertical, for the purposes of access/egress (sometimes called Fleeting). This action is usually carried out using chain blocks and pull lifts and the equipment used is down-rated.
Drawn-up Dimension	The minimum distance between the suspension level and the bottom hook saddle (also known as closed-height).
Effective Span	The distance between the centres of the adjacent supports, due allowance being made for the end fixing, continuous beams and cantilevers.
Effective Working Length (EWL)	The distance between the extreme inside ends of the eyes in a straight sling.
Effort	The pull on the hand chain or lever required to lift a specified load (chain blocks and pull lifts). The specified load is usually the working load limit of the block.
Equipment Tag Number (ETN)	A unique identification number given to an item of lifting equipment for registration purposes and to facilitate traceability.
Extended Dimension	The distance between the suspension level and the bottom hook saddle of a chain block, when the bottom hook is in the extended position. It equals the sum of the drawn up dimension and the range of lift (or height of lift).
Factor of Safety	The ratio of the load that would cause failure of an item of lifting equipment to the load that is imposed upon it in service i.e. SWL (This is to allow for detrimental criteria such as wear and tear, dynamic loadings etc).
Falls	The passes of a rope in a winching/pulley system.
Ferrule	A compression fitting used to secure the eye of a wire rope.
Ferrule-secure eye termination	A wire rope termination made by forming an eye, which is secured by means of a ferrule, pressed on to a rope.
Fit-for-purpose	Equipment free from defect and used only in the manner for which it was designed.

Fixed Lifting Equipment	Lifting equipment permanently installed (e.g. pedestal cranes, gantry cranes, swing jib cranes, beams, beam trolleys, powered hoists, pad eyes etc).
Flemish Eye	Eye termination where the rope end is split into two parts of three or four strands each, which are laid together again in the opposite direction, forming an eye which is symmetrical to the rope axis. The tails of the strands are distributed equally around the main body of the rope. They are fixed in position by means of a metal ferrule sleeve under hydraulic pressure.
Frame	The primary load bearing elements of a container.
Free Fall	A boom or hook-block descending under its own weight, or that of the load.
Free on Wheels	Able to lift load with a wheeled crane without utilizing the outriggers or stabilisers.
Functional Testing	Operation of each motion of the lifting equipment without a load applied in order to determine whether the equipment performs as the manufacturer intended.
Gantry	Elevated structure supporting the track of an overhead travelling trolley or crane.
Gross Capacity (Cranes)	The gross capacity is the capacity shown in the crane's load or capacity charts.
Gross Weight	The maximum allowable weight of a loaded container, at the design sling angle, i.e. the Tare weight (weight of empty container) plus the Pay Load (maximum weight of cargo, that can be carried by the container).
Hand Operated Chain Block	A block reeved with a load chain and operated by a hand chain so as to give a mechanical advantage.
Hazards and Effects Management Process (HEMP)	A structured hazard analysis methodology involving hazard identification, assessment, control and recovery and comparison with screening and performance criteria.
Headroom	The maximum vertical distance between the item to be lifted and the point of suspension of the hoisting machine. E.g. between the lifting padeyes and the underside of runway beam.
Height of Lift	The amount of possible travel between the top and bottom connection points (e.g. hooks) of a hoisting machine.
Hired Mobile Lifting Equipment	Lifting equipment hired by PDO from a contractor and which can be transported from one place to another (mobile cranes, forklift trucks etc).
Hook Load	The total weight suspended from the hook.
Inertia Forces	The forces produced by a change of velocity.
Inspection	A visual inspection by a lifting engineer or lifting tackle inspector carried out carefully and critically and supplemented by other means – such as measurement and where necessary non-destructive testing in order to arrive at a reliable conclusion as to the condition and safety of the equipment. If necessary for the purpose, parts of the appliance shall be dismantled.
Job Hazard Analysis (JHA)	Is a process for discussing and documenting each step of a job, identifying the existing or potential HSE hazards and then

	determining the best way to perform the job to reduce or eliminate the hazards. The JHA will typically include: • Selecting the job to be analyzed; • Breaking the job down into a sequence of steps; • Identifying potential hazards; • Determining preventive measures to overcome these hazards; • Identifying the resources required, i.e. manpower and equipment, to execute the task safely. It is the basis of HEMP.
Lift Category	A categorization of lifting operations (i.e. Routine Lifts and Non-Routine Lifts) reflecting the risk of the lifting operation and the required level of control.
Lift Plan	The Lift Plan details of how the lifting operations should be undertaken, the Lifting Equipment and Lifting Accessories to be used, how the equipment and Lifting Accessories shall be rigged up and the control measures in place to manage the risks.
Lifted Equipment	Any device which is used to suspend the load, including containers, tanks, skips, skids, drum rackets, pipe racks, frames, gas cylinder racks, pallets, flexible industrial bulk containers ('big bags'), tree cages, cargo nets, and cargo baskets.
Lifting engineer (Surveyor)	A person from an approved third party certification agency who has the appropriate practical and theoretical knowledge and experience of the lifting equipment to be thoroughly inspected as will enable him to detect defects or weaknesses and to assess their importance in relation to the safety and continued use of the lifting equipment and who is approved by the lifting equipment engineer. (Their activities are to be monitored by their employer, which includes site visits)
Lifting (Tackle) Inspector	A person from an approved third party certification company who has the appropriate practical and theoretical knowledge and experience of the lifting accessories to be thoroughly inspected against the applicable lifting equipment standards in relation to the safety and continued use of the lifting tackle and who is approved by the lifting engineer. (Their activities are to be monitored by their employer, which includes site visits)
Lifting Appliances	Any mechanical device capable of raising or lowering a load, eg cranes, fork lift trucks, powered hoists, manual hoists, lever hoists, beam trolleys, beam clamps, sheave blocks, winches, runway beams, mono-rail hoist, etc.
Lifting Tackle or Lifting Accessory or Lifting Gear	Any item whatsoever, which is used or designed to be used directly or indirectly to connect a load to a lifting appliance, a crane or chain block etc, and which does not form part of the load, but which is not itself able to lift or lower a load, e.g. slings, shackles, eyebolts, etc.
Lifting Equipment	Lifting Equipment, is a generic term and comprises Lifting Appliances (equipment performing the lifting), Lifting Accessories (devices which connect the load to the lifting appliance), and Lifted Equipment.
Lifting Operation	A task concerned with the lifting and lowering of a load. It includes the selection attachment and use of suitable lifting equipment.

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Lift Planner	A person who has appropriate practical and theoretical knowledge and experience of the lifting operations to enable him to prepare a full working lift plan.
Lifting Point	Generic term for the certified point(s) or attachment(s) on an item of plant, by which it can be lifted safely. The term also applies to points or attachments fixed to structural members and from which a load can be suspended. For example lifting lugs, lifting eyes, trunnions, fabricated lifting plates, padeyes and jacking points.
Lifting Set / Sling Set	Lifting slings and shackles used to connect a container to the lifting equipment.
Live Loads	Any load, except wind load, that gives rise to a variation of stress into a crane. Such variation may be due to any change of position or magnitude of an externally applied load, or to the movement of the crane structure itself.
Load Line	A wire rope suspending a hook.
Loose Lifting Equipment	Lifting Equipment that is portable enough so that it can easily be moved or carried by a person(s) to/from a store / location to a worksite to conduct a lifting operation. This may include Lifting Appliances (e.g. manual lever hoists, chain falls, beam clamps etc) and Lifting Accessories (e.g. slings, shackles etc.)
Luffing	See Booming.
Measured Deflections	The deflections measured in such a manner that they relate to precisely the same conditions as those covering the calculated deflection.
Mechanical Advantage	The ratio between the load raised and the effort required to raise it.
Mobile Lifting Equipment	Lifting equipment that can be transported from one installation to another (e.g. mobile cranes, forklift trucks etc). This equipment is likely to be owned and used by the Contractor.
Mode Factor	A factor, which takes into account, the geometry of the sling assembly, the number of parts and other constants as specified in the appropriate British Standard.
NDT	Non-Destructive Testing
(NDT)-Inspector	The term inspector is used to describe any person carrying out NDT inspection on lifting equipment. In all cases, the inspector shall have experience and training suitable to the NDT inspection being performed. (min. as per ASNT Tc-1a level 2 or equivalent)
Net Capacity (Cranes)	The net capacity is determined by deducting the crane capacity deductions from the crane's gross capacity. The deductions differ from manufacturer to manufacturer as well as between crane types. Deductions normally are: - Weight of main hook block Weight of slings and rigging Weight of auxiliary hook block Weight of all wire rope from boom tip and the block Weight of any stowed jib

Non-routine Lift	A lifting task that is of greater complexity than a routine lift, such that it requires specialist resources, guidance, and special procedures written to enable its safe completion. These lifts are normally subdivided into simple, complicated and complex lifts.
Operating Level	The level on which the operator stands.
Overload Testing (Static)	Operation of the lifting equipment with a load exceeding the rated load but without operating the full range of motions of the equipment in order to determine whether the equipment is stable, structurally sound and fit for the use for which it was designed.
Overload Testing (Dynamic)	Operation of the lifting equipment with a load that exceeds the rated load applied in order to determine whether the equipment is stable, structurally sound and fit for the use for which it was designed.
Pay Load	The weight of a load within a container.
Permanently Attached Slings Sets	Permanently Attached Slings Sets are used only for transportation of containers. They must not be used for general lifting duties. These slings are colour coded Purple.
Permissible Working Stress	The stress numerically equal to the basic stress, multiplied by the relevant duty factor corresponding to the load.
Performance Testing	Operation of each motion of the lifting equipment with the rated load applied in order to determine whether the equipment performs to the manufacturer's specification.
Person in charge of the lift (PIC)	Is the person, appointed by the production co-ordinator or site manager, who co-ordinates and controls all aspects of lifting operations on site.
Personnel Platform/Carriers	A Personnel Platform / Carrier is designed and intended to give access to a work place at height for personnel and their tools and equipment to carry out minor work or inspections at a limited time. The platform is not designed for the actual transfer of personnel or to be used as a hoisting or lifting tool.
Plant	Generic term covering, machines, sub-assemblies and structures.
Portable Lifting Equipment	Lifting equipment, which can be transported from one part of a worksite to another or between worksites. This category of equipment is usually supplied to a worksite for a period of six months whereupon it is returned, for inspection and replaced with identical items of equipment (chain blocks, pull lever hoists, beam clamps, Tirfor, etc)
Pre-use Inspection	A visual check and, if necessary, a function check of the Lifting Equipment by a competent person before each use. In determining the suitability and scope of the inspection, reference should be made to information such as manufacturer's instructions and relevant industry standards.
Proof Load Test	A test load (mass or force) applied to an item of lifting equipment/accessory to prove its integrity. Proof load tests can be carried out to various standards, but results must be recorded on a Test Certificate.
Pulley (or Sheave)	A grooved wheel over which a rope passes. Pulleys are usually shaft mounted and free to rotate in response to movement of the rope.

Radius (Slewing Cranes)	Horizontal distance between the point at which the centre of rotation meets the ground and the vertical centreline passing through the load lifting attachment
Radius (Non-Slewing Cranes)	Horizontal distance from the centreline through the load lifting attachment to the nearest axle or track measured at ground level.
Radius Indicator	A device that shows the radius at which the crane is operating and the corresponding rated capacity.
Range of Lift	The vertical distance that the bottom hook travels between the extended and highest positions.
Rated Capacity Limiter	A device that automatically cuts, with a specified tolerance, motions that could increase risks, if the rated capacity is exceeded.
Rated Capacity Indicator	See ASLI
Reeving	Configuration of the hoisting rope in a winching system.
Report of Inspection	A report of inspection is the report issued by the third party certification lifting engineer on completion of an unsatisfactory survey. The report of inspection shall contain all of the information as required by LOLER 98, Schedule 1.
Rigging Store	An ISO container, or similar, modified specifically to suit the storage of lifting equipment.
Routine Lifts	These are lifts involving loads of known or evaluated weight, shape and centre of gravity. The Routine Lift will be performed in normal environmental conditions (e.g. not in adverse weather) using standard rigging arrangements. Examples of Routine Lifts are loading/off-loading supply vessels and vehicles, moving grocery boxes, lifting re-bar, and delivering concrete by skip. They undertaken on a day-to-day basis that are fully addressed by existing 'generic' training and competence procedures.
Runway Beam/Monorail	An overhead structural beam certified to a specific SWL and used for the attachment of lifting equipment, such as trolleys, beam clamps, etc.
Safe Working Load (SWL) or Rated Capacity	The maximum load (as determined by a competent person) which an item of Lifting Equipment may raise, lower or suspend **under particular service conditions**, e.g. the SWL can be lower than, but can never exceed, the WLL. Normally SWL = WLL unless the Lifting Equipment has been de-rated.
Serving / Sizing or Whipping	The binding, in wire or twine, at the end of a rope to prevent the strands from opening or fraying.
Slinger	The person responsible for attaching and detaching the load to and from the crane and for correct selection and use of lifting tackle.
Sling Angle	The angle the sling makes with the horizontal. Maximum allowed is 90º included angle or 45º to the vertical.
Sling Assembly	A sling in the form in which it is actually used.
Soft Eye	An unsupported loop formed at the end of a rope to facilitate connection of a lifting device.
Snatch Block	A single pulley with a hinged side plate to allow easy access to the

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	pulley wheel for rope attachment.
Stinger	A single wire rope sling with an eye on one end and a hook on the other usually suspended from the crane's hook.
Structural Integrity	The reliability of the load bearing structure.
Statement of Conformity	A statement issued by the manufacturer confirming that any necessary manufacturing tests have been carried out, and confirming the SWL. The statement has the same status as a test certificate and must be retained for inspection when required.
Tag Line	A length of rope attached to the load and used to guide the load, being lifted, into the desired position
Tank Container	A container that consists of the tank or tanks, and the load bearing structure.
Tare	The weight of the container without cargo. Tare weight shall include all fixtures normally fixed to the container in service.
Technical Authority	The technical authority is responsible for assuring the technical integrity of an operational facility, in the context of this document this covers approval of this document, and deviations from this document.
Ton (T)	For the purposes of the lifting equipment management documents, one long ton shall be interpreted as 2240 pounds, which is 1016 kilograms.
Ton (short) or US Ton (T)	For the purposes of the lifting equipment management documents, one short ton shall be interpreted as 2000 pounds, which is 907.18 kilograms.
Ton (long) (T)	For the purposes of the lifting equipment management documents, one long ton shall be interpreted as 2240 pounds, which is 1016 kilograms.
Tonne / metric tonne (t)	For the purposes of the lifting equipment management documents, one tonne shall be interpreted as 1000 kilograms.
Test Certificate of Proof Load	A Test Certificate of Proof Load is the certificate of a proof load test, which would normally be carried out at the completion of manufacture and be supplied with the equipment. A new Test Certificate of proof load will require to be issued if the equipment is subject to repair or modification of any load bearing structure, or if the independent lifting engineer deems it is necessary to ensure continuing integrity.
Thimble Eye	A loop formed at the end of a rope around a supporting metal eye, i.e. the thimble.
Thorough Inspection	A visual Inspection by a lifting engineer or lifting tackle inspector, carried out carefully and critically, and supplemented by other means, such as measurement and where necessary non-destructive testing, in order to arrive at a reliable conclusion as to the condition and safety of the equipment. If necessary for the inspection, part of the equipment shall be dismantled.
Thorough Inspection of Lifting Equipment	An inspection and certification of lifting equipment carried out by a lifting engineer from an third party certification company in accordance with PDO's procedures and any subsequent amendments thereto. The inspection carried out by the lifting engineer shall carefully and critically, supplemented by other means, such as measurement and where necessary non-

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	destructive testing, in order to arrive at a reliable conclusion as to the condition and safety of the equipment. If necessary for the inspection, part of the equipment shall be dismantled. The lifting engineer shall be independent of the supplier of Lifting Equipment.
Toolbox Talk	Toolbox Talk, also known as 'Toolbox Meeting' is required to be carried out for all work with significant safety exposure. The Toolbox Talk must be done at the work site. It is the final check in the hazard assessment process and the start of the implementation of the work. The Toolbox Talk shall cover the work plan, the hazards, the controls, roles & responsibilities, and any recovery measures to be taken if the controls are not completely effective.
Uniform Load Method	A method of rating multi-legged slings for use at any included angle between the sling legs of up to 90° and 120°. The preferred method for rating general-purpose slings is in accordance with ISO 7531.
Velocity Ratio	The ratio between the velocities of a chain block hand chain and the load. It is equivalent to the number of metres of hand chain overhauled to raise the load a distance of one metre.
Wind Load	The forces produced by the velocity of the wind, which is assumed to act horizontally.
Webbing	A part of a flat lifting sling, comprising a woven narrow fabric, generally of a coarse weave and multiple plies, the prime function of which is load bearing.
Whipping	See Serving.
Working Load Limit (WLL)	The maximum load, determined by the manufacturer, which an item of Lifting Equipment is designed to raise, lower or suspend. Some standards and documents refer to WLL as the 'maximum SWL'.

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Appendix 2: Applicable Documents

The following internationally-recognized authorities and/or (inter)national standards and/or PDO documents are applicable for lifting and hoisting operations. **Please note that round textile slings are not allowed within PDO's Well Engineering Department.**

Category	Applies to	PDO Document	International Standard
Inspection/Certification	Lifting Tackle and - Appliances	Procedure PR-1708 Inspection, testing and certification	
Inspection/Certification	Cranes	Procedure PR-1708 Inspection, testing and certification	
Inspection/Certification	Mechanical Handling	Procedure PR-1708 Inspection, testing and certification	
Inspection/Certification	Containers	Procedure PR-1708 Inspection, testing and certification	
Inspection/Certification	Test Weights	Procedure PR-1708 Inspection, testing and certification	
Maintenance Operation	Cranes		API RP2D BS 7121
Design and Procurement Maintenance Operation	Swing Jib Cranes		BS 7333 BS EN 14985
Design and Procurement Maintenance Operation	Overhead Traveling Cranes		ASME B30.11 & B30.16 & B30.17 & B30.2 BS 466-1984 BS EN 14492
Design and Procurement Maintenance Operation	Mobile Cranes	Road Transport Manual SP2000	BS EN 13000 BS EN 13586 Access BS 7121 Pt 1,2 & 3 BS 5744 –1979
Design and Procurement Maintenance Operation	Chain Blocks		ASME B30.16 JIS B 8802 BS EN 13157 BS EN 14492

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Maintenance Operation	Rope Blocks		BS EN 13157
Design and Procurement Maintenance Operation	Winches		ASME B30.7 BS EN 14492-1
Maintenance Operation	Fork Lift Trucks	Road Transport Manual SP2000	BS 5639 Pt 1 BS ISO 2330 BS ISO 5057
Design and Procurement Maintenance Operation	Pallet Trucks		BS EN ISO 3691 - 5
Design and Procurement Maintenance	Containers		BS EN 12079-1
Design and Procurement Maintenance Operation	Mobile Elevated Work Platforms		BS ISO 16368 BS ISO 16653 BS EN 280 BS ISO 18893 IEC 61057 IEC-TS 61813
Design and Procurement	Textile Slings - Flat		BS EN 1492-1
Design and Procurement	Textile Slings - Round (see note above)		BS EN 1492-2
Design and Procurement	Wire Rope Slings		ISO 8792, ISO 8793, ISO 8794 BS EN 13414-1 ISO 7531 ASME B30.9
Design and Procurement	Steel Wire Ropes		BS EN 12385 API Spec 9A ISO 10425
Design and Procurement	Lifting Components for Steel wire Rope Slings		BS EN 1677 BS EN 13411-2
Design and Procurement	Short Link Chain for Lifting Purposes (Non Calibrated)		BS EN 818
Design and Procurement	Chain Slings - Grade T (Metric)		BS EN 818
Design and Procurement	Chain Slings - Grade T (Imperial)		ASTM A 391

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Design and Procurement	Lifting Components for Grade T Chain Slings		BS EN 1677
Design and Procurement	Shackles (Metric) Shackles (Imperial)		BS EN 13889 BS 3551
Design and Procurement	Collared Eyebolts (Metric) Collared Eyebolts (Imperial)		EN ISO 3266 ASTM A489 ASTM A 153 (zinc coating)
Design and Procurement	Thimbles for Wire Rope		BS EN 13411-1
Design and Procurement	Rigging Screws and Turnbuckles		BS 4429
Design and Procurement	Hoist or Sling Hooks		BS EN 1677
Design and Procurement	Wire Rope Grips		BS EN 13411-5
Design and Procurement	Wedge Sockets		BS EN 13411-6
Design and Procurement	Monorails		BS 2853 BS EN 1993-6
Design and Procurement	Manual and Hydraulic Jacks		BS EN 1494
Design and Procurement	Man basket		BS EN 14502-1

Alternative Standards and Authorities

American National Standards Institute	ANSI
American Petroleum Institute	API
American Society of Mechanical Engineers	ASME
Australian Technical Standards	ATS
Australian / New Zealand Standards	AS/NZ
British Standards Institute	BSI
Canadian Technical Standards	CTS
Code of Federal Regulations	CFR
The Provision and Use of Working Equipment Regulations	UK PUWER
Lifting Operations and Lifting Equipment Regulations	LOLER
European National Standard	En
International Standards Organization	ISO
Occupational Safety and Health Administration	OSHA

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Appendix 3a: Roles and Responsibilities

Position	Responsibilities
UEQ	Provide resources for the preparation and maintenance of Code of Practice, procedures, specifications and guidelines necessary for safe operation of lifting equipment.
Lifting engineer UEQ/3	Develop and maintain lifting equipment standards and procedures Verify that operators comply with Code of Practice, procedures, specifications and guidelines for lifting equipment Verify nomination of a Competent Authorised Person for each work site Participate in investigations of lifting equipment incidents
Lifting Engineer (Surveyor)	Inspect and certify lifting equipment
Lifting Inspector	Undertake inspection and certification of lifting tackle in accordance with this procedure
NDT Inspector	Undertake all types of NDT as required by this procedure or as requested by the surveyor
Contracts department	Verify that contractors comply with all PDO lifting equipment requirements as regards documentation Liaise with the lifting engineer
Supplies department receipts	Arrange inspection of new equipment Arrange inspection of containers in service Ensure that contracting companies adhere to PDO lifting equipment requirements Ensure that mobile cranes, forklifts and containers are used safely Ensure proper storage and protection of lifting equipment at site.
Store or yard	Ensure that mobile cranes and forklifts are used safely Maintain forklift logbooks Ensure containers can be traced Ensure that lifting tackle is correctly stored

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Engineering	Design new lifting equipment according to PDO requirements Design modifications to existing lifting equipment Ensure lifting equipment is included in the scope of new projects Liaise with the lifting engineer
Field operations, Production co-ordinator or Site manager	Ensure safe operation of lifting equipment Appoint Competent Authorised Person for lifting equipment Appoint the Person-in-Charge (PIC) for each lifting operation Ensure a lifting equipment register is maintained Liaise with the lifting engineer
Maintenance	Ensure implementation of lifting equipment maintenance plans Provide maintenance reports and electrical integrity report to lifting equipment inspectors prior to inspection Monitor maintenance activities as documented in SAP Ensure that colour coding is correctly applied to inspected items Maintains records of qualified personnel Liaise with lifting engineer
Procurement	Ensure that PDO lifting equipment requirements are incorporated in contracts Liaise with lifting engineer
Safety department	Analyse data on lifting equipment incidents Provide information on accident prevention Liaise with the lifting engineer
Lifting equipment asset custodian All locations	Ensure all items of lifting equipment are maintained and certified in accordance with this procedure. Take care that the lifting equipment is cleaned prior to the inspection, test weights are available and after satisfactory results of the inspection the lifting equipment is marked/color coded. Nominate Competent Authorised Person for relevant location.

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Competent Authorized Person (CAP) All locations	Control lifting equipment at relevant location Ensure that lifting equipment identification is maintained Maintain lifting equipment records and advise of any non-conformities Monitor the condition of lifting equipment at the relevant location Coordinate and organize inspection and certification work at site Liaise with lifting engineer
Crane operator	Control the crane operations Perform pre-use crane inspections Maintain crane operation logbook
Powered industrial truck operator (forklifts)	Perform a pre-operational check to demonstrate operational readiness of the truck Ensure the equipment is within inspection and testing intervals by examination of the periodic re-certification tags and/or documentation Adhere to all tags on the controls Drive at speeds appropriate for the existing conditions (space, load, lighting, surface conditions, etc.) and at or below posted limits Ensure other personnel are not in the swing radius prior to performing turning manoeuvres
Banks man / Signaller	Co-ordinate the lifting movements and maintains radio- and/or visual communication with crane operator and persons close to the load Participate in JHA/risk assessment for the lift Should not get involved as Rigger when also performing the role of a Banks man.
Slinger /Rigger	Inspect the rigging, select rigging to suit the load, install the equipment Connect/disconnect the load and participates in *JHA*/risk assessment for the lift
Mobile aerial platform operator	Duly complete all required operation logs, pre-use inspection procedures and checks Performs a pre-operational check to demonstrate operational readiness Assess the stability of the ground and environmental conditions are within operating procedures; and tests the communication system Verify that the lifted personnel wear the required PPE for the lift
Person in charge of the lift (PIC)	Co-ordinate and control all aspects of lifting operations on site

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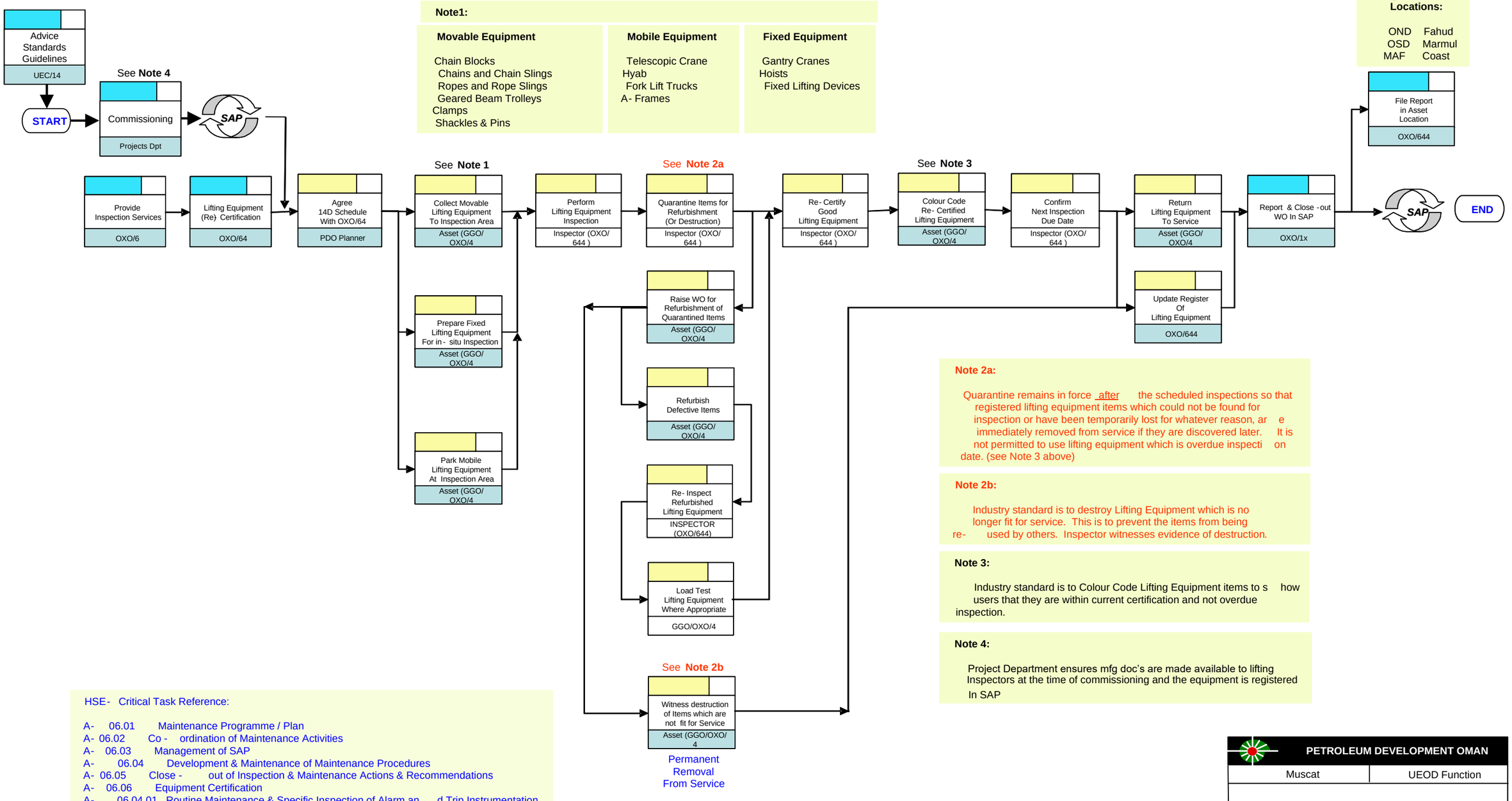
Lifting Equipment maintainer	Ensures technical integrity

Appendix 3b: Roles and Responsibilities in Maintenance / Inspection Process



Note1:

Movable Equipment	Mobile Equipment	Fixed Equipment
Chain Blocks Chains and Chain Slings Ropes and Rope Slings Geared Beam Trolleys Clamps Shackles & Pins	Telescopic Crane Hyab Fork Lift Trucks A- Frames	Gantry Cranes Hoists Fixed Lifting Devices

Inspection Files Locations:

OND Fahud
OSD Marmul
MAF Coast

Note 2a:

Quarantine remains in force after the scheduled inspections so that registered lifting equipment items which could not be found for inspection or have been temporarily lost for whatever reason, are immediately removed from service if they are discovered later. It is not permitted to use lifting equipment which is overdue inspection date. (see Note 3 above)

Note 2b:

Industry standard is to destroy Lifting Equipment which is no longer fit for service. This is to prevent the items from being re- used by others. Inspector witnesses evidence of destruction.

Note 3:

Industry standard is to Colour Code Lifting Equipment items to show users that they are within current certification and not overdue inspection.

Note 4:

Project Department ensures mfg doc's are made available to lifting Inspectors at the time of commissioning and the equipment is registered In SAP

HSE- Critical Task Reference:

A- 06.01 Maintenance Programme / Plan
A- 06.02 Co - ordination of Maintenance Activities
A- 06.03 Management of SAP
A- 06.04 Development & Maintenance of Maintenance Procedures
A- 06.05 Close - out of Inspection & Maintenance Actions & Recommendations
A- 06.06 Equipment Certification
A- 06.04.01 Routine Maintenance & Specific Inspection of Alarm and Trip Instrumentation
A- 06.04.02 Routine & Specific Maintenance of Alarm and Trip Instrumentation
A- 06.04.03 Testing of Instrument Trips & Alarms
A- 06.06.01 Routine Maintenance & Specific Inspection of Lifting Devices & Equipment
A- 06.06.02 Routine & Specific Maintenance of Lifting Devices & Equipment

Location INTERIOR | COAST | EXTERNAL

PETROLEUM DEVELOPMENT OMAN	
Muscat	UEOD Function
Lifting Equipment (Re)- Certification	
Revision : 2	Date : June 2010
Produced By : UEC/14	Dwg . No: SE 8a(ii)

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Appendix 4: Training and Competency Requirements

Position	
Crane operator	• Be at least 21 years old • Shall hold the appropriate and valid ROP vehicle driving license and PDO vehicle driving permit. • Have passed an approved crane operator's training course / assessment, appropriate to the type and capacity of crane he will be required to operate. • Have passed a rigging and slinging training course / assessment approved by PDO • Have a minimum of 1 year experience as a crane operator and a minimum of 50 hours operating the type of crane to be used in the operation. • Be physically fit to operate a crane, demonstrable by a medical certificate • Be fluent in spoken and written Arabic and/or English
Powered industrial truck operator (forklifts)	• Be at least 21 years old • Shall hold the appropriate and valid ROP vehicle driving license and PDO vehicle driving permit. • Have passed an approved fork lift truck driver training course / assessment appropriate for the equipment to be used. The training must comprise practical instruction / examination. • Be physically fit to drive a fork lift truck, demonstrable by a medical certificate. • Be fluent in spoken and written Arabic and/or English
Banks man / Signaller	• Be at least 21 years old • Have passed a rigging and slinging course approved by PDO • Have a minimum of 1 years experience as a rigger and slinger. • Be physically fit to undertake the Banks man duties (including vision/hearing irt signaling) • Be fluent in spoken and written Arabic and/or English
Slinger / Rigger	• Be at least 21 years old, unless working under the direct supervision of a competent person; • Have passed a rigging and slinging training course approved by PDO • Be physically fit to undertake the duties of a rigger or slinger, demonstrable by a medical certificate.
Mobile aerial platform operator	• Be at least 21 years old • Have passed an approved mobile aerial platform operator's training course / assessment, appropriate to the type of lifts involved, including practical examination • Have a minimum of 1 year experience as a mobile aerial platform operator and a minimum of 50 hours operating the platform • Be physically fit to operate a mobile aerial platform, demonstrable by a medical certificate • Be fluent in spoken and written Arabic and/or English

Crawler side boom tractor operator	• Be at least 21 years old • Have passed a side boom operator course / assessment approved by PDO • Be physically fit to operate crawler side boom tractor, demonstrable by a medical certificate • Be fluent in spoken and written Arabic and/or English
Person in charge of the lift (PIC)	• Be at least 21 years old. • Have a minimum of 3 years experience in an engineering discipline in the oil and gas industry. For PIC-Rig Moves: min. 3 years experience in Rig Moving as Foreman or (Assistant) Rig Move Supervisor. For PIC Yard Operations: min. 3 years experience in Yard operations as Foreman, (Assistant) Yard Supervisor or qualified for PIC-Rig Moves. • Be familiar with “Procedure for Lift planning” PR-1709 • Have passed a rigging and slinging training course / assessment, approved by PDO. • Be fluent in spoken and written Arabic and/or English
Lifting Equipment maintainer	• Be at least 21 years old. • Have a minimum of 3 years experience in an engineering discipline in the oil and gas industry. • Be familiar with maintenance requirements on all types of lifting equipment to be maintained •Be familiar with “Procedure PR-1708 for Lifting Equipment Inspection, Testing and Certification”. • Have passed a rigging and slinging training course / assessment, approved by PDO. • Be fluent in spoken and written Arabic and/or English
Competent Authorized Person	• Be at least 21 years old. • Have a minimum of 3 years experience in an engineering discipline in the oil and gas industry. • Be familiar with “Procedure for Lifting Equipment Inspection and Certification PR-1708.”. • Have passed a rigging and slinging training course approved by PDO. • Be fluent in spoken and written Arabic and/or English
Lifting Inspector	• Have ONC or City & Guilds in mechanical engineering • Qualified as a competent Person by LEEA or equivalent. • Have a minimum of 5 years experience in inspection of lifting equipment. • Shall hold the appropriate and valid ROP vehicle driving license and PDO vehicle driving permit. • Be familiar with “Procedure PR-1708 for Lifting Equipment Inspection, Testing and Certification”. • Be fluent in spoken and written Arabic and/or English. • Be physically fit to undertake the lifting inspector duties
Lifting Engineer	• Have HND or BSc in mechanical engineering. • Qualified as a competent Person by LEEA or equivalent. • Have a minimum of 10 years experience in inspection/certification services for lifting equipment. • Shall hold the appropriate and valid ROP vehicle driving license and PDO vehicle driving permit. • Be familiar with (Inter) national Standards and PDO’s procedures. • Be fluent in spoken and written Arabic and/or English. • Be physically fit to undertake the lifting engineer duties

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Appendix 5: Design, Test, Certification and Inspection Matrix

Lifting equipment a.o.	*PROOF LOAD TESTING*					*PERIODIC EXAMINATION REQUIRED*						*DOCUMENTATION REQUIREMENTS*						*DESIGN FACTORS*					
	Proof load					Inspection records formally kept of equipment condition												*These may vary slightly dependent on manufacturers*					
	% Above SWL				MGW X 2.5	Pre-use	*MONTHS*					Certificate of Conformity/test	Destruction Sample Certificate	Calibration Certificate	Stress Calculations	Full Fabrication Package	Other	2:1	3,5:1	4:1	4,5:1	5:1	8:1
	10	25	50	100			6	12	24	36	48												
(Offshore) pedestal cranes		X				V		V			L	X				X	X						
Overhead-, Gantry Cranes		X				V		V			L	X				X	X						
Chain blocks			X			V	V				L	X					X					X	
Manual Lever Hoists			X			V	V				L	X					X			X			
Wire Rope Hoists (Tirfors)				X		V	V				L	X					X			X			
Personnel Hoists	X					V	V	L				X											X
Winches		X				V	V				L	X										X	
Mobile Cranes, side booms & Derricks	X					V		V			L	X					X		X				
Jacks			X			V	V				L	X					X						
Fabricated padeyes				X		V	V				L	X			X	X	X						
Mobile work platforms (personnel lifting)	X					V	V	L				X										X	
Hooks				X		V	V					X					X			X			
Beam Trolleys			X			V	V				L	X					X					X	
Beam-, Plate Clamps				X		V	V					X					X					X	
Sheave Blocks			X			V	V				L	X					X					X	
Powered Industrial Truck (Forklift)	X					V	V				L	X					X						
Shackles				X		V	V					X					X					X	
Eyebolts				X		V	V					X					X			X			
Turnbuckles				X		V	V					X					X			X			
Wire Rope Slings				X		V	V					X										X	
Man Made Fibre Slings				X		V	V					X											
Chain Slings				X		V	V					X											
Below Hook Lifting Devices (eg spreader bars)				X		V	V					X				X	X					X	
(Offshore) Containers (including					X			V			L	X				X	X	X					
Man baskets			X			V	V	L				X				X	X						X

notes:

V = Thorough Inspection

L = Load Test

Other =for example MPI report

Listing is not comprehensive and for guidance only. Check Procedure PR-1708 Insp/test/cert for details

Proofloads indicated are for guidance only. Check PR-1708 for details, especially for loads above 10t

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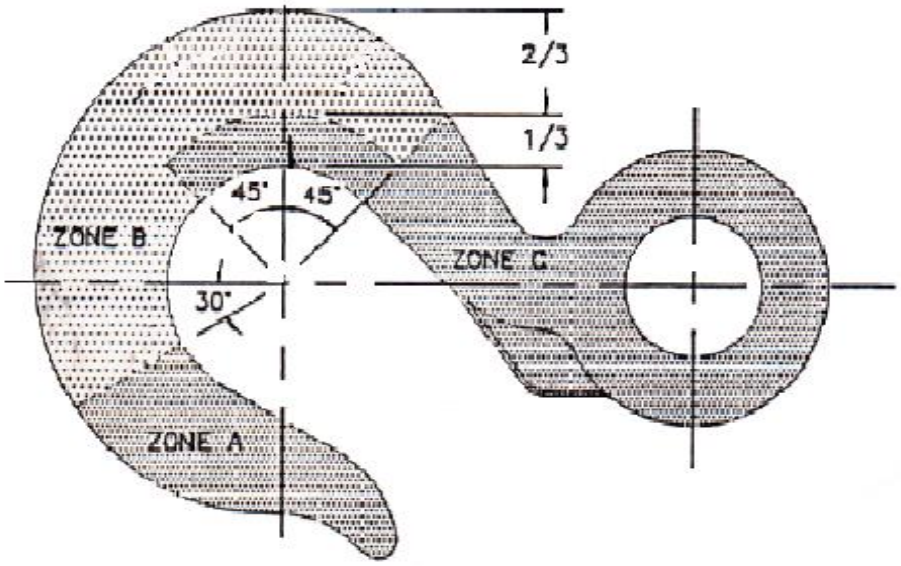
Appendix 6: Hook Stress Zones



For zone A worn more than 15% of original thickness.

For zone B worn more than 10% of original thickness.

For zone C worn more than 5% loss of original thickness.

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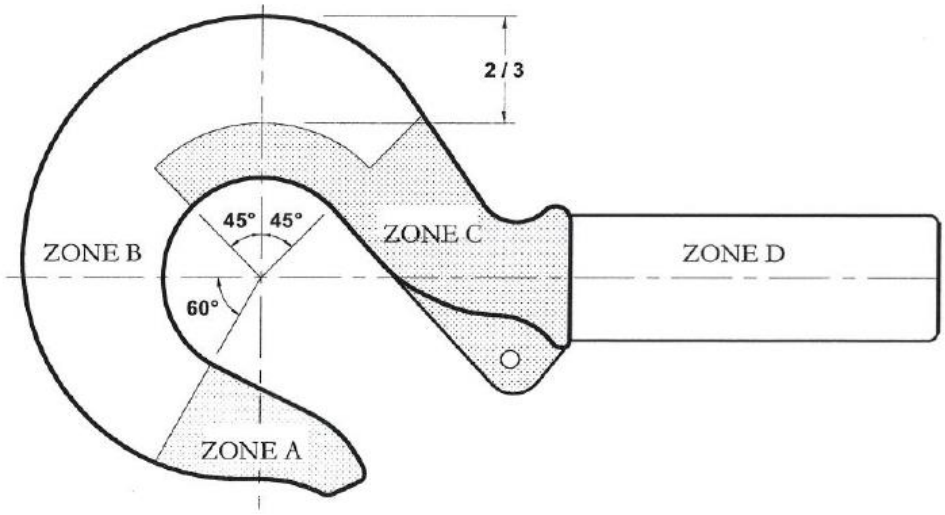

For zone A worn more than 15% of original thickness.

For zone B worn more than 10% of original thickness.

For zone C worn more than 5% loss of original thickness.

For zone D minimum thread size and/or 8% loss of original diameter

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Appendix 7: Proof load tables

PROOF LOADS FOR LIFTING ACCESSORIES (Chapter 5)

Equipment type	Proof Load All SWL's	Proof Load SWL ≤ 25 t	Proof Load SWL ≥ 25 t	Applicable Standards
Beam clamps				
Plate clamps		2 x SWL	1.22 x SWL + 20 t	Cl.Soc. Rules
Single leg wire rope slings handsplice	1.25 x SWL			ISO 7531
Multi leg wire rope slings handsplice	Each leg 1.25 x SWL			ISO 7531
Single leg wire rope slings mech. splice	2 x SWL			ISO 7531
Multi leg wire rope slings mech. splice	Each leg 2 x SWL			ISO 7531
All chainslings Gr.8 (T)	Each leg 2 x SWL			CEN 818-4
All synthetic slings	Each leg 2 x SWL			BS EN 1492-1
Master links		2 x SWL	1.22 x SWL + 20 t	Cl.Soc. Rules
Rigging screw	2 x SWL		BS 4429	
Lifting caps	2 x SWL		BS 4278	
Shackles	2 x SWL		BS 3551	
Eyebolts	2 x SWL		BS 4278	
Swivels		2 x SWL	1.22 x SWL + 20 t	Cl.Soc. Rules
Hooks and hook blocks		2 x SWL	1.22 x SWL + 20 t	Cl.Soc. Rules

PROOF LOADS FOR CRANES (Chapter 6)

Equipment type	Proof Load All SWL's	Proof Load SWL < 25 t	Proof Load SWL ≥ 25, < 50 t	Proof Load SWL ≥ 50 t	Applicable Standards
(Offshore) Pedestal crane		1.25 x SWL	SWL + 5 t	1.1 x SWL	API 2D : 1999
Overhead crane/ structure	1.25 x SWL				BS 7121 Pt.2
Mobile crane	1.1 x SWL				
Truck loading crane	1.25 x SWL				BS 7121 Pt.2
Gantry crane	1.25 x SWL				BS 7121 Pt.2
Pillar and wall cranes	1.25 x SWL				BS 7333

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PROOF LOADS FOR APPLIANCES (Chapter 7)

Equipment type	Proof Load	Proof Load	Proof Load	Proof Load	Proof Load	Proof Load	Proof Load	Applicable Standards
	All SWL's	SWL < 10 t	SWL ≥ 10, < 20 t	SWL ≥ 20 t	SWL < 25 t	SWL ≥ 25, < 160 t	SWL ≥ 160 t	
Powered hoists		1.5 X WLL	WLL + 5 t	1.25 X WLL				BS7121 Pt 2
Manual hoists (chain blocks)		1.5 X WLL	WLL + 5 t	1.25 X WLL				BS 3243
Lever hoists (pull lifts)	1.5 X WLL							BS 4898
Wire rope hoists (Tirfors)	2 X WLL							Manufacturer
Beam trolleys		1.5 X WLL	WLL + 5 t	1.25 X WLL				Cl. Soc. Rules
Sheave blocks					1.5 X WLL	WLL + 5 t	1.25 X WLL	Cl. Soc. Rules
Snatch blocks					1.5 X WLL	WLL + 5 t	1.25 X WLL	Cl. Soc. Rules
Gin wheel					1.5 X WLL	WLL + 5 t	1.25 X WLL	Cl. Soc. Rules
Powered winch	1.25 X WLL							BS 3701
Manual winch	1.25 X WLL							BS 3701
Monorails & pad eyes	2 X WLL							BS2853
Manual jacks	1.5 X WLL							BS EN 1494
Hydraulic jacks	1.5 X WLL							BS EN 1494

PROOF LOADS FOR MECHANICAL HANDLING EQUIPMENT (Chapter 8)

Equipment type	Proof Load	Applicable Standards
	All SWL's	
Forklift trucks	1.1 X WLL	BITA [2]
Pallet trucks	1.1 X WLL	BITA [2]
Excavator	1.1 X WLL	BS 7121 Pt.2
Mobile work platforms	1.1 X WLL	BS EN 280

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PROOF LOADS FOR CONTAINERS AND LIFTING BEAMS (Chapter 10)

Equipment type	Proof Load All SWL's	Proof Load SWL <10 t	Proof Load SWL ≥ 10, < 160 t	Proof Load SWL ≥ 160 t	Applicable Standards
Lifting beams		2 X WLL	1.04 X SWL + 9.6 t	1.1 X SWL	Cl. Soc. Rules
Containers	2.5 X MGW – TARE				BS EN 12079

Note: -

1. Where no international standard exists, then proof loads quoted were based on Classification Society Rules such as Bureau Veritas, Germanischer Lloyds etc.

2. BITA is the abbreviation for British Industrial Truck Association.

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Appendix 8: Service life extension of Mobile cranes

The owner of a mobile crane who wishes to extend the service life of his crane may apply for an extension by submitting to PDO's Technical Authority a "Proposal for Extension of Service Life of a Crane". This proposal shall comprise:

A Case proposal;

An Inspection and Testing Report;

A Final Assessment and Recommendation Report.

The owner of the mobile crane shall prepare the Case Proposal. The owner shall engage an Independent Third Party Certification Company to carry out the inspection, arrange for testing, conduct an assessment, recommendations on the estimated remaining service life and propose an inspection / maintenance scheme.

The elements of the Assessment Procedures are outlined as follows:

Elements of the Assessment Procedures for Extension of Service Life of a Crane	To be performed by
I. Case proposal: Part 1 of the Case proposal is a written record of the crane detailing the following: Usage patterns (e.g. number of operating cycles per hour at certain loading condition); Records of any past accidents, failures, defects that could affect the structural integrity of the crane, and replacement carried out; Records of maintenance carried out; Possible modes of failure. Part 2 of the Case Proposal consists of a proposed scheme to evaluate the remaining service life of the crane and shall include the following: The methodology and assessment employed including testing and inspection to be carried out to address the potential fatigue stresses experienced by the crane; and the acceptance criteria adopted. The criteria shall be based on an acceptable code and standard such as British Standard 7910; "Guide on the methods of assessing the acceptability of flaws in fusion welded structures" and any other codes / standards acceptable to PDO's Technical Authority.	Owner (can be assisted by an Independent Third Party Certification Authority)
II. Inspection of the mobile crane: The inspection of the mobile crane shall be carried out in a suitable testing environment and shall include but not limited to the following: A thorough visual inspection shall be carried out on the mobile crane. Critical load bearing parts such as the boom section and areas that are not accessible during the annual inspection shall be dismantled to facilitate the inspection. Welding at critical load bearing parts (e.g. hinges) shall be inspected and any defects shall be recorded. Direct a Non-Destructive Testing company to conduct the necessary testing such as NDT and / or mechanical testing.	Independent Third Party Certification Authority

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III. Non-Destructive Testing and Mechanical Testing: The following load bearing parts shall be tested using an appropriate testing method to ascertain its mechanical integrity: Main Jib/Boom Fly Jib and / or other attachments; and Slew rings Hook Blocks Wire ropes, etc The Independent Third Party Certification Authority may specify other parts of the cranes to be tested if it has reason to believe that there are possible defects, which can only be detected by NDT.	Non-Destructive Testing Company
IV. Inspection and Testing Report : At the end of the inspection and testing, a report shall be prepared and shall include the following details: □General condition of the crane based on the visual inspection; □Location where visible defect/s was/were found; □Method/s of Non-Destructive Testing used; □Description of the types of flaws detected (with photographs attached) □Recommend any corrective actions to be carried out on the crane.	Independent Third Party Certification Authority
V. Assessment The Independent Third Party Certification Authority shall thereafter review the results of the inspection and testing based on the proposed methodology and assessment carried out on the mobile crane and carry out, if his professional experience and judgment think it necessary, a stress analysis on critical locations of the crane.	Independent Third Party Certification Authority
VI. Recommendations The Independent Third Party Certification Authority shall then recommend an estimated remaining service life for the crane based on his professional experience, and the possible failure mode and mechanism stipulated in the Case Proposal. The Independent Third Party Certification Authority shall also propose an inspection / maintenance scheme for the crane for the extended service life, so that any defects or deterioration in the crane can be detected and actions can be taken to remedy any unsafe situation before the mechanical integrity of the crane is affected.	Independent Third Party Certification Authority
VII. Final Report At the end of the assessment, the Independent Third Party Certification Authority shall furnish a report to PDO's Technical Authority, submitted through the owner of the crane. The report shall detail the results of the Assessment and Recommendations as outlined above and shall be duly endorsed by the Independent Third Party Certification Authority. This final report will be used as a supporting document by the owner to apply to PDO's Technical Authority for the extension of the service life of the mobile crane.	Independent Third Party Certification Authority

IMPORTANT NOTES

The Independent Third Party Certification Authority and the testing agency appointed under Section III Non-Destructive Testing and Mechanical Testing shall be Independent of each other.

The crane shall meet the requirements as stipulated in the PDO's Lifting and Hoisting Procedure for Inspection, Testing and Certification.

The extended service life of the mobile crane if granted will be for a period not exceeding 3 years. An owner of a crane who wishes to extend further the service life of the crane is required to carry out another assessment.

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