



RP 38-3

INSPECTION AND MAINTENANCE OF OFFSHORE PEDESTAL CRANES AND ANCILLARY EQUIPMENT

June 1992

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SCOPE AND PURPOSE This Recommended Practice gives guidance in the form of check lists for maintaining offshore pedestal cranes and ancillary equipment to safe operational levels. It's purpose is the recommendation of procedural checks to be carried out at periodic intervals to enable the identification. and remedy of any deficiencies which could reduce the capability and operational safety of the crane.											
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CONTENTS

Section	Page
FOREWORD	iv
1. INTRODUCTION.....	1
1.1 Scope	1
1.2 Application	1
2. INSPECTION CLASSIFICATION.....	1
2.1 Initial Inspection	1
2.2 Regular Inspection.....	2
2.3 Annual Inspection	2
2.4 Deficiencies Arising from Inspection	2
2.5 Inspection Records	2
3. NDT INSPECTION.....	3
4. TRAINING AND RULES OF MAINTENANCE AND OPERATING STAFF....	3
4.1 Platform Maintenance Staff.....	3
4.2 Crane Manufacturers Staff	4
4.3 Crane Driver.....	4
5. ROPES.....	5
5.1 Running Ropes	7
5.2 Pendant Ropes.....	9
5.3 Other Ropes	9
6. WINCH DRUMS	9
7. WINCH BRAKES/CLUTCHES.....	11
8. HOOK AND HOOK BLOCKS.....	12
9. SLEW DRIVE BRAKES/CLUTCHES.....	13
10. PRIMARY LOAD PATH ELEMENTS.....	14
10.1 Slewing Bearing and Fasteners	14
10.2 Pedestal Adapter.....	16
10.3 Booms.....	17
10.4 'A' Frame	19
10.5 Machinery Bed Structure	20
11. PRIME MOVERS.....	20
11.1 Diesel Drivers	20
11.2 Electric Motors.....	23



12. PNEUMATIC SYSTEMS.....	24
13. POWER TRANSMISSION SYSTEM	25
14. HYDRAULIC SYSTEMS.....	27
15. MACHINERY HOUSING.....	29
16. DRIVERS COMPARTMENT	29
17. ACCESS/EGRESS	31
18. SAFETY DEVICES	31
18.1 Safe Load Indicator (SLI).....	32
18.2 Gross Overmoment (Overload) Protection System (GOP).....	32
18.3 Emergency Load Release	34
18.4 Boom-Out Inhibit	35
18.5 Overhoist Limits	36
18.6 Overlower Limit	37
18.7 Maximum and Minimum Radius Cut-Outs/Limits.....	37
18.8 Emergency Stop	38
18.9 Engine Overspeed Shut-Down	39
18.10 Slack Rope Preventers/Indicators	40
18.11 Slew Limits	41
18.12 Pendulum Type Radius Indicator.....	42
18.13 Wave Following.....	42
18.14 Rope Temperature Sensors	43
18.15 Wind Speed Indicator/Wind Direction Indicator (Windsock)	43
18.16 Fire Extinguisher and Life Jacket.....	43
18.17 Fire and Gas Systems	43
19. ELECTRICAL - GENERAL	44
20. BOOM CAGES (REFER ALSO TO SECTION 10.3.3)	45
21. ANCILLARY LIFTING EQUIPMENT.....	46
22. OVERLOADS	47
23. STORAGE OF SPARES.....	49
24. LOAD TESTING	50
25. CERTIFICATION	52
APPENDIX A.....	53
DEFINITIONS AND ABBREVIATIONS	53



APPENDIX B.....	54
LIST OF REFERENCED DOCUMENTS.....	54



FOREWORD

Introduction to BP Group Recommended Practices and Specifications for Engineering

The Introductory volume contains a series of documents that provide an introduction to the BP Group Recommended Practices and Specifications for Engineering (RPSEs). In particular, the 'General Foreword' sets out the philosophy of the RPSEs. Other documents in the Introductory volume provide general guidance on using the RPSEs and background information to Engineering Standards in BP. There are also recommendations for specific definitions and requirements.

Value of this Recommended Practice

This Recommended Practice recommends procedural checks and maintenance activities to obviate potential hazards arising from the use of offshore cranes and ancillary equipment.

There is no other published representative document covering the scope of this Recommended Practice.

Application

Text in *italics* is commentary. Commentary provides background information which supports the requirements of the Recommended Practice, and may discuss alternative options.

This document may refer to certain local, National or International regulations but the responsibility to ensure compliance with legislation and any other statutory requirements lies with the user. The user should adapt or supplement this document to ensure compliance for the specific application.

Feedback and Further Information

Users of BP RPSEs are invited to submit any comments and detail experiences in their application, to assist in their continuous improvement.

For feedback and further information, please contact Standards Group, BP Engineering or the Custodian. See Quarterly Status List for contacts.



1. INTRODUCTION

1.1 Scope

This Recommended Practice provides guidelines to Operators for maintenance of Pedestal Cranes and Ancillary Equipment to safe operational levels.

These maintenance practices identify:-

- (a) Deficiencies which could reduce the capability and operational safety of the crane.
- (b) Actions required to correct deficiencies to maintain good operational capability.

It is envisaged that this Recommended Practice will assist Operators in development of their own Inspection and Maintenance schedules according to their specific equipment and its location and operational use. Where established Inspection and Maintenance schedules are in place, the Operator may use this Recommended Practice to support or complement such schedules as appropriate.

It is expected that the crane and its elements, particularly those of high utilisation such as prime mover, gearboxes, pumps, motors etc. would be maintained on the basis of condition. The frequency of Inspection and levels of Maintenance stated in this Recommended Practice are for guidance only.

1.2 Application

This Recommended Practice takes the form of check lists which provide simple definitions and allows for easy use. The check lists are supported by commentary shown in *italics*, which gives where necessary an expanded definition and reasons for implementation. Where applicable, the operator should accommodate any periodic examination of the crane or its components required by regulations or third party inspectors to ensure compliance with legislation and any other requirements.

2. INSPECTION CLASSIFICATION

2.1 Initial Inspection

Prior to first time use, new cranes shall be inspected by a qualified inspector to levels of compliance required by the crane manufacturer



and to the relevant sections of the RP. For certification requirements refer to Section 25.

2.2 Regular Inspection

2.2.1 For cranes in regular service, the inspection intervals are dependant upon the nature of the cranes components or systems and of the degree of their exposure to wear, deterioration or malfunction and of the consequences to operational safety. Two inspection categories have been assigned herein viz 'frequent' and 'periodic'.

- (a) Frequent inspection - visual daily to monthly intervals
- (b) Periodic inspection - at stated intervals which shall include daily and monthly inspection.

2.3 Annual Inspection

2.3.1 Each crane shall be inspected fully every 12 months by a qualified inspector, whereby all remedial work will be identified and cleared prior to issue of an inspection certificate. Annual inspection shall include regular inspection schedules.

2.4 Deficiencies Arising from Inspection

2.4.1 All deficiencies arising from inspections shall be carefully examined for impairing safe operation. In such instances the crane shall be taken out of service or its operation limited to remove the unsafe condition. 'CAUTION' notices shall be positioned at the control cabin and at the prime mover as appropriate.

2.4.2 Where cranes have been subjected to major repair or modification to either structural members or to the main functional services, the cranes shall be thoroughly inspected and function/load tested by a qualified inspector (refer to section 24 - Load Testing).

2.5 Inspection Records

2.5.1 Inspection details which include reports as well as records of repairs and modifications carried out on the cranes shall be dated and signed for monthly, quarterly and annual inspection. These records shall be kept readily available by the operator.

2.5.2 Cranes Not In Regular Use:-



Cranes which have been idle for a period of one month up to six months, shall be inspected according to the periodic requirements of 2.2.1 (b).

- 2.5.3 Cranes which have been idle for a period of 6 months shall be given a complete inspection according to the requirements of 2.3.1.

3. NDT INSPECTION

NDT examination of weldments referred to in this Recommended Practice should be in accordance with recognised inspection and acceptance standards such as [ANSI/AWS D1.1](#).

The extent of examination is as follows:-

- (a) All welds should be visually inspected.
- (b) All fillet welds to be subjected to 100% Magnetic Particle Inspection.
- (c) On Primary load carrying structures, all butt welds to be 100% inspected by radiography or ultrasonic examination. In areas where joint configuration or material thickness preclude radiographic/ultrasonic examination, alternative methods should be sought from the crane manufacturer or approved inspection body.
- (d) Tee butt welds to be 100% ultrasonically examined.
- (e) All butt welds on Primary load carrying structures to be also subjected to 100% Magnetic Particle Inspection.

Where reference is made in this Recommended Practice to 'full/fully NDT', this is taken to embrace all of the above.

4. TRAINING AND RULES OF MAINTENANCE AND OPERATING STAFF

Maintenance of Offshore Lifting Equipment will primarily involve platform maintenance staff, crane driver and crane manufacturers staff. Such personnel should be competent in the services they provide. The minimum requirements expected of maintenance and operating personnel are as follows:-

4.1 Platform Maintenance Staff

- (a) Understand fully the Crane Manufacturers procedures as described in the Maintenance and Instruction Manuals.



- (b) Conversant with the cranes safe operational envelope e.g., lifting duties, safety systems/limits and of emergency recovery and safe shutdown procedures.
- (c) Where appropriate to have received training and instruction on more specialised aspects of maintenance.
- (d) Understand the effects of dynamic loading.

4.2 Crane Manufacturers Staff

- (a) Investigate and advise remedial actions arising from any serious mal-function or damage to the crane.
- (b) Provide engineering advice and/or provide Engineer to complete more specialised maintenance work.
- (c) Conduct or supervise trouble-shooting activities.
- (d) Advise and approve any necessary modifications or changes to components or to the crane structure consistent with safe crane performance and where appropriate, with the requirements of the regulating bodies.
- (e) Provide service instruction/training to users.

4.3 Crane Driver

- (a) Physically able to operate the crane; able to judge distances , heights and clearances during day and night operation under all weather conditions.
- (b) Adequately trained for the type of crane being driven. The training should cover instruction at the crane manufacturer's works/test site followed by instruction by a qualified driver on the crane at it's offshore location.
- (c) Familiar with the cranes safe operational envelope e.g. lifting duties, safety systems/limits and of emergency recovery and safe shut down procedures.
- (d) Correctly respond to all crane and platform warning systems.
- (e) Trained in day to day crane inspection including routine checks on lubrication levels, rope condition, loose or damaged components, healthy status check on safety systems and general wear and tear.



- (f) Trained to perform routine maintenance tasks including all crane lubricants, rope change-out, hook/block change-out and general rigging.
- (g) Fully conversant with the duties and instructions of the slinger.
- (h) Have an understanding of dynamic loading and effects on the crane.

Personnel involved with maintenance and operation of offshore lifting equipment should be familiar with the crane manufacturer's maintenance and operating requirements and be competent and qualified to execute such tasks. Where necessary staff should attend training courses as prescribed by the crane manufacturer and/or professional agency in order to obtain the required qualifications.

5. ROPES

Crane ropes used for luff and load hoist systems, are often spooled onto their drums in multiple layers and, as such, they need to be tolerant to crushing and abrasion.

The load hoist rope will usually be of non-rotating, multi-strand construction and the luff rope usually six strand construction. Both rope types should incorporate an independent wire core with all wires in the construction galvanised. Galvanising gives added protection to the rope when in store whilst enhancing its fatigue life in operation.

Where non-rotating rope is used, the following should be noted:-

- (a) *Failure of non-rotating rope can occur suddenly and without apparent warning and is usually initiated by breakages of the inner wires of the construction.*

Total failure could therefore occur without showing any visible indication at the outer wires. Evidence of one broken external wire, is a strong indicator that the rope may already have several broken internal wires and could therefore be close to total failure.

- (b) *Loss or drying-out of the lubricant accelerates corrosion and fatigue of the internal wires. Such conditions will promote early failure of the rope. Close proximity of gas turbine exhausts and flare radiation effects in addition to a saline environment, will serve to exacerbate the problem.*

The following practices should be observed:-

- (i) *The outer and inner wires of the rope should be inspected for any visible breaks. The internal wires should be examined by twist-opening the strands with rope grips or lever clamps. For non-rotating rope constructions, the ropes should be discarded if broken wires are found and /or corrosion is evident. For six strand rope, use discard criteria according to national regulations - [ISO 4309](#) for example.*

Such inspection should be undertaken by suitably qualified personnel



- (ii) Ropes should be lubricated with a penetrative lubricant-BP Energol WRP is recommended. The lubricant should be applied by pressure lubricator. It is essential that the lubricant penetrates the inner wires particularly on non-rotating ropes.

Never use viscous (thick/heavy) lubricants on wire rope, these create a harmful 'barrier' effect leading to corrosion and rapid failure of the internal wires.

- (iii) Rope change-out (according to rope condition or prevailing statutory requirements) should be undertaken only in accordance with the crane/rope manufacturers procedures. Where provided, dedicated spooling or rope change-out drums should always be used. It is essential, from the 'dead turns' onwards that the bottom and subsequent layers of new rope are spooled onto the drum under a tension of approx. 10% of its safe working load prior to normal use.

For cranes which always operate in 'single-fall', the rope tension when spooling new rope onto the drum in terms of load on the hook should be approx. 0.1 times SWL.

Where SWL of the rope =

$$\frac{\text{minimum breaking load [MBL]}}{\text{factor of safety [usually 5]}}$$

Refer to the rope test certificate for this information.

For cranes which operate under 'multi-fall' configuration, for which the rope length should be checked for the maximum number of falls assigned, the rope tension when spooling new rope onto the drum in terms of load on the hook should be approx. 0.1 times SWL times number of falls.

When spooling-on rope for the boom hoist system, the weight of the boom only (no load on the hook) will provide the necessary back tension. It may however be necessary to lower the boom below the normal rest (crutch) position in order to apply the back tension from the specified dead turns onwards. The boom should not however be lowered further than that recommended by the crane manufacturer.

As rope is spooled onto the drums, it should be closely examined for undue abrasion particularly at kick-over and cross-over points and to ensure the 'spooling pattern' is maintained throughout all rope layers.

NB: After rope change-out, all rope associated safety systems such as over hoist cut-outs, over lower/dead turns on drum protection etc., should be reset and function tested before normal use of the crane.

- (iv) Pendant ropes should be inspected and lubricated as for running ropes with particular attention paid to the condition of the wires local to the entry point at the terminations. With the application of good lubrication/inspection procedures, pendant ropes can be expected to remain in service for 3/5 years.
- (v) Other ropes on the crane, which are not in the primary load path but which have important functions such as, safety harness wires, boom handrail wires, boom back stop support wires, constant tension wires (e.g., supporting temperature sensors in the luff system) etc. should be checked as part of the drivers daily routine, with a more thorough examination every three months.



- (vi) *All rope terminations and anchor points should be examined on the same frequency as wire ropes.*

NB: Only use ropes and terminations as specified originally for the crane. Alternates should not be used without prior approval of the crane manufacturer. Fitment of the wrong rope could seriously affect the cranes elastic constant, operational performance, operational life and operational safety.

FOOTNOTE

It should be noted that some BP regional operating companies, notably XEU, have developed a means of assessing expected rope life via a critical rating system which is part of the 'Lifting Equipment Certification Manual' also developed by XEU.

This critical rating system is a good inspection enhancement vehicle serving as a guidance for discard. However, discard should always be undertaken on lines of knowledgeable judgement by a person competent in ropes and rope systems.

In exercising good rope housekeeping practices, in-house experience on change-out/discard indicates a rope life of 2 years and beyond is achievable. However, to meet such a target it is necessary to thoroughly examine the condition of any 'used rope' removed from the crane. Modern inspection techniques are now available for determining the condition of both the external and internal wires of the rope and is recommended for inspection off the crane and in situ.

5.1 Running Ropes

5.1.1 Daily - Monthly

- (a) Check rope is spooling evenly on drums without loss of pattern and without undue gapping.
- (b) Check rope for condition - abrasion, particularly at flanges and cross-over points; crushing, usually due to slackly spooled rope; corrosion, signs of rust; loss of lubricant, particularly on active sections e.g., continued use around sheaves; broken wires - see Discard.
- (c) Check rope for other abnormalities, e.g., spiralling, basketing etc.
- (d) Check terminations for condition and security.
- (e) Check levels of lubrication at the rope and its terminations.

5.1.2 Monthly - 3 Monthly

Lubricate ropes using a penetrative lubricant such as BP Energol WRP via a pressure lubricator.



For sections of rope which are difficult to access, such as 'dead lengths' and terminations, lubricate by hand with oil based penetrative lubricant followed by a hand applied coating of BP Energol WRP.

5.1.3 3 Monthly - 12 Monthly

Inspect the internal wires of the rope for corrosion, broken wires and lubricant quality. Use the correct tools - twist-grips and procedures as specified by the rope manufacturer only for this operation.

5.1.4 Discard

Nominally every 12 months or according to rope condition.

- (a) For multi-strand rope, discard immediately if external or internal broken wires are found or if corrosion or rusting is evident in the core wires.
- (b) For six strand rope constructions, use discard criteria according to national regulations e.g. [ISO 4309](#).

5.1.5 Change-Out

Nominally every 12 months or according to rope condition and/or discard assessment

- (a) Check that the replacement rope is the correct size (diameter and length) and construction. Ensure these details are as specified by the crane manufacturer.
- (b) Check that the test certificate clearly identifies with the rope and that the rope taken from store was on a 'first in', 'first out' basis.
- (c) Only use change-out practices specified by the rope/crane manufacturer.
- (d) Ensure new rope is not dragged over the ground/deck or fouls obstacles or any part of the crane structure when spooling onto the winch drums. Where possible use dedicated rope spooling gear.
- (e) Where multi-layer spooling is used, ensure that all layers of rope are spooled onto the drum under as much tension as possible, or at least, 10% SWL.



- (f) Check that 'turn' is not induced during spooling.
- (g) Ensure all terminations are compatible with the rope.
- (h) Ensure all rope associated safety systems-overhoist cut-out, dead turns on drum protection etc., are correctly reset and function tested before resuming normal use of the crane.

5.2 **Pendant Ropes**

Pendant ropes should be changed out every 3/5 years. This assumes good lubrication and inspection practices (as for running ropes) have been applied.

5.3 **Other Ropes**

Ropes which are not used in the primary load path, but have other important functions, e.g. used as hand rails, secondary support etc., should be changed out at the same time as pendant ropes.

6. **WINCH DRUMS**

All drums specified for BP cranes incorporate rope grooving - helical for a single rope layer and Lebus for multi-rope layers. The grooving may be machined as an integral part of the drum or alternatively may be fitted with removable shells or laggings. The purpose of the grooving is to give maximum support to the rope and to ensure uniform spooling through all rope layers. The distance between the drum flanges and the condition of the rope flanges are critical factors in maintaining rope discipline and rope life. Unduly worn or splayed flanges will be readily indicated by loss of rope pattern leading to rapid deterioration of both rope and drums. Where plain drums are fitted (usually on older cranes) the deterioration of both rope and drum under such condition will be much greater than for grooved drums. Where loss of rope pattern and resulting wear is evident, the drums must be re-worked i.e. brought up to original standard before continued operation.

6.1 **Daily - Monthly**

- (a) Check drum flanges and kicker strip if fitted, for undue rope scrubbing or heavy wear.
- (b) Check drum flanges for spreading or splaying.
- (c) Check drum mountings for general condition and security.
- (d) Check condition of all external lubrication/environmental seals.
- (e) Check brake drums/discs for scoring or uneven wear.



- (f) Where applicable ensure drum rotation indicators (Tachos/Encoders) are positively in contact drive with the drum assembly.
- (g) Check for condition and security of rope termination clamps at drum flanges.
- (h) Ensure correct function of any rope paying-on gear.

6.2

Monthly - 6 Monthly

- (a) Check all major fasteners associated with the drum against the manufacturers recommended torque figures. Typically and where applicable, such fasteners would be:-
 - (i) Main drum unit foundation bolts.
 - (ii) Bolted/screwed-on drum flanges.
 - (iii) Bolted/screwed-on back stops or brake drums/discs.
 - (iv) Bolted/screwed-on back stops or spragg clutches.
 - (v) Bolted/screwed-on ratchet (boom hoist drum only)
- (b) Check condition and securement of final drive gear/chain pinions/wheels.
- (c) Visually check for 'cracks' at all main weld areas on drum and drive mounting; this may be indicated initially by local paint cracking.

6.3

12 Monthly - 24 Months or at Every Rope Change-out

- (a) Check for aggressive wear at rope grooving.
- (b) Where applicable remove grooved shells or laggings and check condition of the exposed drum and shell internals. Shell fasteners to be renewed and their screw tappings in the drum examined for damage or corrosion.
- (c) Examine internal and external rope termination points, including tail ropes where appropriate - renew all securing fasteners and ensure tapped holes are of full thread form and corrosion free.



- (d) Examine all major welds for cracking at flanges to drum, drive bosses to drum, drive bosses to flanges etc. All paint should be removed locally for this examination and made good afterwards.
- (e) Clean and thoroughly examine open gear/sprocket drives for wear, full face width and correct pitch line contact. Associated pinion drivers should also be examined at this time.

6.4 Every 2 Years - 5 Years

Completely overhaul/change-out drum assembly, NDT all major welds and renew bearing seals and fasteners as appropriate.

7. WINCH BRAKES/CLUTCHES

A variety of brake/clutch designs are used on BP cranes; early cranes may have 'open' friction type i.e., band/shoe/plate either of fail-safe or non-fail-safe types, whereas later crane designs will incorporate dual fail-safe braking, one set either band or disc acting directly on the drum via a spragg clutch or back-stop, and the other set acting-downstream of the drum (motor drive end) - this brake will normally be a multi-plate disc unit. Brakes used on mechanically driven 'open units' are usually dynamically rated i.e. are used to retard the winch whereas the brakes on modern cranes are usually used to hold the drum stationary, i.e. the dynamic braking will be done hydrostatically.

All brakes (and clutches) are sensitive to contamination (water, oil, grease, etc.). Caliper disc type brakes however, are the most tolerant to this. For best performance, the brakes must be correctly adjusted, be free in operation and the braking surfaces drum/disc must be flat and true. For caliper disc brakes it is essential that the friction pads must act precisely at right angles to the disc. Spragg clutches or back stops tend to be viscous sensitive, therefore ensure the correct oil grade is used for the prevailing temperatures and that the correct level is maintained.

7.1 Daily - Monthly

- (a) Band/shoe brakes and clutches should be checked for adequate friction material thickness i.e., ensure material has not worn down to rivets or thickness limit. Leading and trailing edges and band-joint connections are areas where high wear can be expected.
- (b) For oil immersed multi-disc brakes, check for correct oil grade and level. For dry pack discs, check they are not oil contaminated e.g., due to failed or leaking local seals.
- (c) Check all brakes for correct adjustment and that all mechanical elements operate freely and fully without hesitation. Check that all actuators are leak-free (air/hydraulic types) and that they are not unduly held-off, even partially, due to incorrect or residual line pressure.



- (d) Caliper disc brakes should be checked for equal operation either side of the disc - one sided operation must be rectified before any further crane operation.

7.2 Monthly - 6 Monthly

- (a) Bolt-on palm ends on hand brakes/clutches should be checked for condition and tightness.
- (b) Spring applied actuators should be checked for correct operating spring length (measured setting). Disc springs should be checked for correct stack height, broken springs and for signs of hang-up (either at O/D or I/D of the spring) and for correct lubrication.
- (c) Check spragg clutches or back stops for correct oil grade and level. NB spragg clutches are particularly sensitive to small changes in oil level and viscosity. Oil should be changed every 6 months.
- (d) Pawl and Ratchet Systems usually fitted to luff drums on older cranes should be checked for condition and free operation. Check also, condition of fasteners and securement associated with the Pawl/Ratchet System.

7.3 12 Monthly - 24 Months

- (a) Overhaul braking system - renew all defective components.
- (b) Ensure all replacement friction linings are to crane manufacturers specifications, do not use non specified or non agreed alternatives.
- (c) Check the brake holding capacity according to the crane manufacturers ratings and procedures. Where dual system braking is employed, each system should be individually checked.

8. HOOK AND HOOK BLOCKS

Hooks and hook blocks are in the front line with respect to damage through use and abuse. There have been several instances where hooks have failed disastrously in operation due to a number of reasons but particularly due to corrosion of the threaded shank of the hook which cannot be visually inspected directly. Deterioration of the threaded shank to failure level can be rapid, sometimes less than 6 months but is of course dependant upon quality of lubricant, sealing, correct adjustment and level of abuse in operation.



Hooks specified by BP are designed to safeguard key components against corrosion and damage, however, it is recommended that all hook components be fully inspected on a regular basis. Hooks and Hook Blocks should be returned to shore for full strip-down, NDT, and re-work every 2 years. Fully re-worked Hooks/Blocks must be proof load tested and re-certified.

In the event of the Hook/Block having been dipped into the sea, it should firstly be hosed-down with fresh water followed by strip-down, cleaning and refurbishment to levels which satisfy its original specification. The associated section of rope and its terminations should also be examined and treated at the same time.

8.1 Daily - Monthly

- (a) Check safety catch functions correctly without hang-up.
- (b) Check that hook swivels smoothly and that by 'feel' there are no signs of bearing 'catch' or brinnelling.
- (c) Check hook for increased admittance dimension, undue flattening (burring) 'nicks' and cracks.
- (d) Check that all split pins securing hook swivel nut and rope guards are intact - split pins should be of stainless steel.
- (e) Ensure rope anchor points are in good order and properly secured.
- (f) Visually check that all sheave and hook shank bearing seals are sound.
- (g) Ensure all rope guards are secure and are set at correct clearances from sheaves.
- (h) Check sheave tread profiles for undue wear and damage.
- (i) Ensure all lubricant channels (grease points) are clear, undamaged and provide free flow of lubricant.

8.2 Every 2 Years

Overhaul hook and blocks completely, renew all bearings and seals. Critically examine and NDT inspect the hook and threaded shank - renew if in doubt.

9. SLEW DRIVE BRAKES/CLUTCHES

On modern cranes, slew brakes are usually multi-plate disc pack of either dry or oil immersed type. These brakes are principally used as 'holding' brakes with the dynamic braking being effected hydrostatically. In some cases, the slew brake may be used as a slipping clutch or torque limiter to limit undue lateral forces from being induced to the boom structure when the crane is lifting from supply boats. When brakes are used as torque limiters, it is essential, by virtue of the dynamic nature



of operation, for the brakes to be more particularly examined for wear of the friction materials and actuators for correct spring adjustment. Additionally all interacting valves and systems should be inspected for condition, correct pressure settings and sound operation as part of the brake check procedure. On older cranes, brakes/clutches may be open band, shoe, or plate type. Such equipment will be under constant dynamic loading when in use and as such will need careful and frequent attention with respect to wear of the friction materials and adjustment to the correct settings for optimum and safe performance.

Examination should be as for Winch Brakes, Section 7.

Additionally, where hydraulic drives and torque limiting systems are used, the following checks should be made on a **3 monthly basis:-**

- (a) Check slew system pressure for both main circuit and for torque limiting operation. Where crossline relief valves are used, the slew pressure should be checked in both directions.
- (b) Where torque limiting regulation is via the slew brake(s) ensure the brake line pressure is correct in all modes i.e:-
 - (i) brakes engaged - zero pressure
 - (ii) brakes in torque limiting.
 - (iii) brakes held-off
- (c) Check condition and function of any change-over valves and mechanism which may be used in conjunction with differential braking or torque limiting systems.

9.1 Slew Lock

Slew lock devices (mechanical pin or gear-dog types) should be checked for securement, smooth operation (without hang-up) corrosion or damage. Instrumentation associated with these devices should also be carefully examined for correct function and condition.

Overhaul completely every 2 years.

10. PRIMARY LOAD PATH ELEMENTS

10.1 Slewing Bearing and Fasteners

The main problems arising with slewing bearings are loss of tension in the fasteners, and internal corrosion of the rolling elements and bearing raceways.

Loss or insufficient bolt tension would result in early failure of the fastener through fatigue giving rise to potential separation of the crane from its pedestal. Correctly maintained bolt tension is therefore essential.



Corrosion of the rolling elements and raceways is usually brought about by incorrectly fitted or damaged environmental seals. Excessive corrosion can seriously damage the rolling elements and raceways to a point of failure of these components which again potentially, could lead to separation of the crane from its pedestal.

Some cranes may be fitted with retention devices designed to hold the crane to its pedestal in the event of any mechanical failure of the slewing. These devices and their fasteners, should be included in the slewing inspection and maintenance schedules. The condition of the slewing should be periodically monitored by analysing grease samples taken from the raceways for particle content and also by conducting ROCKING tests to procedures specified by the slewing and crane manufacturers. A better approach is to use built-in acoustic or similar systems which monitor the condition of the raceways directly and much more accurately. Where practical e.g., at the time of slewing replacement, it is recommended such systems be fitted.

It should be noted that the slewing can also be damaged in storage and during handling/transportation. Due attention should be given to following the manufacturers specific procedures on these aspects. For example, when handling/transporting the slewing, the spider or strong-back must be fitted. Similarly, the slewing should always be lifted in its horizontal plane only, vertical lifting can seriously distort the slewing.

10.1.1

Monthly to 6 Monthly

- (a) Check the tension in four bolts (one in each quadrant) at slewing to pedestal and slewing to crane according to crane manufacturers procedures.
- (b) Check bolt tension in any associated retaining device.
- (c) Ensure all grease filled weather protection caps for fasteners are in place, correctly fitted and in good condition.
- (d) Check that the main bearing environmental seals are in good condition. Renew immediately if damaged or distorted.
- (e) Check final drive slew gear teeth for undue wear - tearing and plucking. Ensure pinion drive has full face width contact and correct pitch line setting - check backlash.
- (f) Ensure all guards are in place, correctly fitted and secure.
- (g) Check rocking clearances.
- (h) Ensure all lubrication points are undamaged and provide free flow of lubricant.

10.1.2

6 Months to 12 Months



- (a) Remove at least one fastener from each mounting circle and examine for corrosion and stress corrosion cracking. Renew rather than replace the bolt.
- (b) Check lubricant for water content and particle content (laboratory analysis).

10.1.3 Change-Out

- (a) Remove the slew bearing every 5 years complete to crane manufacturers procedures and, ship to shore based premises for full examination and NDT inspection. The bearing should be examined for corrosion effects, condition of rolling elements and raceways - indentations/brinelling, scuffing, cracking, wear (loss of material); gear teeth profiles, condition of lubricant (particle and water contact) and full dimensional check.
- (b) Refurbish to slewring manufacturers procedures and acceptance standards and reassemble with new environmental seals.
- (c) Check condition of any retaining device and NDT inspect. Refurbish to slewring/crane manufacturers procedures and acceptance standards.
- (d) Re-install to pedestal, to crane/slewring manufacturers procedures. Ensure 'soft zone' is correctly positioned. Use new mounting bolts throughout - ensure these are the correct grade and are identifiable with the test certificate; tighten to crane manufacturers specified levels and procedures.
- (e) Fit new grease filled protection caps.
- (f) Ensure slew pinion(s) backlash is correctly set.
- (g) Establish new base line for rocking motion.

10.2 Pedestal Adapter

Padeyes and other welded appendages used for the attachment of equipment to aid slewring removal, should be fully NDT inspected prior to use. Welds fixing slewring mounting flange to pedestal column should be visually examined (internally and externally) for cracks and corrosion approx. every 6 months - paint 'cracking' at the welded joint can be a good indicator of cracks in welds and should be thoroughly investigated further if there is any doubt about such symptoms.

After slewring removal, flange welds to pedestal should be blast cleaned and NDT inspected. All other primary welds should be similarly treated particularly at internal and external stiffeners. The slewring mounting flange should also be



checked for flatness in accordance with the slewing manufacturers requirements. Any in-situ remedial work such as re-machining of the flange which may be necessary to obtain the prescribed flatness levels, should only be undertaken with the prior agreement of the crane manufacturer. The use of resin grouting to achieve the correct levels of flatness is not a preferred option, however, if there is no other recourse, this should only be undertaken with the prior agreement of both the slewing and crane manufacturer.

On refitment of the slewing, it is important to ensure the 'soft-zone' markings on the slewing align with those on the pedestal. If such markings are not evident, as may occur in older machines, then advice from the crane manufacturer should be obtained.

10.2.1 Every 6 - 12 Months

Visually inspect all welds for cracks and corrosion - if in doubt, use NDT inspection methods.

10.2.2 Every 5 Years

Blast clean selective welds and fully inspect using NDT procedures. This inspection should also extend into the pedestal column/stand and deck structure. The scope of this inspection should be developed by a competent Structural Engineer.

10.2.3 Every Slewring Change-Out

- (a) Check welds at padeyes, brackets and all other appendages used for crane jacking or slewing handling systems using NDT inspection procedures and proof load test prior to change-out of slewing.
- (b) After slewing removal, check pedestal mounting flange for flatness in accordance with the slewing manufacturers requirements. Any remedial work necessary, should only be undertaken with the prior agreement of both the slewing and crane manufacturer.
- (c) Inspect pedestal mounting flange welds for cracks.

10.3 Booms

The boom structure should be visually examined for weld defects on a 6 monthly basis - suspected weld defects to be further examined using NDT procedures. Such welds include all fillet and full penetration welds on the main cords and all boom foot and boom head bosses in the primary load path and also the lifting padeyes and appendages for access support ways. A fastener from one lower boom section joint should be removed and examined for condition. (Corrosion etc.).

Sheave bearings should be checked by hand for smooth rotation and for any undue lateral movement. Sheave treads should be examined for undue wear. Rope guards



should be secure and correctly set, i.e., distance from sheaves outside diameter to guard.

Booms should be changed-out every 5 years for full structural examination on-shore including blast cleaning and NDT together with any rework of the sheave assemblies, boom head and boom foot pins and bearings and full re-paint. All fasteners at the boom section flanges should be renewed. Shipment and general transit of new/old and reworked boom sections should be via purpose built protective transit cages. These cages should be structurally examined, particularly the lifting padeyes prior to use.

Where only one crane is available on a platform and hence where usually the 'spare' boom may also be stored on the platform, then increased inspection of the spare boom is recommended by virtue of its constant exposure to a corrosive marine environment.

10.3.1 Daily - Monthly

- (a) Check that all aircraft warning , floodlighting and any other luminaries and their enclosures used on the boom are securely in place, free of damage and that they function correctly.
- (b) Ensure all appendages are secure and that all pins, bolts, split pins, etc., are in good condition.
- (c) Check condition of sheave treads and bearing seals and security of rope guards.
- (d) Check condition and security of rope anchor and load sensor points.
- (e) Where applicable, ensure that suspended (chandelier) over-hoist cut-out devices are firmly anchored and in good condition.
- (f) Ensure all walkways and handrail systems are secure and are in good order.
- (g) Check visually for undue cracking of paint at welded joints - investigate further if in doubt.

10.3.2 6 Monthly - 12 Monthly

- (a) Remove and examine for corrosion and thread condition one fastener from one lower boom section flange joint. Replenish with new bolt.
- (b) By hand check sheaves for smooth rotation, and lateral movement - this is best done at time of rope change-out.



- (c) Check rope guards for wear.

10.3.3 Every 5 Years

Overhaul beam completely and fully NDT inspect selected welded joints. The scope of this inspection should be developed by a competent Structural Engineer. Cages used for storing and transportation of the lower sections should be similarly examined.

Note: This may also involve Certifying Authorities and/or Third Party Inspectors.

10.4 'A' Frame

Primary load path structures including Pedestal Adapter, Boom, 'A'-Frame and Machinery Bed boom and pedestal should be examined visually every 12 months for signs of weld cracking - paint cracking is a good indicator of this. Every 5/6 years or at time of re-paint selected major welded joints should be blast cleaned and NDT Inspected.

The scope of this selective weld inspection should be developed by a competent Structural Engineer who can identify the primary welds and locations of stress concentration etc. Inspection of other/remaining welds will be dependent upon the findings from the selective weld inspection for which the Structural Engineer should advise his recommendations.

This inspection should also extend into the Pedestal Column/stand and the deck structure.

Following any undue crane overload/overmovement (in excess of those induced by test) which may accidentally arise, the primary load path structural welds must be visually examined followed by NDT inspection if weld damage is suspected. Refer also to section 22 'Overloads'.

N.B. The hard print lifting data from the cranes SLI and recording system should be examined immediately after every down-load of the data, for cases of severe crane overloading. In all cases of severe overloading and/or if the GOP system has been triggered, the cranes primary load path elements must be subjected to thorough examination as above. Refer also to section 22 'Overloads'.

10.4.1 Daily - Monthly

As for Boom, Section 10.3.

10.4.2 6 Monthly - 12 Monthly

- (a) Remove and examine for corrosion and thread condition, one fastener from the tensile (tie) members of the 'A' Frame flanged joint. Replenish with new bolt.
- (b) Check by hand, sheaves for smooth rotation and lateral movement - this is best done at time of rope change-out.



10.4.3 Every 5 Years

Fully NDT Inspect all welded joints.

10.5 Machinery Bed Structure

10.5.1 Monthly - 6 Monthly

Visually check all welds local to the slewing mounting, 'A'- frame connection and boom foot connection points.

10.5.2 Every 6 to 12 Months

Check conditions and security of all sheeting panel connections/mountings.

10.5.3 Every 5 Years

Blast clean and fully NDT inspect selected welded joints. The scope of this inspection should be developed by a competent Structural Engineer.

11. PRIME MOVERS

Prime movers for most BP Pedestal Cranes are usually Diesel units located within/on the crane structure. Prime movers on some other cranes will most probably be electric motor driven either located on the crane or remotely from it. Prime movers may be specified for operation in hazardous areas or be affected by other ongoing activities such as steam/water jetting or solvent spraying during clean-down or by airborne powders/chemicals from drilling operations. These activities and the additional complication of flameproofing to meet hazardous area criteria would require enhancement of the normal maintenance practices.

The basic examination levels should be imposed as a minimum.

11.1 Diesel Drivers

Loss of performance should be investigated immediately by a competent person preferably from the engine manufacturer or his approved agent. Symptoms of poor performance include; poor starting, lumpy running, reduced rpm (low and high idle), smoky exhaust emission, high fuel consumption, high sump oil consumption, tendency to stall under load and poor starting.

It is recommended that corrective maintenance associated with any of the above symptoms be limited to change-out of the air, oil and fuel filters only for those not competent with diesel engines.

Other routine work such as fan belt tightening, coolant change-out etc. should be in accordance with the manufacturer's recommendations. Engine lubrication oil should be changed-out monthly.



After 10,000 running hours, in-situ overhaul (space permitting) or total change-out of the engine with a re-conditioned unit, should be undertaken. Couplings and cardan shaft drives should be changed-out or reworked at this time.

With the engine removed, a thorough examination should be made of engine mountings (hard or soft), engine radiator and its mountings, all water coolant hoses and connections, Hydraulic oil heat exchanger mountings, hoses and connections. Ancillary power users i.e., generators which are not part of the engine proper, should also be thoroughly examined at this time.

The engine exhaust system including silencer, spark arrester and all joints and supporting brackets should be inspected periodically.

All engine instrumentation should be routinely checked daily and reconditioned or renewed and re-calibrated at time of engine change-out or major overhaul.

Torque converters should be re-conditioned or replaced at same time as engine overhaul.

Diesel engines which are specially protected to operate in zone 2 hazardous areas, impose particularly intensive maintenance requirements for which the operator should make due allowance.

Protective devices which may not normally be of the diesel engine manufacturers supply, such as water cooled exhaust/turbo chargers, or spark arresters, induction flame traps, overspeed shut-down devices, automatic fuel-shut-off etc. must be maintained according to the manufacturers instructions and/or the crane inspection/maintenance manual or alternatively with the requirements of EEMUA; see also Section 18 'Safety Devices'.

11.1.1 Daily - Monthly

Daily Inspections

The daily or prior to use (if less frequently than daily) visual inspections shall include but not necessarily be limited to, the following:-

- (a) Check coolant level - ensure anti-freeze quantity is maintained and allowance made during each top-up.
- (b) Check oil lubricant level and note condition.
- (c) Check hose and piping runs for tightness, leaks and chaffing.
- (d) Ensure 'Rig-Saver' is manually operative.
- (e) Ensure all guards are secure and correctly fitted.
- (f) Ensure all gauges (locally mounted) are functioning
- (g) Check for security and chaffing of locally run electrical cables.



- (h) Check soundness of exhaust system and quality of emission
- (i) Check lubrication filter status indicators for condition of filters.
- (j) Check security of engine, radiator and oil cooler mounting.
- (k) Check local start/stop and emergency stop controls.
- (l) Check fan belts for tension and condition.
- (m) Check condition of auxiliary air compressors - belt drive tensions, cooling coils, unloader valves etc.
- (n) Check engine and/or compressor air filters.

11.1.2

Monthly - 6 Monthly

- (a) Check radiator and hydraulic oil cooler and their mountings for condition, performance and security.
- (b) Check condition of water coolant hoses and connections.
- (c) Check exhaust - silencer, spark arrester, all flanges and mountings.
- (d) Check couplings and cardan shaft drives for condition and security.
- (e) Check ancillary water jacket heaters and lubrication oil heaters for condition and performance
- (f) Function check overspeed shut down device and automatic fuel shut-off system - refer to section 18.9.
- (g) Where applicable check induction flame traps, gas conditioners, water cooled exhaust system and water cooled turbo chargers - normally for zone 2 Hazardous Areas.
- (h) Ensure correct functioning of variable air inlet/outlet louvers.
- (i) Check condition of starter motor and pinion.
- (j) Check particle content of lube oil.



11.1.3 Every 12 Months

Check compression of each cylinder; correct if out-of-tolerance.

11.1.4 5 Yearly or 10,000 Hours

- (a) Change-out engine for re-conditioned or new unit. Where applicable, re-condition or replace torque converters at same time. In circumstances where it is not practical to change-out the above, then as much in-situ overhaul as possible should be undertaken.
- (b) Examine flexible engine mountings for condition - replace if condition is suspect.
- (c) Examine all engine support structures/sub frames for cracks at welds and parent metal.
- (d) Strip down couplings and cardan shafts - renew as necessary.
- (e) Examine engine/sub-frame securement points to bedplate. Ensure screwed holes have full thread form.
- (f) Where applicable, recondition or renew auxiliary air compressors.

11.2 Electric Motors

Electric Motor prime movers should be changed-out or reconditioned every 7 years.

11.2.1 Daily - Monthly

- (a) Ensure all guards are secure and correctly fitted.
- (b) Check all locally mounted gauges/instruments are functioning.
- (c) Check for condition, security and chaffing of locally run electrical cables.
- (d) Check for correct function of local start/stop and emergency stop controls.
- (e) Check for securement and performance of ancillary equipment i.e., compressors etc.



11.2.2 Monthly - 6 Monthly

- (a) Check couplings/cardan shaft drives for condition and security.
- (b) Check belt drive tensions and condition.

11.2.3 5 Yearly - 7 Yearly

- (a) Change-out or recondition motor and starting system.
- (b) Examine flexible mounting for condition - replace if in doubt.
- (c) Strip down couplings/cardan shafts - review as necessary.
- (d) Examine sub-frame structures for cracks at welds or parent metal.
- (e) Examine sub-frame securement points to bedplate - ensure screwed holes have full thread form.
- (f) Where applicable, renew or re-condition auxiliary attachments i.e., compressors etc.
- (g) Renew drive belts/pulleys or primary drive pinion as applicable.
- (h) Re-cable and re-gland.

12. PNEUMATIC SYSTEMS

Pneumatic systems should routinely be kept water free by manually venting the drain cock on the air receiver. Where cranes are fitted with both manual and automatic drain facilities it is recommended that the manual drain be operated periodically.

Check for correct functioning of all local and remote gauges and Safety Relief Valves.

Check system for corrosive activity particularly where Carbon steel is used. Re-work as necessary preferably with non-corrosive materials.

NB: NEVER enter into any re-work of an active pressurised pneumatic system - ALWAYS vent the system pressure first. NEVER attempt to remove plugs, fittings or gauges from a pressurised system - this can be lethal.

Air dryers should be routinely checked for correct, dew point temperature setting and the equipment including filters should be maintained for continuous operation.

Air lubrication systems should be maintained to a high standard for continuous operation with correct lubrication/air ratio.

12.1 Daily - Monthly



- (a) Check for correct functioning of all local and remote instrumentation.
- (b) Check air dryers for correct dew point and temperature settings and condition of all filters.
- (c) Ensure correct functioning of air lubrication systems.
- (d) Check automatic water drain systems function correctly. Manually operated water drain systems should be routinely checked during this period.

Warning: Never attempt to remove fittings or plugs to achieve drain off from pressurised reservoirs or the air system generally.

- (e) Check pipework/fittings for integrity and corrosion where carbon steel has been used - replace with approved corrosion resistant metals. NB: vent system completely before attempting any re-work.

13. POWER TRANSMISSION SYSTEM

The power transmission system covers any mechanical, hydraulic electric, pneumatic drive, either singly or in combination, with the prime mover to end user (ex winch, slew pinion etc.). The loss of performance of any such system readily becomes noticeable to crane operators familiar with the crane, usually by a reduction in speed or lack of torque to either lift the load or to slew the crane. Noticeable loss of performance should be investigated immediately and brought up to its original standard. It is essential that operators who are new to or unfamiliar with the crane, receive full instruction as to the cranes correct performance standard.

NB: Loss of system performance may hazard the crane/platform and operatives. All crane services (luff, hoist and slew) should be checked periodically for correct operational speed against a nominal hook load at a designated radius.

Gearboxes which form part of the transmission system usually have an operational life greater than that of the prime mover. However, it is recommended that major overhauls of gearboxes align with those of the prime mover.

13.1 Daily - Monthly

- (a) Check that gearboxes and motors show no movement at their bolted mountings. Units which operate bi-directionally are prone to 'racking' and should be rectified immediately.
- (b) Check lubrication levels of all gearboxes and for signs of emulsification.



- (c) Check gearboxes for any undue rise in temperature, noise, vibration or for any excess emission from breathers - investigate immediately should any of these occur.
- (d) On open gear drives, check for tooth profile condition and lubrication quality.
- (e) On open chain drives, check chain for correct tension, general wear and for 'bunching' or 'jumping' at the sprockets. Check tooth profiles of sprockets and maintain specified lubrication levels.
- (f) Ensure all guards are correctly fitted and secure.

13.2 Monthly to 6 Monthly

- (a) Check for correct tightness of fasteners at all major mountings i.e., gearbox mountings, motor mountings etc.
- (b) On closed gear drives, check (via inspection panels) for tooth profile lubrication condition.
- (c) On closed chain drives, check for correct tension and general wear and for 'bunching' or 'jumping' at the sprockets. Check tooth profiles of sprockets, lubrication condition and levels.
- (d) Check that chain cases are 'leakfree' and securely mounted and that all inspection panels are properly sealed against the environment.

13.3 6 Months to 12 Months

Examine all open spline drives for wear, corrosion and general condition. Parallel sided splines should be examined by separating the drive from it mating components. Involute spline drives should be checked for excessive back lash using the crane manufacturers procedures. NB; failure of spline drives can result in dropping of the load or boom or loss of slew drive.

13.4 5 Years - 7 Years

Overhaul transmission at same time as prime mover. Re-condition or renew main drive components as necessary.



14. HYDRAULIC SYSTEMS

The main problems arising from the use of hydraulic systems offshore are corrosion of components, piping and fittings; dirt entering the system and water entering the system. Cranes specified to BP Group [GS 138-1](#) which incorporates BP Group [GS 134-1](#) - Hydraulic Power Supplies does much to allay these problems. On older cranes however, pipework and fittings are often found to be of carbon steel and perhaps protected by a coat of paint. Such piping systems are readily corroded and are a constant source of dirt entering the hydraulic system during repair work or change-out of components or in any piping rework. Where practical, consideration should be given to changing the carbon steel pipework and fittings for materials which are corrosion resistant. This would be particularly beneficial where repair work of a recurring nature was prevalent.

It is essential to prevent dirt and water from entering the system - dirt kills hydraulics. Main sources of entry are:

- (a) Via Filler/Breather
- (b) Past poor condition Hydraulic Ram Rod seals
- (c) During maintenance where pipework/components need to be removed
- (d) From breakdown of protective coatings on hydraulic reservoir internals - usually on older cranes (modern cranes have stainless steel tanks).

14.1 Daily - Monthly

- (a) Check for correct fluid levels at main and auxiliary hydraulic tanks; where hydraulic rams are used, ensure that maximum and minimum fluid levels for the tanks are compatible with the maximum and minimum stroke volumes of the hydraulic rams.
- (b) Ensure the oil is clean and has not emulsified i.e., does not appear 'milky'. Investigate cause and rectify immediately if this condition is evident.
- (c) Check that all hydraulic filter status indicators read clear - if not, change filters immediately.
- (d) Check filters and strainers are clear at tank fill points.
- (e) Ensure all local instrumentation functions correctly - particularly those associated with boost pressure monitoring and temperature measurement.
- (f) Check suction and load pressure hoses for condition and securement. Change immediately if suspect.
- (g) Ensure all piping supports are secure and that there is no external wear or abrasion to pipework or hoses.



- (h) Ensure accumulators are charged (oil and gas) to correct pressures.
- (i) Check hoses for abrasion, signs of perishing and corrosion of the fittings.

14.2 Monthly - 6 Monthly

- (a) Check hydraulic tank breathers function correctly. Breathers which incorporate a low pressure relief valve should be checked for correct setting. Bladder type breathers should be checked for signs of perishing or tearing, particularly at the neck.
- (b) Check for correct function of all auxiliary hydraulic equipment used to operate the crane under 'no-power' or 'emergency conditions'.
- (c) Ensure tightness of all pump mountings - use manufacturers recommended figures.
- (d) Check all piping and fittings for corrosion - if carbon steel is used; consider replacement in corrosion resistant materials.
- (e) Check for undue leaks at hydraulic ram gland seals and examine piston rod for scoring, pitting or surface lifting.
- (f) Check ram eyes (anchor ends) for free movement and security.
- (g) Take oil sample for particle analysis.

14.3 6 Months - 12 Months

- (a) Check hydraulic rams for creep i.e., fluid passing the main piston seals.
- (b) Change-out suction strainers in hydraulic tank.
- (c) Dead weight test all pressure gauges and check calibration.
- (d) Check for correct setting of Relief Valves for all main services and boost circuits - re-establish tamper proof seals.
- (e) Check pressure in brake lines - brakes held off and brakes engaged.



14.4 5 Years - 7 Years

- (a) Overhaul or change-out pump drive splitter gearbox and all major hydraulic components.
- (b) Drain and clean tank internals, thoroughly inspect and refurbish accordingly.
- (c) Renew all hydraulic hoses.

15. MACHINERY HOUSING

The machinery housing provides essential protection for environmentally sensitive equipment such as open brakes/clutches, open gears/chain drives etc. It should be ensured therefore that all doors operate freely and close effectively. Doors which do not properly close or are left open, even partially, can detrimentally affect the performance of such equipment. The performance of the diesel prime movers cooling system can also be seriously influenced by open doors.

15.1 Daily - Monthly

- (a) Ensure that machinery housing is in good repair and provides full environmental protection for all essential equipment.
- (b) Ensure doors and catches are in good working order and that seals and kick-out panels are not defective.
- (c) Check all appendages are secure.
- (d) Ensure fire extinguisher is in place and is of current issue.
- (e) Ensure PA speakers and warning lamps are functional.

15.2 6 Monthly

Where applicable, spent fluids and storm drains systems should be checked and cleared of obstruction by 'rodding'.

16. DRIVERS COMPARTMENT

The drivers compartment should be maintained to good weatherproof order and be kept fully functional to levels commensurate with good ergonomic practices. It is essential therefore to ensure clear unobstructed lines of vision are provided via the correct function of window wipers/washers, heating, ventilation and demisting systems. The driver's seat together with its associated adjusting devices must also be maintained to correct operating levels. The cabin floor should be free of all potential operational hazards such as loose bolts, shackles etc. which could become trapped against controllers - foot operated types in particular are prone to being rendered inoperable via trapped objects.



16.1

Daily - Monthly

- (a) Check compartment is in good repair and is weather proof.
- (b) Ensure doors and catches are in good order and seals and kick-out panels are not defective.
- (c) Check all appendages are secure.
- (d) Ensure fire extinguisher is in place and is of current issue.
- (e) Ensure all communications - radio, PA, telephone etc. are in working order.
- (f) Check that heating, ventilating and demisting systems are in working order.
- (g) Check window wipers and washers for correct function.
- (h) Ensure that operation and instruction manuals are complete and are in place.
- (i) Ensure crane duty charts are complete and in place.
- (j) Check that all labels are legible and secure i.e., for controls/instrumentation (identification and function), emergency instruction and warnings.
- (k) Ensure all instrumentation lighting is in working order.
- (l) Check all hand and foot controllers operate freely without hang-up .

16.2

6 Monthly

- (a) Check condition and security of cabin mountings to main structure.
- (b) Where applicable, replace heating and vent filters.



17. ACCESS/EGRESS

All means of access and egress should be maintained to as-built securement and non-slip standards. Walkways should be free of standing water, oil based fluids, trip hazards or obstructive items.

The structural standard used for stairs, walk-ways and handrails etc. is often light-weight and as such is easily damaged during major maintenance operations e.g. change-out of pumps, motor etc. Where such damage hinders safe use, repair work should be undertaken immediately.

17.1 Daily - Monthly

- (a) Check all walkways, handrails, ladders and safety hoops are properly secured and all fasteners are corrosion free.
- (b) Check that all walkways are clear of loose items and trip hazards.
- (c) Check that all self closing/self latching gates operate correctly.
- (d) Ensure chain type barriers are in place and in good condition.
- (e) Ensure trap-doors operate freely and close securely.
- (f) Where wire rope hand rails are in use, check rope and terminations for corrosion and security. Ensure these are correctly adjusted to the specified tension levels.
- (g) Check all doors and their latches function correctly and that all seals are maintained to draught free and weather proof levels.

18. SAFETY DEVICES

All crane safety devices provide the essential safeguards necessary to ensure that the crane safely performs within its design parameters and/or provides safeguards for the crane driver and other operational personnel on the platform or supply boat.

The crane should not be used unless its full complement of safety devices are in correct working order. Such devices include:-

- Safe Load Indicator (SLI)
- Gross Overmoment (Overload) Protection System (GOP)
- Emergency Load Release
- Boom-Out Inhibit
- Overhoise Limits
- Overlower Limit
- Maximum and Minimum Radius Cut-Outs/Limits
- Emergency Stop
- Engine Overspeed Shut-Down
- Slack Rope Preventers/Indicators
- Slew Limits
- Pendulum Type Radius Indicator



- Wave Following
- Rope Temperature Sensors
- Wind Speed Indicator/Wind Direction Indicator (Windsock)
- Fire Extinguisher and Life Jacket
- Fire and Gas Systems

18.1 Safe Load Indicator (SLI)

These devices may be simple mechanical, electrical, hydraulic or electronic for which they display as statutory the magnitude of the load on the hook and its radius, and where fitted, the magnitude of the overmoment generated. They may have facilities for programming, recording (cranes work cycles), status indication (system healthy) and sea state revision (signal from CCR). In some cases the SLI may provide signals to other safety systems such as boom-out inhibit gross overmoment protection (GOP).

Whatever type of SLI is fitted, it is essential to provide a high order of maintenance from dynamometer (load cell) through to display. Particular attention should be paid to mechanical SLIs which utilise rod or cable driven cam systems - these are most susceptible to water ingress, heavy corrosion and seizure.

18.1.1 Daily - Monthly

- (a) For electronic SLIs, check for healthy status - rectify the cause of errors displayed.
- (b) For mechanical SLIs, check rod/cable drives and linkages for condition and free operation.
- (c) Check all associated alarms and cut-outs function to specification and any associated linkages for condition and free operation. Where SLIs are provided with a crane-lift recording facility, ensure the memory store has sufficient usable capacity.

18.1.2 Monthly - 12 Monthly

- (a) Check condition of all load and moment dynamometers/load cells for abrasion, corrosion and security.
- (b) Calibrate check against known hook load and operating radius every 12 months. NB, where electrical load cells are used the securing bolts must be torque tested to the manufacturers recommendations prior to any calibration checks.

18.2 Gross Overmoment (Overload) Protection System (GOP)

This system protects the crane from overloads/overmovement arising from hang-up of the hook load with the supply boat. The system is normally 'stand-alone' and will usually operate regardless of available crane power supplies.



The system may seldom or never be used in earnest and as such could be prone to rapid deterioration and/or seizure.

It is essential therefore to trigger the system periodically under controls prescribed by the manufacturer and agreed by the operator. Daily checks should be made to ensure the system is healthy and that stored energy supplies are maintained at their correct gauge settings.

Routine, checks should be made for general condition e.g. corrosion, hydraulic leaks, water ingress, action of linkages, bearing and pin connection in the primary load path.

The unit should be completely overhauled on shore every 4 years preferably to coincide with rope change-out.

Where bolts are used in the primary load path of the GOP, at least one sample bolt should be removed annually for full NDT and corrosion inspection. A new bolt must be supplied as replacement and tightened to the correct torque.

NB: The GOP system is perhaps the most important safety device on the crane. It is essential therefore that the system be maintained at 100% functional condition - any defects or malfunction should be reported immediately and the crane should not be used for lifts over the sea until remedial action has been effected.

18.2.1 Before Using the Crane

Ensure 'Healthy Status' indication system is functioning correctly This may involve pressure gauges which should be set to their correct zonal bands; pressure switches which should be set to their correct high/low trip points; positional indicators of key valves in the circuit which when at their correct collective setting will give illuminated indication in the drivers compartment.

For electronic GOP systems ensure that healthy status indication by press-button/lamp or by display is functioning.

Note: The crane should be taken out of service until causes for loss of healthy status or any fault in the GOP system has been rectified.

18.2.2 Daily - Monthly

- (a) Ensure all pipework and fittings used in the system are leak free.
- (b) Ensure all gauges function correctly.
- (c) Check for leaks at main cylinder gland seals and for condition of exposed piston rod. Check for scoring of the rod and for any seal particle debris - rectify the causes.



- (d) Ensure system nitrogen recharge bottles are available on demand and are charged to correct pressures.
- (e) Check for security and free operation of all bearings, pins and linkages.
- (f) Check all electrical cables/wiring and their terminations are secure and damage free.

18.2.3 Monthly - 12 Monthly

- (a) Bolts used in the GOP system primary load path should be examined for corrosion to the following suggested procedure:-
 - (i) Place boom in rest.
 - (ii) Remove one bolt only, for NDT and corrosion inspection. If corrosion free, fit new bolt and tighten to correct torque. If bolt is corroded, renew on a one for one basis - ensure the bolts are coated with corrosion protection agents prior to fitment.
- (b) Examine any sheaves used in the GOP system for free rotation damage or undue tread wear.
- (c) Check all pin connections in the primary load path operate freely, are corrosion free and secure.
- (d) Every 6 months, test trigger the GOP system to crane manufacturers controlled procedures.

18.2.4 Every 5 Years

Overhaul the GOP system mechanical components completely. This is best undertaken onshore by the original equipment supplier. The overhauled unit to be fully pressure tested and certificated prior to re-installing on the crane, after which, a full load test and trigger test should be conducted. All primary load path fasteners to be renewed.

18.3 Emergency Load Release

- (a) Every 6 to 12 months check all pressures - operating and residual are correctly set.
- (b) Apply a nominal 4 ton tension in the load hoist as displayed on the SLI.



Note - if a load is applied to the hook as opposed to using a fixed pull-point on the platform, ensure this remains on the deck at all times.

Press the release button and check the ensuing residual tension is as prescribed.

- (c) Ensure the 'Stay-put' and 'Reset' functions perform to specification.

The emergency release of the hook load is activated via a push button (often called the panic button) located in the driver compartment. Pushing the button will disengage the hoist-brakes and permit the rope to pay-out in an ordered manner under a prescribed tension. On older cranes this may not be ordered i.e., the load would most likely release under free-fall.

Like the GOP, this system will rarely be used in earnest, however, it is essential to periodically test the system for correct function. The testing should be in accordance with agreed manufacturers procedures whereby lifting of the hoist brakes, back tension in the line and system inter activities should be observed.

It is important to ensure the 'stay-put' and re-set function of the release button performs to specification.

18.4 Boom-Out Inhibit

The boom out inhibit system prevents undue over-moments from occurring due to booming out too far (increasing radius) for the prescribed hook load. The system normally takes a signal from the cranes SLI system which applies the luff winch brakes and cuts the power to drive the winch or luff rams in an over-moment situation. Re-activation of the system is usually obtained by either lowering the load to the ground or by booming in (reducing operating radius). This system should be checked at the same time and frequency as the SLI.

NB: Ensure that the SLI is functioning correctly prior to testing the Boom-Out Inhibit. Take register of the load/radius limit at which the boom-out inhibit should function as displayed on the SLI. If the boom-out inhibit does not function, boom out a further metre on radius and stop. If Boom-out inhibit still fails to function, investigate immediately; any malfunction of the boom-out inhibit should be corrected prior to any further operation of the crane.

18.4.1 Daily - Monthly

Ensure the system is in healthy status and functions as prescribed at all times against specified Load/Radius combinations - refer also to SLI.

If any malfunction is found, the crane should not be used in service until the problem is rectified.



18.5

Overhoist Limits

The overhoist limit prevents the hook block from contacting the boom head sleeves. The system usually gives audible/visual warning prior to cut-out.

Check cut-out, and if fitted, audible/visual warning system for correct function and correct drawn-up hook to boom head sheave dimension. This should be checked for all falls of rope combinations.

Overhoist limits specified by BP take register from winch drum rotation and is the preferred method. However, some cranes may use overhoist limits located at the boom head activated by the hook assembly being raised into a lever or hanging weight system (often known as chandeliers). These systems are prone to corrosion and high wear and tear often resulting in either part or the whole of the unit falling from boom head with lethal potential. A thorough visual inspection of such units should be made weekly - faulty or worn components in any part of the suspension should be renewed immediately. Where practical, it is recommended suspended overhoist limits be re-placed with the preferred drum rotation type.

NB: It should be noted that on some cranes where, because of the geometric relationship of the load hoist winch to the boom foot pin, luffing of the boom may drive the hook upwards. In such cases, the overhoist limit should prevent any further motion to both the load hoist drum and luffing action.

18.5.1

Daily - Monthly

- (a) Ensure overhoist limits are correctly set and that the system functions correctly. Limits should also be re-set and function checked after every rope change-out. Where applicable, ensure that luff motion is also inhibited where this service also influences the overhoist system.
- (b) Check all associated sheaves and/or annunciators for correct operation.
- (c) Where overhoist limits are effected by winch drum rotation, check that the limits are set correctly for each hook block reeving condition i.e. 1 FALL, 2 FALL, 3 FALL etc.
- (d) Where overhoist limits are located at the boom head and activated by suspended (Chandelier) systems, these must be examined for wear and tear, damage, corrosion and security.

18.5.2

Every 2 years

For suspended (chandelier) systems conduct complete overhaul.

18.5.3

Every 4 years

For winch drum operated systems, conduct complete overhaul.



18.6 Overlower Limit

The overlower limit prevents too much rope from being spooled off the drum. The overlower limit is usually activated by a device fixed to and driven by the winch system which 'counts' the number of drum rotations and hence rope spooled out. The device should prevent the drum from paying out any further rope when 3/4 coils (dead turns) of rope are reached.

The overlower limit may be separate from or integrated with the overhoist limit device. Unlike the overhoist limit, the overlower limit usually has only one setting which is set for a single fall operation but satisfies all hook block reeving combinations. This setting however is critical and should be carefully checked for condition and correct function. The 'setting' applies to the load hoist rope proper and not to tail ropes which are fitted as part of the GOP system on some cranes. The 'setting' should also take into account, the worst case geometry of the crane - usually with the boom at minimum radius.

NB: If the overlower limit is reached, it is essential to re-spool the rope back onto the drum under tension from the 'dead turns' onwards - see Rope Section.

18.6.1 Daily - Monthly

Check for general condition of mechanical items of the unit at the winch drum. Ensure the mechanism is corrosion free and adequately lubricated.

18.6.2 Every 3 months

Check for correct function during each full rope lubrication stage.

18.6.3 Every 12 months

Check for correct setting and function test after every rope change-out.

18.6.4 Every 4 years

Overhaul completely.

18.7 Maximum and Minimum Radius Cut-Outs/Limits

The maximum and minimum radius limits, safeguard the crane boom from operating outside its specified duty envelope. In most cases the limiting devices will incorporate a 'ramp-down' facility which automatically reduces the speed of the boom prior to cut-out. The cut-out limits should be checked for correct setting against the radius displayed on the SLI and also on the mechanical pendulum type radius indicator located on the boom. Any over run must be corrected immediately.

NB: Over-run in the boom-out direction, could lead to the crane being subjected to excessive overmovements, whilst over-run past the minimum radius limit, could



result in damage to the boom against its mechanical back stops and in extreme cases, could result in the boom falling backwards over the crane.

Valves, Cams and linkages associated with these devices should be checked for freedom of operation in actual use and by in-situ operation by hand when the boom is stationery. Components which are not 'hand-free' should be investigated.

Check that the boom back-stops, particularly the shock absorbing type, function correctly. A seized shock-absorbing unit can seriously damage the boom.

18.7.1 Daily - Monthly

- (a) Ensure the speed ramp-down and cut-out settings are as specified by the crane manufacturer. These should be checked against the radius displayed on the SLI and/or Mechanical Pendulum Indicator on the boom.
- (b) Check for correct function and annunciation.
- (c) Ensure that mechanical devices and electrical switches etc. are secure and corrosion free. Freedom of operation should where practical be checked by hand without sign of resistance or hang-up of the system. This should be undertaken with the crane inert.
- (d) Ensure boom back stops are secure and corrosion free. Gas/Hydraulic Shock absorbing units should be examined for leaks and for signs of pick-up or damage to the piston rods.

18.7.2 Every 4 years

Overhaul completely.

18.8 Emergency Stop

Emergency stop is normally activated by stay-put manual reset push button located in the drivers compartment and additionally local to the prime mover. The emergency stop should be activated periodically via both cabin and local prime mover buttons ensuring in each case the engine is shut down by fuel pump (rack closing), air inlet manifold closing and fuel supply line from the tank to fuel pump closing. Additionally check that all crane motions are brought quickly to rest with and without hand controllers selected and that all brakes progressively apply without inducing undue shock loading to the crane structure.

It is essential that all linkages, pivot pins, activators etc. associated with shut-down systems are in good order and operate without hang-up. Renew immediately any suspect component.

NB: Emergency stop should only be test activated under 'no-load' conditions or to a load limit recommended by the crane manufacture or prime mover supplier. The emergency stop should not be used as an alternative to engine or prime mover shut-down.



Where electrical prime movers are used, activation of the emergency stop should cut all electrical power supplies to the prime mover. All other down stream actions should be as for diesel prime mover.

Check all re-set functions for positive action.

18.8.1 Daily - Monthly

With the crane inert, check by hand that all linkages, pivots, springs etc. used in the system operate freely without hesitation or hang-up.

18.8.2 Periodically

- (a) Activation of the emergency stop should only be operated according to frequency and constraints specified by the crane manufacturer. Checks should be made via operation of both local and remote buttons in turn.
- (b) Ensure all system alarms are properly annunciated.
- (c) Ensure all devices used in the system return to their correct setting/positions according to activation of the 're-set' button or to 're-set' procedures.

18.8.3 Every 4 years

Overhaul completely.

18.9 Engine Overspeed Shut-Down

The engine Overspeed Shut-down system will usually be the only automatic 'shut-down' device on the crane. The system is designed to trip-out at a pre-determined overspeed limit arising from ingestion of any air-born hydrocarbon gases.

It is readily practical to induce shut-down by providing a gas source, however, the system can usually be triggered manually or via enclosed test button local to the prime mover; alternatively by other procedures prescribed by the crane or engine manufacturer. When triggered, all downstream effects should be exactly as for Emergency Stop.

Function of use/re-set checks should be made as for Emergency Stop.

18.9.1 Daily - Monthly

- (a) With the crane inert, check by hand that all linkages, pivots, springs etc. used in the system operate freely without hesitation or hang-up.



- (b) Where applicable, and again with the crane inert, trigger and re-set the system manually.

18.9.2 Periodically

- (a) Activation of the Engine Overspeed Shut-down system should only be undertaken according to the frequency and constraints specified by the crane manufacturer.
- (b) Ensure all system alarms are properly annunciated.
- (c) Ensure the system fully restores to its correct setting on activation of the re-set button or to 're-set' procedures.

18.9.3 Every 4 years

Overhaul completely.

18.10 Slack Rope Preventers/Indicators

Slack Rope Preventers are provided to maintain even spooling of the rope on and off the drum throughout all its layers and to prevent the rope from coiling or looping off the drum under low tension conditions.

Indicators serve merely to warn of rope spooling problem - they are not preventers.

In some cases both preventers and indicators may be fitted.

'Preventers' are extremely active mechanically and as such their rolling elements, pivot pins and springs should be regularly checked for wear. Components which do not rotate as specified can cause severe damage to the rolling elements and to the rope.

'Indicators' with mechanical elements are much less active than preventers and are prone to seizure through corrosion. Equally though, as with preventers, these should be regularly checked.

18.10.1 Daily - Monthly

- (a) Check that all rolling elements rotate freely without hesitation or hang-up.
- (b) Ensure all linkages, pivots, springs etc. are secure, corrosion free, and operate freely throughout the full working range i.e., all rope layers.
- (c) Check for correct setting and function of all indicators (hydraulic or electrical) and ensure associated alarms are correctly annunciated.



18.10.2 Every 12 months or during rope change-out

Thoroughly inspect all rotating elements for wear abrasion damage, and smooth rotation. Check fasteners for tightness according to manufacturers specified torque limits.

18.10.3 Every 2 years (aligning with a rope change-out operation)

Overhaul completely.

18.11 Slew Limits

Slew Limits warn of or prevent the crane from slewing into sensitive or restricted areas on the platform. The limits are usually cam operated valves or switches located close to the slewing axis either within the crane or its pedestal.

The Slew Limits may also in some cases be used to relay signals to other systems, for example, a signal may be taken to reduce the slew brake torque when the crane is lifting over the sea. In other cases, the slew limits may be interactive with boom angle movements.

It is essential therefore that checks are made for condition i.e. corrosion, seizure etc. Where practical and only where safe to do so, in-situ hand operation will provide the best 'feel' for operating performance. Where mechanisms are close to electrical slip rings, the electrical power should be normalised before hand operating the mechanisms.

Slew Limits are normally infrequent operation and therefore a full overhaul is advocated every 2 to 4 years.

18.11.1 Daily - Monthly

- (a) Ensure that the slew limits are correctly set, and that the associated alarms are annunciated accordingly.
- (b) Ensure linkages, pivots, springs, cams, valves etc. used in the system are corrosion free and secure.
- (c) Where practical, hand operate the mechanisms to check for free movement without hesitation or hang-ups. Ensure the crane is inert during the check. Normalise electrical power where mechanisms are close to slip rings prior to hand checking.
- (d) Check that all other interlinked systems perform as specified.

18.11.2 Every 2 - 4 years

Overhaul completely.



18.12 Pendulum Type Radius Indicator

The pendulum radius indicator enables the crane to be used under supervision in the event of failure of the SLI system. The indicator must be referenced to the cranes duty charts located in the drivers compartment for sea and platform lifting. The unit is very simplistic and checks will usually be limited to ensuring the pivot bearing is in good order and that the markings of radius intervals are legible.

18.12.1 Daily - Monthly

- (a) Check that the indicated radius identifies with that displayed by the SLI.
- (b) Ensure that pendulum/pointer freely operates without hang-up and does not foul the graduated quadrant mounting.

18.12.2 Every 5 years

Overhaul completely - arrange to coincide with boom change out or boom rework.

18.13 Wave Following

Wave following or wave compensation systems should be checked for smooth operation, without slack rope occurring. Hydraulic system pressures when in wave following mode should be checked for correct setting in both rise and fall i.e., spooling in/spooling out conditions. Check also that any rise/fall indicators in the drivers compartment operate correctly and in sympathy with the hook load.

Wave following systems are usually an inherent part of the hydraulic pump system design.

18.13.1 Daily - Monthly

- (a) Ensure pressure settings are correct for both rise and fall of the hook and that these pressures correspond with the hook line tensions displayed on SLI as prescribed by the crane manufacturer.
- (b) Check that slack rope does not occur during operation and that the rope spools evenly on the winch drums at all times.
- (c) Ensure any rise/fall indicators operate in sympathy with hook movement.



18.14 Rope Temperature Sensors

Rope temperature sensors are fitted, usually in place of the luff ropes, in cases where the ropes are at risk to loss of lubricant due to high levels of temperature from platform sources such as Flares and gas turbine exhaust emissions.

It is essential that the sensors and indicating systems function correctly at all times. If the crane is located close to heat generators the indicating system should be checked daily whether the crane is active or not.

Associated suspension equipment and constant tension winches should be checked weekly for general condition and operation. This should include all associated sheaves and terminations.

NB: Loss/drying-out of lubricant will considerably reduce the life of the rope and its operational safety. Boom head and/or 'A' Frame sheaves used for the load hoisting rope and luff rope may also be affected by loss of bearing lubricant and should be examined accordingly.

18.14.1 Daily - Monthly

- (a) Check for correct function preferably on a daily basis, and whether or not the crane is in use.
- (b) Ensure all alarms are set to annunciate at the required temperature setting and are correctly annunciated.

18.15 Wind Speed Indicator/Wind Direction Indicator (Windsack)

Wind Speed and wind direction indicators should be examined for securement of their mountings, particularly those of the windsack which can be subjected to high wear and tear due to aggressive weather conditions.

18.15.1 Daily - Monthly

Check for corrosion and securement of the mounting fasteners particularly those of the wind direction indicator (Windsack).

18.5.2 Every 6 Months

Calibrate and check condition of wind speed indicator.

18.16 Fire Extinguisher and Life Jacket

See commentary on Drivers Compartment, section 16.

18.16.1 See Drivers Compartment, section 16.

18.17 Fire and Gas Systems

18.17.1 Daily - Monthly



Where fitted, ensure that fire and gas detection systems and 'break-glass' call points are secure and free of damage.

Ensure associated electrical cable is correctly ran and supported and is clear of local abrasion points.

19. Electrical - GENERAL

Electrical problems generally arise out of other activities on the crane such as, cabling may be damaged due to say hydraulic pump or motor being changed-out and/or the cable is not properly secured afterwards or, luminaries and their enclosures may receive knocks and abuse from unsolicited sources. Cabinet doors left open to driving rain is another problem source. In other words, problems arising electrically, are mainly due to human factors. From a wear and tear aspect the electrical problems are generally associated with mechanical movement, electric motors/generators, brush gear at collector columns, and switches/solenoids etc. The items below generally outline the main areas for concern.

<i>Cabinets</i>	-	<i>check door seals and glands for water tightness and ensure anti-condensation heaters are in working order.</i>
<i>Cables</i>	-	<i>check for abrasion and cuts and deterioration due to high local temperatures (diesel etc.). Ensure that all cable and/or armouring is free of crushing.</i>
<i>Earthing</i>	-	<i>Check condition of all earthing and security of connections. Check that earthing shoe-brush at slewing is in sound operating order and makes positive contact with the slewing.</i>
<i>Lighting</i>	-	<i>Check that all luminaries and enclosures are free of damage and free of water entrapment.</i>
<i>Collector Column</i>	-	<i>Check all brushes for wear and cleanliness. Ensure all mountings, bearings and torque arms are in good order.</i>

19.1 Daily - Monthly

- (a) Ensure all working and instruction labels are securely in place and are fully legible.
- (b) Ensure all cable runs are free of damage and are securely and properly positioned in cable trays. Ensure all cable transits are damage free and meet the specified sealing levels.
- (c) Check that all earth continuity strips are securely in place and free of damage.

Ensure the earthing Shoe brush at the slewing is in good operating order and makes positive contact with the slewing under all circumstances.



- (d) Ensure all luminaries (including emergency lighting) and enclosures are in place, function correctly and are free of damage or water entrapment.
- (e) Ensure all aircraft warning luminaries are of equal illuminance and enclosures are of equal colour.
- (f) Ensure 'Protection Levels' are maintained to those specified at all times.
- (g) Check all cabinet/door seals and glands for water tightness and where applicable check that anti-condensation heaters operate correctly.
- (h) Every month simulate loss of platform power and check for satisfactory change-over to the Uninterruptable Power Supplies (UPS).
- (i) Where electrical circuits extend into the platform system and interface with other equipment in switchrooms and distribution boards etc., these should be inspected and maintained at the same time.

19.2 6 Monthly - 12 Monthly

- (a) Check all brush gear used at the collector column for wear and cleanliness.
- (b) Ensure the collector column mountings, bearings and torque arms are in good order.
- (c) Ensure voltage control regulators are functioning correctly.

20. BOOM CAGES (REFER ALSO TO SECTION 10.3.3)

Boom Cages are supplied for storage and transportation of each boom section. These items are designed to meet the dynamic forces when they are lifted onto the platform from supply boat by the pedestal crane. Consequently they should be maintained to a high standard, periodically NDT inspected, load tested and re-certified accordingly. They should only be used for lifting including test loads according to sling configurations specified by the manufacturer.

20.1 6 - 12 Months

- (a) Check condition of welds and for damage to structural steel work.
- (b) Closely examine condition of lifting points.



- (c) Repair all damaged paint work to correct procedures.

20.2 Every 12 Months

- (a) NDT all main lift points and load carrying points.
- (b) Load test and re-certify.

Note: This inspection may involve Third Party Inspector/Independent Surveyor.

21. ANCILLARY LIFTING EQUIPMENT

Lifting equipment under this category is as follows:-

- (a) Manual Chain Hoists
- (b) Air/Electrically powered hoists
- (c) Wire rope winches
- (d) Come - alongs (TIRFOR)
- (e) Jacking systems and equipment
- (f) Trolleys
- (g) Loose gear
- (h) Runway beams

Periodic checks should be strictly in accordance with the equipment manufacturers requirements.

Every 12 months

Complete overhaul and load test in respect of mechanical components. Full NDT inspection and load test all non-mechanical items such as lifting beams, padeyes, spreaders etc.

Note: This inspection may involve Third Party Inspector/Independent Surveyor.

Ancillary Lifting Equipment , which is provided for general maintenance of plant/equipment offshore tend to suffer deterioration beyond the norm, due generally to high exposure to a marine environment, showing as corrosion and also to physical damage (knocks) through mobilisation from



store to point of use. Lifting equipment which is built-in as part of, or over plant, also tends to suffer from neglect simply because it may be too difficult to access and hence even routine lubrication gets missed under guise of 'catch it next time', but this too never happens.

Lifting equipment most prone to rapid deterioration are generally standard off the shelf items which may not have had any treatment or protection against corrosion etc. Such items in this category are, manual chain hoists, air/electrically powered hoists, wire rope winches, come-alongs, jacking systems and equipment - example, for slewing removal.

Unless these items are routinely lubricated and properly maintained, they can be potentially lethal in use. The lifting equipment manufacturers operation and maintenance procedures which should recognise the pertinent conditions and locations of use should be strictly adhered to. However, lifting equipment of this type, should be overhauled every 12 months and load tested in accordance with manufacturers requirements.

22. OVERLOADS

On overload occurring:

- (a) Make the hook load safe i.e. discharge to nearest 'platform' loading or laydown area. Make actions known by radio to radio room/CCR.
- (b) Stop the crane do not lower the boom. Where the crane is obstructive to helicopters or in the vicinity of heat sources adjust accordingly by slew action. Report intended actions to Installation/Operations management.
- (c) Visually inspect the cranes luff ropes, rope anchorages, rope condition around sheaves and at winch drums. Visually inspect also for signs of damage to the boom particularly at sheave points and at the mid third section of the boom structure. Visually inspect the 'A' frame structure for signs of damage. Some of these inspections may be difficult to undertake due to the crane being stopped away from the normal access position.
- (d) When inspections in (c) are cleared, lower boom into rest and examine as follows:-
 - (i) Check luff and load hoist ropes for broken wires flattening/crushing at sheave and drum points and for any other damage.
 - (ii) Check condition and security of all rope termination including pendant systems.
 - (iii) Check all sheaves for tread damage or fracture/breakages.
 - (iv) Check sheave points and associated boom and 'A' frame structures for damage/security.



- (v) Check thoroughly for any weld failure or structural damage to boom cords and lacings and check that top lacings have not suffered rope (whiplash) damage.
- (vi) Check hook assemblies for deformation (increased admittance dimension) safety latch operation, brinnelling of the thrust bearing by 'feel' while gently rotating, and security of the main captive nut. Permanent load deformation should be re-set, heat treated and NDT inspected according to the hook manufacturers procedures.
- (vii) Check for damage to load/moment sensors to ensure they have not been loaded beyond their operating design levels - re-calibrate according to manufactures instructions.
- (viii) Check tightness of all fasteners used in the primary load path. Remove and inspect for deformation or thread damage; one off sample fastener from each primary load path item which would normally be under tensile loading (Over and above the pre-set tensile load in the bolt). Such fasteners should be taken from the Boom (bottom cord flanges), 'A' frame (ties), Luff and Load Hoist winch mountings, slewing bearing (fore and aft) and GOP system. Such bolts should not be re-used - replace with new bolts.
- (ix) Check 'rock' clearances on slewing being as prescribed by manufacturer and obtain grease samples for particle analysis.
- (x) On ram luffing cranes, check ram rods for deformation and for pick-up. Check ram cylinder for permanent swelling. Check ram anchor points and associated structure for damage.
- (xi) Rework all damaged components to procedures and standards prescribed by the crane manufacturer.
- (xii) Function test and overload test the crane as prescribed by the crane manufacturer.
- (xiii) Where necessary, the crane to be re-Certified.

Note: The inspection checks, remedial work, re-testing/re-commissioning may involve Third Parties, e.g. Certifying Authorities.

An overload is considered to be that load which is in excess of the maximum test load for a given operating radius or alternatively a load which visibly causes physical damage to the cranes elements.

Cranes which have been subjected to overloads which may have been induced by:-



- (a) Snatch or partially snagged loads on the supply boat.
- (b) Triggering the GOP system.
- (c) Hoist rope failure.

*Should be subjected to an immediate inspection of the cranes primary load path elements prior to any re-use of the crane. See also section 10.
High overloads and shock loads can severely damage the crane and should be reported immediately.*

Where cranes are fitted with 'load' recording as part of the SLI system, this data should be downloaded and examined under report of any high/shock loads occurring to the crane.

It is essential that the procedures and inspection checks listed are undertaken by a competent person. Remedial work should be undertaken to procedures and standards specified by the crane manufacturer. On completion of any major re-work, the crane should be function tested then overload tested to levels prescribed by the crane manufacturer.

Note: The inspection checks, major re-work, function and overload testing may involve crane manufacturers Inspectors/Engineers and/or Certifying Authority Surveyors. The crane may also be required to be re-Certified.

23. STORAGE OF SPARES

Crane spares with the exception of large structural items such as booms should be stored in a dry dust free environmentally secure store. Items which are particularly sensitive to dirt and/or damage such as ropes, hydraulic equipment, electrical equipment, fasteners, bearings etc. may require additional protection and attention whilst in store. The treatment of some of these items (but not necessarily limited to) are outlined in check list fashion. It is particularly important that spares, especially ropes for example, which can suffer some deterioration whilst in store for too long a period, are used on a first-in store/ first-out of store basis.

Boom sections which are large but relatively delicate structures, should be stored and transported in purpose built steel cages. These cages are themselves pieces of lifting equipment for which inspection and testing against accredited documentation must be maintained.

In all instances, crane spares should be periodically checked for damage, corrosion and general condition whilst they are in store so as to avoid call-up of any item which is not fit for purpose through degeneration in store.

23.1 Every 3 to 6 months

- (a) Hydraulic Components - Ensure all ports and piping are plugged and sealed with steel plugs and/or blanking plates.
 - (i) Ensure fittings are protected with steel or plastic plugs or caps
 - (ii) Ensure all exposed shafts and mounting surfaces are coated with rust inhibitors and are adequately protected



from damage or loss of components (e.g. keys from shafts).

- (b) Ropes - Ensure these are properly coiled and protected with hemp/plastic wrapping. Where rope is stored coiled on steel or wooden drums, ensure rope exposure is minimised or protected against damage due to slinging or handling. Rope should be used on a first-in store/ first-out of store basis.
- (c) Slewrings - Should be fitted with handling spider and stored crated complete. Slewrings in long term storage should also be vacuum wrapped. Handling of the slewing outside of its crate should be undertaken in the horizontal position and only with the spider fitted.
- (d) Electrical Components - Should be stored in sealed boxes or packages.
- (e) Fasteners - Bolts should be stored and transported in wooden boxes. Where fasteners are un-galvanised, these should be treated with rust inhibitors. Bolts used in the cranes primary load path should have their threads protected against damage.
- (d) Bearings - Bearings and gearing which may be assembled and stored as part of other packages such as sheaves gearboxes etc. should be protected from the environment and damage by hard cover plates over the components entry points.
- (e) Boom Sections - These should be stored and transported in purpose built steel cages. All machined areas of the boom should be coated with rust inhibitors.

The spare boom sections should be inspected every 6 to 12 months according to items applicable in schedule 10.3.1 and 10.3.2 (page 18).

24. LOAD TESTING

Load testing is to be carried out every 12 months as a statutory requirement and after every repair, alteration or change-out of primary load path structures or mechanical elements. Such items include but may not necessarily be limited to the following:-

- Boom
- 'A' Frame
- Machinery Bed
- Slewing/Fasteners



- Pedestal
- Winch Mountings/Fasteners
- Winch Brakes/Clutches
- Sheaves
- Load Sensor Carriers

The following checks should be carried out:-

- (a) Check that test load is as prescribed by the crane manufacturer for minimum, maximum and mid-point radii.
- (b) Lift the test load corresponding with the radius to just clear the deck and hold for approx. 15 mins; check for brake-slip and any undue movement at rope terminations and load sensor carriers. On ram luffing cranes, check for creepage at the luffing rams (change of stroke); particularly check areas of repair or alteration.
- (c) Luff-in to check the luff drive system whilst maintaining the test load just above the deck.
- (d) Repeat load test for each load/radius condition in (a).

The crane should be load tested after repairs or alterations have been undertaken on any of the primary load path structures and after NDT inspection of associated welds. The repair or alteration can only be considered to be complete upon thorough inspection after the load test has been completed.

Since the magnitude of the test load will vary from crane to crane, according to design standards, crane geometry and limiting features, the applied load must be carefully selected by the qualified inspector familiar with the cranes duty charts and the cranes limitations. Therefore, when structural items have been repaired, altered or changed-out, it is necessary to load test the crane at various geometries, and, it is recommended this be done at minimum, mid and maximum radius with corresponding loads and falls at the hook block. This procedure would also satisfy testing of the load hoist, boom hoist winch or luffing rams to check holding adequacy of replacement brakes, clutches, motors, lock valves etc. When load testing the load hoist winch as a single piece of equipment, it is only necessary to apply a single part hook load commensurate with the working capacities of the winch, rope, brakes etc. and crane duties/geometries.



25. CERTIFICATION

General requirements as tabulated below:-

EQUIPMENT TYPE	CERTIFICATE REQUIRED				
	OVERLOAD TEST	MATLS.	WELDING	PRESS. TEST	ROPE/CHAIN BREAKING TEST
PED. CRANES OET CRANES BOP CRANES GOLIATH/ GANTRY CRANES	YES	YES	YES	YES	YES
HOISTS-ROPE/ CHAIN/TROLLEYS WINCHES	YES	NO	NO	NO	YES
FIXED INSTLNS- LIFTING BEAMS PADEYES DAVITS	YES	YES	YES	NO	NO
LOOSE EQUIPT- HOOKS/HOOK BLKS	YES	YES	YES	NO	NO
SPREADER BEAMS	YES	YES	YES	NO	NO
SLINGS/TERMS.	YES	NO	NO	NO	YES
SHACKLES, BEAM CLAMPS, RIGGING SCREWS	YES	NO	NO	NO	NO
JACKS (HYD.)	YES	YES	YES	YES	NO
PROTECTIVE BOOM CAGES	YES	YES	YES	NO	NO

All lifting equipment will require to be certified according to the requirements of National/International bodies, Certifying Authorities or to specified standards.

Certification of lifting equipment will usually be limited to an overload test at an approved test house/authority for the lifting equipment as a whole. However, in certain circumstances, usually relating to heavy or specialised lifting equipment, there may be a need to obtain additional certificates covering individual aspects of the equipment such as materials, welding, pressure vessel testing, ropes, etc. There may also be instances where the design of lifting equipment (mainly heavy or specialised), will require certified approval by for example, certifying authorities. The certification, shown tabulated, generally outlines (not exhaustively) what is needed for various lifting equipment.



DEFINITIONS AND ABBREVIATIONS

Definitions

Standardised definitions may be found in the BP Group RPSEs Introductory volume.

Abbreviations

EEMUA	The Engineering Equipment and Materials Users Association
GOP	Gross Overmoment (Overload) Protection System
NDT	Non Destructive Testing
PA	Public Address
SLI	Safe Load Indicator



LIST OF REFERENCED DOCUMENTS

A reference invokes the latest published issue or amendment unless stated otherwise.

Referenced standards may be replaced by equivalent standards that are internationally or otherwise recognised provided that it can be shown to the satisfaction of the purchaser's professional engineer that they meet or exceed the requirements of the referenced standards.

ISO 4309	Wire Rope for Lifting Appliances - Code of Practice for Examination and discard
BP Group GS 138-1	Offshore Pedestal Cranes (was BP Std 112)
BP Group GS 134-1	Hydraulic Power Supplies (was BP Std 115)

