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BR 3027(2)

LIFTING EQUIPMENT POLICY

MANUAL OF SAFE USE, EXAMINATION AND TESTING

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PROPOSALS FOR CHANGES

Fleet and their supporting authorities are to use the form S2022 to inform the BR Sponsor of proposed changes to this BR in accordance with (iaw) BR 023 - Technical Instructions for Submarines (TISMS). Others are requested to use the form below which should be forwarded to the addresses shown on page (ii) of this publication.

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LIFTING EQUIPMENT POLICY - MANUAL OF SAFE USE, EXAMINATION AND TESTING

A detailed Contents List precedes each Chapter and Annex

WARNINGS AND CAUTIONS

LIFTING EQUIPMENT

POORLY MAINTAINED LIFTING EQUIPMENT CAN CAUSE SERIOUS INJURY OR POSSIBLE LOSS OF LIFE. ENSURE THE EQUIPMENT TO BE USED IS OF A PROVEN AND TESTED DESIGN AND IS SUITABLE FOR THE TASK TO BE PERFORMED, I.E. "FIT FOR PURPOSE".

COMPOSITE ROPE

COMPOSITE ROPE MUST NOT BE USED FOR LIFTING PURPOSES.

LIVERPOOL SPLICE

THE LIVERPOOL SPLICE IS NOT TO BE USED FOR ROYAL NAVAL AND RFA PURPOSES.

MECHANICAL SPLICES

ALL MECHANICAL SPLICES ARE TO BE TESTED TO 2 TIMES THE SWL FOLLOWING MANUFACTURE.

WHIPPING TWINE

WHIPPING TWINE SHALL NOT BE USED.

FLASH BACK

FLASH BACK IS NOT TO BE PRESSED INTO THE SPLICE.

FERRULE TERMINATION

FERRULE TERMINATIONS SHALL NOT BE USED WITH 6 TIMES THE 12 CONSTRUCTION (12/FIBRE).

MINIMUM DISTANCE

A MINIMUM DISTANCE OF 10 TIMES THE ROPE DIAMETER BETWEEN FERRULES SHALL BE MAINTAINED.

WORN OR OVERSIZED DIES

WORN OR OVERSIZED DIES WILL IMPAIR THE INTEGRITY OF THE SPLICE.

HEALTH AND SAFETY

ALL PERSONNEL ARE TO COMPLY WITH THE REQUIREMENTS OF THE HEALTH AND SAFETY AT WORK ETC. ACT 1974, AS AMENDED BY THE CONSUMER PROTECTION ACT 1987, AND WORK TO ANY REGULATIONS MADE BY THE SECRETARY OF STATE UNDER POWERS CONFERRED ON HIM BY THE ACTS AND TO COMPLY WITH THE CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH (COSHH) REGULATIONS AND ANY LOCAL HEALTH AND SAFETY INSTRUCTIONS OR PROCEDURES.

WARNINGS AND CAUTIONS (continued)

RISK ASSESSMENT

IT IS THE RESPONSIBILITY OF THE MAINTAINER TO CONSIDER ALL PRECAUTIONS AND POTENTIAL HAZARDS FOR EACH MAINTENANCE PROCESS AND WHERE A SIGNIFICANT RISK IS IDENTIFIED A SUITABLE ASSESSMENT IS TO BE CARRIED OUT TO ENSURE COMPLIANCE WITH CURRENT REGULATIONS.

MANUAL HANDLING AND LIFTING

THE MANUAL HANDLING AND LIFTING OPERATIONS REGULATIONS 1992 (AS AMENDED IN 2002), LIFTING OPERATIONS AND LIFTING EQUIPMENT REGULATIONS 1998 (LOLER):

1 **DO NOT LIFT HEAVY EQUIPMENT WITHOUT DUE CONSIDERATION OF LIFTING AND HANDLING REGULATIONS.**

2 **APPROVED LIFTING EQUIPMENT, TESTED IN ACCORDANCE WITH BR 3027(1) LIFTING EQUIPMENT POLICY AND BR 3027(2) LIFTING EQUIPMENT POLICY, MANUAL OF SAFE USE, EXAMINATION AND TESTING , IS TO BE USED.**

FAILURE TO COMPLY CONSTITUTES A SERIOUS HAZARD TO PERSONNEL.

HIGH PRESSURE (HYDRAULIC)

HIGH HYDRAULIC PRESSURE IS APPLIED TO SOME COMPONENTS DESCRIBED IN THIS PUBLICATION. UNCONTROLLED RELEASE OF THIS PRESSURE IS HAZARDOUS TO PERSONNEL AND MAY CAUSE DAMAGE TO EQUIPMENT. BEFORE DISCONNECTING THE PRESSURE SUPPLY AND DELIVERY PIPES, THE SYSTEM MUST BE ISOLATED AND TAGGED OUT IAW BR 167, CHAPTER 13 AND BR 023 (TISMS) AND ANY INTERNAL PRESSURE MUST BE RELEASED SLOWLY. ANY PERSONNEL WORKING ON HIGH PRESSURE SYSTEMS SHOULD WEAR EYE PROTECTION. FOR DETAILED SAFETY PRECAUTIONS REFER TO BR 2000(53)(2).

STANDARDS AND PROCESS SPECIFICATIONS

THE SAFETY WARNINGS AND PRECAUTIONS DETAILED IN THOSE STANDARDS AND PROCESS SPECIFICATIONS REFERENCED WITHIN THIS BR ARE TO BE STRICTLY OBSERVED.

TAGOUT AND ISOLATIONS

A FULL TAGOUT SYSTEM IS TO BE EMPLOYED IAW THE INSTRUCTIONS CONTAINED IN BR 023 TISMS (1) CHAPTER 12 (SUBMARINE TAGOUTS). FOR DETAILED TAGOUT AND ISOLATION SAFETY PRECAUTIONS REFER TO BR 167, CHAPTER 13, SECTION 1 (SUBMARINE AND GENERAL SERVICE TAGOUTS).

CAUTION

CLEANING WIRE ROPES. Petrol, paraffin, solvent and steam cleaning is not to be used to clean wire ropes in preparation for re-lubrication. Where possible, proprietary lubricant should be injected under pressure to lubricate wires. Pressure application forces out dirt and debris, replacing it with clean lubricant.

LIST OF ASSOCIATED PUBLICATIONS

Reference	Title
BR 023	Technical Instructions for Submarines – Volume 1
BR 067	Admiralty Manual of Seamanship
BR 167	The Safety, Health and Environment Manual
BR 300(SM)	Submarine Weapon Engineering Manual
BR 367	Anchors, Chain Cables and Associated Equipment
BR 2000(53)(2)	Hydraulic Engineering Practice, Volume 2
BR 3001	Fleet Engineering Orders (Surface Ships)
BR 3027(1)	Lifting Equipment Policy
BR 6004	A Safety Handbook for RN Slingers
BS EN 12385-1	Steel Wire Ropes. Safety. General Requirements
BS EN 12385-4	Steel Wire Ropes. Safety. Stranded Ropes for General Lifting Applications
BS 7121-4	Code of Practice for Safe Use of Cranes. Lorry Loaders
BS EN 1492-1 + A1	Textile Slings. Safety. Flat woven webbing slings made of man-made fibres for general purpose use
BS EN 1494 + A1	Mobile or Movable Jacks and Associated Lifting Equipment
BS EN 13157	Cranes. Safety. Hand Powered Cranes
BS EN 13414-1	Steel Wire Rope Slings. Safety. Slings for General Lifting Service
BS EN 13414-2 + A2	Steel wire rope slings. Safety. Specification for information for use and maintenance to be provided by the manufacturer
BS EN 13889	Forged Steel Shackles for General Lifting Purposes. Dee Shackles and Bow Shackles. Grade 6. Safety
Def Stan 02-113	Requirements for Mechanical Handling (Beyond Review Date)
Def Stan 02-177	Requirements for the Manufacture, Test and Identification for items of Smith's Work (Category 3) (Beyond Review Date)
Def Stan 02-187	Requirements for Polyester Roundslings, Protection Sleeves and associated Metal fittings (Category 3) (Beyond Review Date)
Def Stan 07-279	Requirements for Replenishment at Sea HM Surface Ships (Category 1) (Beyond Review Date)
ISO 2415	Forged Shackles for General Lifting Purposes - Dee Shackles and Bow Shackles
ISO 14518	Cranes. Requirements for Test Loads

(continued)

LIST OF ASSOCIATED PUBLICATIONS (continued)

Reference	Title
JSP 375	Management of Health and Safety in Defence
JSP 467	The Specification of Power Driven Lifting Appliances used for Handling Conventional and Nuclear Armaments.
JSP 482	MoD Explosives Regulations
JSP 518	Regulation of the Naval Nuclear Propulsion Programme
JSP 848	Ministry of Defence Small Craft Policy
JSP 862	MoD Maritime Explosives Regulations – Surface Ships and Submarines
MEPP No 003	Maintenance and Routine Examination of Lifting Equipment and Material Handling Equipment

NOTES

(1) The original system and/or equipment was designed to standards or specifications that may now be obsolete (for example, Director General Ships (DGS) Specifications, Defence Standards, British Standards, etc.). As a consequence, the existing system and/or equipment may not be compliant with the latest design standards.

(2) BRs may exist in different media formats including Hard Copy (BR), Digital (DBR), microfiche (BRF) and on other electronic media/compact disc (BRd). The media format is subject to change with the increasing unreliability and unavailability of microfiche viewers and the subsequent increase in the use of digital media. To establish the current issue status of specific BRs the reader should refer to the online version of BR1.

STATUTORY LEGISLATION

The following statutory requirements, as applicable, shall be adhered to for all equipment covered by this document:

The Health and Safety at Work Act 1974.

The Lifting Operations and Lifting Equipment Regulations 1998.

The Provision and Use of Work Equipment Regulations 1998.

The Merchant Shipping (Hatches and Lifting Plant) Regulations 1988.

The Merchant Shipping (Life-Saving Appliances) Regulations 1999.

The Manual Handling Operations Regulations 1992. (Amended 2002).

The Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations 2006.

The Provision and Use of Work Equipment Regulations Merchant Shipping 2006.

The Management of Health and Safety at Work Regulations 2006.

GLOSSARY OF TERMS

Accessory for lifting: Minor work equipment that attaches a load to a lifting machine, e.g. shackle, chain, sling, spreader bar, eyebolt, etc.

Afloat use: Where the item of Lifting Equipment is used essentially for use afloat, on board ship or for the transfer of stores between ships at sea e.g. Replenishment At Sea (RAS).

Anchorage: A means of securing a crane in position, e.g. via foundation bolts or a wire termination e.g. on a winch.

Anemometer: An instrument for measuring wind speed. Required on a crane to verify that the weather conditions are safe for the crane to operate.

Ashore use: Where the item of lifting equipment is essentially for use ashore, in harbour or for the transfer of stores on land.

Automatic rated capacity indicator: Previously known as Automatic Safe Load Indicator - a device fitted to a crane, or incorporated in its design, that automatically gives visual indication to the driver when the load being lifted or carried by the crane approaches the Safe Working Load. It also provides a continuous audible warning to the driver and other persons in the vicinity when the load being lifted or carried exceeds the Safe Working Load (see definition of 'Safe Working Load').

Auxiliary hoist rope: A secondary load lifting rope from an auxiliary drum, usually used for lifting lighter loads than the main hoist rope.

Axle lock: A device which may be fitted on wheel mounted mobile cranes to prevent relative movement between the sprung/pivoted road axle on the chassis frame of the crane mounting in order to increase the stability of the crane during lifting operations.

Baby: See 'Overhauling Weight'.

Backstays (or guy legs): Structural members of a derrick crane which extend backwards and downwards from the top of the mast (or king post), to the outer end of the crane sleepers (or lying legs).

Bale strop: A single wire with ends spliced and both sides of a circle seized around thimbles to form a double strop.

Ballast (Kentledge): Dead weight, built-in or added to the structure of a crane, to ensure stability. On derrick cranes the ballast, also known as Kentledge, is applied centrally at the intersection between the sleepers and the backstays.

Banksman: A safety person sited in such a position that he can be seen by the appliance operator (e.g. crane driver) to direct the operator in positioning or controlling the load. The term is also used where vehicles such as dump trucks, lorries, forklift truck etc are operating in a confined area or reversing; the banksman acts as safety watch protecting operators and personnel/equipment within the vicinity of operation.

Becket: The fitting on the block to which the standing part of the rope used in the purchase may be anchored.

Birth certificate: The original certificate issued by the manufacturer. The certificate may take the form of a Test Certificate, European Declaration of Conformity, Certificate of Incorporation, Statement of Conformity, other Manufacturers Certificates or Report of Thorough Examination.

Blocked condition: See 'Outriggers Set'.

Blocking up base: The effective spans when outriggers or other means are used to increase stability.

Blocks: Single, double, treble, fourfold, fivefold, or sixfold; a block with 1, 2, 3, 4, 5 or 6 sheaves.

GLOSSARY OF TERMS (continued)

Blondin: A wire attached between two fixings and loaded at the centre.

Bolster: Bolster lifting sling.

Bowsill: Stiff-leg derrick crane.

Bracing: A device that steadies or supports other components. Braces can be used instead of guys to secure a derrick.

Counterweight: Weights added to a crane in such a position as to provide a counterbalancing effect.

Crane: A machine incorporating an elevated structural member or jib beneath which suspended loads can be controllably raised or lowered vertically, and also moved horizontally, either by slewing the crane, derricking the jib, or by other means not solely involving a travelling motion of the crane.

Crane centres: The distance between the centre line of the mast of a derrick crane and the centre line of the pin connecting the backstay to the sleepers. Depending on the design of the crane, this dimension may not be the same as the track centres.

Crane driver (or operator): The person who is operating the crane for the purpose of positioning loads (or operating for erection of the crane). He must be trained, certified, over 18 years of age and medically fit for his duties.

Derrick cranes (mast or kingpost): The vertical rotating structural member of a derrick crane to which the machinery and jib foot mountings are attached.

Derricking (or luffing or jibbing): Angular movement of the crane jib in a vertical plane to change the hook radius (see also 'Trolleying').

Derricking ties (or suspension or jib ties or pendants): Ties that support the outer end of the jib. On a derricking jib the ties are usually fixed lengths of rope incorporated in the suspension system to reduce the length of the live derricking part of the suspension system. Also, sectional lengths of ties facilitate adjustment in suspension length when changing the length of the jib on mobile cranes.

Dock work: Means the mooring of a ship, loading and unloading of goods from a ship at dock premises, the embarking or disembarking of passengers on or from a ship at dock premises, the embarking or disembarking on or from a ship of its crew at dock premises and any incidentals thereto. It does not include any work carried out solely by members of the crew under the direction of the Captain or other ship's staff.

Dormant lifting equipment: Equipment that is not in use and is not subject to thorough examination. The equipment must have the potential to be brought back into use after being thoroughly examined.

Drawn up dimension: The distance between the suspension level and the bottom hook saddle when the bottom hook is in the fully raised position.

EC declaration of conformity: A declaration that the equipment satisfies wide ranging health and safety requirements, and the appropriate conformity assessment procedure has been carried out, and in some cases has been subjected to type examination by an approved body, and carries CE marking and other pertinent information.

Effective date: The effective dates for thorough examination and test are those recorded in the Register of Lifting Equipment and in the Thorough Examination Report/Test Certificate.

Effort: The physical exertion applied to a manually operated lifting machine in order to move a specified load (usually the working load limit of the machine).

End fittings: Fittings attached to the end of a sling (e.g. webbing slings - by stitching).

GLOSSARY OF TERMS (continued)

Examination: See 'Thorough Examination'.

Extended dimension: The distance between the suspension level and the bottom hook saddle when the bottom hook is in the extended position. It equals the sum of the drawn up dimension and the range of lift.

Factor of safety: The ratio between the minimum breaking load of an item of Lifting Equipment and its Safe Working Load.

Fall block: See 'Hook Block'.

Falls of rope: The total number of vertical parts of rope or lines from which the pulley hook is suspended (see 'Parts of Rope').

Fitness for purpose: The ability of the Lifting Equipment to operate in its intended operational role in a safe and suitable manner. The Lifting Equipment is of adequate strength for the purpose for which it will be used, is of sound material and free from patent defect, is properly installed or assembled and properly maintained.

Fixed luff jib: A jib that can be adjusted to a fixed angle of inclination.

Flat eye: A soft eye produced by sewing the webbing back on to itself without twisting.

Flat woven webbing sling: A sling consisting of webbing with woven edges, sometimes terminating in end fittings.

Fly-jib (or jury jib): A detachable auxiliary jib fitted at the end of the jib.

Fly-jib mast: A tall structural member located near the jib-head that carries the fly-jib suspension guys.

Free-on-wheels (or mobile condition): The operational condition of a wheel-mounted crane when supported solely by its wheels and able to handle appropriate loads without requiring the use of outriggers.

NOTE

Free-on-wheels duties, if permitted, may be accompanied by restrictions imposed by the crane manufacturer in respect to travelling the crane with loads suspended from the hook, travelling speed, jib length, etc.

Freestanding height: The maximum height at which a tower crane can operate without being held by ties or guys.

Functional inspection: An inspection carried out by a Lifting Equipment Examiner at defined intervals in accordance with a written examination scheme, or whenever considered necessary by a Lifting Equipment Examiner. During which a load up to the maximum Safe Working Load (SWL) or as defined within the written examination scheme shall be lifted. This load is to be representative of the normal maximum loads lifted. The load is to be raised, lowered and traversed throughout the full design range by the lifting equipment in its full design configuration, so that all parts of the system are tested, including the control system, braking and safety gear. For winches and capstans the SWL is applied, pulled and paid out. The speed of operation, power supply parameters, pressures, voltage and current settings are an important factor in the inspection and are to be recorded as part of the inspection data.

NOTE

The functional inspection may be a separate inspection or included as part of a written scheme of examination. Functional inspections carried out by a lifting equipment examiner must be recorded.

GLOSSARY OF TERMS (continued)

Gabbards: A structure of vertical towers and, where necessary, inter-ties on which a derrick crane is erected. They may be in fixed positions or mounted on travelling bogies.

Gantry: The structure for supporting the track of an overhead travelling crane, an elevated structure in the basic crane which carries the jib suspension ropes.

Gauge: The dimension between the inner faces of the railheads of the rail track.

Grommet strop: An endless strop similar to bale strop but formed from a single strand, taken from a wire and wound on itself to form a grommet and seized together.

Halstead sling: A replacement for an endless sling with a single wire strop.

Hammerhead (or swan-neck jib): A jib incorporating a forward off-set or crank in the upper part of the structure to achieve, for example, an increased clearance between a suspended load and the jib structure.

Hand operated chain pulley block: A block reeved with a short link calibrated load chain and operated by a hand chain to give a mechanical advantage.

Hatch covering: Includes hatch covers, hatch beams and attached fittings and fixtures.

Hazardous duties: Includes all aspects where Lifting Equipment is likely to be subjected to special conditions or requirements. These include environmental conditions such as shock loading or inaccuracy of weight. When such circumstances arise, it is essential that only equipment marked with a reduced Safe Working Load (SWL) is used and systems should therefore be instituted to prevent normally rated equipment having a similar SWL being selected in error.

NOTE

Whilst it is the responsibility of the user to take such steps, the following advice should be considered:

(1) For specific installations where the equipment is fixed permanently in position it is to be marked with the reduced SWL for that specific duty.

(2) For specific installations where the equipment is portable, the user should provide written instructions to the operative which include an instruction to use a normally rated piece of equipment (i.e. SWL = WLL) but of appropriately higher capacity, thus achieving the same effective reduction. (SWL = Safe Working Load, WLL = Working Load Limit).

(3) For an industry, or a definable section of an industry where the majority of tasks require equipment having a reduced working load, then all the equipment should have a reduced working load i.e. that corresponding to the most hazardous duty.

Head fitting: The means by which the block is attached to its anchorage or to the load being lifted.

Height of lift: The vertical distance between the ground or other datum level and the seat of the hook, when the hook is in its highest position.

Hoisting/lowering: The movement of the hook/load in the vertical direction.

Hook block (or fall block): The pulley block attached to the crane hook, which is suspended in the falls of the load hoisting rope.

In-service: A service condition (of a crane) with the crane handling loads up to the safe working limit in permissible wind speeds and meeting the requirements and specifications as detailed by the manufacturer.

GLOSSARY OF TERMS (continued)

In-service inspection: Is a visual inspection carried out by a Responsible Person for obvious signs of damage or wear which might affect the equipment's fitness for use. In service inspections include weekly inspections of machinery etc. They do not include inspections carried out by a Competent Person as part of a written scheme of thorough examination or operator pre-use checks.

Installation/reinstallation: Lifting Equipment erected or built on board ship/Lifting Equipment that is re-erected or re-built in a new location.

Intermediate suspension: Additional suspension ropes attached at one or more intermediate positions along the length of a jib. The purpose of the intermediate suspension is to reduce the sagging deflection of long jibs and to dampen out vibrations.

Jib (or boom): The main structure from which the load is suspended.

Jib angle indicator: A device fitted on a crane with derricking jib, which shows the angle of inclination of the jib.

Jib foot: The end of the jib nearest to the crane.

Jib head (or point): The end of the jib remote from the crane.

Jib length: The shortest distance between the centre of the jib pivot or foot pin and the centre of the jib head pulley pin. If jibs have a portion that extends to the rear of the jib pivoting point, that portion is ignored when stating the jib length.

Jib rest: A structure fitted on ship or the truck of a truck-mounted crane to provide support for the crane jib during transportation. The jib is usually positively attached to the jib rest which may incorporate springs or other means to protect the structure from shock loadings in transit (see also 'Bolster').

Jib safety ropes: See 'Safety Ropes'.

Jib safety stops: Structural members, which bear on the jib when it is raised to maximum elevation to help prevent the jib kicking backwards over the cab, and to protect the driver and minimise damage to the machine should the jib fall backwards over the top of the cab.

Jib ties: See 'Derricking Ties'.

Kentledge: See 'Ballast'.

Kingpost:

(1) Mobile crane. The vertical pivot in the axis of rotation about which the crane upper works slew (or rotate).

(2) Derrick cranes. See 'Mast'.

Lacing: See 'Bracing'.

Level indicator: A device fitted on a crane which shows whether the crane is standing level or not.

Level luffing: An arrangement whereby the hook moves approximately horizontally when the jib is derricked (or luffed).

Life start date: That date, determined by the Lifting Equipment Examiner and entered on the equipment certificate when an item of Lifting Equipment has been examined and is ready to start its useful life, e.g. a store item removed from store for use.

GLOSSARY OF TERMS (continued)

Lifting appliance: Any machine which is able to raise, lower or suspend a load. It excludes machines incorporating a guided load, (i.e. lifts) and continuous mechanical handling devices (i.e. conveyors).

NOTE

In its wider aspect it includes any stationary or mobile appliance (and every part thereof including attachments used for anchoring, fixing or supporting that appliance, but not including vehicle coupling arrangements) which is used in dock premises for the purpose of suspending, raising or lowering loads, pulling or moving them from one position to another whilst suspended. It includes transporting devices and docking trolleys and lift trucks but does not include:

(1) Pipes, roadways or gangways.

(2) Screw, belt, bucket or other conveyors used for the continuous movement of goods or people, but not including the lifting appliance used to suspend, raise, lower or move any of these items.

(3) Survival craft or rescue boat, launching and recovery appliances or arrangements.

(4) Pilot hoists.

Lifting equipment: All work equipment used for lifting, suspending or lowering loads, except safety equipment, and includes its attachments used for anchoring, fixing or supporting it. Lifting equipment may be mobile, fixed or portable and includes chain slings, eyebolts, hooks, shackles, wire ropes and slings, natural and synthetic fibre ropes and slings, bosuns chairs, cranes, fork lift trucks, ammunition embarkation rails, davits, derricks, aircraft and helicopter lifts, chain blocks, eyeplates.

Lifting equipment examiner: RN Lifting Equipment Examiners are defined as Senior Rates of the ME, WE and Warfare branches (GS and SM) identified by SOC and who have completed the ME 427 Lifting Equipment Examiner's Course at HMS SULTAN. Such personnel are deemed as Competent Person (Lifting Equipment).

Lifting equipment record keeper (LERK): As for lifting equipment examiner but has the additional task of being responsible for the co-ordination of all lifting equipment planned maintenance and defect rectification through ME, WE and Warfare maintenance planners. This includes the task of maintaining the central electronic register of thorough examination and testing for all items of ship's/submarine's lifting equipment.

Lifting gear: See 'Accessory for Lifting'.

Lifting operation: An operation concerned with the lifting or lowering of a load that involves the use of lifting equipment.

Lifting plant: See 'Lifting Equipment'.

Limit switch: An automatically actuated device to stop a particular motion at its limits of operation.

Live lifting equipment: Equipment that is in date for thorough examination.

Load: Includes any material, person or accessory for lifting, or any combination of these raised or lowered by any Lifting Equipment.

Load-radius indicator: A device fitted on a crane that shows the radius of the hook and the corresponding Safe Working Load.

GLOSSARY OF TERMS (continued)

Load test: A test load (mass or force) applied by the manufacturer or lifting equipment examiner for the purpose of testing lifting equipment to prove its integrity. The load figure and method of test is recorded in the report of a thorough examination. Old equipment may have separate test certificates.

NOTE

Competent persons decide whether a load test is necessary outside of the period set by RN policy. (Refer to BR 3027(1), Sect 3, Chap 7, Table 7.1).

Long ton: Is the name of the Imperial unit of mass and equals 2,240 pounds (1016kg). This may be identified as either 'Ton (Long)' or abbreviated to 'T(L).

Lower pivot jib: A jib in which the jib foot is pivotally attached directly to the revolving frame or turntable of a mobile crane.

Lower works: The non-rotating lower part of a crane including the mounting, located below the slewing ring (see also 'Upper Works').

Luffing: See 'Derricking'.

Main chords: The principal longitudinal structural members of a jib. For example, a jib of rectangular cross section would have four main chords. These may be of angular, round tube, rectangular tube or other cross section.

Main hoist rope: The principal load lifting rope.

Manufacturers certificate: A certificate drawn up by a manufacturer that provides sufficient evidence to show compliance with European Directives.

Margin of stability: When the crane is handling any SWL at the appropriate radius, the margin of stability is the additional load, expressed as a percentage of the SWL, required to bring the crane to a condition of tipping with the jib adjusted to maintain the same operating radius.

Mast - mobile cranes: Suspension Mast (or Forward A-frame or Forward Gantry). A tall structural member located at, or near, the jib foot that carries the jib suspension ropes. The mast supplements the function of the gantry.

Mechanical advantage: The ratio between the load raised and the effort required.

Minimum breaking or failure load: The specified load (mass or force) below which the item of equipment does not fail, either by fracture or distortion to an extent that the load is released.

Mobile condition: See 'Free-on-wheels'.

Mode factor: The Mode Factor takes into account additional stresses incurred by the sling when used in a defined lifting mode. It takes account of multiplicity of legs, the geometry of the lift and bending radius.

Mono tower: An arrangement whereby the jib of a tower crane is carried by a single tower which may be either fixed or slewing.

Multi-leg sling: A combination of more than one strop joined by a single link or ring.

Multipurpose equipment: Multipurpose equipment is any equipment designed to a standard specification to lift a variety of loads up to the marked SWL, i.e. used for general (multi) purposes and not designed for one specific lifting application.

GLOSSARY OF TERMS (continued)

One trip sling: A sling which has not previously been used for any other load and is fitted to the load at the commencement of the journey/task and is intended to be disposed of at the destination of that journey/task.

Operating level: The level on which the operator stands.

Operative: A trained and competent person actually using the equipment.

Out of service: When a crane is not required for use, when wind pressures exceed those permitted for in service conditions, or out of use without a load on the load lifting attachment and according to conditions specified by the manufacturer.

Outreach: The horizontal distance from the centre line of the lifting hook to the nearest point of the machine, other than the jib.

Outriggers: Extensible structural members on the crane mounting to increase the effective base on which the crane stands (see 'Blocking Up Base').

Outriggers set (or blocked condition): The operational condition of a wheel-mounted crane when supported on its outriggers to permit handling of appropriate loads.

Overhauling Weight (or ponder weight, pear weight or baby): A weight securely fitted to the hoisting rope above the lifting hook, to cause the empty hook to lower under gravity.

Parts of rope: The total number of rope lines supporting a structure, e.g. the jib, (see also 'Falls of Rope').

Pear weight: See 'Overhauling Weight'.

Ponder weight: See 'Overhauling Weight'.

Pre-slung cargo sling: A sling that was in position round the goods before they were handled in the course of (dock) operations.

Proving ring: A weighting device sometimes used in the testing of cranes. An accurately calibrated steel ring is suspended between the crane hook and the load. The measured diametric deformation of the ring is proportional to the weight of the load.

Pulley (or sheave): A grooved wheel over which a rope passes. On cranes, pulleys are usually shaft mounted and free to rotate under movement of the rope.

Pulley block: A block with sheaves for use with either natural or synthetic fibre rope, or with steel wire rope and forming a rope purchase.

Quarantined lifting equipment: Equipment placed in or subject to enforced isolation in such a way that ensures it cannot be used. It may be out of date for thorough examination, awaiting repairs or documentation, etc, or dormant.

Radius: The horizontal distance between the point at which the centre of rotation of the crane meets the ground, and the vertical centre line through the hook.

NOTE

In the case of a non-slewing crane, the radius is the horizontal distance from the centre of the lifting hook to the centre line of the nearest axle or bogie measured at ground level.

Rail centres: Horizontal distance between each set of rail tracks.

GLOSSARY OF TERMS (continued)

Rail ties: Rail plate securing fasteners.

Range of lift: The vertical distance that the bottom hook travels between the lower extended position and highest raised position.

Rear pivoted luffing jib: A luffing jib that is pivoted towards the rear of the tower on which it is supported.

Records: Individual records for each lifting equipment that are sufficient to enable its current condition to be assessed relative to previous reports of condition and performance.

Register of lifting equipment: A register held by the ship or supporting shore establishment listing all lifting equipment for which the ship/shore establishment is responsible.

Report of thorough examination: A report issued by the Lifting Equipment Examiner giving results of the thorough examination. This will detail the defects found and shall include a statement that the item is fit, or is not fit, for continued safe use. The report of thorough examination must be retained for inspection when required (see also 'Thorough Examination').

Representative sample block: A block representative of a production run or batch of blocks of the same type, i.e. with the same gears, brake casing, chain, hooks etc, but not necessarily the same range of lift.

Representative sling: A sling representative of a production run or batch of slings of the same type, i.e. having webbing of the same type of weave, the same width and the same material, the same type of stitching and the same end fitting (if applicable), but not necessarily of the same length.

Responsible person: A person who is competent to plan and carry out the lifting of loads, who is familiar with the safe use of the Lifting Equipment they are required to use and the areas in which they are required to work (e.g. crane operator, banksman, slinger, etc). They shall also have sufficient knowledge and training to enable them to recognise obvious defects and the responsibility for the pre-use checks and in-service inspection of their equipment.

Resultant load: The load imposed on the head fitting of the block by application of the SWL.

Rig: 1/1 rig, 2/1 rig etc. A rig with top and bottom single blocks or with top double and bottom single blocks respectively.

Rigging: Boat's equipment consisting of spars, sails etc. The term is also used to collectively group ships equipment e.g. Awnings.

Rigging Warrant: Paperwork required that provides authority for the operation or use of lifting equipment on associated vessels or whilst working within the confines of government establishments.

Rope fall: The rope connecting the blocks of a rig.

Rope parts: The part of the fall between the blocks.

Running load test: A test during which a load is lifted sufficiently to enable the fitness for purpose of the moving parts of the Lifting Equipment to be assessed, and to demonstrate that no inherent weakness has been built into the Lifting Equipment that would be apparent when in service. During the test, operations such as hoisting and slewing are to be carried out at slow speed (see Note). Where appropriate, the load is to be slewed as far as possible in both directions with the boom at the lowest angle to the horizontal for which the Lifting Equipment has been approved.

NOTE

Any speed slower than its normal speed will be acceptable for test purposes.

GLOSSARY OF TERMS (continued)

Saddle (or trolley): A wheel-mounted structure mounted on the jib of a crane, from which the hook is suspended. Movement of the saddle along the jib is controllable and provides the means of varying the hook radius.

Saddle jib: A jib that carries a saddle or trolley, from which the hook is suspended.

Safe load indicator: See 'Automatic Rated Capacity Indicator'.

Safe working load (SWL): The maximum load specified by the design authority that an item of lifting equipment is approved to raise, lower and suspend in all operating conditions. The SWL is specified in the equipment BR or handbook, the test certificate, the equipment, and in any relevant literature supplied by the manufacturer. The administrative authority may from time to time issue directives on the SWL for particular equipment. The SWL will normally be the same as the Working Load Limit (WLL), or the maximum working load, where the term is used, it may, however, be less.

NOTE

Confusion can exist between the terms SWL and WLL. By way of explanation WLL is the load value assigned to the 'maximum' SWL under ideal conditions (by calculation), and in most cases the WLL and the actual SWL will be the same. However, depending upon the conditions of use, it may be necessary for the lifting equipment examiner to reduce the working load to a practical SWL, and it is in these cases that they will differ. If the operating conditions indicate that a reduction is required, it is essential that the user declares this information at the time of ordering so that the correct SWL may be attributed to the equipment and certificate. The manufacturer or supplier will in the absence of such a declaration assume that the circumstances of use are suitable for employment of the equipment rated at the value where the SWL is equal to the WLL.

Safety equipment: Items used for the safety of personnel. This includes safety harnesses, belts and their lines, lifelines, plank stages and bosuns chair, together with their associated equipment.

Safety hook: A crane hook provided with a safety latch across the throat opening of the hook to prevent the sling being accidentally dislodged.

Safety of life at sea equipment: Standards of equipment, design, manufacture and upkeep of Life Saving Equipment designated by the International Convention for Safety of Life at Sea (SOLAS).

Safety ropes (jib arrestors): Wire ropes fitted between the upper most side of the jib and a fixed part of the crane structure to prevent the jib from impacting on the ground or deck in the event of a failure of the jib luffing mechanism.

Service conditions:

(1) In-service. With the crane handling loads up to the SWLs in permissible wind speeds.

(2) Out of service. With the crane either not required for use, or out of use when wind speeds exceed those permitted for in-service conditions, and without load on the hook.

Short ton: Is a unit of mass equal to 2,000 pounds (907.18kg) and is generally used in the United States. This may be identified as either 'Ton (Short)' or abbreviated to 'T(S).Care needs to be taken as it is quite often simply called 'ton' without distinguishing it from the metric tonne (1000kg) and Imperial ton (2,240 pounds).

Single purpose equipment: Single purpose equipment is any equipment designed for and dedicated to lifting a specific load in a specified manner, or working in a particular environment, i.e. used for a single purpose.

GLOSSARY OF TERMS (continued)

Sleepers:

(1) General. Ground supports for rail tracks.

(2) Still Leg Derrick or Scotch Derrick Sleepers (or Lying Legs). The horizontal structural members of a derrick crane that connect the crane sole plate at the bottom of the mast to the bottom end of the backstays.

Slewing: The rotary motion of a crane jib or load about the centre of rotation.

Slewing centre: See 'Centre of Rotation'.

Slewing lock (swing lock): A mechanical device (such as a pin or latch) to lock the crane upper works positively against rotation in one or more positions relative to the lower works (see also 'Swing Brake').

Slewing ring: A bearing (or bearings) on which the slewing part of a crane rotates.

Slewing tower: A tower that slews with the jib and is mounted on a slewing ring.

Sliding tower section: A section of tower which is supported within the top of the main tower of a crane, and which carries the jib, counter-jib and cat-head assembly. When additional sections are added to the main tower, the sliding tower can be raised within it to increase the height of the crane.

Sling: A flexible component for connecting the lifting appliance and the load during handling and lifting.

Sling in basic configuration: A single or endless sling as used for determination of working load limit.

Sling or sling assembly: A sling in the form in which it is actually used.

NOTE

In some cases this will be the same as the sling in basic configuration, in others it will be a form thereof, as in a choke hitch, or a derivation of, a multiple thereof.

Snatch block: A single block with a hinged portion, through which a rope can be passed to facilitate reeving. For use with natural or synthetic rope or with steel wire rope.

Snickling sling: Method of slinging when the chain (wire, rope etc) is taken around the object to be lifted and the hook is placed around the vertical portion of the chain {wire, rope etc) over the item being lifted.

Soft eye: An end of the sling webbing sewn to form an eye to allow reeving or connection to a lifting device.

Sole plate (or pivot structure): The structure under the mast of a derrick crane that carries the slewing rack, and the pivot about which the mast rotates.

Spreader: A mechanism suspended from the hook of a crane that can be attached to, or detached from, a load, for lifting and handling. They may be either of fixed or adjustable dimensions to accommodate loads of different lengths.

Sponsor: The authority responsible for the provision, technical description and setting to work of the equipment.

Standing part: That part of a purchase wire between the becket and the first sheave.

GLOSSARY OF TERMS (continued)

Statement of conformity: A statement of conformity is a certificate issued by the manufacturer confirming that any necessary thorough examination, including where appropriate, manufacturing tests have been carried out, and confirming the SWL. The statement of conformity has the same status as the certificate of test and thorough examination and must be retained for inspection when required.

Static load test: A test during which the lifting equipment is loaded at rest with a load to enable the fitness for purpose of the structure of an item of lifting equipment and its mounting arrangements to be assessed, and to cater for any transient overloading conditions. Deflections must be measured to enable a record to be made of any permanent set after the release of the load; there should be no permanent set. Records are to be made of all deflection readings.

Stiff leg derrick: American term for Scotch derrick.

Stringer: Track; adds stiffness. See 'Bowsill'.

Strop: A flexible single wire or fibre sling with an eye at each end; used for lifting.

Strut jib: A jib supported and located at its lower end, and supported at its upper end by a suspension member, such as a tie rope.

Suspension level: In the case of a block suspended from a hook, it is the level of the suspending hook saddle. In the case of a block combined with a trolley, it is the level of the surface upon which the trolley runs. In other cases there are similar appropriate levels.

Suspension ties: See 'Derricking Ties'.

Swing brake (slewing brake): A friction device to retard the slewing motion of a crane, or to hold the crane upper works against rotation in any desired position relative to the lower works (see also 'Slewing Lock').

Tagline rope (or steady rope): A rope usually attached to the load or fastened to a crane hook attachment to restrain spinning of the load/attachment.

Tail radius: The maximum distance between the centre of rotation and the rearmost point of the revolving upper works (or superstructure).

Technical file: Documentation drawn up to support, and in particular, provide essential health and safety information on the design and production of Lifting Equipment.

Telescopic cage: The cage which encircles the tower of a crane and is used to raise the jib-counter-jib/cat-head assembly when additional tower sections are to be added to increase the height of the crane.

Telescopic jib: A jib that incorporates extension elements in the basic jib structure. The jib length can be extended (or shortened) by a telescoping motion.

Telescopic tower: A tower which is composed of two or more main sections which nest into each other and enable the height of the tower to be altered by a self-powered procedure.

Test: A load applied to an item of Lifting Equipment at the discretion of the manufacturer or Competent Person either statically or dynamically (running test) to prove the equipment is safe to use at loads up to the SWL.

GLOSSARY OF TERMS (continued)

Test certificate: This is a certificate issued by a competent person identifying the test load applied and the safe working load(s) of the equipment. It identifies details of the test, or test and thorough examination conducted on each item of Lifting Equipment certifying its fitness for safe use. The test certificate must be retained for inspection when required.

NOTES

(1) Birth Certificates/Original Reports of Test and Thorough Examination are to be kept for the life of the equipment. 'Test Certificates' are being replaced by 'Reports of Thorough Examination'. Current in date test certificates, provided under older legislation, remain valid until the date by which the next thorough examination would have been necessary, had the preceding legislation remained in force.

(2) Whilst the appearance of 'Reports of Thorough Examination' may vary, the prescribed particulars are generally the same. Each section of the code details the particulars that should be included on the certificate for that particular equipment.

Test load: A test load is a load (mass or force) applied by the manufacturer or by the lifting equipment examiner for the purpose of a test. This load appears on reports of thorough examinations/test certificates.

Thorough examination: An examination of lifting equipment carried out by a lifting equipment examiner at prescribed intervals of at least once in every period of 6 months for lifting equipment used for lifting people and all other lifting equipment and accessories at least once in every period of 12 months, or in accordance with a written examination scheme.

(1) Thorough examinations shall consist of a detailed examination carried out by a lifting equipment examiner who carefully and critically, and where necessary supplemented by other means such as measurement and non-destructive testing, dismantling for access to, or removal of hidden parts, examines the equipment in order to detect damage or deterioration so to reliably assess the safety of the equipment being examined.

(2) Where dismantling is necessary to gain access to hidden parts or for their removal, detailed inspection will be required on assembly to ensure re-assembly has been completed satisfactorily.

NOTES

(1) The period between thorough examinations within a written examination scheme shall be established on the basis of severity of service conditions, nature of the lifts, prior experience and the recommendations of the Lifting Equipment Examiner.

(2) The above periodicities are the maximum intervals permitted between thorough examinations. Refer to BR 3027(1), Sect 3, Chap 7, Table 7.1 for a more detailed explanation.

Tie bars: See 'Rail ties'.

Tie frames: Frames that allow ties to be attached to the tower of a tower crane.

Ties: Means by which the tower of a tower crane can be braced from an adjacent structure, to enable its freestanding height to be exceeded.

Tipping: A hydraulically driven platform lift, loading or tipping platform or the like, having a platform carrying the load and capable of being raised and lowered or tilted by means of at least one hydraulic working cylinder and-depending on the apparatus structure-a lever system.

Tonne: Abbreviation Te or te; equals 1000kg.

GLOSSARY OF TERMS (continued)

Torque limiting device: A device fitted to the drive chain adjacent to the hand chain wheel, set to limit the input torque so that the load cannot exceed the proof load.

Tower: That part of the structure of a tower crane providing elevation and support for the jib mounting. The tower may or may not slew with the jib.

Tower head: The uppermost part of the main tower of a crane. On a fixed mono tower the tower head is immediately beneath the slewing assembly which it supports.

Track centres:

(1) Crawler-mounted cranes. The distances between the centres of the crawler tracks.

(2) Derrick cranes. The horizontal distance between the centres of each pair of track rails (see also 'Rail Centres').

Traction drives: A geared or friction drive utilised in the movement of an appliance e.g. overhead travelling crane.

Training base: Horizontal base of a crane consisting of a bearing surface and toothed gearing on and by which a crane rotates about its vertical axis.

Travelling: Self-propelling movement of a crane along the ground or track.

Travelling (long travel): Movement of a crane along the ground or track.

Traversing (cross travel): Movement of a cab, trolley or load carriage along the bridge girders or running beam.

Trolleying (or racking): Movement of the saddle (or trolley) along a jib to vary the hook radius.

Upper works: Crane gantry, turntable, cab, crane boom supports, hoist-lines and associated equipment.

Vertrep: Vertical replenishment is a method of supply of seaborne vessels by helicopter.

Velocity ratio: The ratio between the distance moved by the effort and the distance moved by the load.

Wedges: Means of securing a moving unit such as a tower or climbing frame.

Winch: A power driven apparatus of one or more drums around which a rope, chain or wire is wound for moving objects. Often used for ship or equipment manoeuvring.

Windlass: A roller or drum around which a rope, chain or wire is wound for raising or lowering stores. The term is often used for hand-power operated winches on boats.

Working load limit: Working Load Limit (WLL), the maximum load (mass) which an item of lifting equipment is designed to raise, lower or suspend. It is a figure in EXCESS of or identical to the SWL to provide allowance for factors such as hazardous conditions.

Woven webbing: A part of the sling comprising a woven narrow fabric, generally of a coarse weave and multiple plies, the prime function of which is load bearing.

GLOSSARY OF TERMS (continued)

Written examination scheme: A suitable written scheme for the examination of an item of lifting equipment authenticated by a lifting equipment examiner, which identifies:

(1) The specific lifting equipment parts that are required to be thoroughly examined and the maximum intervals between examinations.

(2) Where relevant, those lifting equipment parts that require testing and the maximum testing intervals.

(3) Where relevant, the frequency and extent of inspections between thorough examinations.

LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviation	Meaning
BASS	Boats and Sea Survival
BR	Book of Reference
BRd	Book of Reference compact disc
BRF	Book of Reference microfiche
BS	British Standard
BS EN	British Standard European Norm
C of G	Centre of gravity
COSHH	Control of Substances Hazardous to Health
DBR	Digital Book of Reference
Def Stan	Defence Standard
DGS	Director General Ships
FSWR	Flexible Steel Wire Rope
GS	General Service
iaw	in accordance with
ISO	International Standards Organization
JSP	Joint Service Publication
LEE	Lifting Equipment Examiner
LERK	Lifting Equipment Record Keeper
LESMS	Lifting Equipment Safety Management System
LOLER	Lifting Operations and Lifting Equipment Regulations
ME	Marine Engineering
MEPP	Munitions Engineering Processing Procedures
MMERS	MoD Maritime Explosive Regulations
MOD	Ministry of Defence
MSS	Marine Systems Support
NATO	North Atlantic Treaty Organisation
NED	Next Examination Date
NES	Naval Engineering Standard

(continued)

LIST OF ABBREVIATIONS (continued)

Abbreviation	Meaning
NSN	NATO Stock Number
OEM	Original Equipment Manufacturer
OPDEF	Operational Deficiency
Para	Paragraph
PMS	Planned Maintenance Schedule
PPE	Personal Protective Equipment
RAS	Replenishment at Sea
RCI	Radius Capacity Indicator
RCM	Reliability Centred Maintenance
RFA	Royal Fleet Auxiliary
RoLaRE	Record of Lifting and Rigging Equipment
SDN	Service Drawing Number
SM	Submarine
SOC	Scheme of Complement
SOLAS	Safety of Life at Sea
SQEP	Suitably Qualified Experienced Person
SWL	Safe Working Load
TISMS	Technical Instructions for Submarines
TMD	Tube Mounted Dispenser
TWI	Tactical Weapons Instruction
TWOPS	Tactical Weapon Operating Procedures in Submarines
UIN	Unique Identification Number
UMMS	Unit Maintenance Management System
UWS	Underwater Systems
WE	Weapon Engineering
WEO	Weapon Engineering Officer
WLL	Working Load Limit

POLICY STATEMENT

1 This publication consolidates the mandatory instructions which are to be complied with when carrying out the tests, maintenance, periodical inspections and examinations of Lifting Equipment in HM Ships and Submarines, Royal Fleet Auxiliaries, Harbour Auxiliary Vessels and Mercantile vessels requisitioned for Royal Naval service and certain shore establishments lifting equipment.

2 This publication is to be used as the authority for all requirements of inspection, examination, test and upkeep of lifting equipment designed for use in RN ships, e.g. to Def Stan 02-113, Requirements for Mechanical Handling. It will also be applicable to equipment designed to other standards; however, test loads must only be applied in accordance with the design authority requirements. The handbook or BR for individual lifting equipment will give further instructions and detail in greater depth the checks, inspections, examination and testing appropriate, within the general requirements of this BR.

3 Observance of all Warnings and Cautions in this publication is mandatory.

PREFACE

This publication describes the Lifting Equipment Policy Manual of Safe Use, Examination and Testing for vessels and shore establishments of the Royal Navy and Royal Fleet Auxiliary. This Digital Edition of the BR was reviewed in June 2018, and has undergone a full document review to:

Validate its contents

Correct errors and omissions

Review Warnings, Drawings and Product Data.

Historical change information:

The first Digital Edition of this BR was reviewed in April 2012 and has undergone a full document review to:

Validate its contents

Correct errors and omissions

Review Safety Warnings and Product Data.

INTRODUCTION

AIMS OF THE REVISED UPKEEP POLICY

1 This volume BR 3027(2) is to be read in conjunction with the requirements mandated within BR 3027(1).

2 Where this document identifies the design requirement "Def Stan 02-113" this shall also mean equipment designed in accordance with NES 113, the Defence Standards former identity.

3 The aim of this volume is to give an insight into the varying forms of lifting equipment within use on Royal Naval ships. It further identifies additional safety, test, upkeep etc requirements to ensure that the equipment is not just compliant with relevant statutory legislation but is also considered to be "Fit for Purpose".

4 The description under each subject heading herein gives an overview of the particular types of equipment used without being restrictive to any particular manufacturer. It also reflects the best practice for the upkeep of lifting equipment, as used in civilian industry.

5 JSP 375, the MoD Health and Safety Handbook, sets out the policy of the Secretary of State for the compliance of all MoD employees, both service and civilian, to all Health and Safety legislation. The Second Permanent Under Secretary of State is responsible for ensuring compliance at all levels. The policy sets out the following requirements.

6 Each member of the MoD, whether service or civilian, is required to take all reasonable care for the health and safety of both himself and other persons who may be affected by his acts or omissions at work, furthermore:

6.1 All members of HM forces are required to obey standing orders issued in respect of any duty or requirement imposed on their Commanding Officer or on them as individuals by, or under, any relevant statutory provision or MoD instruction.

6.2 All civilian employees are to follow instructions in respect of any duty or requirement imposed on them by the relevant standing orders.

7 The requirement in respect of the upkeep of lifting equipment is for the increased use of examination and inspection by trained personnel. Testing by loading equipment with test weights has been drastically reduced, because this method can reduce the safe operating life of the equipment.

8 This BR and its policy on the upkeep of lifting equipment is not applicable to:

8.1 Nuclear lifts: Equipment used to lift nuclear material that, in becoming damaged itself or causing damage due to dropping or other mishap during the lift, could prejudice nuclear safety or lead to a radiological hazard. Requirements with this in mind are laid down in JSP 518, Regulation of the Naval Nuclear Propulsion Programme, and the appropriate statutory regulations.

8.2 Lifting equipment used within HM Naval Bases and or other MoD(N) establishments, and contractor establishments or equipment. Requirements are contained in the appropriate statutory regulations and other MoD regulations e.g. JSP 482.

8.3 Tests carried out during manufacture of lifting equipment.

8.4 Chain cable used exclusively for the purpose of anchoring. Refer to BR 367, Anchors, Chain Cables and Associated Equipment.

CHAPTER 1

LIFTING EQUIPMENT - GENERAL

CONTENTS

LIFTING EQUIPMENT

General

1 No lifting machine shall be taken into use for the first time unless it has been suitably tested and all parts thoroughly examined by a Lifting Equipment Examiner (competent person). A certificate of test and examination (birth certificate), specifying the Safe Working Load(s) (SWL(s)) of the machine and unique serial number of the equipment, shall be issued and signed by the person making the test and examination. The original of this certificate shall be kept by the custodian for the life of the equipment and made available for inspection as required.

2 All equipment is to be subjected to static and running load tests as identified within BR 3027(1), Sect 3, Chap 7, Table 7.1. The tests are to be preceded and followed by thorough examination.

3 For further information regarding the testing of these items also refer to Annex A of this document.

4 All lifting equipment is to be periodically examined by the Lifting Equipment Examiner at intervals not exceeding 12 months or at a lesser periodicity as identified within BR 3027(1), Sect 3, Chap 7, Table 7.1 or the previous certificate of thorough examination, in order to confirm whether the equipment and its installation are acceptable for continued use.

5 All parts and working gear shall be of good condition, be of adequate strength, free from patent defect and properly maintained.

6 A report containing the prescribed particulars of every examination shall be kept in a register or data file. Where defects may affect the safety of crane operations, ships are to report by OPDEF action or appropriate RFA procedures as applicable. The Administrative Authority (defined as the operator/owner of the vessel) will then undertake necessary repair action and such legislative notification as may be required.

7 The SWL(s) shall be plainly marked on every lifting machine.

8 Except for the purpose of a test, no lifting equipment shall be loaded beyond its SWL.

9 Any person employed or working on or near the wheel track of an overhead travelling crane, or in any place where he would be liable to be struck by the crane then effective measures must be taken, e.g. by warning the driver of the crane, to ensure that the crane does not approach within approximately six metres. Where any person is working at a place above floor level where he would be liable to be struck by an overhead travelling crane or its load, effective measures shall be taken to warn him of the approach of the crane, unless the work is so connected with or dependent upon the movements of the crane as to make a warning unnecessary.

10 Those cranes that are exposed to the elements and subject to increased deterioration, due to the environmental conditions, are to be subjected to increased and regular upkeep and frequent operational checks.

11 It is essential that a safe system of work is in place and used to ensure the safety of personnel and equipment. This safe system is to include the requirement of a permit to work system being in place together with adequate procedures incorporating complete isolation and locking off of the electrical and/or hydraulic supply to the lifting equipment to ensure the safety of personnel carrying out maintenance work. Provision is also to be made for fencing and notices to direct personnel away from areas where equipment is either under test and or maintenance.

12 Lifting Equipment Safety Management System (LESMS) for detail refer to BR 3027(1). Type 45 refer to the Record of Lifting and Rigging Equipment (RoLaRE) as identified in BR 3027(1). All lifting equipment held onboard is to be captured and recorded in LESMS or RoLaRE as appropriate.

NOTE

It is the responsibility of the users of this document to ensure that where a standard is identified, i.e. British Standard, Defence Standard, RN Book of Reference etc, that it remains extant and the latest edition is to be used in all cases.

Dormant items

13 Eyeplates etc that are inaccessible for periodic testing, or are used infrequently, may be declared dormant items. To prevent unauthorised use they are to be suitably blanked off using the approved methods as identified by the following service drawings:

13.1 Dormancy Seal Type 1 - SDN 003 547 835 - NSN 99-378-4310.

13.2 Dormancy Seal Type 2 - SDN 003 547 836 - NSN 99-354-0305.

13.3 Dormancy Seal Type 3 - SDN 003 547 837 - NSN 99-325-6288.

13.4 Dormancy Seal Type 4 - SDN 003 547 838 - NSN 99-816-0189.

14 The dormancy seals are to be applied/removed using approved tools as identified by SDN 003 547 841, approved tool, Allen key NSN 99-219-4101.

15 The lifting equipment register shall be suitably annotated in order to identify those items that are considered dormant.

Safety gear

16 Safety gear shall be tested and certified prior to hand over. All linkages and moving parts are to be checked for free and effective operation at every thorough examination and prior to use.

17 A spring catch, which prevents inadvertent and accidental displacement of the load, shall be fitted to all hooks in RN service.

Upkeep

18 The upkeep of each type of equipment varies however the following aspects, as a minimum, are to be covered within the upkeep requirements:

18.1 All upkeep requirements identified by the original equipment manufacturer.

18.2 Electrical. Regular maintenance to the motor and control equipment.

18.3 Mechanical. Regular lubrication of drive shafts and sheave bearings, checking and top up of gearbox oil levels, visual checks and lubrication of wire ropes.

18.4 Hydraulic. Regular maintenance of oil cleanliness standards, control and upkeep of couplings, fixed and flexible pipes and drive motors, replenishment of oil levels in header tank and gearboxes.

18.5 Maintenance of exterior finish.

18.6 Spooling equipment. Regular lubrication, preservation and use (protection against seizure).

18.7 Regular cleaning to remove salt deposits, etc.

18.8 Pre-use checks:

18.8.1 All relevant tests and thorough examinations are in date and certificates available.

18.8.2 Visual examination and functional test (no load) through full range of operation.

18.8.3 Functional test, at slow speed with "light" and then with representative weight or dummy store, unless directed otherwise by local standing orders.

18.8.4 Defects are to be reported to the relevant equipment manager for rectification.

18.9 Post use checks:

18.9.1 Equipment to be correctly stowed following use and preserved against deterioration.

18.9.2 Defects are to be reported to the relevant equipment manager for rectification.

NOTE

The comments at sub Paras 18.2 to 18.8 are to be considered as additional to that required by the original equipment manufacturer if not detailed within the maintenance manual for the equipment.

Marking

19 Equipment that has been satisfactorily proof tested and/or in receipt of a certificate of conformity and has passed the subsequent examination shall be marked with:

19.1 The SWL.

19.2 Identification marks to facilitate periodic inspection and cross-reference to other records and documentation, i.e. name of manufacturer, unique serial number, NSN etc.

19.3 Such other marks as are required by BR 3027(1), BR 3027(2), Def Stan 02-113 and the equipment design standards, i.e. BS, ISO, Lloyd's rules.

20 All blacksmith items shall comply with and are to be marked in accordance with Def Stan 02-177 (Requirements for the Manufacture, Test and Identification for Items of Smith's Work), or equivalent specification.

CHAPTER 2

CRANES, HOISTS AND LIFTS

CONTENTS

INTRODUCTION

1 All relevant aspects identified within Chap 1 of this BR 3027(2) are to be complied with to ensure that the equipment used on RN vessels is considered safe for use and 'Fit for Purpose', in addition to the information set out within this Chapter.

2 Various types of mechanical handling equipment are used on board ship, these include:

2.1 Cranes:

2.1.1 Mechanical devices that allow the movement of various loads. These devices are fitted to RN ships for tasks such as launch and recovery of boats, armament and general stores handling etc.

2.1.2 The most common forms are either electrically or hydraulically powered.

2.1.3 The cranes consist of an electric/hydraulic motor, which drives a winch drum. A system of reeved wires and sheaves causes the crane hook and in some cases the jib to be raised or lowered. Rotary movement of the crane is usually by means of motor driven pinion gearing which drives a radial rack.

2.2 Lifts:

2.2.1 Mechanical devices that allow vertical movement of loads and personnel between decks.

2.2.2 The most common forms are either electrically or hydraulically powered.

2.2.3 The lifts consist of an electric/hydraulic motor/pump arrangement, driving either a winch drum operated system of reeved wires and sheaves or hydraulic rams to raise and lower the lift platform/cab between deck levels.

CRANES

3 Several types of crane designs are currently in use and include:

3.1 Overhead travelling cranes (electrically powered).

3.2 Fixed cranes (electrically, diesel or hydraulically powered).

3.3 Mobile cranes (electrically, diesel or hydraulically powered).

Overhead travelling cranes

4 Cranes of this type are generally found in machinery spaces and hangers, the track of which is elevated above the work area. Control may be from an elevated cabin or pendant controller.

Fixed cranes

5 Fixed cranes used on ships may be electrically, diesel or hydraulically powered. They are by definition non-mobile although they generally have the means of horizontal movement, as well as vertical movement, of the load by virtue of the rotary motion (slew facility) within their design capabilities.

Cranes used for handling explosives

6 All crane types used for the purpose of handling explosive stores are to be compliant with the minimum technical requirements of JSP 467 (Power Driven Lifting Appliances used for Handling Conventional and Nuclear Armaments).

7 Cranes that are fully compliant with JSP 467, Chap 1 of this document and the 'Safety Requirements for Cranes' below can be regarded as being 'Fit for the Purpose' of handling explosive stores.

Safety requirements for cranes

8 The Safe Working Load(s) (SWL(s)) shall be plainly marked on every lifting machine. In the case of a jib crane, so constructed that the SWL varies by raising or lowering the jib, there shall be an automatic Radius Capacity Indicator (RCI) and a table, attached to it, indicating the SWL at corresponding inclinations of the jib or corresponding radii of the load. Where this is impracticable, due to the crane design and environmental conditions, then full justification is to be made to the equipment sponsor to ensure the minimum acceptable criteria has been achieved.

9 The RCI is to be fitted to the crane in such a position that it shall be visible to the crane operator, in his normal driving position, at all times and is to be checked on each occasion the crane is used.

10 Except for the purpose of a test, no lifting machine shall be loaded beyond its safe working load.

Crane testing

11 Crane testing is to be carried out in accordance with the original manufacturer's instructions and relevant statutory requirements. However, cranes that are also designed and manufactured to comply with the requirements of Defence Standard 02-113 shall be tested in accordance with BR 3027(1), Sect 3, Chap 7, Table 7.1.

12 For further information regarding the testing of Defence Standard 02-113 designed cranes also refer to Annex A of this document.

13 Manufacturers are to be responsible for detailing all tests required for post installation testing. This shall be detailed in such a manner that allows the same test to be performed regardless of the vessels location.

LIFTS AND HOISTS

14 A lift or hoist is a platform or cage whose movement is restricted by fixed guide(s).

15 Lifts generally operate vertically for the movement of personnel and stores from one level to another. They are generally either electrically or hydraulically powered and range from simple one or two person lifts to larger service lifts for food, machinery, aircraft and equipment operating multi-level.

16 Hoists generally operate vertically e.g. to transfer stores from dockside to ship or stores from ground level to a service level or equivalent position.

17 All lifts, other than aircraft lifts, are to be installed in watertight trunkways.

Safety requirements for lifts and hoists

18 Hoist and lift ways shall be protected by a substantial enclosure fitted with gates in order to prevent persons falling into the lift shaft or coming into contact with any moving parts. The exception to this relates only to aircraft lifts where portable guardrails are erected.

19 Automatic devices are to be fitted on all hoists and lifts that are used for carrying personnel to prevent the platform or cage from over-running.

20 Cage gates are to be interlocked thus preventing the lifts operation until the gate has been closed, ensuring that the lift will come to rest immediately the gate starts to open.

21 The interlock system shall ensure that the gate cannot be opened unless the cage or platform is at a designated level.

22 A means shall be fitted, i.e. fireman's switch, for emergency use in the event of equipment failure of hoists and/or lifts used for the carriage of persons.

Testing and thorough examination of lifts and hoists

23 Testing is to be carried out in accordance with the original manufactures instructions, relevant statutory legislation and MoD requirements (see BR 3027(1), Sect 3, Chap 7, Table 7.1) on all lifts and hoists.

24 For further information regarding the testing of these items also refer to Annex A of this document.

25 There is a need to consider those components that are not normally accessible during the statutory thorough examinations. Recommendations should also be identified for the testing of safety equipment, with the following items subject to examination within the periods stated:

25.1 Landing and car door interlocks. Not exceeding 12 months.

25.2 Stepped diameter shafts. Not exceeding 2 years.

25.3 Safety gear. Not exceeding 2 years.

25.4 Governors. Not exceeding 4 years.

25.5 Worm and other gearing. Not exceeding 5 years.

25.6 Shafts, bearings and pulleys. Not exceeding 5 years.

26 Where overload protection devices are fitted, a full load calibration test shall be carried out at intervals not exceeding 12 months.

27 Lift machinery spaces and control cabinets shall be identified 'restricted access areas'. Access to override controls shall be restricted to specifically nominated persons, there must also be a requirement for a two-person rule and a documented policy of access control.

CHAPTER 3

DAVITS (BOATS AND OTHER) AND BOAT HOISTING ARRANGEMENTS

CONTENTS

INTRODUCTION

1 All relevant aspects identified within Chap 1 of this BR 3027(2) are to be complied with to ensure that the equipment used on RN vessels are considered safe for use and Fit for Purpose, in addition to the information set out within this Chapter.

2 Davits of a variety of designs are in service onboard HM Ships. They are required to launch and recover rigid and inflatable boats, underwater equipment and in a general-purpose role.

3 Davits are either:

3.1 Electrically powered. These consist of an electric motor and winch drum assembly which raises or lowers the load via a series of wires and sheaves from the arm(s) of the davit. A brake mechanism is provided in the drive system to stop and hold the load in any position.

3.2 Hydraulically powered. These consist of a series of pistons and/or hydraulic motors which are supplied with hydraulic oil under pressure from either a local or remote system.

BOAT DAVITS

4 Boat hoisting and lowering arrangement generally incorporate wire, rope, chain strops and slings, with emergency arrangements provided to enable lowering when powered operation is unavailable.

5 Disengaging equipment is provided between the end of the hauling wire and the boat raising points.

6 The Merchant Shipping (Life Saving Appliances) Amendment Regulations requires davits to be designed with adequate strength and stability ensuring the requisite factors of safety are achieved.

TESTING

7 Testing is to be carried out in accordance with the original manufactures instructions, relevant statutory legislation and MoD requirements (see BR 3027(1), Sect 3, Chap 7, Table 7.1) on all equipment.

8 For further information regarding the testing of these items also refer to Annex A of this document.

UPKEEP

9 Correct maintenance will invariably prolong the life of the equipment. Therefore the requisite maintenance as recommended by the original equipment manufacturer and equipment BR as applicable shall be conducted throughout the life of the equipment. Maintenance of davits and boat hoisting arrangements should be undertaken in accordance with the appropriate maintenance schedules.

CHAPTER 4

WINCHES AND CAPSTANS

CONTENTS

Para

INTRODUCTION

1 All relevant aspects identified within Chap 1 of this BR 3027(2) are to be complied with to ensure that the equipment used on RN vessels are considered safe for use and Fit for Purpose, in addition to the information set out within this Chapter.

2 A considerable number of these mechanical devices are fitted in RN ships. All winches and capstans are rigidly constructed and should be declared fit for their intended purpose prior to use. However, their accident potential is high when they are incorrectly operated or inadequately maintained.

3 Motive power can be pneumatic, electric, hydraulic or manual. Infinitely variable speed control is an essential requirement to ensure safe and accurate positioning of the load being handled.

TESTING AND THOROUGH EXAMINATION

4 Testing and thorough examinations are to be carried out in accordance with the original manufacturer's instructions, relevant statutory legislation, equipment BR, periodic test form and MoD requirements (see BR 3027(1), Sect 3, Chap 7, Table 7.1) on all winches and capstans.

5 For further information regarding the testing of these items also refer to Annex A of this document.

UPKEEP

6 Winches require regular usage to prevent seizing of drives and action to prevent the effects of corrosion. The upkeep of each type varies considerably and therefore the requisite maintenance as recommended by the original equipment manufacturer and equipment BR as applicable shall be conducted throughout the life of the equipment.

7 Maintenance of capstans and winches should be undertaken in accordance with the appropriate maintenance schedules.

CHAPTER 5

WEAPON AND ARMAMENT STORE - HANDLING ARRANGEMENTS

CONTENTS

INTRODUCTION

1 All relevant aspects identified within Chap 1 of this BR 3027(2) and JSP 467 are to be complied with to ensure that the equipment used on RN vessels are considered safe for use and Fit for Purpose. The following relevant documentation is to be complied with as appropriate to ensure the equipment used on RN vessels are considered safe for use and Fit for Purpose, in addition to the information set out within this Chapter:

1.1 BR 3027(1) and (2) Lifting Equipment Policy.

1.2 UWS Load Test Policy.

1.3 JSP 467 The Specification of Power Driven Lifting Appliances used for Handling Conventional and Nuclear Armaments.

1.4 JSP 482 MoD Explosives Regulations, Military Port Operations.

1.5 JSP 862 MoD Maritime Explosives Regulations (MMERS).

1.6 BR 300(SM) Submarine Weapon Engineering Manual (also known as Tactical Weapons Instructions (TWIs)).

1.7 Tactical Weapon Operating Procedures in Submarines (TWOPS).

2 Lifting plant of a wide variety is used by RN ships for the loading, unloading and transfer within the ship of weapon and armament stores. This equipment requires a higher standard of safety built into the design and construction, tests, examination and certification than equipment used for general stores handling duties due to the nature of the stores being handled.

3 For further information regarding the testing of these items also refer to Annex A of this document.

SURFACE SHIP BASED EQUIPMENT

4 Explosive stores are supplied to and removed from ships using different methods dependent on:

4.1 Location of supplier.

4.2 Ship location.

4.3 Ship facilities, receiver and supplier.

4.4 Type and amount of explosive stores.

5 Transfer methods include:

5.1 Alongside. Vehicular or ammunition lighter using dockside crane to supply ship.

5.2 At Buoy. Ammunition lighter using barge crane or ships own crane to supply ship.

5.3 At Sea. RFA Replenishment At Sea (RAS) transfer.

5.4 Alongside or At Sea. Helo transfer (Vertrep).

6 Specified routes and arrangements for embarkation and discharge of explosive stores are designated within the ship and equipment design. Transfer routes are planned around the effective safe passage of explosives and are to be effectively tested prior to use. Some ships may require the pre-assembly of equipment prior to use.

SUBMARINE BASED EQUIPMENT

7 Supply and discharge of explosive stores is completed at a berth specifically licensed for ammunition transfer. Whilst some arrangements within the submarine are permanently rigged much of the equipment requires assembly through the embarkation and, in some cases, containment hatches to effect transfer.

HANDLING ARRANGEMENTS

8 These comprise:

8.1 Ammunition cage. A special cage for transportation of explosive stores. The cage is usually lifted using a 4-leg sling with shackles at each corner.

8.2 Ammunition transfer box and cradle, supply box, proprietary equipment box. Special boxes for the transfer of specific stores. The item and type will determine whether the box is retained on board or returned to the supplier following removal of the explosive store. The boxes generally have lifting eyes at each corner to receive a 4-leg sling and shackles. Boxes that remain onboard often contain lifting equipment that requires on board upkeep by the lifting equipment examiner.

8.3 Vertrep store nets, palnets. A store net manufactured from wire, manila or webbing with or without an in-built pallet (palnet) for the transfer of explosive stores. Used for Helo, RAS and crane transfer of explosive stores, usually configured with the 4 corners gathered to a central lifting point. Although the ship usually has its own Vertrep net, the supplier invariably supplies the net used for handling explosive stores.

8.4 Ammunition strops, harnesses and slings. These are generally special to type equipment, which incorporate additional safety features and increased factors of safety for handling explosives.

8.5 Transfer trolleys. Designed to handle a specific weapon or explosive store e.g. torpedo trolley. They are used both ashore and onboard to manoeuvre stores along the ammunition route. They are not to be used for any purpose other than their design requirement.

8.6 Ship internal ramps and covers. These are ship builder supplied items that are used over obstructions to enable weapons/explosive stores to be transferred along set routes.

8.7 Embarkation rails. Fitted to HM ships and submarines for the transfer of weapons/explosives along specific routes. Some rails are permanently rigged others are rigged when required. On each occasion rails are rigged and prior to use, they are to be examined by the lifting equipment examiner and a test gauge and test load passed along the entire length before it is passed fit for use. The WEO on HM submarines is suitably qualified to authorise use of the installed system.

8.8 Ammunition winches, transfer shuttles and transfer arrangements. Ship equipment incorporated into ammunition routes to allow movement of stores. The incorporated winches may either be electric, hydraulic, pneumatic or manual and the transfer shuttles electric, hydraulic, or air rams to activate an arrangement of wires to move lift shuttles.

CONTROL OF AMMUNITION LIFTING AND HANDLING ARRANGEMENTS ON BOARD SHIPS AND SUBMARINES

NOTE

The use of Tactical Weapon Operating Procedures (TWOPs) is mandatory in Submarines.

9 Extreme care is to be taken with due consideration for safety of personnel, store and facilities when moving any item of weapon or explosive equipment. Staff must be competent in the use of facilities, they must be trained and certified in the equipment they are using.

UPKEEP

10 All upkeep requirements identified by the original equipment manufacturer, to ensure statutory compliance, shall be carried out on the equipment. This shall also include the additional requirement as identified within Chap 1 of this document and the following:

10.1 Pre-use. Functional test, at slow speed with "light" and then with representative weight or dummy store.

CERTIFICATION

11 All powered lifting equipment is to be classified in accordance with JSP 467, Table 1.

MAINTENANCE

12 Correct maintenance will invariably prolong the life of the equipment. Therefore the requisite maintenance as recommended by the original equipment manufacturer and equipment BR as applicable shall be conducted throughout the life of the equipment.

CHAPTER 6

POWERED AND MANUAL LIFTING APPLIANCES

CONTENTS

INTRODUCTION

1 All relevant aspects identified within Chap 1 of this BR 3027(2) are to be complied with to ensure that the equipment used on RN vessels are considered safe for use and Fit for Purpose. The following relevant documentation is to be complied with as appropriate to ensure the equipment used on RN vessels are considered safe for use and Fit for Purpose, in addition to the information set out within this Chapter:

1.1 BR 3027(1) and (2) Lifting Equipment Policy.

1.2 UWS Load Test Policy.

1.3 JSP 467 The Specification of Power Driven Lifting Appliances used for Handling Conventional and Nuclear Armaments.

1.4 JSP 482 MoD Explosives Regulations, Military Port Operations.

1.5 JSP 862 MoD Maritime Explosives Regulations (MMERS).

1.6 BR 300(SM) Submarine Weapon Engineering Manual (also known as Tactical Weapons Instructions (TWIs)).

1.7 Tactical Weapon Operating Procedures in Submarines (TWOPS).

2 For further information regarding the testing of these items also refer to Annex A of this document.

3 Powered and manual lifting appliances are used for a variety of activities on ships either as portable or integrated into the ships systems.

4 Types of equipment include:

4.1 Powered lifting appliances. Electric, pneumatic and hydraulic equipment.

4.2 Manual lifting appliances. Hand operated chain blocks, lever hoists and lifting/pulling machines.

APPLICATIONS FOR MANUAL APPLIANCES

5 Manual appliances (except chain blocks) can be used for:

5.1 Lifting.

5.2 Pulling.

6 Chain blocks are designed for vertical use only and shall not be used for pulling operations.

HAND OPERATED CHAIN BLOCKS

7 Despite being labour intensive, chain blocks are used for a wide number of activities. They are preferred to power operated hoists in areas where:

7.1 A permanent installation for infrequent use is required.

7.2 A temporary installation for erection or maintenance is required.

7.3 A suitable power supply is not available.

7.4 A precision location of the load is required.

8 The lifting action performed by a chain block is accomplished by means of a sprocket wheel, called a load wheel. The fit of the chain is of the utmost importance since a badly fitting chain, whether too long or too short, will cause the chain to jump as it moves over the sprockets. Jumping is dangerous in that initially, the shock loading on the chain is increased considerably and secondly, the rate of wear increases.

RUNWAY TRACKS

9 Runway tracks are used with both powered and manually operated load blocks to allow movement of the lifting appliance, thus permitting it to span a number of work areas. During routine examinations or prior to load testing, care must be taken to inspect all sections of the runway, step junctions and turntables etc, in addition to the track wheels of the block itself. End stops and turntables are known to work loose with vibration at sea, potentially leading to accidents and dangerous occurrences.

MARKING

10 Runway tracks are to be marked with their Safe Working Load (SWL) and Next Examination Date (NED).

UPKEEP

11 Correct maintenance will invariably prolong the life of the equipment. Therefore the requisite maintenance as recommended by the original equipment manufacturer and equipment BR as applicable shall be conducted throughout the life of the equipment.

CHAPTER 7

LIFTING JACKS

CONTENTS

INTRODUCTION

1 All relevant aspects identified within Chap 1 of this BR 3027(2) are to be complied with to ensure that the equipment used on RN vessels are considered safe for use and Fit for Purpose. The following relevant documentation is to be complied with as appropriate to ensure the equipment used on RN vessels are considered safe for use and Fit for Purpose, in addition to the information set out within this Chapter:

1.1 BR 3027(1) and (2) Lifting Equipment Policy.

1.2 UWS Load Test Policy.

1.3 JSP 467 The Specification of Power Driven Lifting Appliances used for Handling Conventional and Nuclear Armaments.

1.4 JSP 482 MoD Explosives Regulations, Military Port Operations.

1.5 JSP 862 MoD Maritime Explosives Regulations (MMERS).

1.6 BR 300(SM) Submarine Weapon Engineering Manual' then after this add in bracket s '(also known as Tactical Weapons Instructions (TWIs)).

1.7 Tactical Weapon Operating Procedures in Submarines (TWOPS).

2 For further information regarding the testing of these items also refer to Annex A of this document.

3 Lifting jacks form part of loose items of lifting equipment as well as components of fixed items used on board ships.

4 Two basic types of lifting jack are used, these are:

4.1 Hydraulic.

4.2 Mechanical (ratchet, friction or screw).

USES

5 Some of the tasks performed by lifting jacks are:

5.1 Raising of heavy weights.

5.2 Tensioning or exerting pressure on a unit.

5.3 Deflection testing.

5.4 Gaining access to equipment (training base or slip rings).

UPKEEP

6 Correct maintenance will invariably prolong the life of the equipment. Therefore the requisite maintenance as recommended by the original equipment manufacturer and equipment BR as applicable shall be conducted throughout the life of the equipment.

CHAPTER 8

LIFTING STRUCTURES, BEAMS, SPREADERS AND STUMP MASTS

CONTENTS

INTRODUCTION

1 All relevant aspects identified within Chap 1 of this BR 3027(2) are to be complied with to ensure that the equipment used on RN vessels are considered safe for use and Fit for Purpose. The following relevant documentation is to be complied with as appropriate to ensure the equipment used on RN vessels are considered safe for use and Fit for Purpose, in addition to the information set out within this Chapter:

1.1 BR 3027(1) and (2) Lifting Equipment Policy.

1.2 UWS Load Test Policy.

1.3 JSP 467 The Specification of Power Driven Lifting Appliances used for Handling Conventional and Nuclear Armaments.

1.4 JSP 482 MoD Explosives Regulations, Military Port Operations.

1.5 JSP 862 MoD Maritime Explosives Regulations (MMERS).

1.6 BR 300(SM) Submarine Weapon Engineering Manual' then after this add in bracket s '(also known as Tactical Weapons Instructions (TWIs)).

1.7 Tactical Weapon Operating Procedures in Submarines (TWOPS).

2 For further information regarding the testing of these items also refer to Annex A of this document.

LIFTING BEAMS, SPREADERS AND FRAMES

3 The use of a lifting beam in place of long slings will in general increase the stability of the lift. Particular attention should be taken where the lifting points are below the level of the centre of gravity. To achieve a stable configuration, the height of the lifting triangle must be increased in relation to the loading triangle. (Refer to BR6004 A Safety Handbook for RN Slingers).

Beam weight

4 The weight of the lifting beam, spreader or frame, together with its loose gear, must be added to the weight of the load when assessing the total load imposed on the crane.

Loose gear

5 Loose gear is defined as any load carrying component that can be detached from the lifting beam etc.

6 Lifting beams etc may be fitted with a number of different types of standard items of loose gear such as shackles, wire rope slings, chain slings, webbing slings, plate clamps, turnbuckles etc it is essential that these components are retained with the parent equipment and not detached for alternative use. The complete assembly, together with its loose gear, comprises the total unit covered by the test certification.

7 Items of loose gear can be replaced without affecting the overall test certificate or requiring re-test of the assembly, providing the new component is certified as tested and is of the same type, size and standard as the original.

STUMP MASTS

8 Stump masts are used to support and anchor load wires used to provide facilities such as Replenishment At Sea (RAS) equipment.

9 Masts may be fixed, portable, retractable, stayed or non-stayed. Fixed masts are permanently secured to the ships structure, whilst portable masts are stored remote from their in-use position. Once erected, they are secured to the ship's structure by bolts. Retractable masts as their name suggests, are extended and used in situ.

MARKING

10 The following shall be permanently and legibly marked on each lifting beam, spreader, frame etc:

10.1 Unique identification marks. This should be repeated on all detachable components.

10.2 Safe Working Load (SWL).

10.3 Where applicable, the SWL of the individual lifting points.

10.4 The weight of the beam, including loose gear, shall be marked in a prominent position.

10.5 The Centre of Gravity (C of G) for the unloaded beam. This is to be determined as the balanced position using the normal lifting point of the unloaded beam, other C of Gs may be identified on beams with varying lifting positions however they are to be marked to identify the load configuration to which they relate.

UPKEEP

11 Therefore the requisite maintenance as recommended by the original equipment manufacturer and equipment BR, PMS/UMMS as applicable shall be conducted throughout the life of the equipment, together with the following' To 'Therefore the requisite maintenance as recommended by the original equipment manufacturer, equipment BR and the platform maintenance management system shall be conducted throughout the life of the equipment, together with the following:

11.1 Portable masts:

11.1.1 It is essential that the mast is correctly secured in position and that securing bolts are tightened to the correct torque in readiness for use.

11.1.2 Post use cleaning and storage. With bolt holes plugged using dummy screws or bolts.

11.2 Portable stump masts and eyeplates in exposed positions:

11.2.1 Periodic load tests will be deemed invalid if bolt holes used for securing the mast or eyeplates are not blanked immediately after use.

11.2.2 Grease or silicon shall not be used as this can inadvertently be washed out, thus exposing the threads.

11.2.3 Threaded holes left open to the elements in exposed positions will suffer severe degradation of female threads within a very short time period. This will cause incorrect mating of the threads even when the correct torque tightening procedures are used in readiness for use.

CHAPTER 9

ROPES AND LIFTING ACCESSORIES

CONTENTS

INTRODUCTION

1 All relevant aspects identified within Chap 1 of this BR 3027(2) are to be complied with to ensure that the equipment used on RN vessels are considered safe for use and Fit for Purpose. The following documentation is to be complied with in all respects to ensure that the equipment used on RN vessels are considered safe for use and Fit for Purpose, in addition to the information set out within this Chapter:

1.1 BR 3027(1) and (2) Lifting Equipment Policy.

1.2 UWS Load Test Policy.

1.3 JSP 467 The Specification of Power Driven Lifting Appliances used for Handling Conventional and Nuclear Armaments.

1.4 JSP 482 MoD Explosives Regulations, Military Port Operations.

1.5 JSP 862 MoD Maritime Explosives Regulations (MMERS).

1.6 BR 300(SM) Submarine Weapon Engineering Manual (also known as Tactical Weapons Instructions (TWIs)).

1.7 Tactical Weapon Operating Procedures in Submarines (TWOPS).

2 Reference shall be made to BR 067 Admiralty Manual of Seamanship for all equipment identified within this Chapter.

3 Thorough examinations are to be carried out in accordance with the periodicities identified within BR 3027(1), Sect 3, Chap 7, Table 7.1 unless advised otherwise by the competent person following the previous examination and identified accordingly on the certificate of thorough examination.

4 For further information regarding the testing of these items also refer to Annex A of this document.

WIRE ROPES

General

5 Wire rope is manufactured from drawn steel wire, a number of single wires are spun together to create a strand which may be laid around a core of fibre or steel.

6 The wire rope used for slings is to be based on BS EN 12385-1 Steel Wire Ropes. Safety. General Requirements and BS EN 12385-4 Steel Wire Ropes. Safety. Stranded Ropes for General Lifting Applications and BS EN 13414-1 and 2 Specifications for Steel Wire Rope Slings.

Composite rope

WARNING

COMPOSITE ROPE. COMPOSITE ROPE MUST NOT BE USED FOR LIFTING PURPOSES.

7 This type of rope consists of a combination of galvanised steel rope and fibre rope spun together to form a rope which from the outside has the appearance of a fibre rope and a core of steel wire.

8 Composite rope can be identified by examining the 'cut' end section where sight and touch will indicate the wire cores.

Splices and terminations

WARNING

LIVERPOOL SPLICE. THE LIVERPOOL SPLICE IS NOT TO BE USED FOR ROYAL NAVAL AND RFA PURPOSES.

9 The reason for not allowing the Liverpool splice within RN service is that due to the direction of the splice i.e. the tucks follow the direction of rope lay, there is a possibility for the tucks to draw out should the rope be allowed to freely rotate.

Mechanical splices

WARNINGS

(1) MECHANICAL SPLICES. ALL MECHANICAL SPLICES ARE TO BE TESTED TO 2 X SWL FOLLOWING MANUFACTURE.

(2) WHIPPING TWINE. WHIPPING TWINE SHALL NOT BE USED.

(3) FLASH BACK. FLASH BACK IS NOT TO BE PRESSED INTO THE SPLICE.

(4) FERRULE TERMINATION. FERRULE TERMINATIONS SHALL NOT BE USED WITH 6 X 12 CONSTRUCTION (12/FIBRE).

(5) MINIMUM DISTANCE. A MINIMUM DISTANCE OF 10 TIMES THE ROPE DIAMETER BETWEEN FERRULES SHALL BE MAINTAINED.

(6) WORN OR OVERSIZED DIES. WORN OR OVERSIZED DIES WILL IMPAIR THE INTEGRITY OF THE SPLICE.

10 Mechanical splices, known under the trade names Marisplice, Superloop and Talurit (to give some examples) are frequently used to form end terminations for single and multi-leg slings.

11 These splices are formed using a proprietary metal ferrule, sized correctly for the rope diameter, passed over the wires to form a loop and then compressed using correctly sized swage dies clamped under high pressure. (See BR 067).

NOTES

(1) EL ferrules are for ropes with thin plastic covers. Cover to be removed prior to pressing.

(2) DL ferrules are for ropes with a hard polypropylene cover, often impregnated into the rope. Cover to be removed prior to pressing.

(3) Aluminium ferrules are for galvanised ropes.

(4) Copper ferrules are for stainless steel ropes.

(5) Correct swage dies corresponding to the ferrule type and size and rope diameter are to be used.

Wedge anchorage

12 Anchorages of this type are used in crane wire terminations; the rope is fed into a shoe and clamped by a mechanical wedge. The greater the pull the tighter the wedge operates. Wedge and sockets of the correct size for the rope are to be used. The rope is to be fitted so that the live and loaded part does not kink where it leaves the socket.

Wire rope grips

13 A number of proprietary rope grips are available for use to form a sling. Many failures of this type of termination have occurred due to incorrect assembly of the fittings, the use of wrongly sized fittings and an insufficient number of grips fitted. Wire rope grips (Bulldog) or similar are **NOT** to be used for lifting purposes. See BR 067 for further information and guidance.

Wire failure

14 Steel wire ropes are highly loaded machine elements, performing many lifting functions well. It is, however, susceptible to overload, prior damage, corrosion (particularly internal), wear and metal fatigue, which can cause failure, economic loss and personal injury. A rope failure can have disastrous consequences.

15 Any break in a wire rope should be investigated immediately, the item being quarantined, out of service. The subsequent examination should be carried out by a Suitably Qualified Experienced Person (SQEP) - Lifting Equipment Examiner Competent Person RN (Lifting Equipment). The maximum amount of broken wires permitted in Flexible Steel Wire Rope (FSWR) is: Where 10% of the total number of wires are broken in one rope lay or over a length equivalent to 8 diameters of rope.

WARNING

CORRECT PPE AND RIGGING GLOVES. CORRECT PPE AND RIGGING GLOVES SHOULD BE WORN WHEN CARRYING OUT A VISUAL EXAMINATION FOR BROKEN STRANDS; FISH-HOOKS.

16 Every wire rope subjected to corrosion, abrasion or fatigue will fail if it is not taken out of service. The load test policy must be adhered to.

17 The fatigue distribution along the rope length depends both on the design and the mode of operation of the reeving system.

Upkeep

CAUTION

ROPE CORE. The rope core forms part of the load carrying capacity of the wire rope, the condition of the core must not be overlooked when completing thorough examinations.

18 During the thorough examination the competent person is to search for broken wires (i.e. with 'flats'), distortion of strands (usually due to severe kinks), lack of lubrication and signs of corrosion. The latter is usually worse on the inside and therefore the rope is to be opened for internal inspection.

19 It is further suggested that the periodic examinations shall look for and follow the requirements identified within MEPP No 003 (Munitions Engineering Processing Procedures).

CAUTION

LUBRICATING WIRE ROPES. Petrol, paraffin, solvent and steam cleaning should not be used to clean wire ropes in preparation for re-lubrication where possible proprietary lubricant should be injected under pressure to lubricate wires. Pressure application forces out dirt and debris, replacing it with clean active lubricant.

20 Wire ropes are to be thoroughly impregnated with suitable lubricant during manufacture and re-lubricated through its useful life.

CORDAGE

Natural fibre ropes

21 Natural fibre ropes are made from a variety of materials, namely:

21.1 Manila. There are three main grades of manila rope. However, only grade 1 shall be used for lifting purposes.

21.2 Sisal. Not considered suitable for lifting purposes.

21.3 Hemp. Not considered suitable for lifting purposes.

21.4 Coir. Will not stand wear or water and **shall not** be used for lifting purposes.

Identification

22 Fibre rope is generally identified by the use of a 'rogue yarn' of distinctive colour woven into the rope, as identified within BR 067.

Man-made fibre or synthetic ropes

23 Man-made fibre ropes are used more increasingly due to their distinct advantages over natural fibre, some of which are:

23.1 Higher tensile strengths for an equivalent diameter fibre rope.

23.2 Greater capacities for absorbing shock loading.

23.3 Freedom from rotting, mildew, etc.

23.4 Can be stored wet.

23.5 Generally, no deterioration of performance whether wet or dry.

23.6 Immune from degradation from contact with oil, petrol and many solvents.

23.7 Resistant to acid and corrosives.

Nylon

24 Nylon is the generic term for synthetic fibre formed by polyamides.

25 Nylon is to be considered unsuitable for lifting purposes due to its susceptibility to stretching. It does however have good shock resistance and is often used in moorings and anchor wraps.

Polypropylene

26 Cordage manufactured from polypropylene has similar handling characteristics to natural fibre, it has a 'whiskery' surface. Partly because of this surface, it has a far higher resistance to fusion than other synthetic ropes making it effective for capstan work.

Polyester

27 Considered to be the best man-made fibre for most purposes.

Comparative strengths

28 The strengths of a fibre rope is somewhat less than the aggregate strength of the yarns used in its construction and as the size of the rope is increased so the proportional strength of the rope decreases.

CHAIN (EXCLUDING ANCHOR AND MOORING CHAIN)

Introduction

NOTE

This section does not cover the requirements for anchor or mooring chain. Refer to BR 367 (Anchors, Chain Cables and Associated Equipment).

29 Chain remains one of the principle components of lifting gear and is unlikely to be superseded regardless of the increased use of wire rope. It has a longer life and is more robust than wire rope, almost 100 % flexible and can be stored for long periods without deterioration. It does not kink or curl, it grips the load better and possesses superior shock absorbing properties. Chain is however as much as 5 to 6 times heavier as wire rope of the same Safe Working Load (SWL).

Chain failure

30 A chain will generally break for one of four reasons:

30.1 From a defect in one or more links.

30.2 Through the application of a static load in excess of its breaking load.

30.3 Shock loading: the sudden application of a load that exceeds the normal shock the chain would have been capable of handling.

30.4 A twisted or misaligned chain under load.

31 Static overload is the least likely cause for breakage, since the chain will begin to stretch when the overload reaches a value around the proof load. Continued loading will cause the links to stretch to such an extent that it will be apparent by inspection. Links, manufactured using good quality material and design, will bind or lock before actual breakage.

32 Shock loading is the most frequent reason for fractures.

Wear in chain links

33 The amount of wear that can be tolerated in a chain must always be a decision to be taken by the Lifting Equipment Examiner (LEE) who will, or should, know the actual condition of use, etc. As a general rule however, up to 10% wear can be accepted for chain in normal use.

Upkeep

34 Particular attention should be paid to the degree of wear on chain links and elongation of rings during the thorough examination, since this will indicate whether overloading has taken place.

35 All chain should be thoroughly cleaned (oil, paint etc burnt off at low temperature) before examination.

36 Periodic proof testing chains is not a statutory requirement and therefore shall not be carried out.

37 Chain should be dried and examined after use and then stored in a clean dry store. It is essential when hanging chains that it is permitted to hang freely so that it does not twist or kink. Where the chain cannot hang freely (due to its length) ensure that it is adequately supported to prevent damage, hanging the chain in bites or loops is acceptable for this purpose. Each loop is to be securely fastened to stop the chain rattling, thereby creating noise problems for the ship. Chains are to be frequently lubricated.

PROPRIETARY LIFTING SLINGS

Introduction

38 Proprietary lifting slings are usually standard stock items, bought to meet both a general or specific lifting requirement on a ship. They are available in a number of lengths, with a variety of end terminations.

39 Due to the nature of the materials used they are not to be load tested during their in service life. They are however to be inspected prior to and following each occasion of use, and are also to be thoroughly examined in accordance with the periodicity identified within BR 3027(1), Sect 3, Chap 7, Table 7.1.

Types

40 There are basically three types of proprietary lifting sling:

40.1 Round slings. An endless loop of polyester fibre enclosed in a tubular outer sleeve, these shall be in accordance with Def Stan 02-187.

40.2 Webbing Sling. Manufactured from polyester webbing in two forms:

40.2.1 A strop with an eye at each end.

40.2.2 An endless strop.

40.3 Webbing slings are made up as a single layer of webbing (simplex) or a double (duplex). The two basic forms are made with a variety of different assemblies, including single leg, multi leg, and either soft eyes, rings or hooks. These shall be in accordance with These shall be in accordance with BS EN 1492-1 + A1 - Textile slings. Safety. Flat woven webbing slings made of man-made fibres for general purpose use.

Safe working load (SWL) and marking - round and webbing slings

41 Care must be taken when using proprietary slings manufactured from polyester yarn as manufacturers employ a variety of markings for identifying the safe working load of the sling.

42 The Certificate of Conformity issued with the sling (when new) is to identify the pertinent information required by Chap 1 of this document together with details of the test sample as a minimum.

43 Polyester yarn slings are never subjected to load testing, in the event that concern is raised on the slings' condition it is to be thoroughly examined and if found unsuitable it is to be destroyed.

44 Round and webbing slings require little or no maintenance, if the outer sleeve or surface of the sling is intact, not worn or abraded it can be readily assumed that the inner cores will be satisfactory.

Boat strops, slings and disengaging gear (see also small boat lifting policy at Annex B)

45 Various types of lifting equipment are used for the launch and recovery of boats of differing designs. The following paragraphs identify the generic requirement for the testing and upkeep of this equipment.

46 All lifting equipment components are to be tested and thoroughly examined in accordance with the requirements identified within BR 3027(1), Sect 3, Chap 7, Table 7.1.

47 The following additional tests are also to be carried out as applicable:

47.1 Two-legged bridle. The joining ring shall be tested to twice the lifting weight of the boat. If however, the working load in either leg of the bridle exceeds the lifting weight of the boat, the ring shall be tested to twice this working load.

47.2 Three-legged bridle. Where the distribution of forces is indeterminate, it is to be assumed that the test load for the middle leg is 4/3 lifting weight of the boat, each side leg equal to the lifting weight and the test load for the joining ring of the three legs is to be twice the lifting weight of the boat.

47.3 Boats suspended from two lifting appliances, e.g. davits. The working load is to be calculated on the basis of one half the lifting weight of the boat on each sling. The ring joining legs of the sling is to be tested to the lifting weight of the boat, but if the working load in either leg exceeds half the lifting weight of the boat the ring should be tested to twice this working load.

48 Boat strops and slings are to be visually examined prior to each occasion of use. Furthermore, they are to be replaced at intervals not exceeding 5 years, regardless of condition, from:

48.1 The date of manufacture (or certification date) where the item is supplied unpacked (ex manufacture).

48.2 Where the item is supplied 'sealed' in polythene wrapping, the 'life start' is the date of unpacking.

NOTE

For information regarding upkeep policy of Boats smaller than 24m in length please contact equipment sponsor or Boat class manager.

Upkeep

49 All webbing slings and load lashings are to be regularly examined, paying particular attention to knots, twists and kinks. Early failure is likely to occur where these are present. Although webbing materials are resistant to wet deterioration, slings and lashings that have been returned to store wet are likely to show signs of deterioration. Chemical attack can reduce the life of webbing as can sunlight.

50 Nylon strops are to be stowed away and under cover away from direct sunlight. They are to be examined monthly by the LEE.

51 Particular attention is to be paid to the outer cover of lashings. Cuts and abrasions will often pierce the outer cover and cut the inner strands, thereby reducing the component strength.

52 Protectors are to remain in place, where these have been specified, and are to be as listed on the manufacturer's certificate.

53 End connections should be critically examined to ensure they are securely attached and that the fittings have not deteriorated through either: corrosion, cracking, distortion, etc and that toggles and clips operate correctly.

EYEBOLTS, EYENUTS, SHACKLES, SWIVELS, EYEPLATES, TURNBUCKLES, RIGGING SLIPS, GRABS, GIRDER CLAMPS, HOOKS, TIE-DOWN POINTS AND MISCELLANEOUS EQUIPMENT

Introduction

54 This section comprises the majority of loose gear and is in the main the most neglected, ill maintained and ill used. Management, custodians and the lifting equipment examiner should review such gear critically and with care.

Eyebolts

55 Eyebolts, one of the most widely used items of lifting gear, have severe limitations in usage and high levels of accidents occur as a result of misuse. However, British Standard eyebolts provide an acceptable level of safety and performance when correctly used.

56 Dynamo eyebolts are intended for vertical lifting only. Loading out of the vertical, by even 5°, impose stresses that could lead to failure. They shall only be used in circumstances where the need to ensure accurate vertical loading is fully appreciated and observed. Where two or more dynamo eyebolts are to be used together, a spreader beam or lifting frame shall be used to achieve the lift.

57 Eyebolts with links are intended for general lifting purposes and are particularly used in place of collar eyebolts where the load cannot be confirmed in a single plane. It may be loaded in any direction to its full rating providing the angle of inclination to the axis of the screw thread does not exceed 15°; at greater inclinations the SWL rating is to be reduced. However, the ratings for inclined loading are approximately double those for a comparably sized collar bolt.

58 Bow or eyenuts are used to screw onto a male thread to permit a lifting operation to be completed. Both types permit the use of hooks of similar SWL. The nut must be made fully tight and make contact with the material square and effectively. Only vertical lifts shall be used.

Eyebolt threads

59 It is essential for safe lifting that eyebolts are only screwed into tapped holes with which they are compatible. A strength loss in excess of 50% is possible. in cases where eyebolts with threads different to the tapped hole have been used.

60 Whilst new equipment will increasingly be provided with metric tapped holes much existing equipment, with unified or British standard thread forms, will remain in service for many years with the problem of mismatch likely to remain for the foreseeable future. Tapped holes, should be identified as follows:

60.1 Stamping or embossing adjacent to the hole.

60.2 The use of a disc or plate of suitable material, e.g. aluminium or other non-rusting metal, or plastic in appropriate conditions, located as near as practicable to the tapped hole. All discs/plates are to be permanently secured in place, either by mechanical means or by suitable adhesives.

Shackles

61 Where new manufactured shackles are provided for use on RN ships they shall comply with the requirements of Def Stan 02-177, BS EN 13889 (Shackles for Lifting Purposes) or ISO 2415 (Forged Shackles for Lifting Purposes). However, there are numerous legacy shackles in service that may not be compliant with the standards identified in the preceding sentence these shackles may still be used but it is the users responsibility to ensure they remain fit for purpose.

Marking

62 The marking requirements are as identified within BR 3027(1) and Def Stan 02-177. The lifting equipment engineers association further recommends that the grade marking should appear on both the shackle body and the pin.

63 The recommended positions for marking are as follows:

63.1 On the shackle body, the marks should appear on the sides of the body between the eyes and the crown. In general, no marks should be stamped on either of the eyes or the crown of the shackle.

63.2 On the shackle pin, the quality mark should appear on one end of the pin. In most cases, the screwed end of the pin will be most suitable, although with certain types of pin the head end will offer a larger surface for the mark.

63.3 See also BR 3027(1), Sect 3, Chap 7, Fig 7.2.

64 Stamping of the eyeplate should generally be avoided. Marker plates, securely fixed to the supporting structure, identifying the SWL date of last test and unique identity of the eyeplate are recommended.

Upkeep

65 Hooks are to be critically examined at the highly stressed parts to ensure early detection of any serious surface irregularities or fine cracks. It is common to use non-destructive testing for this purpose, i.e. dye penetrant, magnetic particle or radiography. If the crack revealed is very small it may be filed out and the surface generally smoothed off. However, if the extent is uncertain, then small hooks should be scrapped and larger hooks are to be radiographed.

66 All safety catches should be checked on each occasion prior to use in order to ensure correct operation.

LINK PLATES FOR SECURING AIRCRAFT

Introduction

67 There are three types of link plates for securing aircraft fitted to RN vessels, two mild steel and one stainless steel. Comprising a ring contained by a bridge piece welded into a cup that in turn is integrated into the flight deck.

68 Link plates are not to be subjected to regular in service testing. They are to be tested at initial installation and thereafter thoroughly examined at intervals not exceeding 12 months or as advised by the competent person following the previous examination.

69 Link plates should be replaced if the bridge piece or ring has lost 10% material thickness on the nominal dimensions.

Upkeep

70 The link plate cups should be kept clean of debris to prevent seizing. Refer to UMMS for maintenance regime.

MISCELLANEOUS LOOSE GEAR

Introduction

71 Similar precautions and problems with the items discussed in this Chapter are relevant to all items of loose gear used for lifting purposes, upkeep, test and thorough examination being the most important factors. All equipment shall therefore be tested at manufacture with subsequent thorough examination performed either in accordance with BR 3027(1), Sect 3, Chap 7, Table 7.1 or as advised by the competent person.

ANNEX A

LOAD TEST REQUIREMENTS

CONTENTS

GENERAL

1. The loads depicted within this Annex are only applicable to equipment designed in accordance with Def Stan 02-113 Requirements for Mechanical Handling. For commercially designed equipment, test loads as identified by the original equipment manufacturer are to be applied.

2 Prior to and following load testing a thorough examination is to be carried out in accordance with the statutory requirements and relevant Defence Standards.

3 Load tests for all types of lifting equipment shall be carried out at the periodicities identified within BR 3027(1), Sect 3, Chap 7, Table 7.1.

4 Applied test loads shall be in accordance with the original manufacturers' recommendations and/or as stated within the pertinent equipment load test requirements. The loads shall be applied in such a manner to ensure the statutory requirements have been fulfilled and further to give confidence that the equipment can be considered safe for use and also fit for purpose.

5 The acceptance criteria for all equipment types following the load test, is that there shall be no deformation, cracks, flaws, loose connections or identification of any other defects likely to prejudice the safe operation of the equipment.

6 Guardrails and stanchions in the way of test wires are to be removed prior to commencement of all tests.

7 Sufficient warning notices and guardrails are to be erected to warn all personnel to keep clear during testing.

CRANES (Chap 2 refers)

NOTE

Further information can be found within ISO 14518 (Cranes Requirements for Test Loads) and BS 7121-4 (Code of Practice for Safe Use of Cranes and Lorry Loaders).

8 Cranes manufactured to comply with the requirements of Defence Standard 02-113 are to be tested in accordance with the following requirements:

8.1 A static load test equal to 2 x SWL is to be performed on the crane. The load is to be applied in steps of 10% steps with deflections checked and recorded. This test is performed to give confidence that the crane structure is of adequate strength to cope with a suddenly applied load without deformation.

8.2 A static load test equal to 2.2 x SWL is only to be performed on equipment defined as Safety of Life at Sea (SOLAS). All other equipment which may be used for life saving duties are to be tested iaw OEM recommendations.

8.3 A running load test equal to 1.5 x SWL is to be performed by the crane throughout its full range of motions. This is to be carried out at the cranes best possible speed.

8.4 A functional test equal to the SWL is to be performed on the crane throughout its full range of motions and speeds. This is to gain confidence that no deterioration in crane operation has occurred due to the tests in excess of the SWL.

8.5 A test of the brake should be completed with the maximum of wire paid out, i.e. the most tension in the wire, followed by a test with the maximum wire reeled in. These tests are to verify that the brake is capable of holding the load in the most adverse conditions with the jib at maximum radius. With maximum wire paid out check is to be made to ensure that at least three dead turns remain on the drum for grooved drums; for plain drums six dead turns should be left on the drum.

DAVITS (BOAT AND OTHER) AND BOAT HOISTING ARRANGEMENTS (Chap 3 refers)

9 Davits (boat and other) and boat hoisting arrangements are to be tested as for cranes, refer to Para 8 of this Annex.

WINCHES AND CAPSTANS (Chap 4 refers)

10 All units are to be load tested at manufacture, following installation, modification, or repair to 2 x SWL followed by a running test equal to 1.5 x SWL. The application of the tests shall be in accordance with the original equipment manufacturers recommendations.

WEAPON AND ARMAMENT STORE HANDLING APPLIANCES (Chap 5 refers)

11 Embarkation rails. Embarkation rails are to be tested iaw Weapons Systems V Class PMS W109/08; T Class W103/06 and W109/07; A Class RCM Maintenance Schedule refs 18A2 and 18A3:

11.1 Check that the following items are in date for Visual or Load Test Examination iaw the relevant Test Specification. Any item that will expire during the next running cycle is to undergo Thorough Examination or Load Test iaw the paragraphs below.

11.2 Load Testing of items is to be closely managed and liaison maintained with Base Staff in order to minimise turn-around time.

NOTE

Form S2029(147) to be signed on completion of any examination or load test.

11.3 Casing Inserts and Under Casing Stiffeners are to undergo Thorough Examination 6-Monthly and Load Test 3-Annually.

11.4 Shackle Adaptor Assy is to undergo Thorough Examination Annually and Load Test 3-Annually iaw test spec 1050/451.13.

11.5 Embarkation rails, stanchions, securing bolts and fixed supports are to undergo thorough examination Annually.

11.6 Static and running load tests over the full working lengths of the embarking rails and submarine mounting positions are to be conducted 3-Annually using test weights as detailed:

11.6.1 Static load 8800lb.

11.6.2 Running load 6600lb.

11.7 Trolley Tube Mounted Dispenser (TMD) Lifting Assy is to undergo Thorough Examination Annually and Load Test 5-Annually iaw test spec 1050/523.6.

NOTE

See also Test Form 514-10 Weapon Embarkation Installation Inspection.

11.8 All other equipment is to be tested in accordance with the original equipment manufacturers recommendations.

POWERED AND MANUAL LIFTING APPLIANCES (Chap 6 refers)

12 All requirements within the general section, Paras 1-7, shall be applied together with the following:

12.1 Static load test. A static load equal to the following is to be gradually suspended from the hook:

12.1.1 For a SWL up to 25 tonnes the static load is to equal 2 x SWL.

12.1.2 For a SWL above 25 tonnes the static load is to equal (1.22 x SWL) + 19.5 tonnes.

12.1.3 For SOLAS equipment the static test load to be applied shall be 2.2 x SWL.

12.2 Running test. The hook block shall be loaded with a test weight equal to that shown below:

12.2.1 For a SWL up to 25 tonnes the test weight is to equal 1.5 x SWL.

12.2.2 For a SWL above 25 tonnes the test weight is to equal (1.22 x SWL) + 7 tonnes.

12.2.3 The load shall be raised, held and lowered to ensure that every part of the mechanism and each tooth of the gears are subjected to the load.

12.3 Brake test. Where the brakes are not tested as a part of the equipment overload test they shall be subjected to a load equal to that identified for the running test. In order to ensure satisfactory operation of the brakes without slippage. Under no circumstance are these loads to be exceeded.

NOTE

Care must be taken to note 'seal friction', i.e. the friction on the appliance imposed by the shaft seals, which can hold the load instead of the brake.

13 For manual sheave blocks the following light load test iaw BS EN 13157 + Amendments shall precede those detailed above:

13.1 For single sheaves, a static load test of 4 x SWL shall be applied to blocks using single sheaves operation. This load shall be at least equal to 2 x the head load.

13.2 For multiple sheaves, a static load test of 2 x SWL shall be applied to blocks using single sheaves operation. This load shall be at least equal to the head load.

NOTE

Chain blocks are not necessarily subject to static load testing and should adhere to manufacturers testing recommendations.

14 For all manual lifting appliances the following light load test shall be applied following appropriate static load testing:

14.1 Following static load testing, the block shall be loaded with a test weight of between 2% and 10% of the SWL which should then be raised and lowered through a height of between 250mm and 500mm to ensure free and correct operation of mechanisms.

14.2 Acceptance criteria for manual lifting appliances shall be as identified above. Further, on release of the hand chain at any point during raising and lowering operations, the brake shall be capable of holding the load.

LIFTING JACKS (Chap 7 refers)

NOTE

For further information, see BS EN 1494:2000 + A1 (Mobile or Movable Jacks and Associated Lifting Equipment).

15 All requirements within the general section above shall be applied together with the following:

15.1 Static tests. Each jack shall be tested in its fully extended configuration, prior to its overload device being set, whilst subjected to a static load equivalent to its rated capacity plus 50%, i.e. 1.5 x SWL.

15.2 Proof tests. Jacks shall be tested, using the handle supplied by the original manufacturer, by raising and lowering a weight 25% in excess of the rated lifting capacity throughout the entire range of movement, without deformation or failure of any part.

WIRE ROPE, CORDAGE AND PROPRIETARY SLINGS (Chap 9 refers)

16 Lifting equipment that is defined under this heading shall not be subjected to overload testing following assembly.

17 Prior to assembly of component parts, a sample of the wire rope, cordage or webbing material shall be subjected to a test to destruction. Where the end terminations are made up using a mechanical ferrule or is "potted", a sample termination shall also be subjected to a test to destruction in order to confirm the minimum breaking strength of the termination.

EYEPLATES

18 The test is to apply a load of 2 x SWL in vertical direction. It must be emphasised that the test is not intended and does not necessarily test the surrounding structure. Prior to any test the Lifting Equipment Examiner (LEE) shall survey the area and location of the eyeplate paying particular attention to the surrounding structure.

19 Where applicable a load of 1.5 SWL is to be applied along the eyeplate at 45 degrees and across the eyeplate at 45 degrees.

20 Eyeplates that are inaccessible for periodic testing, declared dormant or are used infrequently shall be suitably blanked off and a test shall be completed immediately prior to use for lifting purposes if the last test date is in excess of the periodicity identified within BR 3027(1), Sect 3, Chap 7, Table 7.1 or as previously advised by the competent person.

RAS EQUIPMENT

Examination and testing of RAS highpoints

NOTE

For further information, see Def Stan 07-279 (Requirements for Replenishment at Sea HM Surface Ships).

General notes

21 Cranes are always to lift vertically and must not be used to apply test loads.

22 For testing of eyeplates see Annex A, Para 18 of this document.

23 For testing of RAS winches/capstans see Chap 4 of this document.

24 All test weights are to allow for weight of the sling, tray, etc and for friction losses in pulleys.

25 Fender barges are to be obtained and used where required.

Sliding padeye

26 A dynamic test (no load) is to be completed to ensure correct functionality of equipment and controls prior to load testing.

27 A static load test of 2 x SWL is to be completed iaw Def Stan 07-279.

28 A running load test of 1.5 x SWL is to be completed iaw Def Stan 07-279.

29 A four tonne brake test using an appropriate pulling machine iaw Def Stan 07-279.

Fixed highpoints/portable stump masts

30 A thorough examination of eyeplates and load testing is to be carried out in accordance with Def Stan 07-279. The surrounding structure must be examined to ensure adequate support for the fixed highpoints/portable stump masts.

AIRCRAFT TIE DOWN AND VEHICLE LASHING POINTS

Link plates

31 Link plates for securing aircraft shall be load tested on initial installation (or after any hot worked repair) to the following:

31.1 A 1.25 tonne SWL link plate shall be load tested to 2 x SWL.

31.2 A 4.5 tonne SWL link plate shall be load tested to 2 x SWL.

31.3 A stainless steel 56kN SWL link plate shall be load tested to 1.5 x SWL.

ANNEX B

LIFTING POLICY FOR MoD BOATS UNDER 24 METRES IN LENGTH

CONTENTS

INTRODUCTION

1 This policy defines the criteria to be used for a MoD Boat's Lifting Points and structure, and the Lifting Equipment used to attach the Small Boat and, or the Small Boat's Lifting Points, to the Davit or Lifting Appliance. A MoD boat is defined as any vessel typically under 24m included on the MoD Boat Register, along with various small craft owned and operated by MoD Units that are not permanently manned (JSP 848 refers). All other Lifting Equipment shall conform to BR 3027(1).

2 Throughout this policy the term 'Lifting Points' means those Lifting Points fitted to the Small Boat to facilitate its own lifting. The term 'Lifting Equipment' means the Lifting Equipment used for attaching the Small Boat, or the Small Boat's Lifting Points, to the Davit or Lifting Appliance.

3 The policy includes the requirements for:

3.1 Factors to be taken into account when designing and selecting materials for Small Boat Lifting Points and Lifting Equipment.

3.2 The minimum 'Factors of Safety' to be used when calculating the required strength of Lifting Point and Lifting Equipment components.

3.3 The Loads to be used when load testing Lifting Points and Lifting Equipment.

3.4 The minimum requirements for Thorough Examination and Inspection of Lifting Points and Lifting Equipment.

4 It is to be noted that DES Ships MSS-MX-MHL is not the sponsor of the Lifting Policy for MoD Boats under 24 metres in length. The sponsor of this policy remains as DES Ships CSS-Boats. The policy has been incorporated with BR 3027 as being the most appropriate location as it covers lifting requirements albeit of a specific concern.

GENERAL DESIGN REQUIREMENTS

5 Lifting Points and Lifting Equipment must be capable of withstanding the stresses to which they will be subjected, both in and out of use. Due regard to the effects of atmosphere, environment, dynamic loading, and lifting configuration must be given.

6 Materials must be chosen on the basis of the working environment, with due consideration to, and allowances for, the effects of corrosion, abrasion, impact, temperature, and ageing.

7 When determining the Safe Working Loads (SWL) to be applied to Lifting Points and Lifting Equipment, due care must be taken to allow for such factors as:

7.1 Maximum all up weights.

7.2 Through life weight growth.

7.3 Slinging configurations that may result in some legs of the sling carrying greater loads than others, especially 4 legged slinging arrangements that can result in one or two of the legs being unloaded.

DESIGN FACTORS OF SAFETY

8 The SWL is the maximum load an item is designed to safely raise, lower, and suspend under its design operating conditions.

9 When designing Lifting Points and Lifting Equipment the minimum Factors of Safety identified within Chap 6 of this document together with the following shall be applied to the SWL to determine the minimum allowable breaking loads:

9.1 Fibre Rope 8 : 1.

9.2 Lifting Boat Structure 6 : 1.

10 In addition, where and if appropriate, designs shall ensure that when the required Static Proof Test Loads are applied to components, their 0.2% proof or yield stresses shall not be exceeded.

LOAD TESTING

11 Lifting Points and Lifting Equipment shall undergo appropriate type, or sample, load testing to verify the required minimum Factors of Safety between the SWL's and the minimum design breaking loads have been achieved.

12 Before first entering service, Lifting Points and Lifting Equipment shall undergo load testing. Refer to Table 1.

TABLE 1 LOAD TESTING

Component	Static Proof Load Test (Ref Para 9)
Rope	2.5 SWL
Chains	2.5 SWL
Fibre Rope	2.5 SWL
Webbing (without rings)	2.5 SWL
Single Sheaves Block	4.0 SWL (SWL = 0.5 x Resultant Load)
Multiple Sheaves Block	2.5 SWL
All Other	2.5 SWL
Lifting Point's Boat Structure	2.5 SWL

13 Prior to and following the Static Proof Load Testing and Dynamic Load Testing, the Lifting Points and Lifting Equipment shall be subjected to a Thorough Examination, to ensure the test has not permanently damaged any component.

14 It is recognised that existing in-service craft have only been Proof Load Tested to 2 x SWL at build, albeit some may have been periodically re-tested during the in-service life of the craft. However, most of the existing in-service craft have limited deck space and experience has shown that it is difficult to put the necessary weight (pig iron, water ballast, sand bags, hydraulic pressure) onto the craft to carry out the proof load test without over stressing decks and other parts of the boat structure/furniture. As there is no previous history of failures of lifting fittings/structure on any of the small craft that fall under the responsibility of Boat and Sea Survival (BASS), and in order to minimise the potential adverse effects of proof load testing, it is not proposed to re-test any of the craft to the higher loading as a matter of course.

MARKING

15 Each lifting point and item of Lifting Equipment shall be marked with a Unique Identification Number (UIN).

PLANNED MAINTENANCE

16 The following information, where appropriate, shall be provided for a boat's Lifting Points and Lifting Equipment:

16.1 A checklist for use when carrying out the inspections required by the Regulations.

16.2 Maintenance and repair instructions.

16.3 A schedule of periodic maintenance.

16.4 A diagram of lubrication points with recommended lubricants.

16.5 A list of replaceable parts.

16.6 A list of source of spare parts.

16.7 A record of inspection and maintenance.

MAINTENANCE, CHECKS, INSPECTIONS, THOROUGH EXAMINATION AND TESTING

17 The definitions and minimum requirements for maintenance, checks, inspection, thorough examination, and testing certification are as per BR 3027(1).

18 The definition and minimum requirements for competent people to undertake required inspections and thorough examinations are given in BR 3027(1).

19 The selected periodicity between checks, inspections, thorough examinations, and testing shall not exceed those listed in Table 2.

NOTE

Where arduous usage or difficult working conditions exists, or when the Competent Person deems it appropriate, the periodicity between checks, inspections and thorough examinations shall be reduced as necessary.

TABLE 2 MAINTENANCE, CHECKS, INSPECTIONS, THOROUGH EXAMINATION AND TESTING

Item	Check and Inspection	Thorough Inspection	Thorough Examination Including Proof Load Test
Group A			
Small Boat Metallic Lifting Points and Equipment.	All items for Lifting to be checked by the intended user prior to use and following use.	Where applicable, after installation or re-installation.	Before initial use (after manufacture or installation).
Examples include: Chain slings Eyebolts Hooks Shackles	In-service inspections carried out by a Responsible Person.	At least every 6 months by a competent person or in accordance with a Written Examination Scheme.	On the decision of the Lifting Equipment Examiner.
	In accordance with the administrative authorities/manufacturers instructions.	Less than 6 months if a risk assessment or if a Thorough Examination carried out by Lifting Equipment Examiner indicated that the next examination should be less than 6 months.	After any repair of modification which is likely to alter the SWL or affect the strength of the Lifting Equipment.
	As determined by the Lifting Equipment Examiner at suitable intervals between Thorough Examinations.	Each time exceptional circumstances occur which are liable to jeopardise the safety of the accessory, e.g. following substantial alteration or renewal or after repair of any stress related part, long periods out of use, significant change in the conditions of use, after an accident, etc. In the absence of an appropriate report/certificate indicating that the item has been previously examined/tested.	
Group B			
Wire ropes, Wire rope slings.	As for items in Group A.	As for items in Group A plus: Every month after broken wires appear.	Sample of rope tested to destruction (at manufacture); breaking load recorded for Certificate of Conformance. Terminations to be tested at manufacture (other than Dock splice).

(continued)

TABLE 2 MAINTENANCE, CHECKS, INSPECTIONS, THOROUGH EXAMINATION AND TESTING (continued)

Item	Check and Inspection	Thorough Inspection	Thorough Examination Including Proof Load Test
Group C Natural and Synthetic Fibre ropes and slings. Textile based slings - webbing.	As for items in Group A.	As for items in Group A. NOTE Boat slings are to be replaced at intervals not exceeding 2 years.	As for items 'B' plus: Webbing slings - appropriate tests carried out at manufacture to include strength thickness and proof test.