Ministry of Defence

JSP 975
MOD Lifting Policy

Implementation

Part 2: Code of Practice and Guidance

Version 1.0 Mar 2024

Foreword

This JSP 975 Part 2: Code of Practice and Guidance should be read in conjunction with, JSP 975 Part 1: Directive.

This publication, JSP 975 Part 2: Code of Practice and Guidance supports JSP 975 Part 1: Directive, by means of outlining equipment specification, process and personnel requirements, for the implementation of general and high risk lifting and lowering applications.

JSP 975 Part 2: Code of Practice and Guidance applies to the application of lifting operations and lifting equipment and defines responsibilities, dependent on the category of the lift and functional role of the equipment. Organisations that engage in any type of lifting operation should ensure they have a safe system in place.

In relation to the enhanced criticality involved with the lifting and lowering of both conventional and nuclear armaments, specific guidance has been provided for the supply (via either the external market or internal asset reassignment) and provision for use of lifting equipment.

JSP 975 Part 2: Code of Practice and Guidance Annex L is to be used by personnel responsible for providing specific MOD requirements in support of the technical specifications for conventional and nuclear armaments handling, lifting equipment. It contains direction and guidance on the design, applied process for use and minimum standard requirements such that the probability of risk associated with the handling of explosive armaments is reduced to a tolerable level as low as reasonably practicable (ALARP), in order to primarily safeguard personnel and, where reasonably practicable, equipment and the environment.

Preface

How to use this JSP

1. JSP 975 is to be used by staff responsible for the planning, control and execution of lifting operations, in conjunction with staff responsible for sites/locations where lifting operations may be undertaken for and on behalf of the Ministry of Defence (MOD). It defines the staff, responsibility and applied process requirements such that the risk associated with the conduct of operations for the lifting and lowering of loads, including persons, is minimised to a tolerable level As Low As Reasonably Practicable (ALARP), in order to safeguard personnel.

2. This JSP 975 defines the direction to be followed in accordance with the requirements placed on Defence by Statute, Central Government and Defence policy. Furthermore, it provides the supporting detail necessary to assist the user to comply with the policy.

3. The JSP is structured in two parts:

   a. Part 1 - Directive, which provides the direction that must be followed in accordance with statute or policy mandated by Defence or on Defence by Central Government.

   b. Part 2 - Guidance, which provides the guidance and best practice that will assist the user to comply with the Directive(s) detailed in Part 1.

4. This policy applies to the application of lifting operations and lifting equipment and defines responsibilities, dependent on the category of the lift and functional role of the equipment.

Coherence with other Policy and Guidance

5. Consideration should be given to related documents published by the various Defence Functional Owners and authorities. Where particular dependencies exist, these other Defence Functional Owners and authorities have been consulted in the formulation of the policy and guidance detailed in this publication.

NOTE: The following documents will require review, in order to ensure coherence with this policy.

Related Publication	Title
JSP 375	Management of Health and Safety in Defence
JSP 800	Defence Movements and Transport Policy
JSP 815	Defence Safety Management System
JSP 816	Defence Environmental Management System
JSP 892	Risk Management
JSP 950	Medical Policy (Part 6 - Occupational Health/Medicine, Chapter 6 - Civilian Occupational Health Policy)
DSA02-DLSR	Defence Movements and Transport Regulations
DSA02-DMR	MOD Shipping Regulations for Safety and Environmental Protection

Related Publication	Title
DSA02-DNSR	Defence Nuclear Safety Regulations of the Defence Nuclear Enterprise
DSA02-OME	Defence Ordnance, Munitions and Explosives Regulations
DSA03 DLSR	Movement and Transport Safety Regulations - Defence Codes of Practice
DSA03 DMR	Naval Authority Rules for the Certification of MOD Shipping
DSA03-DNSR	Defence Nuclear Safety Regulations of the Defence Nuclear Enterprise
DSA03 OME part 2	In-Service and Operational Safety Management of OME
DNSR/TAG/D010	Control of Lifting
BR 3000	Marine Engineering Manual
BR 3001	Fleet Engineering Orders (Surface Ships)
BR 3027(1)	Lifting Equipment Policy
BR 3027(4)	Lifting Equipment Policy - Royal Fleet Auxiliary
BR 6600	Royal Marines Landing Craft and Small Craft Operations
BRd 875	Regulations for RFA Vol 5 Pt 1 Chapter 4
AESP 0200-A-090-013	Land Equipment Engineering Standards (LEES)
AESP 0200-A-093-013	Land Equipment User Maintenance Standards (LEUMS)
AESP 0200-A-307-013	The All Arms Equipment Recovery Manual
AESP 2590-E-100-013	Management of Lifting and Recovery Equipment in the land Environment
JAP (D) 100E-10	Military Aviation GSE Management & Policy
MEPP 003	Munitions Engineering Process Procedure (Maintenance Routine Examination of Lifting Equipment and Materials Handling Equipment)
DE&S 03/2011 Version 3, dated Aug 2023	Safety & Environmental Protection Leaflet
ONR. NS-TAST-GD-056	ONR Technical Assessment Guide (TAG) - Nuclear Lifting Operations
MITER	Service Provision Manual

Public Sector Equality Duty

6. JSP 975 (Parts 1 and 2) have been assessed in accordance with Equality Analysis guidance and are considered compliant with the Equality Act 2010. The result of the assessment is NO IMPACT on protected groups. Details are found in JSP 975 Part 2 Annex M.

JSP User Requirements

7. This JSP 975 is to be used by staff with appropriate practical and theoretical knowledge of both the management of lifting operations and the use of lifting equipment and those who have management responsibility for such staff and lifting operations.

Further Advice and Feedback – Contacts

8. The sponsor of this JSP 975 is DES EngSfty-EG DefAuth-Pol (Chair of Lifting and Hoisting Policy (LHP) Working Group).

9. In the first instance, queries regarding interpretation and implementation of this JSP 975 should be directed to a local competent person with authority to interpret this publication, for clarification.

10. Thereafter, where the local competent person considers a raised query as being beyond their scope of competency and/or authority, the issue regarding policy concerns should be clearly documented with a detailed proposal for review and assessment by the LHP Working Group.

11. For further information on any aspect of this policy, or to provide feedback on the content, contact:

Job Title	Email	Telephone
DES EngSfty-EG DefAuth-Pol	Jonathan.Miles108@mod.gov.uk	N/A

Contents

1 Defence Lifting Policy Implementation

Application

1. This policy provides direction and guidance on lifting operation application, including:

    a. organisation and management.

    b. hazard categorisation of lifting operations:

        (1) Basic.

        (2) Intermediate.

        (3) Complex.

    c. risk assessment compilation.

    d. lift plan compilation:

        (1) safe system of work.

        (2) method statement.

    e. lifting personnel training, competency (including currency) and requirements.

    f. use of hired equipment and lifting contractors.

2. Lifting equipment items used within Defence, pertaining to this policy, are considered within the following categories:

    a. equipment which lifts and lowers whilst the load is directly suspended, including:

        (1) overhead travelling cranes.

        (2) dockside cranes.

        (3) floating cranes (barge, vessel and ship-mounted).

        (4) mobile cranes (chassis, truck-mounted, crawler).

        (5) lorry loading cranes.

    b. mechanical handling equipment, including:

        (1) fork (lift) trucks.

        (2) telescopic handlers (including reach stackers, container handlers).

        (3) hydraulic excavators, used for lifting (when configured for fork, slinging and/or grabbing duties).

        (4) loading shovels, used for lifting (when configured for fork duties).

        (5) mobile elevating work platforms.

(6) scissor lifts (static and mobile).

(7) tail lifts.

(8) vehicle lifts.

(9) other machines, appliances, apparatus, tools and/or installations, for the lifting and lowering of loads (pallet trucks operating in excess of 300mm height of lift).

NOTE: Accessories for lifting are to be included, in the context of securing the load(s).

c. conventional lifts, including:

(1) passenger/goods.

(2) goods and services.

JSP User Requirements

3. This JSP 975 is to be used by staff with appropriate practical and theoretical knowledge of both the management of lifting operations and the use of lifting equipment and those who have management responsibility for such staff and lifting operations.

Safety

4. MOD lifting operations and the maintenance of lifting equipment used by the MOD are to be in accordance with the Defence Safety Authority vision ‘Protecting people, the environment and operational capability through independent Health, Safety and Environmental Protection regulation, assurance, enforcement and investigation’. This is amplified by the Defence Safety Authority Charter.

5. When considering what constitutes suitable and sufficient levels of safety, the following hierarchical approach should be adopted:

a. primarily and where reasonably practicable, the evident risk(s) should be eliminated, prior to the commencement of any given activity.

b. where this is not achievable, physical control measures should be put in place to restrict access to the hazard zones of the lifting area and/or the load being lifted.

c. where access is required to the lifting area and/or load then only those authorised to be in the vicinity of the activity are to be present; such authorised personnel should be suitably briefed regarding the lifting operation and provided with sufficient information, instruction and training, in order for them to carry out the activity safely.

d. where necessary, appropriate Personal Protective Equipment (PPE) should be provided, in addition to the above; PPE should never be considered as an alternative to the above but used, where deemed necessary, to compliment the hierarchical approach to dealing with risk(s).

Safe Equipment

6. Manufacturers and suppliers of lifting equipment have a regulatory responsibility to provide sufficient information and instruction to facilitate correct installation, safe operation and maintenance. The necessary detail is primarily provided via an Operation and Maintenance Manual for the equipment (often referred to as an O & M Manual).

7. MOD Military off the Shelf (MOTS) Equipment Support Publications and equivalent Royal Navy and Royal Air Force publications remain authoritative documents from which stakeholders can access specific direction and guidance for the safe use of in-service lifting equipment.

8. Where issued, either by the MOD or the supplier of the equipment, the Safety Case, Electronic Safety Notices (ESN, via JAMES portal) and/or Safety Alert Bulletins should also be referenced to provide urgent additional safety information directly to users.

NOTE: Where the above publications, notices and artefacts are not available to the end user, they should be requested from the Authority responsible for issuing the equipment.

9. Equipment should be inspected, assessed, maintained, repaired, adjusted and/or reset, as per manufacturer's guidelines and specifications, and supported by documentation providing suitable verification of such works, in conjunction with sufficient information and instruction to enable continued safe use.

10. Defence lifting assets are to be periodically reviewed by a Safety and Environmental Panel comprising a quorum of key stakeholders.

Safe Person(s)

11. When considering lifting operations, a safe person is someone satisfying the criteria of Suitably Qualified and Experienced Personnel (SQEP) for their specific role. This principle should consider the following factors when assessing if an individual is SQEP:

a. competency (including currency) – Knowledge, Experience and Education.

b. training.

12. Competency may have been initially obtained, through previously attained experience and adequate training; however, consideration should be given to changes in tasks, technology and systems which could adversely affect understanding. Where doubt exists, regarding current levels of competency, then adequate training should be provided and undertaken.

13. Where competency for any given task is not being exercised on a regular basis (the regularity being dependent on the risk level of the activity and evaluated by a competent person accordingly), then adequate and appropriate refresher training should be provided and undertaken, in order to re-establish currency of competency.

14. The adequacy of training is dependent on the nature and risk level of the activity and should take into account the competency of the individual(s) concerned. Furthermore, consideration should be given to the manner in which the activity is to be carried out, such as being supervised or in sole control of their work function.

Safe Place

15. When evaluating a safe place, consideration should be given not only to the risks associated with the operation of the lifting equipment but also the risks in supporting the use. This will include ground stability and strength, environmental conditions, physical obstructions/limitations, traffic movement (people and vehicles), manual handling, noise, fumes and vibration.

16. An evaluation, via risk assessment, should include not only those directly involved with the lifting operation but also those who could be indirectly affected by the activity.

Safe Practice

17. All lifting operations should be suitably and sufficiently planned, prior to commencement. The extent of management, supervision and planning will vary, depending on the complexity of any given lifting operation and the nature of the load(s) and lifting equipment detailed for use.

18. A basic and generic lift plan will suffice for low risk, straightforward, repeated lifting operations, to be followed by those undertaking the lifting operation. This should be periodically reviewed and assessed by a competent person, with the appropriate knowledge and experience of such lifting operations, in order to ensure that any such generic lift plans remain suitable and sufficient for the intended purpose.

19. Basic lift plans can be added to with the detail necessary to satisfactorily accommodate non-routine lifting operations, where the actual activity remains low risk.

20. For non-routine lifting operations, where the risk level is raised, due to either the complexity of the lifting operation or criticality of the load(s), a suitable, sufficient and specific lift plan should be compiled by a competent person, with the appropriate knowledge and experience of the intended lifting operation or process requirements.

21. Appropriate supervision should be provided proportionate to the risk(s) associated with the lifting operation and/or criticality of the load(s).

22. Where there is a defined procedural requirement for supervision, regardless of risk level, then appropriate supervision should be implemented and the procedure unequivocally followed.

23. Where no such stringent procedural requirements exist and the lifting operation is considered by a competent person as being low risk and routine, then supervision by a competent operator of the lifting equipment during the process should be satisfactory.

24. The need for supervision should be considered, for elevated levels of risk, not only for the lifting operation itself but also to take into account the risks pertaining to the operating environment, management of communication transmissions, consideration of load path obstruction, load and lifting equipment stability, travel path visibility, human and vehicle traffic in close proximity to the activity.

References to Legislation, Approved Codes of Practice, Standards and Design Codes

25. References to Statutory Instruments and Regulations[1] relate to the versions current at the date of supply and use.

Legislation, Approved Codes of Practice and Guidance

26. Regulations that define the deliverable requirements for the supply, build and/or installation of lifting equipment place the primary duty of compliance on the manufacturer (or their chosen supplier/agent). Such regulations are not applied retrospectively, as they only relate to an item of lifting equipment where the date of manufacture/supply corresponds with the relevant legislation enacted and in force, at that time. Primarily, for this publication, these would include:

a. The Supply of Machinery (Safety) Regulations 1992 (SI 1992, No 3073) and 2008 (SI 2008, No 1597).

b. Lifts Regulations 1997 (SI 1997, No 831) and 2016 (SI 2016, No 1093).

27. Regulations that define the requirements for use of work and lifting equipment primarily place the duty of compliance on the duty holder (employer). Such regulations are retrospective and risk-based (goal setting) and should be applied to the provision (for use, not supply into service or onto the market) and use of lifting equipment, regardless of vintage. Primarily, for this publication, these would include:

a. The Provision and Use of Work Equipment Regulations 1998 (SI 1998, No 2306) (PUWER 98)[2] and (Northern Ireland) 1999 (SI 1999 No 305) (PUWER(NI) 99).

b. The Lifting Operations and Lifting Equipment Regulations 1998 (SI 1998, No 2307) (LOLER)[2] and (Northern Ireland) 1999 (SI 1999 No 304) (LOLER(NI)).

c. Merchant Shipping and Fishing Vessels (Provision and Use of Work Equipment) Regulations 2006 (SI 2006, No 2183) and Amendment Regulations 2008 (SI 2008, No 2165).

d. Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations 2006 (SI 2006, No 2184) and Amendment Regulations 2008 (SI 2008, No 2166).

e. The Management of Health and Safety at Work Regulations 1999 (SI 1999, No 3242) (MHSWR 99)[3].

28. Where retrospective application results in lifting equipment being deemed unsafe then appropriate remedial measures should be taken to bring any such item(s) up to a satisfactory level of safe serviceability, prior to further use.

[1] www.hse.gov.uk/work-equipment-machinery/
[2] www.gov.uk/government/publications/mgn-619-loler-and-puwer-regulations-2006
[3] www.hse.gov.uk/managing/introduction/

29. Retrospective remedial work may either not be technically feasible, due to the vintage of the lifting equipment or cost prohibitive. In such instances, the lifting equipment should not be used and a suitable alternative sought.

30. The Management of Health and Safety at Work Regulations address the duty of employers to implement and manage health and safety arrangements and processes to safeguard employees, undertaking workplace activities.

31. The Provision and Use of Work Equipment Regulations address the requirements for the safe management and use of workplace equipment including machinery, appliances, apparatus, tools and installations within a workplace environment. The duties are placed on all who control and operate work equipment, including contractors on a MOD site.

32. The Lifting Operations and Lifting Equipment Regulations focus on the requirements to control the lifting and lowering risks associated with work operations utilising lifting equipment (Work Equipment for the lifting and lowering of loads, including people).

33. Lifting equipment may also be supplied with supplementary items (ladders, emergency rescue and release systems, PPE etc) and fitted equipment (accumulators, pressurised systems, etc.) whose management and use will be governed by specific regulation that should also be referenced and complied with accordingly.

34. When dealing with contractors, it should be remembered that absolute legal duties cannot be fully delegated. The extent of delegation will depend on the nature of the lifting operation, the degree of dependency on the contractor(s) and the mutually agreed contractual terms and conditions. Coordination and cooperation between the employing organisation and chosen contractor(s) should be engaged and maintained, in order to ensure that legal duties are appropriately discharged by all parties concerned and operations safely executed (Reference guidance HSE INDG 368 Using contractors – A brief guide).

Application of Standards

35. Standards are similarly split into Supply standards defining compliance requirements for the supply/build and installation of lifting equipment and User standards supporting compliance regulations pertaining to the use of the lifting equipment.

36. Where applied, the specific and appropriate Supply standard for any given item of lifting equipment should be stipulated by the lifting equipment supplier (or their chosen agent) and referenced within supply documentation.

NOTES:

(1) For new build, the latest supply/build standard should be applied. Superseded and withdrawn standards relate to in-service equipment built when such standards were pertinent at the time of build.

(2) When applying BS EN 13001 to new build, the discrete approach to assessment (i.e. Limit state or Allowable Stress) should be agreed with the Project Technical Authority.

37. Primary user standards, supporting legislative compliance, pertaining to activities undertaken with MOD lifting equipment include:

a. BS 7121-1 - Code of practice for safe use of cranes - Part 1: General (the principles contained within this standard can be applied to the use of other types of lifting equipment).

b. BS 7980 - Vehicle lifts - Installation, maintenance, thorough examination and safe use - Code of practice.

c. BS 7255 - Code of practice for safe working on lifts.

38. All references in this publication to Supply Standards (or similar documents), relate to the versions and amendments pertaining to the date of manufacture or significant modification of the lifting equipment and use, unless otherwise stated. It must be ensured that the correct version, in line with the date of manufacture of the lifting equipment, is applied.

Acquisition of Exemption for the Armed Forces

39. An exemption from a requirement of the regulations can only be granted by the Secretary of State for Defence and only where they are satisfied that the activities detailed in an Exemption Case Submission (ECS) are to be carried out in the interests of national security.

40. Any exemption granted will be time limited and subject to strict conditions of application. The time limitation and/or conditions of application should be monitored by those responsible for the activity, in order to avoid transgression of the terms of the ECS.

41. The ECS must demonstrate that (in order to protect operational capability, in the interests of national security) Defence is reliant on the exemption being granted, as per the regulatory requirements (PUWER, regulation 36 and LOLER, regulation 12). The ECS is to include the following information:

a. the description and purpose of the particular equipment and/or operation giving rise to the exemption request.

b. how, without the exemption, essential front line operational capability would otherwise become either impossible to undertake or severely hampered.

c. an outline of the number of people that could be foreseeably placed at potential risk.

d. detailed supporting reasoning, such as exemption being sought due to the complexity of arrangements necessary to either eliminate or reduce risk, to as low as is reasonably practicable; concerns regarding the sufficiency and/or availability of appropriately trained staff; excessively prohibitive time scales for the implementation of alternative measures and the associated projected cost data etc.

e. an action plan for compliance with best practice in the short and medium to long term – i.e. mitigation options to minimise risk to as low as reasonably practicable, availability of suitably competent personnel, timescales for implementation, likely costs etc.

f. the time period for which an exemption is required and the rationale for it.

g. the plan for suitable and sufficient health monitoring, assessment and risk level acceptance.

h. where renewal of an existing exemption is being sought, details of the success or otherwise of previous action plan(s), including the results of health monitoring.

Legislative and Compliance Obligations

42. The MHSWR, regulation 3 – risk assessment, is an essential process requirement to identify the hazards and corresponding risks associated with a given activity; for the purposes of this publication, a lifting operation. This will enable a Safe System of Work (SSoW) to be defined, in terms of **a procedure or a set of procedures to remove or reduce the risks involved in an operation, to a tolerable level as low as reasonably practicable (ALARP). Supplementing the SSoW with the process detail associated with a proposed lifting operation will enable the compilation of a satisfactory and, hence, compliance with the LOLER, r**egulation 8 – organisation of lifting operations.

43. The PUWER, regulation 4 – suitability of work equipment, should be addressed, when selecting appropriate equipment for a lifting operation, with factors to be considered including:

a. the nature of the load to be lifted (goods, persons, stability, volatility etc).

b. its weight, shape, centre of gravity with availability of appropriate lifting points.

c. the presented location of the load and where it is to be positioned upon completion of the lifting operation.

d. how often the lifting equipment is to be used to carry out the task.

e. the environment in which the lifting equipment will be used.

f. the personnel available and their knowledge, training and experience.

44. Suitable accessories for lifting should be appropriately specified and utilised, such as correctly orientated and secured slings, eyebolts, shackles, spreader and lifting beams, etc. Depending on the nature and/or stability of the load, bespoke and purpose-built specialist handling attachments and equipment may be required, in order to satisfactorily secure the load.

45. Specialist handling attachments and equipment should only be purpose built and certified by competent persons or providers, and only done so where no appropriate proprietary items either exist or are readily available to purchase or hire.

46. The principal hazards associated with lifting operations include:

a. uncontrolled loss of load(s).

b. uncontrolled lowering of load(s).

c. lifting equipment instability/collapse.

d. incident during travel and/or transportation.

47. Additional hazards include unstable ground or vessel, lifting equipment contacting overhead power lines, encroaching on restricted zones (rail, road, air etc) or colliding with other items and the potential for personnel to be struck by moving loads and/or equipment in congested locations.

Thorough Examinations

48. Thorough Examination and Test procedures should be prepared before any undertaking, and strictly adhered to, by the competent person (assessor). Thorough Examination procedures should clearly identify a scope of examination, rejection criteria to be applied and indicate any known supplementary actions required, such as dismantling, periodic exposure of hidden critical parts, safety device functional verification, load testing and/or non-destructive testing (NDT).

49. The minimum periodicities for the thorough examinations of lifting equipment are stipulated within the LOLER, for the various points in time in an items service life.

50. Operational scenarios may be such that there could be a genuine need to exceed a regular periodicity. This can only be undertaken on the basis of an Examination Scheme, in order to comply with regulation. Such scenarios could include prolonged deployment but limited use. Detailed maintenance programmes, pre-use inspection procedures in conjunction with strict quarantine protocols for defective equipment could form the basis of an engineering risk-based justification for a periodicity extension, under an Examination Scheme.

51. An Examination Scheme should be compiled by a competent person, which could include the duty holder. However, acceptance of application of any Examination Scheme is at the discretion of the competent person (assessor) carrying out the thorough examination and referenced within the report of thorough examination (JSP 975 Part 2: Code of Practice and Guidance Annex K).

52. Depending on the nature of the equipment, its use and concerns raised, a thorough examination of lifting equipment should be considered after any exceptional circumstances which are liable to jeopardise the safety of lifting equipment. Exceptional circumstances which may initiate a thorough examination include:

a. subsequent to a dangerous or beyond design specification incident.

b. subsequent to an extended period (beyond the examination periodicity) out of use.

c. as part of a life extension or down-rating exercise.

d. as a response to investigation and/or remedial work undertaken regarding component excessive wear, clearances or operational concerns.

53. The requirement for testing and the process to be undertaken is at the discretion of the competent person (assessor) carrying out the thorough examination. This could be due to concerns regarding overall capability of equipment, integrity post repair, stability, functionality of safety devices and/or calibration of load indicating and/or limiting systems.

54. Testing should be considered in its widest context and not simply limited to the application of load and overload. Functionality testing may be used to trigger devices which are pre-set and not possible to simulate within a thorough examination. Where

necessary, appropriate Non-Destructive Testing (NDT) techniques should be used to verify the integrity of structural sections (thickness checks) and welded repairs (i.e. Dye Penetrant – Steel/Aluminium and/or Magnetic Particle Inspection – Steel).

55. The procedures used for thorough examination and load testing should be in accordance with manufacturer's specification, supported by relevant standards (JSP 975 Part 2: Code of Practice and Guidance Annex B), certification and Test Records (JSP 975 Part 2: Code of Practice and Guidance Annex L, Appendix B).

Maintenance

56. Lifting equipment should be maintained (PUWER, regulation 5) and inspected (PUWER, regulation 6) at suitable intervals by persons competent for the function, in order to monitor deterioration and detect defects, before the condition develops such that health and safety of users and those in the vicinity of the equipment could be compromised.

57. Road going vehicles should also have an up-to-date Mandatory Equipment Inspection (MEI), in accordance with DSA DLSR LSSR ESRS.

58. The frequency of maintenance activities should take into account the:

a. manufacturer's specification.

b. intensity of use.

c. operating environment.

d. criticality of operations.

e. risk to health and safety from malfunction or failure.

59. The extent and complexity of maintenance can vary considerably from simple checks on basic equipment to integrated programmes for complex plant. In all circumstances, for maintenance to be effective, it should be targeted at the parts of equipment where failure or deterioration could lead to health and safety risks.

60. Additional maintenance measures may be required where particularly onerous conditions of use are regularly experienced. Any such additional measures need to be reviewed and revised in the light of operating experiences.

61. Where items of equipment are hired, it is important for both the hire company and the person responsible for hiring the equipment to establish who will carry out safety-related maintenance, for the hire period. This is particularly important when equipment is on long-term hire. Where the hire company is distant from the user, it might be uneconomical for their staff to carry out simple checks and make minor adjustments, so an appropriately trained user representative may be allocated the responsibility to carry them out. However, both parties should agree and document exactly what they are responsible for and make sure that this is communicated to the people who will be carrying out the maintenance.

62. A detailed maintenance log may not have been in existence for the full service life of the lifting equipment. Where this is the case, a maintenance log should be initiated at the earliest opportunity, in order to commence the traceable recording of relevant maintenance activity such as:

a. scheduled maintenance completion.

b. maintenance inspection.

c. intermediate maintenance/repair of the entre lifting equipment or critical components.

d. replacement item documentation and/or certification.

Roles and Responsibilities

Managers

63. Managers should ensure that all lifting operations are suitably and sufficiently risk assessed (reference JSP 375, Volume 1, Chapter 8) and accompanied by appropriate lift plans, incorporating comprehensive safe systems of work and detailed process method statements produced by persons competent for the function and authorised by those responsible for the lifting operation.

64. Generic standard operating procedures and lift plans may be used for low risk straightforward and repeatable lifting operations (e.g. general yard and workshop areas, stores lifting of benign/stable loads, use of vehicle lifts, etc.).

65. Lifting operations (Intermediate and Complex) involving greater complexity will require an individual specific to each individual lifting operation. The basis for all lifting operations could be the generic lift plan. These generic lift plans should be supplemented with the risk assessment(s) and process details relating to the additional hazards and complexities pertaining to the given lifting operation.

66. Consideration should be given to the medical surveillance of lifting personnel and operatives (reference to JSP 375, Volume 1, Chapter 14).

Personnel

67. All personnel should only undertake lifting functions based on their ability to satisfactorily perform the duties and responsibilities detailed within a lift plan and/or standard operating procedure.

68. All personnel should ensure that they are clearly aware of the requirements set for them, in order to support the safe and effective completion of a lifting operation, in a positive and productive working environment.

69. All personnel should work responsibly to complete their designated functional duties stated within the lift plan. Responsible application shows professionalism which assists in building team cohesion, essential for the safe and satisfactory completion of a multifaceted lifting operation.

Safe Systems – Functional Roles, Competency and Application

Lifting Roles

70. The following roles, defined below, represent the essential functional elements required to ensure that a lifting operation is carried out safely. The actual role titles may not necessarily be applicable across all service domains (JSP 975 Part 2: Code of Practice

and Guidance Annex I). Furthermore, where suitably qualified, an individual need not necessarily be restricted to a single functional role, depending on the risks associated with the lifting operation; however, the function associated with each role for a lifting operation should be suitably and satisfactorily covered. The roles are to be allocated, as required, depending on the nature of and hazards presented by a given activity, summarised in Table 1: Required Lifting Roles.

Ser	Activity	Role	Lift Category		
			Basic	Intermediate	Complex
1	Ownership	CO/HoE	Required	Required	Required
2	Management	LM	Required	Required	Required
3	Planning	APLO	Required	Required	Required
4	Site Visit	APLO	Not required, where pertinent RAMS are in place	Requirement to be defined, at the discretion of the APLO	Required
5	Lifting Operation	APLO	Not required, where pertinent RAMS are in place	Requirement to be defined, at the discretion of the APLO	Required
6		SLO	Required	Required	Required
7		SSLO	Required	Required	Required
8		Operator	Required	Required	Required

Table 1: Required Lifting Roles

Commanding Officer (CO) / Head of Establishment (HoE)

71. The CO/HoE retains overall responsibility for the lifting operation. It is essential that, where required, there is a single focal point for ownership and ultimate decision making. This does not mean that the CO/HoE concerned needs to be an expert in lifting operations but that they have the authority to both objectively question and adjudicate those managing and controlling the process.

Lift Manager (LM)

72. A Lift Manager, appointed by a Commanding Officer (CO)/ Head of Establishment (HoE) or someone of equivalent rank/authority should ensure that:

a. this policy and the Lift Plan are communicated across all levels of the command, including to APLOs, SLOs, SSLOs and those directly involved in execution of the task.

b. that the activity has a sufficient quantity of qualified and experienced APLOs, SLOs, SSLOs and Operators.

73. The Lift Manager or Career Managers are responsible for authorising course applications (such as APLO and equivalent), ensuring the nominated individual's meet the pre-course entry requirements (see JSP 975 Part 2: Code of Practice and Guidance Annex G).

NOTE: Service domains may have a differing framework but essentially authorisation to be given by a person with relevant authority to do so.

Appointed Person Lifting Operations (APLO)

74. An APLO is designated by the LM, as the senior role involved in the management control, planning and oversight of lifting operations. Depending on the nature of the lifting operation and/or where the activity is being undertaken, this may include consultation with other responsible bodies and/or authorities to ensure effective collaboration.

75. The predominant guidance for the safe use of cranes, including planning of lifting operations is contained within the BS 7121 standard series. In this series of standards the term ‘Appointed Person’ is used, referring to the competent person for the planning of lifting operations. This would be the person with the requisite skills, knowledge and experience to make the relevant assessment of the requirements of the lifting equipment being used and the intended lifting operation(s) to be undertaken.

76. The initial planning for any given lifting operation should include:

a. location assessment or site reconnaissance, ensuring that the supporting structure, ground or vessel stability upon which the lifting equipment will operate is capable of sustaining the maximum applied loads in a stable manner (including maximum outrigger and pad loads, for mobile cranes; allowable pitch, roll and freeboard for waterborne lifting equipment). Furthermore, it should be confirmed that access routes, set up and set down areas can sustain the dead weight of the lifting equipment and the load(s).

b. ensuring that satisfactory pre-operational function checks, intermediate inspections, maintenance and up to date thorough examinations of all the equipment have been satisfactorily completed.

c. taking responsibility for the organisation and control of the lifting operation.

d. ensuring that the SLO and other members of the lifting team are fully briefed on the contents, scope and requirements of the risk assessment and method statement (Lift Plan).

e. being familiar with the relevant parts of any given Construction Health and Safety Plan, where the lifting operation is being carried out as part of a construction activity.

f. confirmation of the current required competency of the SLO and SSLO, for the given activity.

77. The APLO may appoint a SLO to be present throughout a lifting operation (an APLO shall be present for a Complex Lift) to provide control and ensure that it is carried out in accordance with the lift plan. Where the APLO is not present, the authority for control of a lifting operation is delegated to the SLO. However, the APLO retains overall authority and responsibility for the lifting operation.

78. The Lift Coordinator to be appointed by the HoE/CO to co-ordinate multiple lifting equipment operations in close proximity and be present during lifting operations.

Supervisor Lifting Operations (SLO)

79. A SLO should be designated by the APLO, to primarily supervise and direct the lifting operations to a safe level of completion.

80. Legislation requires the duty holder to provide appropriate supervision. Appropriate supervision is deemed as being proportionate to the risk, taking into account the complexity of the lifting operation, load(s) to be lifted and/or visibility issues throughout the lifting path.

81. Levels of supervision are determined by the nature of the work, and the competence of those involved in using the lifting equipment and assisting with the lifting operation. It does not mean, for example, that an experienced lifting equipment operator will have to be under direct supervision every time they carry out a routine lift, unless specific procedure dictates. However, guidance by a supervisor would be required when lifting a critical load or where part of the lifting operation could be unseen by the operator (i.e. particularly relevant to lifting in and out of holds).

82. Further assistive roles and responsibilities could be delegated, at the discretion of the APLO, for Basic and Intermediate lifting operations, including the following:

a. assist the APLO to conduct site visits and aid the planning for Basic and Intermediate lifts.

b. ensure that all lifting equipment specified by the APLO is used appropriately, in accordance with the lift plan.

c. ensure that sufficient and suitably qualified personnel are available to safely carry out the lifting operation.

d. ensure that the conditions at the location are the same as those identified in the lift plan and carry out a dynamic risk assessment immediately prior to the lifting operation.

e. report any necessary alterations required to the lift plan to the APLO, for authorisation to proceed.

f. Brief all relevant personnel before a lifting operation begins.

g. supervise and direct the lifting equipment Operator and Slinger/Signaller.

h. ensure that the lift plan is executed as compiled and authorised by the APLO.

i. stop the operation in the event of any unforeseen and/or uncontrolled safety risk presenting itself, during the lifting operation.

j. report details of the completed operation to the APLO.

Slinger/Signaller Lifting Operations (SSLO)

83. The principal roles of the SSLO include:

a. visually checking the lifting accessories for damage before and after each use.

b. securely and appropriately attaching the load to and ensuring detachment of the load from the lifting equipment.

c. using the correct lifting accessories in accordance with the lift plan and/or lifting accessory use procedure.

d. initiating and directing the movement of the load by giving the appropriate signals to raise, lower, manoeuvre and place the load safely, to the lifting equipment Operator.

e. relaying signals either directly to or from a secondary Slinger, to the lifting equipment Operator.

NOTE: JSP 975 Part 2: Code of Practice and Guidance Annex I – Lifting Roles – Pan-Services Alternative Terminology – provides a means of cross reference for all Services, in relation to the aforementioned functional roles for lifting operations. [Reference: BR6004 Safety Handbook for RN Slingers.]

Operators

84. Operators should be trained and hold current competency for the lifting equipment they are to utilise.

85. Where deemed a requirement, operators should be in possession of a current military driving licence (FMT600), for mobile equipment and vehicles.

Training Systems

Training Provision

86. Where individuals do not meet the requisite entry requirements, advice should be sought from the Training Requirements Authority (TRA) or Team Leads as to their suitability for training or need for pre-qualification, prior to acceptance on a given course.

Currency and Competency

87. Lift Managers should, where possible, aim to organise lifting operations within their training level exercises to provide all personnel involved in lifting operations an additional opportunity to undertake continuation training to ensure they remain current and competent for their roles.

Types of Lifting Operations

Lifting Operation Categorisation

88. There are fundamentally three categories of lifting operation:

a. Basic.

b. Intermediate.

c. Complex.

89. Categorisation of a lifting operation depends on the assessment of the hazards associated with both the environment in which the lifting operation is to be carried out, and, those associated with the load and lifting equipment. As shown in Figure 1, an increase in either or both environmental and load complexity will lead to a lifting operation being coincidentally allocated a higher category.

NOTE: Guidance on factors that need to be considered when determining the category of lifting is contained at JSP 975 Part 2: Code of Practice and Guidance - Annex D.

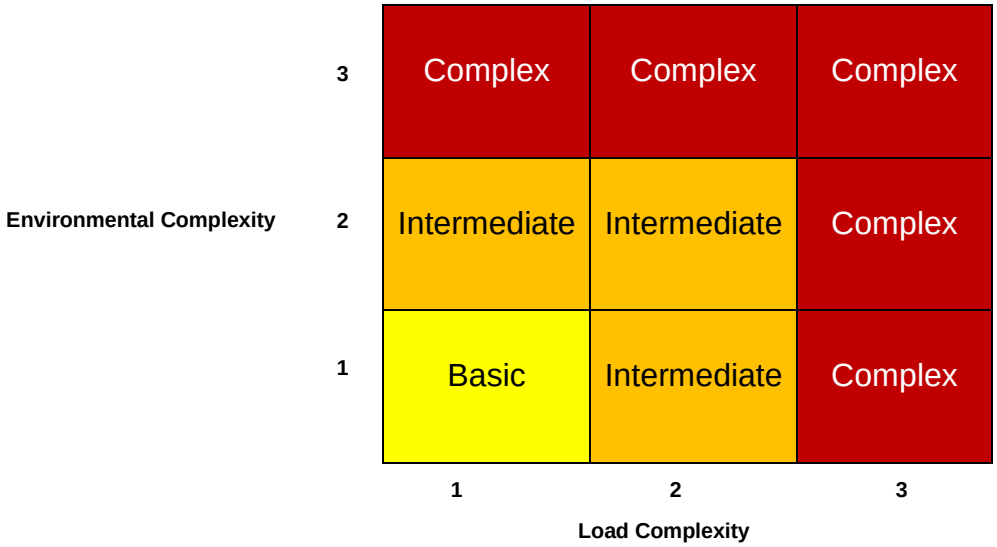


Figure 1: Relationship between Complexity Index and Lifting Category

Basic Lift

90. British Standard Code of Practice for the Safe Use of Cranes (BS 7121-1) defines a basic lift as: *'A lifting operation where the load characteristics are considered straightforward and there are no significant hazards within the working area or on the access route for the crane to the working area'.*

91. All Basic lifting operations require a suitable and sufficient risk assessment, safe system of work and method statement detailing the processes for the conduct of the activity, prepared by a competent person. These may form part of the equipment safety case. For straightforward and repeatable processes these could be generic in form, covering a multitude of similar basic lifting operations and equipment items. The documents should be maintained by an operational area.

92. In the case of a Basic lifting operation an APLO does not need to inspect the task site. Trained Operators and Supervisor Lifting Operations (SLO) should have the competence to recognise factors that increase the lift category from Basic to either Intermediate or Complex. They should carry out a confirmatory assessment prior to all lifting activity.

Intermediate Lift

93. BS 7121-1 defines an intermediate lift as: *'A lifting operation where significant hazards have been identified with the load, the working area or access route of the crane'.*

94. All Intermediate lifting operations require a site and task specific Risk Assessment and Method Statement (RAMS), incorporating a Safe System of Work, prepared by an APLO. A RAMS template (primarily focused on Mobile Crane use, but can be adapted for differing categories of Lifting Equipment) is at JSP 975 Part 2: Code of Practice and Guidance - Annex E. The APLO should:

a. consider significant hazards in the operating area, including areas required for site access, preparation of the lifting equipment and load set down.

b. liaise with relevant stakeholders or authorities to mitigate risks by including any necessary corrective action or special measures, to facilitate a safe system of work.

c. determine the exact requirement for personnel, for the given lifting operation.

NOTE: Where the activity relates to a specific recovery operation, the RAMS template within the All Arms Recovery Manual should be used.

95. The APLO need not visit every site but should be assured and confident that information provided by a delegated representative is sufficiently detailed and correct, for the given activity.

Complex Lift

96. BS 7121-1 defines a complex lift as: *'A lifting operation where significant hazards have been identified with the load or with the working area or access route of the crane, and the crane is used to lift complex loads or persons, or where two or more cranes are used to lift the load, or where the lifting operation is carried out at a location with exceptional hazards'.*

97. Complex lifting operations require a task specific Risk Assessment and Method Statement (RAMS), incorporating a Safe System of Work, prepared by an APLO. Such lifting operations involve enhanced risks, to those of an intermediate lifting operation, associated with a single significant hazard or the complexity introduced by several compounding hazards.

98. The lift plan should include the sequence of operations for lifting the load and contain a sufficiently detailed and accurate drawing of the site, enabling the operator to satisfactorily position the lifting equipment and support. It must include key details such as the site survey findings, the lifting equipment, the load, the pick-up point, load path and set down point, together with the position of any exceptional hazards[4] in the area. In addition, the APLO should:

a. identify reasonably foreseeable exceptional hazards in the operating area, including any areas required for access or setting up of the lifting equipment; this will require the APLO to visit the location of the planned lifting operation as part of the planning process.

b. liaise with any other person or authority as required to eliminate or mitigate risks; include any necessary corrective action or special measures in the safe system of work.

[4] BS 7121-1 Annex E.

Management Systems

99. The exact nature of the safety management system is for each of the Services to define, within their own standard operating procedures. However, there should be in place a safety management system which provides systematic frameworks designed to manage the policies, procedures and processes.

100. The implementation of a safety management system should improve operational effectiveness and efficiency, management of risk and repeatability of process application. It should also assist in:

a. compliance with the requirements of regulations, relevant standards and guidance; and

b. protecting the organisation through the embedding of quality and best practice.

Documentation

Lift Plan

101. A comprehensive lift plan should consider the entirety of the process, including lifting equipment and load delivery restrictions, operational area suitability, assembly/disassembly of the lifting equipment, where necessary, set down and pick up area adequacy and potential environmental issues, either present or that could occur.

102. Satisfactory planning should ensure the availability of a sufficient amount and suitable range of lifting equipment and competent personnel, such that the lifting operation can be carried out safely.

103. Generic lift plans or process specific standard operating procedures comprising of suitable and sufficient risk assessments and method statements (RAMS) would be satisfactory for straightforward, low risk, routine lifting operation. These should be reviewed periodically to ensure that changes have been satisfactorily incorporated and the generic lift plans remain valid. In such cases, the completion of each individual lifting operation to a generic lift plan could be simply a matter for the operator of the lifting equipment and, where deemed necessary, a slinger.

104. A generic lift plan or standard operating procedure for straightforward, low risk, routine lifting operations should include:

a. personnel requirements with designated roles and responsibilities with appropriate PPE, where required.

b. an assessment of the weight, size and stability of the load.

c. selection of the appropriate accessories for lifting (depending upon the nature and weight of the load and the environment in which it is to be used).

d. confirmation of level, hard standing ground or stability of vessel upon which the lifting equipment is to be placed.

e. a review of the anticipated path of the load to make sure that it is not obstructed.

f. preparation of a suitable place to set down the load.

g. securing the lifting accessory to the load (using an appropriate method of slinging and tag lines, where necessary, to prevent the load swinging).

h. trial lift, taking up the slack with the load just clear of the ground/floor (confirming security of lifting accessories and correct positioning with regard to the centre of gravity of the load, stability of lifting equipment).

i. release process and, where necessary, sequence for the slings.

j. lifting equipment and accessory removal and site clearance.

105. The same principles should be applied to similarly straightforward, low risk, routine lifting operations involving mechanical handling equipment and conventional lifts.

106. An operational area that does not hold a lift plan but is required to conduct a one-off lifting operation should seek support from an operational area with an established Lift Management Plan and APLO.

107. The complexity of a lift plan will vary in accordance with the difficulty of the lift. The lift plan shall be in accordance with the requirements of LOLER, Reg 8 (with reference to BS 7121-1) and consider the following criteria, as a minimum:

a. relevant aspects of the location, including operational environment including access restrictions; nature of supporting structure ground capacity to sustain set down and operational loading, vessel stability of waterborne lifting equipment etc.

b. definition of underground voids (i.e. services) and over ground obstacles (i.e. power lines) or obstructions within the load lift path or those which may encroach within the operating envelope of the lifting equipment, jib radius and/or counterweight.

c. technical details of the lifting equipment to be used, including maximum and minimum load and operating radius envelope, environmental and wind speed limitations.

d. the magnitude and nature (weight, centre of gravity, stability, lifting points etc) of the load to be lifted and to what radius.

e. the need for supervision and means of two-way continuous communication, where visibility is impaired for the entirety of the lifting operation.

f. controlled exclusion zone for all non-essential lift personnel and consideration of other persons in the vicinity of the lifting operation (staff, general public etc).

g. checking security of the lifting accessory connection and the load prior to raising to height.

h. no one to operate beneath the raised load.

i. toolbox talk, for all essential lift personnel, prior to commencement.

j. details of the Appointed Person responsible for compilation of and any changes to the lift plan; any changes to either the lifting equipment or the lifting operation are to be appropriately assessed and authorised by an Appointed Person Lifting Operations (APLO) prior to the commencement of a lifting operation.

Risk Assessment

108. A suitable and sufficient risk assessment should **identify the potential hazards** that may arise during a particular activity of lifting operation and **outline the necessary precautions** that should be put in place, in order to reduce the residual risks to a tolerable level, as low as reasonably practicable.

109. The following 5-step process should be used:

a. **identify hazards** – people, equipment, materials and environment.

b. **identify potential casualties** – permanent workers, visitors, general public or intruders.

c. **identify current control measures and decide if more are required** – physical controls (barriers etc), procedural controls (safe working practice etc), behavioural controls (supervision etc).

d. **record all findings** – state clearly what is involved in the task, list hazards and controls, consider people who can be harmed, ensure the risk assessment is signed off and ensure the risk assessments are available to those who need them.

e. **carry out a dynamic review as necessary** – especially of generic risk assessments which might become out of date or require a change in procedure etc.

Method Statement

110. Method statements document the sequence and detail of the individual steps necessary to complete a given activity or lifting operation. The statement should be clear and concise, in order to inform and instruct and avoid possible misinterpretations that could result in injury. Personnel involved in the lifting operation should read it, understand what is expected of them and appropriately follow the measures that are in place to ensure safe completion of the activity.

111. The Method Statement and supporting documentation should include the following:

a. sequential description of the lifting operation elements, including detailed sketches.

b. lifting equipment configuration, such as:

(1) single main, dual and/or auxiliary hoist(s) and requirements.

(2) counterweight provision and assembly requirements, where applicable.

(3) where applicable, jib arrangement (fixed, telescopic, lattice, stowed or erected, length, offset angle, lifting from intermediate point or jib head) and attachments (fly Jib, hoist, forks, grabs etc).

(4) boom configuration (number of parts, lengths, operating envelope, boom and load clearance distance and boom head height).

c. rated capacity of lifting equipment, marked or available within operator manual and/or load/duty charts (considering mechanical handling equipment with varying configurations, over-the-front, over-the-side, 360-degree rotation, slewing duties).

d. capacity of hoist line(s) (including single line pull and multiple falls).

e. load weight, including that of the container/packaging, lifting accessories, lifting equipment ancillaries, empty container load weight, headache (ponder) ball, main block, lifting/spreader beam(s), slings, shackles and/or any other item(s) the lifting equipment manufacturer may specify as being part of the load, to be taken into consideration with regard to the rated capacity.

f. where deemed necessary due to the complexity of the lifting operation and/or criticality of the load, percentage of lifting equipment's rated capacity, influencing 'go/no-go' decisions.

g. factors that may affect the lifting equipment's rated capacity (including machine configuration, operational duty and limitations, platform stability, loading effects, mobile block duty limitations and/or free-on-wheels operation, pick and carry duties, soft footing, in conjunction with adverse secondary effects such as un-level lifting equipment, side loading, increasing load radius, shock loading, wind loading, vessel ballast, waterborne craft buoyancy, wave motion and high-duty cycle).

h. operator qualifications, current competency and proficiency for the specific duties associated with the lifting operation and the lifting equipment to be used.

i. condition of equipment (confirming acceptability for use, including equipment inspection and preventive maintenance programme data, maintenance and repair history, reports of thorough examinations).

j. sources of possible failure should also be evaluated, including the equipment's stability, structure, and other components and where identified monitored during lifting operations.

Example 1

The following outlines selected Royal Navy process applications for General and Armament lifting which satisfies the functional requirements for the planning of lifting operations.

General Lifting

The RN can carry out various types of lifting:

- *alongside store ship – provisions, e.g. food, and equipment.*
- *Replenishment at Sea (ship-to-ship) – fuelling, provisions, equipment.*
- *Replenishment at Sea (Vertical Replenishment (Helo)) – fuelling, provisions, equipment.*
- *defect rectification lifting serials at sea or alongside.*

This case study will go through the 'defect rectification lifting serials'.

1. How is the Lift Plan compiled (by whom)?

For RN ships the lift plan is usually assigned to a Job Information Card (JIC) on the Unit Maintenance Management System (UMMS) for that equipment which can be accessed by the maintainer who is the person responsible for the lift plan, to do this though they must have the necessary ME418(S) and (F) qualifications. In the case of the HPSW Pump removal, the maintainer (M3 Deputy or Section Head (DSH/SH)) will look in UMMS for the JIC associated to the HPSW pump this should have the lift plan attached and have a designated root for the maintainer to follow with all the requirements laid out. Prior to starting they will check the lift plan against the current route and lifting methods available to ensure they are still up to date and have considered any amends to the ship. If there are any differences the maintainer is responsible to ensure the lift plan is updated prior to commencing the lift activity.

2. The structure of management and control of the Lift Plan.

Due to ships being constantly upgraded with compartments being amended to add or remove equipment which sometimes results in lifting points being moved/removed, the responsible person for the lifting activity must first check the designated lifting route is still fit for purpose and that all lifting points are still in date for use (only ME418 ADLEE qualified personnel can examine/test lifting points, the ME418(S) does not qualify individuals to carry out exams/tests). Any amends or changes to the route affecting the lift plans for equipment must be captured and changes submitted via feedback into UMMS. These reviews only occur at the time when the lifting task is required, but outside organisations that amend the design of the ship should consider any affect to the lifting plans and should ensure the UMMS JIC is updated to reflect this to reduce the burden on ship staff.

3. How is the lifting operation controlled, at the time of the activity?

The maintainer will present the lift plan to the Head of Department (HoD; in this case will be the Marine Engineering Officer)/Officer of the Day (depending if the platform is at sea or alongside) and assure them that the measures in place will ensure a safe lifting evolution, this will also take into account the movement of the platform e.g. sea state, where they will liaise with the Bridge team to ensure the platform is kept on a steady and level course as possible, if this is not possible then the maintainer and HoD will have to consider the necessity of the lifting operation at sea and decide whether to delay until the next period alongside in harbour or carry out a Risk Assessment if the operational imperative requires the lift to be done sooner. The maintainer will then brief the various team members involved on the lift plan at the point of lifting and along the lifting route as required, so all personnel involved understand their roles and what the activity will entail. The maintainer will also ensure that all personnel involved will hold the correct qualifications for their assigned task in the lifting evolution. During the lifting operation the responsible person will oversee the activity to ensure the lift is carried out in accordance the plan.

4. Improvement of the Lift Plan, once the lifting operation had been completed (learning points).

Any LFE will be gathered by the maintainer (responsible person) and they will update the lift plan as required via UMMS feedback. This is then fed back to relevant Platform Authority to update the platform documentation and compare to other platforms in their

area of responsibility and update as required. However, if the design of the ship is to be changed due to an upgrade etc, then this upgrade package should have an amendment to it as required to ensure the JICs are kept up to date throughout the life of the ship.

Armament Lifting

The RN can carry out various types of lifting with armaments:

- *ammunition alongside*
- *ammunition by Replenishment at Sea*
- *ammunition by Vertical Replenishment at sea*
- *ammunition at sea internal to the ship*

This case study will go through the 'ammunition serial at sea internal to the ship', the most common being an emergency resupply.

1. How is the Lift Plan compiled (by whom)?

Ammunition lift plans are compiled by Platform Authority who are responsible for ensuring that the class Ammunition routes and associated lifting plans are kept up to date and issued to each class. The responsible person onboard (Officer of the Quarter (OOQ)) is to ensure that the routes are checked against the lift plan prior to any ammunition serial, with any discrepancies logged and then fed back to Platform Authority for update to the class lift plan. The OOQ will hold the E109G Qualification as well as endorsement by the Head of Department for the management of explosives onboard.

2. The structure of management and control of the Lift Plan.

The lift plan is managed and controlled by the responsible person on board in this case it would be the OOQ. They are responsible to the Weapon Engineer Officer (WEO), as the Commanding Officer's representative, for the safe roll out of the lift plan when moving ammunition onboard and RN vessel. Any internal ammunition move will be planned, including during Gunnery Serials in case there is a requirement for an Emergency Resupply. Prior to the serial commencing the OOQ will liaise with the Officer of the Watch (Bridge Team) to ensure the necessary safety pipes are made over main broadcast and that the ammunition route is out of bounds to all those not involved in the serial.

3. How is the lifting operation controlled, at the time of the activity?

The responsible person (OOQ) is the person in control of the lifting operations and ensures that everyone involved is in date with the necessary qualifications prior to the serial commencing. They will also ensure that the lifting equipment involved is in date for test and examination; any out-of-date equipment will be quarantined until it can be inspected/tested by an appropriately qualified person (ADLEE). They will then present the lifting plan to the WEO for approval; part of this is walking the route to show that everything is in place. Any deviations from the lifting plan will require a Risk Assessment to be carried out and approved by the Commanding Officer. The OOQ will then brief the lifting team and show the lifting route and the equipment and lifting points that will be used. They will then inform the OOW that the ammunition move will commence and request to keep the ship on a steady and comfortable course. The OOQ will ensure that the lifting plan is being

adhered to at all times and the management of the ordnance is being complied with in accordance with the Explosives Management Policy e.g. not exceeding the drop height.

4. Improvement of the Lift Plan, once the lifting operation had been completed (learning points).

Any LFE will be gathered by the OOQ (responsible person), and they will update the lift plan as required via submission to Platform Authority.

Example 2

The following are extracts from the RSME Unit Management Plan relating specifically to the management of lifting operations. The Unit Management Plan in its entirety should be read in conjunction with Annex E – Lift Plan and Annex I – Lifting Roles which provide the application and role responsibility details, respectively.

Chapter 4 - Management of Lifting Operations

a. To manage Lifting Operations the ULM must ensure that:

(1) *those engaged to carry out the work are capable of doing so.*

(2) *effective, preventative and protective measures are put in place to control the risks.*

(3) *the right plant, equipment and tools are provided to carry out the work involved.*

b. Managing Lifting Operations to prevent and control risk requires leadership. The ULM can demonstrate visible leadership through the actions of themselves or the Appointed Person. These actions include setting standards for working practices and providing an example by following them. Leaders in health and safety should have a strong grasp of what is needed in a given situation, make clear decisions, and be able to communicate effectively.

c. A systematic approach to managing should be taken to ensure workers understand:

(1) *the risks and control measures on the project.*

(2) *who has responsibility for health and safety?*

(3) *that consistent standards apply throughout the project and will be checked frequently.*

(4) *where they can locate health and safety information which is easily understandable, well organised and relevant to the site; and that incidents will be investigated and lessons learned.*

d. Good supervision is part of showing leadership in health and safety. It:

(1) *focuses workers' attention on risks, and how to prevent them.*

(2) *shows commitment to establishing and maintaining the control measures.*

(3) *involves consulting effectively with workers, taking into account their views.*

(4) *challenges unsafe conditions and working practices when they arise.*

e. There are three levels of control available to units conducting Basic, Intermediate or Complex lifting operations:

(1) *the Chain of Command (CoC) shall ensure that a safe system is in place to assure the effective planning, supervision, training and competency of all personnel concerned with Lifting Operations.*

(2) *competent lift planners: units will be advised by the Unit Lift Manager and an APLO who is directly responsible for preparing lift plans to ensure a safe system of work.*

(3) *competent personnel: Defence must ensure that personnel conducting lifting operations are fully briefed, trained, current and competent.*

For further guidance see Planning and organising lifting operations on the HSE website.

Chapter 5 - Planning of Lifting Operations

LOLER Regulation 8: 'every employer shall ensure that every lifting operation involving lifting equipment is properly planned by a competent person'.

a. Lift Planning is vital to ensuring a safe lifting operation. Suitably Qualified Experienced Personnel (SQEP) must correctly assess lifting operations to determine the appropriate category of the lift. The formality of this process is at the discretion of the APLO, where there is any concern a full risk assessment must be completed.

b. All lift plans should be documented and recorded in a formal method, either in AESPs, safety case documentation or as a specific task relevant document for Basic, Intermediate and Complex Lifts. These are to be retained at the ULMs discretion.

c. When planning a Lifting Operation a task number is required for the lift plan, this is to be generated and issued by the ULM and held on file for the purpose of audit. The ULM may wish to conduct an indiscriminate "sanity check" of lift plans and liaise with Sub Unit APLOs to ensure that the plan is "fit for purpose" i.e. it is properly planned, appropriately supervised and carried out in a safe manner.

d. Post lifting operation the APLO will report to the ULM to confirm the lift is complete, give advice on any further improvements for future lifts and submit the lift teams competency logbooks for inspection.

For further guidance see Planning and organising lifting operations on the HSE website.

Chapter 6 - Supervision of Lifting Operations

LOLER Regulation 8: 'every employer shall ensure that every lifting operation involving lifting equipment is appropriately supervised'.

a. An establishment that employs workers or manages workers under their control must ensure that appropriate supervision is provided. The level of supervision provided will depend on the risks to health and safety involved, and the skills, knowledge, training and experience of the workers involved.

b. Workers will require closer supervision if they are young, inexperienced, or starting a new work activity. Other factors that should be considered when assessing the level of supervision needed include the level of individuals' safety awareness, education, physical agility, literacy and attitude. Even experienced workers may need an appropriate level of supervision if they do not have some or all of the skills, knowledge, training and experience required for the job and the risks involved. Workers should always know how to get supervisory help.

c. Supervisors are a vital part of effective management arrangements. Effective supervisors are those who have the skills, knowledge, training, experience and leadership qualities to suit the job in hand. Good communication and people management skills on site are important qualities for supervisors.

d. The role of the supervisor may include team leading, briefing and carrying out toolbox talks. It may also include coaching and encouragement of individual workers and supporting other formal and informal means of engaging with workers. The supervisor has a particularly important part to play as a front-line decision maker in emergencies or when workers on site face immediate risks that may require work to stop.

For further guidance see Planning and organising lifting operations on the HSE website.

Use of Hired Equipment and Lifting Contractors

General

112. The hiring of resource, outside of the MOD portfolio, in terms of personnel and equipment for a lifting operation should only be considered as a last resort, due to an operational prerogative, issues of availability of suitable, sufficient capability for any given activity.

113. When hiring externally, the CO/HoE is responsible for ensuring there are Safe Persons, Safe Equipment, Safe Practice (Training) and Safe Place, in place for all lifting operations. The procedures for this are detailed within the respective MOD Duty Holding policies (ACSO 1200 previously 3216) for the Army. Further guidance can be obtained from: ArmyCap-GMMvrSpTrg-SO1@mod.gov.uk.

114. The following should be noted:

a. The use of hired equipment (outside of the MITER Contract) or lifting contractors should not be common practice, as the MOD has substantial resource in both the equipment and trained personnel to safely conduct lifting operations. However, there may be occasions when on deployed operations, overseas exercises or specialist tasks, due to availability of service equipment, either hired equipment or a lifting contractor will be required. In such cases, a Government Authorised Explosive Representative (GAER) may be required to oversee.

b. When hiring lifting equipment, it shall be ensured that there is a Safe System of Work in place. Where applicable, due to the time scale of hire, this should include the requirement to conduct familiarisation training for the operators and maintainers to ensure they are fully competent with the hired lifting equipment.

c. Where an operational area does not have the required expertise in lifting operations, they should either:

(1) seek the support of an operational area with a management system in place; or

(2) engage a contractor for a Contract Lift, and not simply hire lifting equipment. It should be ascertained that the contractor has the necessary competence to carry out the work. For a contract lift, there remains a responsibility to deliver to the lifting contractor necessary information to assist them with their planning (i.e. area restrictions, support structure, ground bearing capacity and the weight of the load to be lifted etc). The responsible person is in control of the location and has access to the expertise required for assessing the support structure or ground on which the lifting equipment will operate. They are responsible for support structure or ground assessment and preparation, unless contracted out to a competent service provider.

115. The responsibility for insurance in terms of the lifting equipment, personnel, the load and third-party indemnity must be clarified, prior to commencement.

HIRED LIFTING EQUIPMENT:

Hired and self-managed:

MOD staff should:

• Carry out all work in accordance with BS 7121.

• Supply the APLO.

• Plan the lift and operate a safe system of work.

• Ensure that the lifting equipment is of suitable type and capacity.

• Check the credentials and certification of the lifting equipment hire company.

• Make certain the ground conditions have been assessed so that outrigger loads are adequately spread thus ensuring the ground bearing capacity is not exceeded, prior to commencement.

The lifting equipment Owner has a duty to:

• Provide lifting equipment that is properly maintained, tested and certified.

• Provide lifting equipment suitable for the contracted purpose.

• Provide a competent Operator.

CONTRACT LIFT:

Formally contracted or Included with the delivery of goods:

MOD staff should:

• Specify that all work should be carried out in accordance with BS 7121.

• Specify that the contractor should supply the APLO.

• Specify that the lifting equipment is of suitable type and capacity.

• Provide information on the ground bearing capacity of the lifting area.

• Confirm what other information and/or services will be provided to the contractor.

The Lifting Contractor has a duty to:

• Plan the lift and operate a safe system of work.

• Supply the APLO and, where required, SLO(s) and SSLO(s).

• Organise and control the lifting operation.

• Provide lifting equipment that is properly maintained, tested and certified.

• Provide sufficient lifting equipment suitable for the contracted purpose.

• Provide a competent Operator.

• Make certain the ground conditions have been assessed so that outrigger loads are adequately spread thus ensuring the ground bearing capacity is not exceeded, prior to commencement.

Annex A - Definitions and Glossary of Terms

Accessories for Lifting: Work equipment for attaching loads to machinery for lifting (e.g. eyebolts, shackles, rope/chain slings, lifting beams/frames, spreader bars/beams, quick hitches, grabs, clamps etc) (see also Lifting Arrangement).

Appointed Person Lifting Operations (APLO): A person with training, practical theoretical knowledge and experience necessary to meet the requirements of competency for the planning and management of lifting operations, in line with requirements of the main document.

Armament: A specific item of Explosive Ordnance in receipt of specific safety statements appropriate to the handling tasks involved in its 'Stockpile to Target' sequence (see Explosive Ordnance/Munitions).

Armaments Rated Capacity (ARC): The Armaments Rated Capacity (ARC) defines the magnitude of safe working load and, where applicable, load radius envelope within which all lifting equipment used by the MOD is to operate, when applied for the lifting and lowering of armaments.

The ARC is to be 50% of the Lifting Equipment SWL (or WLL) and is the maximum weight of armaments that can be lifted by the device.

As Low As Reasonably Practicable (ALARP): As soon as a hazard is identified which has the potential to cause harm, the owner of that activity should, in order to satisfy their duty of care, take immediate steps to reduce the risk posed to those who may be affected. With any risk, there will come a point where the safety benefit of reducing it further is negligible compared to the costs of doing so. It requires a balance biased towards safety risk reduction which may only cease when the cost is grossly disproportionate to any benefit achieved. The overall aim should be to provide an activity where all residual risk is removed or, where not reasonably practicable, reduced to an acceptably low level.

Attachment: A device, either mechanical or hydraulic in operation, attached to the boom tip of a loader crane or excavator arm to facilitate the lifting of loads.

Automatic Safe Load Indicator (ASLI): A device that when fitted to Lifting Equipment, automatically gives, within specified tolerance limits, a warning of the approach to the SWL (or WLL) of the Lifting Equipment. It also gives a further warning when the SWL (or WLL) has been both reached and exceeded.

NOTE: Equivalent terms:

a. Rated Capacity Indicator (RCI): Indication (with no functional limitation) of operational envelope constraints.

b. Rated Capacity Limiter (RCL): Limitation (with possible indication) of operational envelope constraints.

c. Longitudinal Load Moment Indicator (LLMI): Indication (with no functional limitation) of operational envelope constraints.

d. Longitudinal Load Moment Control (LLMC): Limitation (with possible indication) of operational envelope constraints.

Availability: The probability of the Lifting Equipment being available to support an operational duty period of eight hours and is not undergoing corrective or preventative maintenance.

Catastrophic Failure: A catastrophic failure is defined as any single hardware, software or firmware fault or any combination of hardware, software or firmware faults which results in:

a. uncontrolled motion of a load.

b. uncontrolled release of a load.

Competent Person (Assessor): A specialist approved by the Providing Authority fulfilling the following minimum criteria, including:

a. access to the requisite resources and equipment necessary to carry out and evaluate thorough examinations and, where required, appraise the results of tests.

b. appropriate practical, theoretical knowledge and experience of the lifting equipment to be thoroughly examined as will enable them to detect defects or weaknesses and to assess their importance in relation to the safety and continued use of the lifting equipment.

c. sufficient independence and impartiality of other interests, to enable the completion of thorough examinations and allow objective decisions to be made and evaluated without prejudice.

NOTES:

(1) Attention is drawn to the United Kingdom Accreditation Service (UKAS), for Competent Person (Assessor) and Inspection Body (IB) accreditation, for external suppliers of the service (Reference: ISO/IEC 17020 Conformity assessment - Requirements for the operation of various types of bodies performing inspection).

(2) Within MOD a person below the grade of Band D, Engineering Specialist, or equivalent is unlikely to meet these minimum criteria.

Competent Person: The competent person should have the necessary knowledge and experience, for the given task.

Competent Specifier: A specialist approved by the Providing Authority fulfilling the following minimum criteria:

a. access to the requisite resources and information necessary for the preparation of specifications.

b. professional qualifications based on theoretical and practical knowledge and practical experience commensurate with the Lifting Equipment being considered for the specific lifting operation.

c. sufficient independence of other interests to be able to select and specify Lifting Equipment that will safely meet all the requirements of the lifting operation.

NOTE: Within MOD a person below the grade of Higher Executive Officer (HEO) or equivalent is unlikely to meet these minimum criteria.

Contractor: The person who by the Contract, undertakes to supply the Articles, or to render such other service as is provided by the Contract. Where the Contractor is an individual or a partnership, then the expression shall include the personal representatives of that individual or the partners, as the case may be. The expression shall also include any person to whom the benefit of the Contract may be assigned by the Contractor with the consent of the Project Technical Authority.

Control System: The complete installation that controls the motors and braking systems associated with each crane motion including all aspects of normal and emergency control for each motion.

Conventional Armament: Explosive Ordnance, which is not nuclear or biological (reference DSA 02 Defence Ordnance, Munitions and Explosives (OME) Regulations).

NOTE: Conventional Armament Lift is to be considered as being a complex lift.

Cross Travel: Motion of a trolley along the bridge of an overhead travelling crane.

Danger: A state or condition in which personal injury is reasonably foreseeable as a result of an incident during lifting operations.

Design Authority: That organisation which, due to its expertise in the specific area, can undertake the design, support any features of the original design and undertake modifications or additions to the original design. Due to inherent features of the design or designs undertaken, and subsequent equipment manufacture, it is intended that once appointed the Design Authority will undertake to either carry out modifications and additions to the original design in its own right, or assess in its capacity as Design Authority, other third-party involvement.

Electrical Control Systems:

a. Type A Control System: Electrical hardware-based handling systems are those which make use of hardwired control and interlocks dependent on the physical opening and closing of electrical contacts and switches. No intelligence is provided. The logic of the system is inherent in the design and this may be analysed to ensure correct functionality.

b. Type B Control System: Electrical/Electronic hardware-based handling systems which make use of semi-conductor logic elements with defined logical behaviour in conjunction with electrical contacts and switches to provide logical as well as physical interlocks. The logic is inherent in the design and is not programmed in any way.

c. Type C Control System: Software-based handling systems contain a computing element, which is programmed using software instructions. Programmable Logic Controller (PLC) based systems fall into this category as do any electronic systems containing a Central Processing Unit (CPU) or Logic Control Unit (LCU).

Electrical Equipment: Any item for such purposes as generation, conversion, transmission, distribution or utilisation of electrical energy, such as machines, transformers, apparatus, measuring instruments, protective devices, accessories, appliances and luminaries.

Electrical Installation: An assembly of associated electrical equipment supplied from a common origin to fulfil a specific purpose and having certain co-ordinated characteristics.

Equipment Operator: The person with such appropriate practical, theoretical knowledge and experience to prepare the lifting equipment for operation or operating the lifting equipment for the purpose of positioning loads.

Excessive Shock: Any reaction resulting in sudden instability or over-stressing of part of the Lifting Equipment in excess of the permissible values for exceptional loading conditions defined in the appropriate design specifications.

Explosive Ordnance/Munitions: All munitions containing explosives, nuclear fission or fusion materials, and all similar or related items or components explosive in nature (see Armament).

Explosives Area: An area in which Explosive Ordnance/Munitions are stored or processed and categorised as either Category A, B or C using a method equivalent to DSA 03.OME Part 2 Defence Code of Practice (DCOP) and Guidance Notes for In-Service and Operational Safety Management of OME.

NOTE: A jetty where armaments are handled in the open is not generally regarded as an explosives area.

Explosives Building: A building containing Explosive Ordnance and categorised as either Category A, B and C by DSA 03.OME Part 2 Defence Code of Practice (DCOP) and Guidance Notes for In-Service and Operational Safety Management of OME.

Factors of Safety:

a. the factor of safety (applied tensile loading) is the ratio between minimum breaking load and Safe Working Load (SWL) or Working Load Limit (WLL).

NOTE: Design Factors utilise either Yield or 0.2% Proof stress against maximum design stress.

b. the factor of safety (applied compressive loading) is the ratio between the applied maximum allowable axial load and the critical buckling load.

Fail to Danger (Dangerous Failure): Any failure of the Lifting Equipment, its associated safeguards, control circuits or its power supply that leaves the machinery in a dangerous condition, or results in an uncontrolled motion.

Fail to Safety (Failsafe): Any failure of the individual components, their associated safeguards, control circuits or their power supply that leaves the Lifting Equipment in a safe condition.

NOTE: Sufficient evidence, by application of techniques such as Failure Modes and Effects Analysis (FMEA) & Criticality Analysis (FMECA), Fault Tree Analyses (FTA) may be necessary to demonstrate, as far as reasonably practicable, that the required confidence level in the equipment has been achieved.

Failure to Support the Function: A failure to support the function is defined as any single hardware, software or firmware fault or any combination of these which results in:

a. a failure to safety.

b. loss of any one of the motions of the Lifting Equipment.

c. a failure resulting in a downtime exceeding eight hours.

Failure: The termination of the ability of an item to perform a required function.

Fault Load: Potential maximum load magnitude applied/recognised in a worst-case failure event.

Fly Jib: A purpose designed extension to the main jib, fitted to obtain a longer reach. It can be fully demountable or stowed on the main jib and when required manually swung and secured into position on a pivot mechanism.

Firmware: Software stored in either Programmable Read-Only Memory (PROM) or Read-Only Memory (ROM).

Hardware Memory (ROM): This typically controls any computer when first switched on and will often be the only software used by Type C control systems.

Hazardous Duties: Hazardous duties include working in adverse environmental conditions such as extremes of temperature, or where lifting procedures could involve the likelihood of shock loading, or where there could be inaccuracies in the load weight.

Hoisting: The motion of raising or lowering of the load in a vertical direction.

Hold-to-run Control: A control that operates in the following manner:

a. movement only occurs as long as the control is held away from the central stop position.

b. the resulting magnitude of the motion can be (dependent on the nature of the control) proportionally dependent on the controls displacement from the central stop position.

c. the control returns automatically to the central stop position when released.

d. when the control is at the central stop position, it automatically applies the service brake(s) for that motion, and where applicable cuts the power to that motion.

e. where a hold-to-run lever is used it should be fitted with a button or other device that when depressed allows movement of the motion as long as the lever is held away from the central stop position. If this button or other device is released, it automatically applies the service brake(s) to that motion and where applicable cuts the power to that motion.

NOTE: A hold-to-run lever is commonly known as a ‘dead man’s’ handle.

Intermediate Inspection: An inspection carried out at appropriate intervals between thorough examinations to identify potential faults and deterioration so that appropriate action may be taken to ensure that the lifting equipment remains safe to use.

Level Luffing: A Jib mechanism which allows the load to move horizontally during Luffing operations, from the maximum operating radius to the minimum operating radius.

Lift Coordinator: The person who plans and directs the sequence of operations of multiple lifting assets to ensure that they do not collide with other lifting equipment, loads or plant (e.g. goliath cranes, overhead travelling cranes, dockside cranes, tower cranes,

straddle carriers, vessel mounted cranes, telehandlers, reach stackers, container handlers, etc.).

Lift Plan: This consists of at least the Risk Assessment, Method Statement, Safe System of Work and any relevant drawings/supporting documentation.

Lifting Arrangement: An assembly of Accessories for Lifting acting as an interface between the Lifting Equipment and the load.

Lifting Arrangement Test: A proof test (the magnitude of which is specified by the Competent Person) of the complete Lifting Arrangement, configured for a proposed Nuclear Armament Lift.

NOTE: Lifting Arrangement Tests should be conducted each time an assembly or any component thereof has been altered.

Lifting Equipment: Work equipment for lifting or lowering loads and includes its attachments used for anchoring, fixing and/or supporting.

Lifting Operation: '*an operation concerned with the lifting or lowering of a load'.*

Lift or Lifting: Any movement of loads or persons that includes a change of height, such that the load becomes freely suspended but unsupported by any other means (i.e. ground, structure, secondary equipment etc).

NOTE: Definition within BS 7121-1 is '*movement of loads or persons that involves a change of height'.*

Lift Manager (LM): A person appointed by a Commanding Officer (CO) / Head of Establishment (HoE) to manage a safe lift system on behalf of the Delivery Duty Holder (DDH).

NOTE: Lift Manager can be considered equivalent to a Unit Lift Manager (ULM) for a given unit.

Limit Switch: A device positioned such that a particular motion may be inhibited at a particular point as follows:

a. Hoist Raise: to stop motion preventing hook block collision with bridge beam(s) and jib head pulley(s) (Block-to-Block).

b. Hoist Lower: to stop motion when the rope is fully payed out (ensuring a minimum of 3 dead turns remaining on the drum).

c. Luffing: to inhibit motion preventing jib over-lower and over-raise.

d. Slewing: to inhibit motion preventing Appliance rotation from colliding with nearby structures.

e. Ultimate Limit Switch: generally restricted to hoist raise motion, in high integrity build. An additional stop switch which serves as a back-up, in the event of Hoist Raise Limit Switch malfunction.

Load: Weight which is lifted by the lifting equipment (including accessories and persons where applicable).

Load/Radius Indicator: A device fitted to Lifting Equipment that shows the radius at which the Lifting Equipment is operating and its corresponding SWL (or WLL).

Long Travel: Motion of Lifting Equipment along the longitudinal path (usually rails).

Luffing: Angular raise and lower movement of a jib, in the vertical plane.

Maintainability: The ease with which an item can be maintained in order to isolate and correct defects or their cause. Equipment should be designed to facilitate ease of inspection and servicing.

Manual Control: Control of the Lifting Equipment directly from the operator's cabin or station with no facility for remote control.

Method Statement: A document produced by the appointed person to describe how the lifting operation is to be carried out.

Nuclear Armament (Weapon): A complete assembly (i.e. implosion type, gun type, or thermonuclear type) in its intended ultimate configuration which, upon completion of the scribed arming, fusing and firing sequence, is capable of producing the intended nuclear reaction and release of energy.

NOTE: Partly assembled Nuclear Armament should be equally and similarly considered.

Nuclear Lift (Complex): A lift by any Lifting Equipment, of any object that, in damaging itself or causing damage due to dropping or other mishap during the lift, could cause an incident, i.e. an occurrence which could give rise to a serious radiological consequence, on or off site, or which could significantly affect the NRP Safety Justification or Site Safety Justification.

Lifts of any items over nuclear submarines, submarine services, caissons and any other facility or utility whose failure would lead to an incident, are included in this definition.

Nuclear Armament Test Lift (Complex): A load of 125% of the heaviest nuclear armament lift applied to the Lifting Equipment provided this does not exceed the SWL (or WLL).

Nuclear Armament Lift (Complex): A lift by a crane or other Lifting Equipment of an object which in being itself damaged or causing damage due to dropping or other mishap during the lift could prejudice nuclear armament safety or serviceability.

On Charge: The term used for the permanent acquisition of a pre-owned Lifting Equipment from another authority. The authority could range from a separate ministry or department to a private supplier.

One Fault Safe (Single Point Failure): No single fault or failure of an individual component or of documented procedure is to cause a failure to danger.

Operating Cycle: A single lifting operation, involving use of hoist, luffing, long travel, slewing and cross travel motions (as appropriate). It is considered to commence when a

load is picked up and end the moment the Lifting Equipment is ready to pick up the next load.

NOTE: For test purposes, the duration of an operating cycle is to be five minutes. If an Appliance is fitted with Electronic Data-logging equipment, the above definition may not be appropriate as the equipment may only record (or log) when a load is detected.

Operator (Lifting Equipment): person who is operating the Lifting Equipment for the purpose of positioning loads or erection of the equipment.

Project Technical Authority: The head of the authority or their formally appointed representative, responsible for the Technical Specification and acceptance of the Lifting Equipment from the original manufacturer or hire company.

NOTE: The Project Technical Authority is responsible for ensuring that the Lifting Equipment complies with the technical requirements and relevant regulations and is considered fit for purpose.

Providing Authority: The head of the authority (or their appointed representative) that owns or will own the Lifting Equipment or, in the specific case of hire from outside the Ministry of Defence, an authorised representative of the user of the Lifting Equipment. This authority is usually delegated to the Head of Establishment.

NOTES:

(1) The Providing Authority is responsible for ensuring that Lifting Equipment is operated, maintained, periodically examined and tested, in accordance with:

a. the original manufacturer's instructions.

b. appropriate requirements of the specific Providing Authority.

c. relevant regulations.

(2) In the case of Lifting Equipment used at a Defence Munitions (DM) establishment, Director Support (DSup) or a nominated representative (usually the Head of Establishment) is the Providing Authority.

(3) In the case of Lifting Equipment hired, for use at a DM establishment, from a source outside the Ministry of Defence or a formally nominated representative (usually the Head of Establishment) remains the Providing Authority.

(4) In the case of Lifting Equipment used on RN vessels, BR 862 and BR 3027 define the duties of the ship's officers.

Rated Capacity: The load that the lifting equipment is designed to lift for a given operating condition (e.g. configuration, position of the load).

Rated Capacity Indicator: See ASLI equivalent terms.

Rated Capacity Limiter: See ASLI equivalent terms.

Recovery: Any operation which deals with the removal of a broken down, abandoned, or accident damaged vehicle which cannot be repaired in situ and driven away unaided.

Remote Control: Where the control position is at a distance from the operator's cabin or station. The remote control position may be fixed or portable.

Rigid Structure: A structure with fundamental natural frequencies greater than 33Hz.

Risk Assessment: A systematic approach to hazard identification and probability assessment. The process should identify what elements of an activity can cause injury/fatality to people or damage to material along with the likelihood of occurrence, in order to evaluate the overall risk. Consideration is then given to the introduction of control measures to reduce the risk of injury/fatality to a tolerable level. The Risk Assessment process should ensure that any residual risk, on the basis of the control measures specified, is reduced to a level as low as is reasonably practicable.

NOTE: A Risk Assessment should not be seen as a process which eliminates all hazards in the workplace; nor, is it a means of preventing "dangerous" activities from being carried out. The nature of MOD undertakings means that operations may involve some level of risk which will require suitable and sufficient control.

Safe: A state or condition in which personal injury is not reasonably foreseeable as a result of an incident.

Safe System of Work: A safe system of work is a procedure focused on elimination of risk(s) involved in any given activity. Where elimination is not possible, then actions should be taken ensuring that any residual risks are at a level as low as is reasonably practicable.

Safe Working Load (SWL): The maximum load that can be safely handled by Lifting Equipment at a specified position and under specific service conditions. The SWL can be the same as but cannot exceed the working load limit.

Service Conditions:

a. In Service: The Lifting Equipment available for handling loads up to its SWL (or WLL) in permissible wind speeds and other conditions as specified by the Project Technical Authority.

b. Out of Service: The Lifting Equipment either not required for use or out-of-use, without load on the hook and in conditions as specified by the Project Technical Authority.

Shock: Any reaction resulting in:

a. sudden oscillation of the load.

b. sudden instability or over-stressing of part of the Lifting Equipment in excess of the permissible values for normal service (with wind defined in the appropriate design specification).

Signaller: The person responsible for directing the lifting equipment operator to ensure safe movement of the lifting equipment and load.

Slewing: Rotary motion of an appliance jib and/or superstructure about a vertical axis.

Slinger: The person responsible for appropriately attaching and satisfactorily detaching the load to and from the lifting equipment. They are to correctly select and use lifting accessories in accordance with the specifications of the lift plan.

Software: Set of instructions, data or programs used to control a computer system. Part of a Type C control system.

So far as is reasonably practicable: The degree of risk in a particular activity or environment be balanced against the time, difficulty and cost of taking measures to avoid the risk. If these are grossly disproportionate to the risk, then it would be quite unreasonable for the people concerned to have to incur them to prevent it.

Suitably Qualified and Experienced Personnel (SQEP): An individual in possession of a relevant professional qualification and (several years of) experience, such that the skills and understanding can be relied upon to resolve a technical problem to the required standards.

Supervisor: Person who controls the lifting operation and is responsible for ensuring that it is carried out in accordance with the APLOs .

Thorough Examination: An examination by a competent person in such depth and detail as the competent person considers necessary to enable them to detect defects and weaknesses and determine whether the equipment being examined is safe for continued use.

Tipping: The condition when Lifting Equipment is subjected to an applied load/moment, causing it to overturn.

Uncontrolled (Motion): An achieved motion that is not in accordance with the magnitude and/or direction demanded by the control system.

USB: Universal Serial Bus; commonly used to attach peripherals to computer-based systems (e.g. a memory stick).

Work Equipment: Machinery, appliance, apparatus, tool or installation for use at work.

Working Load Limit (WLL): The maximum applied load that Lifting Equipment and Accessories are designed to raise, lower or suspend at a specific position.

WOME: This term includes all items identified as Weapons, Ordnance, Munitions or Explosives.

Zero Period Acceleration (ZPA): The acceleration level that is deemed to apply to a rigid structure during a seismic event in any discrete orthogonal direction.

Annex B - Policy, Governance, Standards and Guidance References

AESP 2590-E-100-013 Management of Lifting and Recovery Equipment
CIRIA C703 - Crane Stability on Site, Lifting Equipment Engineers' Association
Construction (Design and Management) Regulations 2015
CPA Best Practice Guide - Maintenance, Inspection and Thorough Examination of Mobile Cranes
CPA Good Practice Guide – Lifting Operations with Excavators
A guide to procedures for operation of cranes in the vicinity of aerodromes. Airport Operators Association
Ground conditions for construction plant
GS6 Avoiding danger from overhead power lines
Guidance to crane users on aviation lighting and notification
LEEA - Code of Practice for the safe use of Lifting Equipment (COPSULE)
Personal Protective Equipment at Work Regulations 1992
Safe Use of Lorry Loaders, CPA - ALLMI Best Practice Guide
Workplace (Health, Safety and Welfare) Regulations 1992
C Vehicle Operator and Lifting Operations, Training and Competency Logbook
AESP 0200-A-307-013 All Arms Recovery Manual
AESP 0200-A-090-013 Land Equipment Engineering Standards
DAP119K-0001 Management of Air Commodities Delivery Team Supported Lifting Equipment

Relevant Industry Standards

1. BS 2573-1:1983: Rules for the design of cranes - Specification for classification, stress calculations and design criteria for structures.
2. BS 2573-2:1980: Rules for the design of cranes - Specification for classification, stress calculations and design of mechanisms.
3. BS 3641-1: Symbols for machine tools - General symbols.
4. BS 5070-1: Engineering diagram drawing practice - Recommendations for general principles.
5. BS 5400-10: Steel, concrete and composite bridges - Code of practice for fatigue.
6. BS 7121: Cranes:
    - Part 1: Code of practice for safe use of cranes; General.
    - Part 2: Code of practice for safe use of cranes; Inspection, testing and examination.
    - Part 2-1: Code of practice for the safe use of cranes; Inspection, maintenance and thorough examination; General.
    - Part 2-3: Code of practice for the safe use of cranes; Inspection, maintenance and thorough examination; Mobile cranes.
    - Part 2-4: Code of practice for the safe use of cranes; Inspection, maintenance and thorough examination; Loader cranes.
    - Part 2-5: Code of practice for the safe use of cranes; Inspection, maintenance and thorough examination; Tower cranes.
    - Part 2-7: Code of practice for the safe use of cranes; Inspection, maintenance and thorough examination; Overhead travelling cranes, including portal and semi-portal cranes, hoists, and their supporting structures.

- Part 2-9: Code of practice for the safe use of cranes: Inspection, maintenance and thorough examination; Cargo handling and container cranes.
- Part 3: Code of practice for safe use of cranes; Mobile cranes.
- Part 4: Code of practice for safe use of cranes; Lorry loaders.
- Part 5: Code of practice for safe use of cranes; Tower cranes.
- Part 7: Code of practice for safe use of cranes; Bridge and gantry cranes, including light crane systems.
- Part 11: Code of practice for safe use of cranes; Offshore cranes.
- Part 12: Code of practice for safe use of cranes; Recovery vehicles and equipment; Code of practice.
- Part 13: Code of practice for safe use of cranes; Hydraulic gantry lifting systems.
- Part 14: Code of practice for safe use of cranes; Side boom pipe-layers.

7. BS 7262: Specification for automatic safe load indicators.
8. BS 7430: Code of practice for protective earthing of electrical installations.
9. BS 7671: Requirements for Electrical Installations; IET Wiring Regulations.
10. BS 7608: Guide to fatigue design and assessment of steel products.
11. BS 8444-3: Risk management - Guide to risk analysis of technological systems.
12. BS 8460: Code of Practice for Safe Use of MEWPs.
13. BS MA 48: Code of practice for design and operation of ships' derrick rigs.
14. BS EN 499-1: Welding terms and symbols - Glossary for welding, brazing and thermal cutting.
15. BS EN 1011-1: Welding; Recommendations for welding of metallic materials - General guidance for arc welding.
16. BS EN 1011-2: Welding; Recommendations for welding of metallic materials - Arc welding of ferritic steels.
17. BS EN 1677-5: Components for slings; Safety - forged steel lifting hooks with latch; Grade 4.
18. BS EN 10160: Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm.
19. BS EN 10228-3: Non-destructive testing of steel forgings - Ultrasonic testing of ferritic or martensitic steel forgings.
20. BS EN 10264-3: Steel wire and wire products; Steel wire for ropes - Round and shaped non-alloyed steel wire for high duty applications.
21. BS EN 12385-1: Steel wire ropes; Safety - General requirements.
22. BS EN 12385-4: Steel wire ropes; Safety - Stranded ropes for general lifting applications.
23. BS EN 13000: Cranes; Mobile cranes.
24. BS EN 13001: Cranes:
    - Part 1: Cranes. General design. General principles and requirements.
    - Part 2: Crane safety. General design. Load actions.
    - Part 3-1: Cranes. General Design. Limit States and proof competence of steel structure.
    - Part 3-2: Cranes. General design. Limit states and proof of competence of wire ropes in reeving systems.
    - Part 3-3: Cranes. General design. Limit states and proof of competence of wheel/rail contacts.
    - Part 3-4: Cranes. General design. Limit states and proof of competence of machinery. Bearings.
    - Part 3-5: Cranes. General design. Limit states and proof of competence of forged and cast hooks.

- Part 3-6: Cranes. General design. Limit states and proof of competence of machinery. Hydraulic cylinders.
- Part 3-7: Cranes. General design. Limit states and proof of competence of machinery. Gears and gearboxes.
- Part 3-8: Cranes. General design. Limit states and proof of competence of machinery. Shafts.

25. BS EN 13135: Cranes; Safety; Design; Requirements for equipment.
26. BS EN 13155: Cranes; Safety; Non-fixed load lifting attachments.
27. BS EN 13557: Cranes; Controls and control stations.
28. BS EN 13849-1: Safety of machinery; Safety-related parts of control systems - General principles for design.
29. BS EN 13852: Cranes; Offshore cranes - Light offshore cranes.
30. BS EN 13852-1: Offshore Cranes - General purpose offshore cranes.
31. BS EN 13852-2: Offshore Cranes - Floating cranes.
32. BS EN 13889: Forged steel shackles for general lifting purposes; Dee shackles and bow shackles; Grade 6; Safety.
33. BS EN 14985: Cranes; Slewing jib cranes.
34. BS EN 60068: Environmental testing.
35. BS EN 60079: Explosive atmospheres.
36. BS EN 60079-11: Explosive atmospheres; Equipment protection by intrinsic safety “i”.
37. BS EN 60204: Safety of machinery; Electrical equipment of machines.
38. BS EN 60204-1: Safety of machinery; Electrical equipment of machines; Specification for general requirements.
39. BS EN 60204-32: Safety of machinery; Electrical equipment of machines; Requirements for hoisting machines.
40. BS EN 60529: Degrees of protection provided by enclosures (IP Code).
41. BS EN 60801: Electromagnetic compatibility for industrial-process measurement and control equipment.
42. BS EN 60801-2: Electromagnetic compatibility for industrial-process measurement and control equipment - Electrostatic discharge requirements.
43. BS EN 60947: Low-voltage switchgear and control gear.
44. BS EN 60947-5-1: Specification for low-voltage switchgear and control gear; Control circuit devices and switching elements; Electromechanical control circuit devices.
45. BS EN 61000: Electromagnetic compatibility (EMC).
46. BS EN 61340-5-1: Electrostatics - Protection of electronic devices from electrostatic phenomena; General requirements.
47. BS EN ISO 148-1: Metallic materials; Charpy pendulum impact test - Test method.
48. BS ISO 281: Roller bearings; Dynamic load ratings and rating life.
49. BS ISO 2408: Steel wire ropes; Requirements.
50. BS ISO 3537: Road vehicles; Safety glazing materials; Mechanical tests.
51. BS ISO 4302: Cranes; Wind load assessment.
52. BS ISO 4309: Cranes; Wire ropes; Care and maintenance, inspection and discard.
53. ISO 4310: Cranes - Test code and procedures.
54. BS ISO 4413: Hydraulic fluid power; General rules relating to systems.
55. BS ISO 4414: Pneumatic fluid power; General rules relating to systems.
56. BS EN ISO 6892-1: Metallic materials; Tensile testing - Method of test at room temperature.
57. BS EN ISO 9001: Quality management systems; Requirements.
58. BS EN ISO 9606-1: Qualification testing of welders; Fusion welding - Steels.
59. BS EN ISO 9606-2: Qualification testing of welders; Fusion welding - Aluminium and aluminium alloys.

60. BS EN ISO 9934-1: Non-destructive testing; Magnetic particle testing - General principles.
61. BS ISO 10245-2: Cranes; Limiting and indicating devices - Mobile cranes.
62. BS EN ISO 10675-1: Non-destructive testing of welds; Acceptance levels for radiographic testing - Steel, nickel, titanium and their alloys.
63. BS EN ISO 10675-2: Non-destructive testing of welds; Acceptance levels for radiographic testing - Aluminium and its alloys.
64. BS EN ISO 11666: Non-destructive testing of welds; Ultrasonic testing; Acceptance levels.
65. BS EN ISO 12100: Safety of machinery; General principles for design; Risk assessment and risk reduction.
66. BS EN ISO 13766-1: Earth-moving and building construction machinery; Electromagnetic compatibility (EMC) of machines with internal electrical power supply - General EMC requirements under typical electromagnetic environmental conditions.
67. BS EN ISO 13849-1: Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design.
68. BS EN ISO 13850: Safety of machinery; Emergency stop function; Principles for design.
69. BS EN ISO 15614-1: Specification and qualification of welding procedures for metallic materials; Welding procedure test - Arc and gas welding of steels and arc welding of nickel and nickel alloys.
70. BS ISO 16625: Cranes and hoists; Selection of wire ropes, drums and sheaves.
71. BS EN ISO 17636-1: Non-destructive testing of welds; Radiographic testing - X - and gamma-ray techniques with film.
72. BS EN ISO 17636-2: Non-destructive testing of welds; Radiographic testing - X - and gamma-ray techniques with digital detectors.
73. BS EN ISO 17637: Non-destructive testing of welds; Visual testing of fusion-welded joints.
74. BS EN ISO 17640: Non-destructive testing of welds; Ultrasonic testing; Techniques, testing levels and assessment.
75. BS ISO 21600: Technical product documentation (TPD); General requirements of mechanical product digital manuals.
76. BS EN ISO 23277: Non-destructive testing of welds; Penetrant testing; Acceptance levels.
77. BS EN ISO 23278: Non-destructive testing of welds; Magnetic particle testing; Acceptance levels.
78. BS ISO/IEC 90003: Software engineering; Guidelines for the application of ISO 9001 to computer software.
79. IEC 60617: Graphical Symbols for Diagrams.
80. IEC 61508: Functional safety for electrical, electronic and programmable electronic safety related systems.
81. BS EN 61508-6: Functional safety of electrical/electronic/programmable electronic safety related systems - Guidelines on the application of IEC 61508-2 and IEC 61508-3.
82. IEC 61508-2: Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems.
83. IEC 61508-3: Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3: Software requirements.
84. BS ISO/IEC/IEEE 26514: Systems and software engineering; Design and development of information for users.

85. BS ISO/IEC/IEEE 26531: Systems and software engineering; Content management for product lifecycle, user and service management documentation.
86. BS EN IEC/IEEE 60980-344: Nuclear facilities; Equipment important to safety; Seismic qualification.
87. PD ISO/TR 18792: Lubrication of industrial gear drives.
88. PD ISO/TR 25599: Cranes; Jib cranes; International standards for design, manufacturing, use and maintenance requirements and recommendations.
89. PD 5304 Guidance on safe use of machinery
90. ASCE/SEI 4-16: Seismic Analysis of Safety- Related Nuclear Structures.
91. ASCE/SEI 43-05: Seismic Design Criteria for Structures, Systems and Components in Nuclear Facilities.
92. FEM Rules 1.001: Rules for the design of hoisting appliances.

Relevant MOD Standards

93. BR 1754: Regulations for the safe storage and handling of petroleum products in HM ships and submarines.
94. Def Stan 00-40: Reliability and Maintainability (R&M).
95. Def Stan 00-42: Reliability and Maintainability (R&M) Assurance Guide.
96. Def Stan 00-42: Reliability and Maintainability (R&M) Assurance Guide; Part 6: Maintainability Demonstrations.
97. Def Stan 00-056: Safety Management Requirements for Defence Systems.
98. Def Stan 00-101: Design Standards for Explosives Safety in MOD Ships and Submarines.
99. Def Stan 00-250: Human Factors for Designers of Systems:
    - Part 1: Overarching People-Related Requirements.
    - Part 2: Particular People-Related Requirements.
    - Part 3: Technical Guidance.
    - Part 4: Human Factors Integration (HFI) Methods, Tools and Techniques.
100. Def Stan 00-600: Integrated Logistic Support; Requirements for MOD Projects.
101. Def Stan 02-113: Requirements for Mechanical Handling; Lifting Equipment used on Royal Navy vessels.
102. Def Stan 02-157: Part 1: Requirements for Deck Coverings: General Requirements.
103. Def Stan 02-324: Part 1: Requirements for Hydraulic Systems.
104. Def Stan 07-279: Requirements for Replenishment at Sea HM Surface Ships.
105. Def Stan 08-101: Requirements for the Construction and System Arrangements in Magazines and Weapon Storage Compartments (Category 1).
106. Def Stan 08-160: Requirements for Electrical Installations.
107. Def Stan 59-411: Electromagnetic Compatibility.
    - Part 1: Management and Planning.
    - Part 2: The Electric, Magnetic and Electromagnetic Environment.
    - Part 3: Test Methods and Limits for Equipment and Sub Systems.
    - Part 4: Platform and System Tests and Trials.
    - Part 5: Code of Practice for Tri-Service Design and Installation.

Relevant Guidance

108. Health and Safety Executive – Risks from handling explosives in ports (ISBN 978 0 7176 0917 8).
109. Engineering Council – Guidance on Risk for the engineering profession (www.engc.org.uk/risk).

Annex C - Guidance on Policy Application to Mechanical Equipment Categories

Ser	Equipment Type	Included with this Policy	Excluded from this Policy
1	Lifting Equipment	All categories of lift (including Self-Deployable Cranes).	Nil.
2	Earthmoving Plant	Equipment used to lift items (using slings, jibs, frames, forks, hooks, quick hitch lifting eyes or similar).	When earthmoving equipment uses excavation attachments covered within the equipment AESP (however, the mounting and demounting of attachments, especially if requiring external lifting equipment will fall within the scope of this policy). SLDT - when conducting standard earthworks or construction activities on bucket, shovel and blade duties. Winching attachments if used for a horizontal pull/hauling (i.e. vehicle recovery) specifically detailed within the relevant AESP documentation.
3	Automotive Bridge Launching Equipment (ABLE)	Lifts not directly in support of General Support Bridge (GSB) and Close Support Bridge (CSB) lifting activities and/or lifts not detailed within the AESPs.	When conducting standard activities described by the system CONUSE and AESPs such as GSB and CSB construction and deconstruction, movement and handling of GSB components.
4	TERRIER, TITAN and TROJAN	Lifts not directly in support of the primary role of TERRIER and TROJAN respectively, and/or lifts not detailed within the AESPs.	When conducting standard activities described by the system CONUSE and AESPs such as bucket and shovel duties for excavation (however, the mounting and demounting of attachments, especially if requiring external lifting equipment will fall within the scope of this policy).
5	Mechanical Handling Equipment (MHE)	All categories of lift. Lifts detailed within the AESP/Safety Case.	When conducting standard activities described by the system CONUSE and AESPs, for activities other than lifting such as transporting load(s).
6	Logistics Vehicles fitted with Crane	All categories of lift.	When conducting standard activities described by the

Ser	Equipment Type	Included with this Policy	Excluded from this Policy
	Auxiliary Lorry Mounted (CALM)	Lifts detailed within the AESP/Safety Case.	system CONUSE and AESPs such as adjusting and transporting loads on the vehicle.
7	Recovery Vehicles	Lifts not within the primary role of the vehicle, as detailed within the AESP/Safety Case.	When conducting standard activities described by the system CONUSE and AESPs.
8	Miscellaneous Equipment	Lifts not within the primary role of the vehicle, as detailed within the AESP/Safety Case.	When conducting standard activities described by the system CONUSE and AESPs.
9	Lifting Equipment JSP 975 Part 2: Code of Practice and Guidance Annex L (Cranes & Mechanical Handling Equipment)	Complex Lifts.	Nil.

NOTE: Vehicle jacks provided as part of the standard vehicle equipment for emergency roadside use (changing a punctured wheel) will not normally be regarded as subject to LOLER. This equipment must not be used as garage workshop or servicing bay equipment.

<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="3">LIFT TYPE</td></tr>
<tr><td>Basic
(within vehicle role)</td><td>Intermediate</td><td>Complex</td></tr>
<tr><td rowspan="9">Equipment Type</td><td>Self-Deployable Mobile Cranes
(TML, 30T Crane, 50T Crane, etc)</td><td colspan="3">Within scope of the MOD Lifting Policy</td></tr>
<tr><td>Earthmoving Plant
(U/LWT, MWT, HWT, MC/WE, SLDT)</td><td rowspan="8">MOD Lifting Policy
Supported by Individual Equipment Safety Cases</td><td colspan="2" rowspan="8"></td></tr>
<tr><td>Automotive Bridging System
(Bridging Vehicle, etc)</td></tr>
<tr><td>Armoured Fighting Vehicles
TITAN, TROJAN, TERRIER</td></tr>
<tr><td>Logistics Vehicle
(GSV, LSV, EPLS, GST, CST etc)</td></tr>
<tr><td>Mechanical Handling Equipment
(RTFL, RTCH etc)</td></tr>
<tr><td>Recovery Vehicles
(434, 512, 513, CRARRV, SV(R), etc)</td></tr>
<tr><td>Miscellaneous Equipment including Static/Gantry Cranes or Tower Cranes
(Port & Maritime Cranes, Workshop Cranes etc)</td></tr>
</table>

Figure 3: Lift Management Responsibilities

Annex D - Hazards to be Considered when Determining the Lifting Operation Risk

Environmental Factors

Clearances

1. The area in which the lifting operation is to be undertaken should be of a sufficient size to enable the lifting equipment to be manoeuvred into position, set up, operated and stowed. There should be sufficient clearances between the lifting equipment and surrounding infrastructure to allow for free movement of both the lifting equipment and load(s). This is to ensure that trapping/crushing points are not created and that damage does not occur to the lifting equipment, load(s) or the surrounding infrastructure, for the operational envelope required by the lifting operation. The Guidance to the LOLER specifies minimum gaps for areas into which persons may enter, including:

a. 6m for an approach to operating crane.

b. 0.6m for an approach to machinery with a slewing motion.

Ground Conditions

2. The stability of lifting equipment is dependent upon the bearing capacity of the ground on which it is positioned. The APLO, as part of producing the RAMS, must ensure the ground conditions are correctly calculated to support the following design details:

a. maximum applied load per outrigger.

b. dimensions of outrigger foundation plate(s)/pad(s).

c. ground-level pressure on outrigger support plate(s).

3. The capability of the ground to accept the maximum induced outrigger and lifting equipment loads should be ascertained by a competent Geotechnical Engineer. Where required, it is essential that outriggers are deployed in the manner specified within the AESP. When siting the lifting equipment, consideration should be given to the length of time that the lifting equipment will remain in position and the likely deterioration of the supporting ground or foundation over time (e.g. timber rotting, undermining by water or frost, drying out, adjacent excavations). Additional hazards to be considered when assessing ground include:

a. underground services.

b. overall compaction and loose fill material.

c. open excavations.

d. high water table.

e. basements and cellars.

f. proximity to canals and rivers (bank-sides).

g. changes to site conditions during works.

h. slope and camber of the ground.

i. access routes, set-up and load set-down area dimensions and capability.

Details of any foundation or load spreading arrangements should be recorded in the method statement by the APLO.

NOTE: Further guidance on assessment of ground conditions and lifting equipment foundations is given in the CIRIA publication C703 - Crane Stability on Site.

4. The lifting equipment supplier/manufacturer should provide the maximum in-service and out of service wind conditions for the specific model of lifting equipment to be used. Wind speeds should be monitored by the use of strategically located and/or handheld anemometers, bearing in mind that wind speed increases with height and the wind pressure on the load may increase as it is lifted.

5. All lifting equipment Operators should be aware of the maximum in-service wind speed for the particular lifting equipment being used. This value may need to be significantly reduced for loads with a large wind sail area.

NOTE: Wind speeds may be estimated by use of the Beaufort Scale. Maximum operating wind speed for the load is to be known and calculated (see BS 7121-1 Annex D).

Sea State

6. The stability of lifting equipment is primarily dependent upon the security of fixing to the base platform. Thereafter, consideration should be given to the potential changes in sea state conditions, in order to assess load stability. The Beaufort Sea State Code can be used to give an approximate but concise description of sea conditions, for lifting operation and load stability assessment.

Specific Location Hazards

Access and Egress to and from the Site

7. It should be ensured that there is adequate access to the set-up and load set-down area(s) for the lifting equipment, load(s), support equipment and required transportation. Furthermore, it should be ensured that adequate egress will be available for the removal of lifting equipment from site.

8. When siting lifting equipment, consideration should be given to the potential of extending elements contacting or approaching hazards such as power lines, communications cables or structures. Advice on siting lifting assets near to overhead power lines can be found in the respective AESP - 201 and HSE Guidance Note GS6 - Avoidance of danger from overhead electric power lines.

Proximity to Railways and Airports

9. Where the lifting equipment is to be sited adjacent to a railway or in the vicinity of an airport/ airfield, the APLO should obtain permission(s) to proceed, from the operator of the facility. The facility operator may impose restrictions upon the lifting operation[5].

NOTE: Where required, the APLO should follow the guidance in the Civil Aviation Publication (CAP) 1096.

Exhaust Gas Emissions

10. Where the lifting equipment is to be used in a restricted or confined space, the APLO should consider the effect of vehicle and support equipment exhaust gas emissions on persons in the vicinity. The appropriate measures such as forced ventilation or the use of fume extraction equipment should be utilised.

Load Factors

11. The following outlines load considerations that may affect the lifting operation risk, including:

a. loads containing a dangerous substance (i.e. munitions, chemicals, fuels, etc.) and application of the ARC.

b. the weight of the load being only estimated and not definitively known.

c. where the load's centre of gravity is difficult to assess, or has the potential to shift (i.e. loosely packed ISO container, palletised loads, contained fluids, vessel ballast etc).

d. the load not having specific or appropriately rated lifting points, such that the load requires strapping or cradling for slinging.

e. the load is physically large (presenting a wind sail) and/or awkwardly shaped.

f. the load is being lifted in close proximity to personnel (i.e. where personnel are required to assist with the positioning and fixing of loads).

NOTE: Loads should not be carried or suspended over areas occupied by people. Where this is not reasonably practicable a safe system of work should be established to minimise the risks to people who may need to be in close proximity to the load.

g. lifting operations involving over-turning or flipping (i.e. topping and tailing) the load, which can result in shock and/or side loading.

h. lifting operations that include potentially unstable parts (i.e. transit strapped assembly components).

i. lifting (changes in buoyancy and wave motion induced sudden tension magnitudes) and lowering (wave motion, over-lower induced slack rope and/or sudden tension magnitudes) loads out of, into and on water, respectively.

[5] The Air Navigation Order makes it an offence to act recklessly or negligently in a manner likely to endanger aircraft.

NOTE FOR ANNEX E

ROYAL SCHOOL OF MILITARY ENGINEERING (RSME) ELECTRONIC LEARNING ENVIRONMENT (ELE)

Annex E documentation is inserted as a Sample of what the Risk Assessment & Method Statement (RAMS) may look like completed. All of this documentation is available on the RSME ELE.

The APLO is given access to the ELE and all of this documentation when running a Supervisor Lifting Operations (SLO) or Slinger Signaller Lifting Operations (SSLO) Course in Unit.

Instruction about its use and validity will be given during attendance on the APLO Course at Minley.

NOTE: Although the following may not fully apply to all types of Lifting Equipment, the applied principles of risk assessment, planning and subsequent documentation remain relevant and valid to all categories of Lifting Equipment and Lifting Operations.

Annex E - Lift Plan – Risk Assessment and Method Statement (RAMS) Template

Task No.			
Planned by:		**DTG:**	

Project:		**Planned Date of Lift:**	**Planned Time of Lift:**
Site Address:			

Client:					
Main Contact:		**Phone:**		**Email:**	
Site Contact:		**Phone:**		**Email:**	

The personnel listed below will be involved in carrying out the lifting operation. Their duties are defined in BS7121-1 (see also JSP 975 PART 2: CODE OF PRACTICE AND GUIDANCE ANNEX I, for specific Services, equivalent role designations).

Function Title	Name
Lifting Equipment Operator	
Appointed Person (APLO)	
Supervisor Lifting Operation (SLO)	
Slinger & Signaller(s) (SSLO)	

The Appointed Person may appoint personnel with more than one duty.

Lift Category	**Basic**		**Intermediate**		**Complex**	
Reason for Category						

Details of Loads - <u>Enclosure 1</u>

Gross Weight of Load:		tonne(s)

Details of Crane

Make and Model:					
Thorough Examination (Completion) Date:					
Capacity:		**tonne(s)**	**Weight of Crane:**		**tonne(s)**

Reference should be made to the Management of Health and Safety in Defence (JSP 375), regarding RAMS.

Counterweight:		**tonne(s)**	**Max In-Service Wind Speed:**		**m/s**
RCI/RCL Code:			**Reeving (No of Falls):**		
Boom Operating Length:		**m**	**Outrigger Dimensions:**		**m**
Max Wind Speed for this Lift:		**m/s**	**Height of Lift:**		**m**
Maximum Radius:		**m**	**Working Radius:**		**m**
SWL at Max Radius:		**tonne(s)**	**SWL at Working Radius:**		**tonne(s)**
Crane Max Working		**%**	**Crane Working**		**%**
Compound Collapse Radius:		**m**			

Lifting Accessories - <u>Enclosure 2</u>

Foundation Area

Have calculations been completed to ensure maximum outrigger loads can be safely sustained by the ground?					**YES/NO**
Outrigger Load:		**tonne(s)**	**Has manufacturer's software been used to calculate outrigger load?**		**YES/NO**
Ground Bearing Capacity:		**Tonne(s)/m^2**	**Foundation Area Required:**		**m^2**
Calculations:					
Additional foundation matting required?			**YES/NO**		

Ground Conditions (Visual assessment)

Access/Egress for crane & transport:	
Lifting Position:	

Identification of Hazards

Proximity Hazard	**Present?**		**Proximity Hazard (cont.)**	**Present?**
Overhead power lines	Yes / No		Confined working area	Yes / No
Other overhead obstacles	Yes / No		Restricted access - width	Yes / No
Underground services	Yes / No		Restricted access - height	Yes / No
Excavations	Yes / No		Other vehicles	Yes / No
Unstable soft ground	Yes / No		Other hazards identified	Yes / No
Uneven ground	Yes / No			
Hazardous chemicals/ materials	Yes / No			
Over-sailing Issues				
Have any restrictions on over-sailing been shown on site plan?			Yes / No / Not Applicable	
Is a zoning system required?			Yes / No / Not Applicable	
Crane's overnight / not in use configuration?				

Assessment of Risk

NOTE: All hazards identified above must be considered and if the risk is not low a MOD Form 5010 is to be produced.

Hazard	Risk (Low, Med, High)	Personnel Affected	Controls Applied	Residual Risk Assessment (req'd)
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
MOD Form 5010 attached?		**Yes/No**		

Weather Conditions

The Appointed Person or in their absence the Supervisor must ensure that the lifting operation only takes place within the manufacturers permitted limits.

Method Statement

Sequence of Operations

1	
2	
3	
4	
5	
6	

Attachments

Enclosure 1	Lift Plan - Details of Load(s)	**Yes/No**
Enclosure 2	Lift Plan - Lifting Accessories	**Yes/No**
Enclosure 3	Lift Plan - Site Plan - Multi Lift	**Yes/No**
Enclosure 4	Lift Plan - Sling Rigging Diagram	**Yes/No**
Enclosure 5	Lift Plan - Elevation Drawing	**Yes/No**
Enclosure 6	Lift Plan - MOD F 5010	**Yes/No**
Enclosure 7	Lift Plan - Weather Report	**Yes/No**
Enclosure 8	Lift Plan - Change Form	**Yes/No**
Enclosure 9	Lift Plan - Calculations	**Yes/No**

Additional Notes

Appointed Person's Acceptance of Responsibilities

I confirm that the lift(s) have been planned and will be carried out in accordance with current legislation and British Standard 7121 and that I accept responsibility for this Risk Assessment & Method Statement.			
Rank:		**Signature:**	
Name:		**Date:**	

Crane Supervisor's Acceptance of Duties

I confirm that I have been fully briefed on this Risk Assessment & Method Statement and that I accept the duty of ensuring that the lift(s) will be carried out in accordance with the method and procedures set out in this document.			
Rank:		**Signature:**	
Name:		**Date:**	

Slinger/ Signaller's Acceptance of Duties

I confirm that I have been fully briefed on this Risk Assessment & Method Statement and that I accept the duty of ensuring that the lift(s) will be carried out in accordance with the method and procedures set out in this document.			
Rank:		**Signature:**	
Name:		**Date:**	
Rank:		**Signature:**	
Name:		**Date:**	

Crane Operator's Acceptance of Duties

I confirm that I have been fully briefed on this Risk Assessment & Method Statement and that I accept the duty of ensuring that the lift(s) will be carried out in accordance with the method and procedures set out in this document. I confirm that the crane to be used as per this plan is fit for purpose.			
Rank:		**Signature:**	
Name:		**Date:**	

NOTE: For maritime lift plan and/or standard operating procedures, refer to BR3027 series.

ENCLOSURE 1 TO ANNEX E - LIFT PLAN - DETAILS OF LOAD(S)

Task No:	*2021-13*	**Date:**	*22 Jan 21*	**Project:**	*Multi Lift 40ft ISO Container*	**Planned Date of Lift:**	*28 Jan 21*

Item to be Lifted	**Item Weight**	**Gross Load Weight***	**Dimensions**	**Lift From**	**Lift To**	**Max Radius**	**Height of Lift**	**Remarks**
40 ft ISO Container	*3.5 t + 1.0 t = 4.5 t*	*5.3 t* ***(6.89 t)*** *(3.45 t each crane)*	*12.2 m(L) x 2.45 m(W) x 2.6 m(H)*	*Position 1 (Diagram reference)*	*Position 2 (Diagram reference)*	*14 m*	*2 m*	*Safety Factor of 30% added to gross load weight.* ***(6.89 t)*** *Load Weight on each crane (3.45 t)*

Task No:		**Date:**		**Project:**		**Planned Date of Lift:**	

Item to be Lifted	**Item Weight**	**Gross Load Weight***	**Dimensions**	**Lift From**	**Lift To**	**Max Radius**	**Height of Lift**	**Remarks**

* Gross Load Weight includes the load, all lifting accessories and hook block.

ENCLOSURE 2 TO ANNEX E - LIFT PLAN - LIFTING ACCESSORIES

Task No:	2021-13	Date:	22Jan 21	Project:	Multi Lift 40 ft ISO Container	Planned Date of Lift:	28 Jan 21

	Description	SWL	Weight	ID Number	Thorough Examination	
					Date Last	Date Next
1	4 m Round Sling	5 t	3 kg	549846	03/09/2020	02/03/2021
2	4 m Round Sling	5 t	3 kg	608558	03/09/2020	02/03/2021
3	4 m Round Sling	5 t	3 kg	11-469693	03/09/2020	02/03/2021
4	4 m Round Sling	5 t	3 kg	11-469694	03/09/2020	02/03/2021
5	D Shackle	7 t	6 kg	VBS FO19/1	03/09/2020	02/03/2021
6	D Shackle	7 t	6 kg	CE 23GTL-1	03/09/2020	02/03/2021
7	D Shackle	7 t	6 kg	VBS FO19/2	03/09/2020	02/03/2021
8	D Shackle	7 t	6 kg	CE 23GTL-2	03/09/2020	02/03/2021
9	ISO Lifting Lug	12.5 t	4.5 kg	8521790	03/09/2020	02/03/2021
10	ISO Lifting Lug	12.5 t	4.5 kg	8521717	03/09/2020	02/03/2021
11	ISO Lifting Lug	12.5 t	4.5 kg	8521752	03/09/2020	02/03/2021
12	Hook Block	32 t	335 kg	2009-037	LOLER Report	01/12/2021
13	Hook Block	32 t	335 kg	2009-014	LOLER Report	10/12/2021

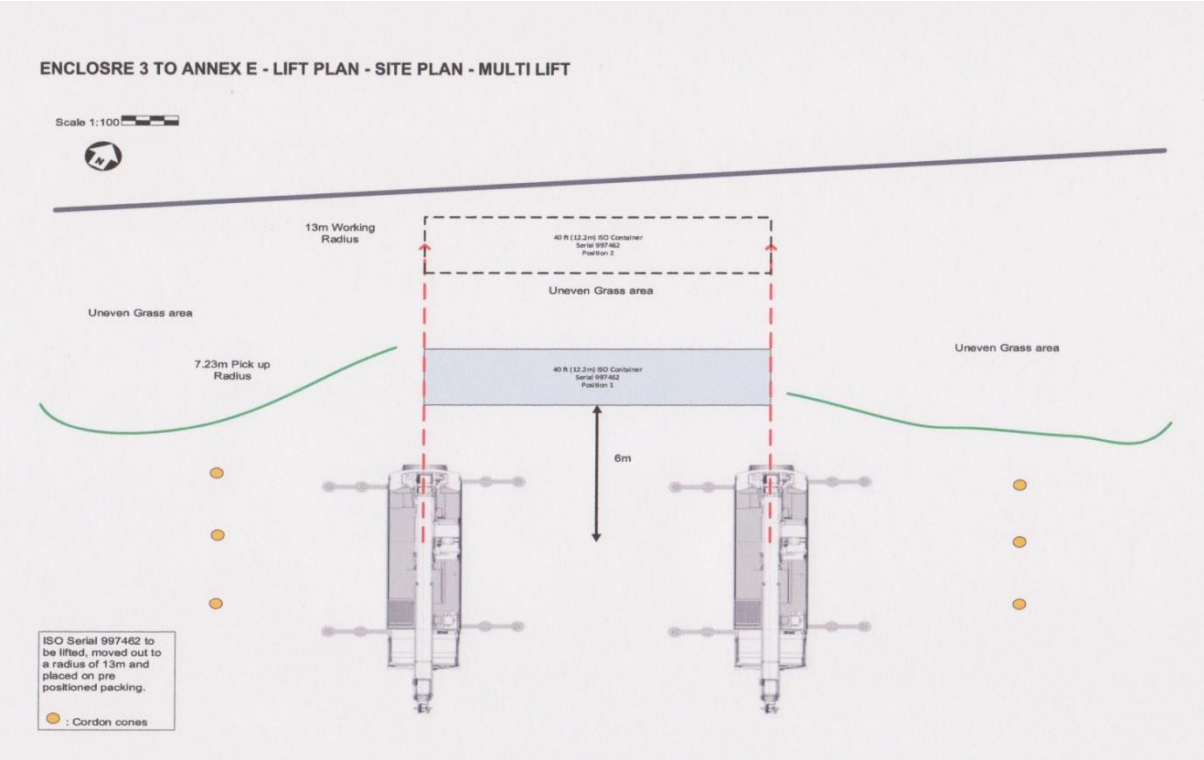
Task No:		Date:		Project:		Planned Date of Lift:	

	Description	SWL	Weight	ID Number	Thorough Examination	
					Date Last	Date Next
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

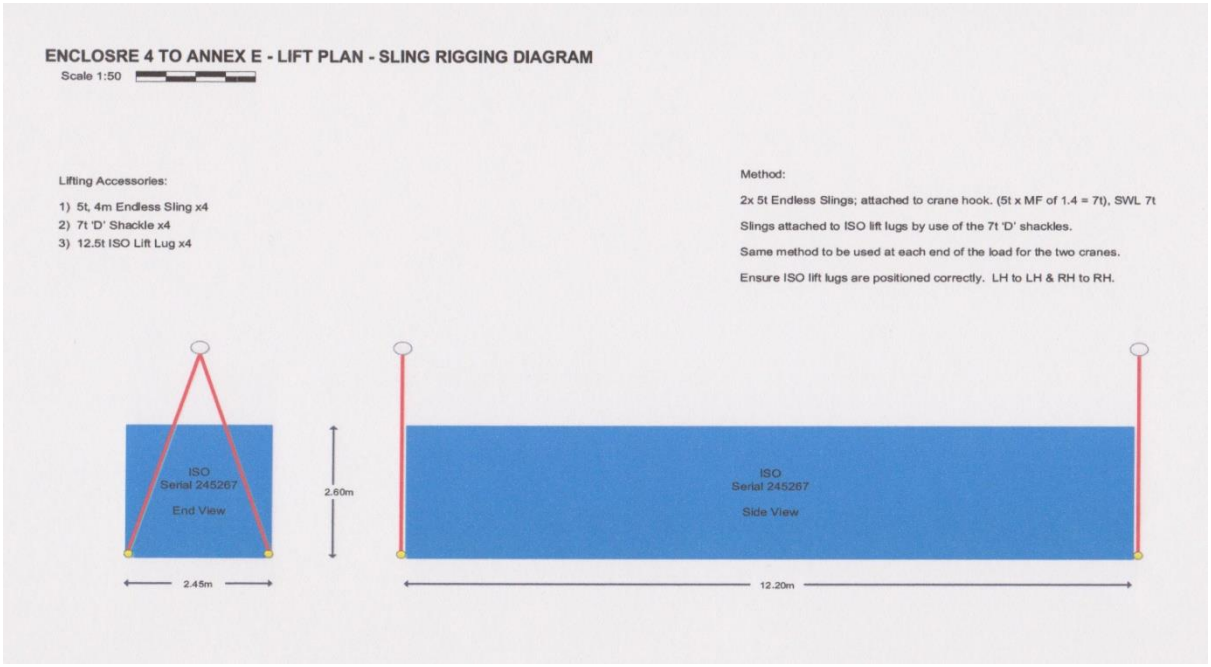
OTHER STORES REQUIRED

Ser	Item	Qty	Remarks
1	Traffic cones	6	For cordon
2	Black foundation pads 0.7 m x 0.7 m	8	4 for each crane
3	Packing for outriggers	32	16 for each crane (4 per outrigger)
4	Tag lines	2	
5	Radios	7	1 for each team member
6	Shovel	1	
7	Line marking paint	1	
8	Spirit level	1	
9	Short ladder	1	
10	Spill kit	1	
11	Bass broom	1	
12	Fine grade sand	50 kg	To aid in foundation areas
13	Sanitation kit	2	COVID protection
14			
15			
16			

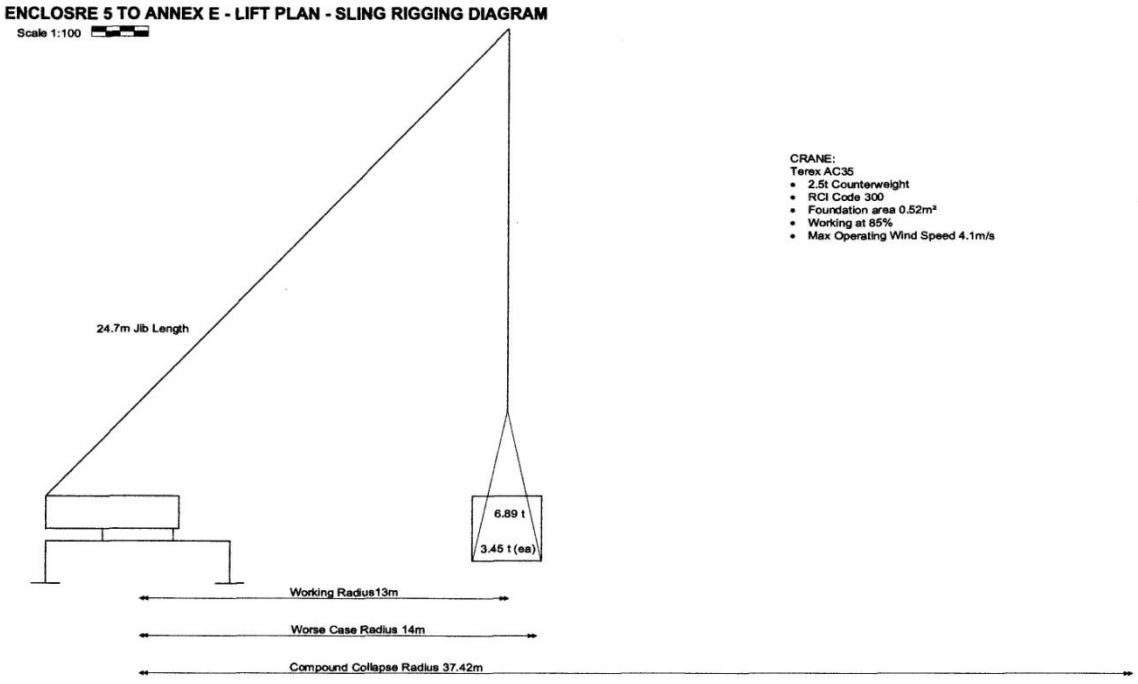
ENCLOSURE 3 TO ANNEX E - LIFT PLAN - SITE PLAN - MULTI LIFT



ENCLOSURE 4 TO ANNEX E - LIFT PLAN - SLING RIGGING DIAGRAM



ENCLOSURE 5 TO ANNEX E - LIFT PLAN - SLING RIGGING DIAGRAM



ENCLOSURE 6 TO ANNEX E - LIFT PLAN - MOD FORM 5010

MOD RISK ASSESSMENT FORM 5010

MOD Risk Assessment Form		MOD Form 5010 07/2020
Establishment/Unit/Ship: Pearson TQ, c/o 3 RSME	**Assessment Ref:** TQ-DS-015a	**Date:** 15 Jan 2021
Section Department: Military Driver Specialist Training – Minley	**Assessment Type (Note 1) tick as appropriate**	
	Specific ☐	**Generic** ☑

Activity/Process:	**Who is at risk?**
Lifting Operations – Minley Crane Training Areas	**All staff:** ☑
	Operators and/or maintenance staff: ☑
	Visitors, vulnerable groups, public, etc: ☑

Ref	Hazard	Existing Control Measures	Significant Residual Risk Assessment Required (Note 2)
1	Falling load	(1) Check contents of load are secure. (2) Use lifting accessories that are compatible and suitable for the lifting equipment and load. (3) Only use lifting accessories that have been thoroughly examined and inspected by a competent person and are free of defect. Ensure through examination reports are up to date. (4) Correctly position and secure the load to the lifting equipment. Use padding and packing to protect lifting accessories, where necessary. (5) Use lifting points as equally distributed from the loads centre of gravity as possible. (6) Carry out a test lift, just clear of ground, to check lifting accessory and load security.	No
2	Failure of lifting equipment	(1) Ensure weight of load plus lifting accessories and hook block are correctly considered with the load, to ensure that the Safe Working Load (SWL) of lifting equipment in the configuration used is not exceeded. (2) Ensure lifting equipment functional checks are carried out before use, to confirm that the equipment is clear of evident defects. (3) Ensure lifting equipment thorough examinations and inspections are in date and defects have been satisfactorily addressed.	No

Ref	Hazard	Existing Control Measures	Significant Residual Risk Assessment Required (Note 2)
3	Contact with lifting equipment or structures	(1) Ensure a Lift Plan, including a Risk Assessment and Method Statement (RAMS) has been compiled. (2) Ensure sufficient manoeuvring space and height is available, for the lifting operation. (3) Where practicable, the lifting equipment path should be clearly defined by marking to ensure that it is kept free from obstruction, and a clearance of no less than 600 mm obtained and maintained between any moving part of the lifting equipment and any obstacle, where access is required. (4) Ensure operator has clear visibility over entire load lifting path or use Signaller with appropriate means of communication to assist. (5) Where appropriate, use tag lines attached to the load. (6) Ensure adequate lighting on route and in the area of the lifting operation.	No
4	Struck or trapped by load(s)	(1) Avoid carrying or suspending loads over personnel. Personnel not to position any part of themselves under a load. (2) Where practicable, separate non lifting equipment users and traffic from the lifting equipment and load (e.g. clearly marked zones, enclosures, barriers and signs). (3) Where practicable, the lifting path should be clearly defined by marking to ensure that the hazard zone is evident to all authorised personnel, during a lifting operation. (4) Where appropriate provide audible warnings when lifting equipment/loads are being moved. Flashing beacons may also be required (e.g. mobile lifting equipment etc.) (5) Ensure lifting equipment users wear relevant PPE (e.g. hard hats, high visibility clothing, safety boots, ear & eye protection etc.). (6) Ensure operator has clear visibility over entire lifting equipment operational envelope or use Signaller with appropriate means of communication to assist.	Yes

Ref	Hazard	Existing Control Measures	Significant Residual Risk Assessment Required (Note 2)
5	Overturning lifting equipment when: Stationary	(1) Ensure ground conditions are suitable and sufficiently stable to support the lifting equipment and load(s). Calculations are to be carried out to ensure the correct area of foundation is used before the lifting equipment is set up. (2) Stabilise lifting equipment (e.g. use counterweights, outriggers, outrigger pads and additional foundation, as required). (3) Minimise crane jib extensions and load swing. (4) De-rate/reduce SWL as appropriate for different configurations and loads that cannot be accurately defined. (5) Use Precision Level Threshold Indicators. (6) Follow equipment manufacturer's instructions.	No
6	Overturning lifting equipment when: Travelling	(1) Pick and carry operations to be carried out only by trained operators. (2) Ensure ground conditions on route are suitable and sufficiently stable for the lifting equipment. (3) Avoid approaching excavations and reinforce weak areas of route (e.g. span weak voids). (4) Drive up and down gradients not across. Avoid road humps, sharp bends, slippery gradients or gradients exceeding the maximum specified for the lifting equipment. (5) Keep travelling speeds, acceleration and braking within manufacturer's specification limits for the lifting equipment. (6) Be aware of exclusion zones. (7) Operator to use seat restraint, where fitted.	No
7	Contact with overhead obstacles/services	(1) Where reasonably practicable, isolate services. (2) Ensure lifting equipment items are sited at least a jib length plus 15m away from overhead power lines suspended from steel towers or 9m from lines supported on wooden poles. (3) Mark the danger area (e.g. ground level barriers, flags or high visibility tape).	No
8	Contact with ground/ underground services	(1) Avoid travelling over unprotected cables and pipes. (2) Consider weight of lifting equipment when travelling over or close to underground services.	No

Ref	Hazard	Existing Control Measures	Significant Residual Risk Assessment Required (Note 2)
9	Environmental	(1) Avoid use of lifting equipment in adverse weather conditions likely to affect stability. (2) Weather conditions are to be monitored throughout the lifting operation. Maximum operational wind speeds are to be adhered to (maximum wind speed for lifting is to be assessed, prior to commencement and monitored). (3) Where conditions cause the maximum wind speed for the lifting equipment to be exceeded, the lifting operation should cease.	No
10	Obstruction to emergency services	(1) Ensure lifting equipment and load(s) do not obstruct emergency services access or egress.	No
11	Lifting of loads	(1) All lifts using cranes are to be planned by a competent person, appropriately supervised and carried out in a safe manner. (2) Allow for plumb and deflection to prevent loads swinging. (3) Operator to employ fluid motions.	No

Likelihood		Risk Matrix		MOD Form 5010 (V1.3 07/2020)
Common, regular or frequent occurrence	3	3 Med	6 High	9 High
Occasional occurrence	2	2 Low	4 Med	6 High
Rare or improbable occurrence	1	1 Low	2 Low	3 Med
Severity		1 Minor injury or illness	2 Serious injury or illness	3 Fatality, Major injury or illness

Hazard Ref	Risk Associated with Hazard (type of incident, injury or illness)	Risk Rating	Additional Controls Required (Note 3)
4	Personal injury, crush injuries, Serious injury/fatality	1 x 3	Trainer (APLO) always present to supervise students. All personnel are briefed on the risks before commencement of lifting operations.

Assessor (Note 4)		Manager (Note 4)		Overall Risk Rating (Highest Risk)
Name/Signature:		Name/Signature:		
Rank/Grade:		Rank/Grade:		
Post/Role:		Post/Role:		
Manager Assessment Review (Notes 4 and 5)				
Date:				Review Frequency
Name/Signature:				

NOTES:

1. It should be ensured that a ‘Generic’ risk assessment is suitable and sufficient for the task and that all reasonably foreseeable hazards have been identified and considered.

2. Where additional hazards are latterly identified they are to be recorded and the generic assessment updated. Only a reference to the applicable safe system of work or simple description of the control measures is required. Where the existing control measures reduce the risk to ALARP and the residual risk is considered tolerable then no further assessment should be needed for the risk relating to that hazard.

3. Where the risk assessment identifies the need for additional control measures, the risk relating to that hazard and any other hazard(s) affected by the change will need to be reassessed, in order to ensure no adverse overall affect has been introduced.

4. Managers are responsible for production of the risk assessment and that by completing this section they acknowledge ownership and declare that the risk assessment is suitable and sufficient. Signatures may be required by local procedures where hard copy risk assessments are used but are not necessary for soft copies as electronic signatures provide an audit trail.

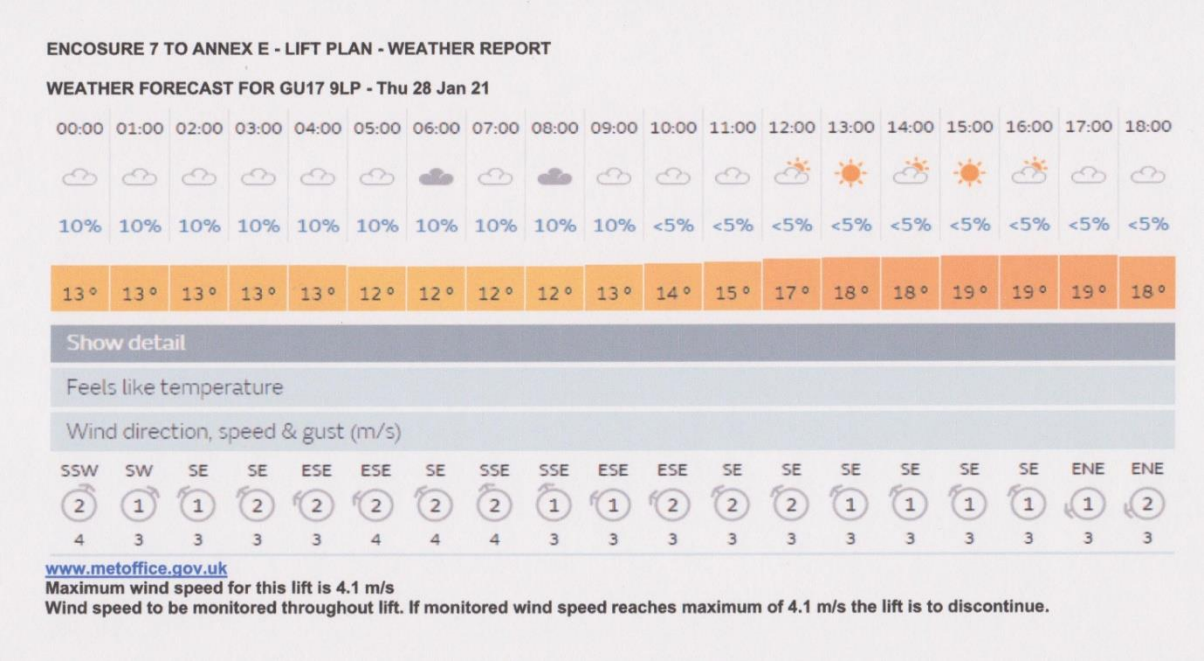
5. Risk Assessments are to be reviewed:

- at a frequency proportional to the risk (e.g. high risk – 6 monthly, medium risk – annually, low risk – every 2 years);
- where required by local instructions/procedures;
- prior to use, where the safe execution of the activity relies on a permit to work and/or stringent adherence to a safe system of work and/or supervision;
- where there is reason to doubt the effectiveness of the assessment;
- following an accident or near miss;

- following significant changes to the task, process, procedure, personnel or line management; and/or
- following the introduction of more vulnerable personnel.

High	Common, regular or frequent occurrence	**3**	**3 Med**	**6 High**	**9 High**
Medium	Occasional occurrence	**2**	**2 Low**	**4 Med**	**6 High**
Low	Rare or improbable occurrence	**1**	**1 Low**	**2 Low**	**3Med**
Risk Matrix Likelihood x Severity			**1**	**2**	**3**
			Minor injury or illness	Serious injury or illness	Fatality, Major injury or illness
			Low	Medium	High

High	Rigorous scrutiny and implementation of control measures required to ensure ALARP. Improve control measures where assessment deems this necessary and/or consider ceasing the work activity. Conducting activities at this level of risk may require formal approval from the appropriate Duty Holder.
Medium	Review control measures and improve if reasonably practicable to do so, consider alternative ways of working.
Low	Maintain control measures and review regularly or where there are any changes to the work activity.



ENCLOSURE 8 TO ANNEX E - LIFT PLAN - CHANGE FORM

Task No.		DTG:	
Project:			
Crane Supervisor:			

Any changes to the Risk Assessment and Method Statement including drawings must be notified to the APLO before continuing with the lifting operation. Changes are to be listed in full below.

Changes Approved by the Appointed Person:

Ser	Change	DTG Contacted APLO	MOD Form 5010 Required	Sign
1			Yes/No	
	APLO Comments:		Permission Granted: Yes/No	

Ser	Change	DTG Contacted APLO	MOD Form 5010 Required	Sign
2			Yes/No	
	APLO Comments:		Permission Granted: Yes/No	

Ser	Change	DTG Contacted APLO	MOD Form 5010 Required	Sign
3			Yes/No	
	APLO Comments:		Permission Granted: Yes/No	

Supervisor Acceptance of Change

I confirm that I have discussed with the Appointed Person the above changes and they have approved these changes to the original Risk Assessment and Method Statement.	Rank:	
	Name:	
	Signature:	
	Date:	

ENCLOSURE 9 TO ANNEX E – WEIGHT

_____m x _____m x _____m = _____m^3 (round this figure up _____ m^3).

_____m^3 x _____ = _____kg (_____ tonne).

Plus 25%: _____kg x 1.25 = _____kg (_____ tonne)

For other shape loads refer to LEEA – Code of Practice for the Safe Use of Lifting Equipment

Crane Working/ Maximum Percentage:

Load weight divided by what crane can lift at a radius.

Working: Load _____ t ÷ what crane can lift ____t (at radius _____ m) = ____ % (rounded up).

Maximum: Load _____ t ÷ what crane can lift ____t (at radius _____ m) = ____ % (rounded up).

Effect of Wind Down Rating:

Height _____m x Length _____ m = _____ m^2 (Ap)

Gross Load Weight: _____t (m)

Ap =
m =

(m) _____t ÷ (Ap) _____ m^2 = _____ (>2?)

$\frac{1.2 \times \_\_\_\_\_}{x}$ = _____ = √ x 14m/s =

Compound Collapse Radius:

_____^{2} + _____^{2} + _____^{2} = _____ √_____ = _____ m.

Outrigger Foundation Area: **100 %**

_____ t ÷ _____ t/m^2 = _____m^2

√____ = _____

Lifting Accessories Configuration Calculations SWL (i.e. 0.8, 1.4):

ANNEX F – Considerations when Conducting Lifts using Multiple Lifting Equipment

Weight of the Load

1. The total weight of the load and its distribution should be either known or ascertained. Where the information is taken from a drawing, confirmation should be obtained regarding the final manufactured assembly weight.

Centre of Gravity

2. Owing to the various effects, the exact centre of gravity of the load might not be known accurately; therefore, the proportion of the load being carried by each individual item of lifting equipment could be uncertain. Iterative test lifts and strategic repositioning of accessories for lifting should allow the centre of gravity to be practically ascertained.

Weight of the Lifting Accessories/Attachments

3. The weight of the lifting accessories/attachments should be considered as part of the overall load to be lifted. The magnitude of deduction from the rated capacity of the lifting equipment to allow for the weight of substantial lifting accessories/attachments can often be significant. The weight of the lifting accessories/attachments; hook blocks, etc, plus their distribution should be accurately ascertained. Where the hoist ropes are reeved round pulleys of a specially designed lifting accessory/attachment (e.g. a lifting beam/frame), the differential between the weight of the removed hook block and hook and the lifting beam/frame should be ascertained when determining the net weight of the lifting accessories/attachments.

Capacities of the Lifting Accessories/Attachments

4. The distribution within the lifting accessories/attachments of the loads that arise during the lifting operation should be established. The lifting accessories/attachments should have a capacity appropriate to the weight of the load to be lifted containing a margin of safety in excess of the required capacity (unless specifically designed for the particular lifting operation). The purpose of the margin of safety being to adequately deal with the potential for induced secondary loading effects caused by the difficulties associated with exact synchronisation of the lifting equipment, during a multiple lifting operation.

Synchronisation of Lifting Equipment Motions

5. In order to minimise variations in direction and magnitude of the amplitudes of lifting equipment during a multiple lifting operation, it is essential that lifting equipment motions are steady and synchronised. Lifting Equipment of appropriate capacity for the lifting operation but with similar characteristics should be used, whenever possible. In practice, there is always some variation due to differences in response to the activation of the control system. The rated capacity of lifting equipment is calculated on the assumption that the load will be raised and lowered in a vertical plane. Lifting equipment is designed to withstand a degree of lateral loading imposed by accelerations in the various crane motions; however, it is unsafe to rely on this lateral strength to withstand horizontal components of ‘out-of-vertical’ lifting. Where items of lifting equipment have dissimilar characteristics, it is unlikely that the motions will be accurately synchronised. Therefore, an assessment should be made of the effect of variations in verticality of the hoist ropes, which could arise from inequalities of speed, together with a determination of the means for keeping such inequalities to a minimum.

Instrumentation

6. Instruments are available to monitor and limit the load, radius and speed applied throughout the lifting operation. The use of such instruments, restriction of motion speeds, together with the strict use of one functional motion at any one time, can assist in the control of the loads applied.

Supervision

7. The APLO should be in attendance and in overall control of a multiple lifting operation (Complex Lift). Primarily, this person should give instructions to personnel operating machines. The exception is in an emergency when a commonly recognised stop signal may be given by any person observing a potentially dangerous situation.

8. Where all of the essential aspects of a lifting operation cannot be observed from one position, other personnel should be positioned at strategic points to observe and report to the person in charge of the operation. It is essential to provide adequate and continuous means of communication and signalling between all essential persons involved in the lifting operation.

Recommended Rated Capacity for Lifting

9. If the APLO is satisfied that all relevant factors have been accurately identified, are being monitored by instruments and lifting operation environmental conditions allow, each item of lifting equipment may be used up to its rated capacity.

10. When all the factors cannot be accurately evaluated, an appropriate de-rating (no less than 30%) should be applied to all lifting equipment directly involved in the lifting of the load.

ANNEX G – Summary of Qualifications and Re-certification Requirements

The following provides an established framework for the attainment and retention of competency, with regard to the essential functional roles required for the safe execution of a lifting operation. Where no specific service domain protocol exists, it should be considered as guidance on the requirements, in terms of entry criteria, qualification processes and maintenance of competency.

Although the role titles may not be readily recognisable to all service domains, the role functions should be transferable. Each service domain should assess their lifting resource capabilities, in order to both demonstrate suitable and sufficient coverage and verify competence of the individuals concerned, for each of the essential functional roles required to safely execute a lifting operation.

Lift Manager (LM)

1. The LM (also referred to as Unit LM, depending on Service area) will be appointed by a Commanding Officer (CO)/ Head of Establishment (HoE) and will manage the safe lift system on behalf of the Delivery Duty Holder (DDH) to:

   a. Ensure that this policy and the Lift Management Plan are communicated across all levels of command, including to APLOs, SLOs, SSLOs and those directly involved in execution of the task.

   b. Ensure that the unit has an adequate quantity of qualified and experienced APLO, SLO, SSLO and Operators.

2. The LM is to authorise all APLO course applications, ensuring the nominated individual's meet the pre-course start standards, as detailed in 4 below.

LM Training and Competency

3. Army - Minimum rank/grade of OR6+ or civilian equivalent and are selected for the role by the CO/HoE.

4. Dispensation for students to attend training without holding the minimum pre-course start standard can only be granted by Army Cap-GM-MvrSp-Infra-SO2@mod.gov.uk who will forward that authority to RSME-HQ-Trg-Ops-SO2 or RSME-HQ-Trg-Plans-SO3.

5. The JPA Competency for the LM, which is valid for 5 years from the date of completing the training, is Joint Operations|LIFTING|UNIT LIFT MANAGER (ULM)|Joint|. Those Service areas without a LM who need to undertake a lifting operation should request assistance from an appropriately LM (with current competency).

Appointed Person Lifting Operations (APLO)

6. The APLO is the senior role involved in the oversight, planning and control of lifting operations.

Training

7. An APLO must be suitably qualified, competent and experienced. To meet this requirement, APLO candidates must meet the following criteria prior to attending the APLO course:

a. **Experience:** 6 months as a qualified SLO to include 6 planned Basic or Intermediate lifts recorded as part the individual's CPD record. The APLO entrance examination must be successfully completed, for consideration.

b. **Rank/Grade:** Substantive OR4+ or specific Services or civilian equivalent.

Competency

8. The JPA Competency for APLO is Joint Operations| LIFTING| APPOINTED PERSON LIFTING OPERATIONS (APLO)|Joint|. The qualification is valid for 3 years providing the individual undertakes at least 6 planned lifts every 6 months and they are recorded as part the individual's CPD record. Requalification is attained by attending a formal 2-day assessment, comprising of 1-day revision/training and 1-day field assessment, including the compilation and application of a full set of RAMS, a theoretical test and practical mobile crane set up. Where the qualification expires without re-qualifying, then re-attendance on the full APLO Course will be required.

Currency

9. Where, during the qualification period, an APLO's currency lapses due to lack of process application, it can be regained by undertaking an assessment by a currently authorised APLO. The re-qualifying APLO must plan and conduct a lifting operation, which will be formally assessed. Successful completion is to be recorded in the individual's CPD record. A copy of the RAMS produced as parts of the re-qualification process are to be retained as a traceable proof of training records.

NOTE: This process does not extend the qualification period.

Supervisor Lifting Operations (SLO)

10. The SLO should supervise Basic lifting operations and may be delegated by the APLO for those designated as Intermediate.

Training

11. SLO candidates should be substantive OR3+ or specific Services or civilian equivalent and they should attend a distributed training course, conducted by a currently authorised APLO.

Competency

12. The JPA Competency for SLO is Joint Operations||LIFTING|SUPERVISOR LIFTING OPERATIONS (SLO)| Joint|. The qualification is valid for 3 years providing the individual undertakes at least 6 planned lifts every 6 months and it is recorded in the Operator's CPD record. Requalification can be undertaken by being formally assessed by a currently authorised APLO (the **APLO must inform the TDA (RSME)** so they can re-award the JPA competency). Where the qualification expires without re-qualifying, then re-attendance on a full SLO course will be required.

13. Royal Navy and Royal Fleet Auxiliary equivalent JPA competency:

ME | Ship Fixed Crane Operation Supervisor (ME418B)|Royal Navy|

14. **Currency.** Where, during the qualification period, a SLO's currency lapses due to lack of process application, it can be regained by undertaking an assessment by a currently authorised APLO. The re-qualifying SLO must supervise a lifting operation, which will be formally assessed. Successful completion will be recorded in the individual's CPD record.

NOTE: This process does not extend the qualification period.

15. Where the qualification period has elapsed but the SLO concerned has been regularly involved in the supervision of lifting operations then consideration could be given to renewing both a qualification and period, via the assessment by a currently authorised APLO of a supervised lift. Successful completion would be appropriately acknowledged within the individual's JPA records. Otherwise, a full course attendance will be required for re-qualification.

Slinger/Signaller Lifting Operations (SSLO)

16. The SSLO is the individual who is responsible for slinging (connecting/disconnecting) and signalling (providing guidance to the operator).

Training

17. The SSLO should be over 18 years[6] of age and be OR2+ or specific Services or civilian equivalent.

18. SSLO must attend a distributed training course, delivered by a currently authorised APLO.

Competency

19. The JPA Competency for the SSLO is Joint Operations|LIFTING|SLINGER SIGNALLER LIFTING OPERATIONS (SSLO)|Joint|. The qualification is valid for 3 years providing the individual undertakes 6 planned lifts within a 6-month period and it is recorded in the Operator's CPD record. Requalification can be undertaken by being formally assessed by a currently authorised APLO (the **APLO must inform the TDA (RSME)** so they can re-award the JPA competency). If the qualification expires without re-qualifying, then re-attendance on a full SSLO course will be required.

20. Royal Navy and Royal Fleet Auxiliary equivalent JPA competencies:

ME|Slinging Specialist (ME418)|Royal Navy|
ME|Slinging Specialist (ME418) - Theory Elements Only|Royal Navy|
ME|Slinging Specialist (ME418F)|Royal Navy|
ME|Slinging Specialist (ME418S)|Royal Navy|
ME|Stevedore Slinging (ME418A)|Royal Navy|

Currency

21. Where, during the qualification period, the SSLOs' currency lapses due to the lack of process application, it can be regained by undertaking an assessment by a currently authorised APLO. The re-qualifying SSLO must conduct slinging and signalling during a lifting operation, which will be formally assessed and recorded within the individual's CPD record.

[6] 17-year olds may undertake training under the direct supervision of the APLO, qualify and be awarded the Competency when 18 years old for such a critical role, as they would no longer be deemed a young person.

NOTE: This process does not extend the qualification period.

22. Where the qualification period has elapsed but the SSLO concerned has been regularly involved in the slinging and signalling of lifting operations then consideration could be given to renewing both a qualification and period, via the assessment by a currently authorised APLO of a lifting operation. Successful completion would be appropriately acknowledged within the individual's JPA records. Otherwise, a full course attendance will be required for re-qualification.

Ser	Role	Course	Details	Qualification period	Re-certification	Location
1	**Lift Manager (LM)** or (ULM)	Cse No: **03a/2520**	**Eligibility** - The minimum start standard to attend the course is: • Minimum rank/grade of substantive OR6+ or specific Services or civilian equivalent. • Letter of appointment from the CO/HoE. **Currency** - Continued involvement in lifting operations. The CO/HoE is to appoint the individual as a LM or (U)LM.	Valid for 5 years	N/A	N/A
2	**Appointed Person Lifting Operations (APLO)**	Cse No: **03a/2320** APLO – 5 days	**Eligibility** - The minimum start standard to attend the APLO course is: • Minimum rank/grade of substantive OR4 or specific Services or civilian equivalent. • Hold a Defence Trainer Course (DTC) or equivalent qualification. • Pass the APLO entrance examination. • Minimum 6 months documented SLO experience. **Currency** – Application of APLO role in at least 6 lifting operations within the previous 6 month period. Documented record, signed by a LM or (U)LM.	Valid 3 years then re-certify attending a Course at the RSME (Minley)	2-day course	RSME, Minley

Ser	Role	Course	Details	Qualification period	Re-certification	Location
3	**Supervisor Lifting Operations (SLO)**	Cse No: **Allocated by HQ RSME DT Cell** Distributed Training - 3 days	**Eligibility** - The minimum start standard to attend the SLO course is: • Minimum rank/grade of substantive OR3+ or specific Services or civilian equivalent with experience relevant to lifting operations. • Preferably 6 months qualified as a SSLO. **Currency** – Application of SLO role in at least 6 lifting operations within the previous 6 month period. Documented record, signed by a LM or (U)LM.	Valid 3 years then re-certify attending the SLO Course	3-day course (SLO, para 15 applies)	Delivered in-unit on an approved course by a current and competent APLO
4	**Slinger / Signaller Lifting Operations (SSLO)**	Cse No: **Allocated by HQ RSME DT Cell** Distributed Training - 2 days	**Eligibility** - The minimum start standard to attend the SSLO course is: • Minimum rank/grade of substantive OR2+ or specific Services or civilian equivalent. • Aged 18+ years. **Currency** – Application of SSLO role in at least 6 lifting operations within the previous 6 month period. Documented record, signed by a LM or (U)LM.	Valid 3 years then re-certify in unit on the SSLO Course	2-day course (SSLO, para 22 applies)	Delivered in-unit on an approved course by a current and competent APLO

Ser	Role	Course	Details	Qualification period	Re-certification	Location
5	**Operator** (Lorry Loader) **(Small Crane) (TML(SC))**	Cse No: **03a/2310** Relevant Equipment Based Course - 10 days	**Eligibility** - The minimum start standard to attend the TML (CL) course is: • Minimum rank/grade of substantive OR2+ or specific Services or civilian equivalent. • Cat-C, or equivalent qualification relevant to the specific Arm and Service, driving licence and be a vocational Driver Cl 2 with 6 months driving experience. **Currency** – Application of Operator role in at least 6 lifting operations within the previous 6 month period. Training to be documented within the individual's CPD records.	Valid 3 years then re-certify attending a Course at the RSME (Minley)	2-day course	RSME, Minley
6	**Operator 30 Tonne Crane (Alpha) (LO 30TC(A))**	Cse No: **03a/2316** Relevant Equipment Based Course - 10 days	**Eligibility** - The minimum start standard to attend the LO 30T (A) course is: • Minimum rank/grade of substantive OR2+ or specific Services or civilian equivalent. • Cat-C driving licence. **Currency** – Application of Operator role in at least 6 lifting operations within the previous 6 month period. Training to be documented within the individual's CPD records.	Valid 3 years then re-certify attending a Course at the RSME (Minley)	5-day Course	RSME, Minley
7	**Operator 30 Tonne Crane (Bravo) (LO 30TC(B))**	Cse No: **03a/2317** Relevant Equipment Based Course - 20 days	**Eligibility** - The minimum start standard to attend the LO 30T (B) course is: • Minimum rank of substantive OR2+ or specific Services or civilian equivalent. • Cat-C driving licence • Class 1 vocational driver qualified or equivalent.	Valid 3 years then re-certify attending a Course at the RSME (Minley)	5-day Course	RSME, Minley

Ser	Role	Course	Details	Qualification period	Re-certification	Location
			Currency – Application of Operator role in at least 6 lifting operations within the previous 6 month period. Training to be documented within the individual's CPD records.			
8	**Operator 50 Tonne Crane (LO 50TC)**	Cse No: **03a/2318** Relevant Equipment Based Course - 5 days	**Course** - Relevant Equipment Based Course - RSME – Minley. **Eligibility** - The minimum start standard to attend the LO 50T (A) course is: • Minimum rank of substantive OR2+ or specific Services or civilian equivalent. • Cat-C driving licence • Hold the Competency of LO 30TC(A) and/or (B). **Currency** – Application of Operator role in at least 6 lifting operations within the previous 6 month period. Training to be documented within the individual's CPD records.	Valid 3 years then re-certify attending a Course at the RSME (Minley)	2-day Course	RSME, Minley

23. The responsibility for designing the appropriate Crane training rests with the lead Training Requirements Authority (TRA) - Land Warfare Centre (LWC), who will capture the pan-defence requirements and ensure they are delivered by the Training Delivery Authority(s) (TDA).

24. Individuals who do not meet the pre-course criteria, via qualifications and experience acquired through civilian industry, may be permitted to attend military training courses. The process for confirming suitability and competence of these individuals will require an authoritative application for dispensation for the student to attend training without holding the minimum pre-course start standard. This is granted by LWC-TrgPlans-MvrSp-SO2 who will forward that authority to RSME-HQ-Trg-Ops-WO.

25. Where individuals do not meet the requisite entry requirements then advice should be sought as to their suitability for training or need for pre-qualification, prior to acceptance on a given course.

Distributed Training

26. The SLO and SSLO courses are designed by the RSME as Distributed Training (DT) courses and are controlled by the TDA, HQ RSME. All APLO's trained at the RSME will have been instructed on how to conduct DT Courses. Initially the APLO will contact the TDA for authority to conduct training:

- RSME-HQ-Courses-Groupmailbox@mod.gov.uk
- Tel: (Civilian) 01634 822345
- Tel: (Military) 94661 2345

Specific to Arm Royal Electrical Mechanical Engineers (REME)

27. The REME also deliver the following courses:

a. The D970 Crane Operators' Course, which teaches the use of Overhead, CALM and AFV cranes.

b. The D968 Crane Instructors' Course, which trains personnel to instruct operators by distributed training.

c. The D108 Recovery Mechanics Course, which teaches Cl1 Recovery Mechanics to conduct expedient recovery of equipment that is battle damaged.

ANNEX H – Lifting Equipment Operator Course Requirements

The following provides an established framework for the attainment and retention of competency, with regard to the operation of specified categories of lifting equipment. Where no specific service domain protocol exists, it should be considered as guidance on the requirements, in terms of main functional duties, entry criteria, qualification processes and maintenance of competency.

Although the Operator titles may not be readily recognisable to all service domains, the competency should be transferable. Each service domain should assess their lifting resource capabilities, in order to both demonstrate suitable and sufficient coverage and verify competence of the individuals concerned, when utilising such lifting equipment categories.

Lorry Loading Crane (Small Crane) (TML(SC)) Operator

1. The role of the (TML(SC)) is to provide a versatile mechanical aid, capable of undertaking a wide variety of lifting and loading activities in the 0-6 tonne SWL range. It is to be capable of use on both road and cross-country terrain. The TML(SC) operator's responsibilities include:

a. Conduct daily equipment checks and specified maintenance in accordance with equipment publications.

b. Control of the lifting equipment as instructed:

i. Carry out bundled lifts.

ii. Carry out estimated lifts.

iii. Carry out Basic and Intermediate lifts.

iv. Carry out ISO Container lifts.

c. Driving lifting equipment assets to task site over all terrain.

d. Establish the method of signalling to be used (hand signals/voice/radio) and follow the instructions from the nominated signaller. In the event that it is necessary to employ more than one signaller, establish who is nominated as the principal signaller.

e. Understand and conduct the duties, as per the TML(SC) specification for set-up and loading.

f. Cease lifting operations, where continuance would compromise safety and/or transgress the safe operating envelope and permitted duties of the lifting equipment.

g. To inform the SLO and APLO, where they consider the manner in which the lifting operation is to be undertaken to be unsafe. In the event that there is a disagreement between the Operator and the SLO or APLO, lifting operations should not commence until the CoC can be informed and the dispute resolved.

Training

2. TML(SC) Operators will have completed the requisite (see JSP 975 Part 2: Code of Practice and Guidance Annex G) Lifting Operations training, relevant to the lifting equipment being operated. TML(SC) operators should meet the following criteria prior to attending the course:

a. **Experience:** Vocational driver or equivalent.

b. **License:** Cat-C.

c. **Rank/Grade:** Substantive OR2+ or specific Services or civilian equivalent.

Competency

3. The JPA Competency for TML(SC) operator is Joint Operations| LIFTING| OPERATOR TRUCK MOUNTED LOADER (SMALL CRANE) (LO TML(SC))|Joint|. The qualification is valid for 3 years providing the individual undertakes at least 6 lifting operations within the previous 6 months which, detailed within the Operator's CPD record. If during the 3-year period the operator's currency lapses, they must not conduct any lifting operations until they have been re-authorised by MITER SERVICE PROVIDER MSP or RSME.

NOTE: This process does not extend the qualification period.

Currency

4. Requalification after 3 years must be undertaken by attending a formal assessment package, which can only be delivered by MITER SERVICE PROVIDER MSP or the RSME. The assessment specifications of this package are aligned to the initial qualification. The duration of training will be assessed case-by-case, with a standard of 2-days training with a 1-day assessment and up to a total of 5-days for those requiring extra tuition, dependant on the Operator's previous experience and initially assessed competency.

Lifting Operator 30 Tonne Crane (Alpha) (LO 30TC(A))

5. The role of the Crane, Truck Mounted, Medium, 30 Tonne, fully slewing, is primarily to provide Defence worldwide with a versatile mechanical aid that is capable of undertaking a wide variety of lifting tasks. The LO 30TC(A) operator's responsibilities include:

a. Conduct daily equipment checks and specified operator maintenance in accordance with equipment publications.

b. Control of the lifting equipment as instructed:

i. Carry out Basic, Intermediate and Complex lifts.

ii. Carry out estimated lifts.

iii. Carry out bundled lifts.

iv. Carry out ISO Container lifts.

c. When suitably trained - conduct Pick and Carry Lifting Operations (tailored 2-day module as part of the course).

d. Driving lifting equipment assets to task site on **metalled highways** only.

e. Establish which method of signalling is to be used (hand signals/voice/radio) and then follow the instructions from the nominated signaller. In the event that it is necessary to employ more than one signaller, establish who is nominated as the principal signaller.

f. Understand and conduct the duties of a **Slinger/Signaller Lifting Operations (SSLO).**

g. Cease lifting operations, where continuance would compromise safety and/or transgress the safe operating envelope and permitted duties of the lifting equipment.

h. To inform the SLO and APLO, where they consider the manner in which the lifting operation is to be undertaken to be unsafe. In the event that there is a disagreement between the Operator and the SLO or APLO, lifting operations should not commence until the CoC can be informed and the dispute resolved.

Training

6. The LO 30TC(A) operator will have attended the PAM 03a/2316 Lifting Operator 30 Tonne Crane (Alpha) (LO 30TC(A)) (10-days) Course. Candidates must meet the following criteria prior to attending the course:

a. **Experience:** Vocational driver or equivalent.

b. **License:** Cat-C.

c. **Rank/Grade:** Substantive OR2+ or specific Services or civilian equivalent.

Competency

7. The JPA Competency for LO 30TC(A) is Joint Operations|LIFTING|OPERATOR 30 TONNE (ALPHA) (LO 30TC(A))|Joint|. The qualification is valid for 3 years provided the Operator remains current and competent, by undertaking at least 6 lifting operations within the previous 6 months, detailed within the individual's CPD record.

8. If lapsed, an Operator must not conduct any Lifting Operations until completion of an assessment course at the RSME (or with MITER SERVICE PROVIDER MSP in Unit). The duration of training will be assessed case-by-case, dependant on the Operators previous experience and competency.

9. After 3 years, the Operator must attend a re-certification course (5-days) at the RSME, Minley.

Lifting Operator 30 Tonne Crane (Bravo) (LO 30TC (B))

10. The LO 30TC(B)'s responsibilities **in addition** to those of the LO 30TC(A) include:

a. Conduct equipment checks and specified **detailed** operator maintenance in accordance with equipment publications.

b. Control and operation of the lifting equipment as instructed:

i. Carry out blind lifts.

ii. Carry out various multi-lifts - ISO Container and balanced targets.

iii. Carry out **night lifting** operations (hours of darkness).

c. Driving lifting equipment assets within the tactical field environment across metalled roads, **rough terrain and at night.**

d. Understand and conduct the duties of a **Supervisor Lifting Operations (SLO).**

e. Understand and conduct the duties of a **Slinger/Signaller Lifting Operations (SSLO).**

Training

11. LO 30TC(B) operators will have attended a PAM 03a/2317 Lifting Operator 30 Tonne Crane (Bravo) (LO 30TC(B)) (20-day) Course. Candidates must meet the following criteria prior to attending the course:

a. **Experience:** Class 1 vocational driver qualified or equivalent.

b. **License:** Cat-C.

c. **Rank/Grade:** Substantive OR2+ or specific Services or civilian equivalent.

Competency

12. The JPA Competency for LO 30TC(B) is Joint Operations|LIFTING|OPERATOR 30 TONNE (BRAVO) (LO 30TC(B))|Joint|. The qualification is valid for 3 years provided the Operator remains current and competent, by undertaking at least 6 lifting operations within the previous 6 months, detailed within the individual's CPD record.

13. If lapsed, an Operator must not conduct any Lifting Operations until completion of an assessment course at the RSME (or with MITER SERVICE PROVIDER MSP in Unit). The duration of training will be assessed case-by-case, dependant on the Operators previous experience and competency.

14. After 3 years the Operator must attend a re-certification course (5-days) at the RSME, Minley.

Lifting Operator 50 Tonne Crane (LO 50TC)

15. The role of the 50-tonne crane is to provide Defence with a versatile mechanical aid heavy lifting capability. The LO 50TC operators' responsibilities include:

a. Conduct equipment checks and specified operator maintenance in accordance with equipment publications.

b. Control and operation of the lifting equipment as instructed carrying out basic, intermediate and complex lifts.

c. Driving lifting equipment assets.

d. Establish which method of signalling is to be used (hand signals/ voice/ radio) and then follow the instructions from the nominated signaller. In the event that it is necessary to employ more than one signaller, establish who is nominated as the principal signaller.

e. Cease lifting operations, where continuance would compromise safety and/or transgress the safe operating envelope and permitted duties of the lifting equipment.

f. To inform the SLO and APLO, where they consider the manner in which the lifting operation is to be undertaken to be unsafe. In the event that there is a disagreement between the Operator and the SLO or APLO, lifting operations should not commence until the CoC can be informed and the dispute resolved.

Training

16. LO 50TC Operators will have attended a PAM 03a/2318 Lifting Operator 50 Tonne Crane (LO 50TC) (5-day) Course. Candidates must meet the following criteria prior to attending the course:

    a. **Experience:** Class 1 vocational driver or equivalent and LO 30TC(A) or LO 30TC(B) Competency (with at least 6 lifting operations within the previous 6 month period of competency, documented within the individual's CPD records).

    b. **License:** Cat-C.

    c. **Rank/Grade:** Substantive OR2+ or specific Services or civilian equivalent.

Competency

17. The JPA Competency for LO 50TC is Joint Operations|LIFTING|OPERATOR 50 TONNE (LO 50TC)|Joint|. The qualification is valid for 3 years provided the Operator remains current and competent, by undertaking at least 6 lifting operations within the previous 6 months, detailed within the individual's CPD record.

18. If lapsed, an Operator must not conduct any Lifting Operations until completion of an assessment course at the RSME (or with MITER SERVICE PROVIDER MSP in Unit). The duration of training will be assessed case-by-case, dependant on the Operators previous experience and competency.

19. After 3 years the Operator must attend a re-certification course at the RSME, Minley.

ANNEX I – Lifting Roles – Pan-Services Alternative Lifting Role Terminology

The following provides a means of cross reference for all services, in relation to lifting operation roles stipulated in the document, main body text.

Role (Civil Designation)	Function	Army	Royal Navy (including Royal Fleet Auxiliary)	Royal Air Force
Employing Organisation (Lift Manager)	Person or organisation that requires a lifting operation to be carried out and is responsible for safe use of the lifting equipment.	Unit Lift Manager (ULM)	Head of Department/Officer of the Day	Service domain allocated personnel competent for the functional role.
Appointed Person	Person nominated (typically by the employing organisation) to plan, and to have overall control of, the lifting operation(s).	Appointed Person Lifting Operations (APLO)	Responsible Person RN Definition: '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, banksperson, 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.' The responsible person in the RN	Service domain allocated personnel competent for the functional role.
Crane Coordinator	Person responsible for planning and directing the sequence of operations of lifting equipment to prevent collision with other loads, equipment and/or structures.	Lift Coordinator		Service domain allocated personnel competent for the functional role.

Role (Civil Designation)	Function	Army	Royal Navy (including Royal Fleet Auxiliary)	Royal Air Force
			is qualified to hold both roles provided they have the ME418(S) and ME418(F) JPA competencies. Personnel with the Stevedore qualification cannot hold these roles.	
Operator	Person who is operating the lifting equipment for the purpose of positioning loads or erection of a crane or structure.	Equipment Operator	Operator RN Definition: 'A trained and competent person actually using the equipment.' Personnel holding the ME418(B) qualification can operate equipment. They are also qualified to locally endorse others on the lifting equipment, on the platform they are embarked in. They must fill out a local certificate which must be kept on file. Therefore, anyone who has been locally trained and endorsed by an ME418(B) qualified person can operate lifting machinery on that platform.	Service domain allocated personnel competent for the functional role.

Role (Civil Designation)	Function	Army	Royal Navy (including Royal Fleet Auxiliary)	Royal Air Force
Supervisor	Person who controls the lifting operation and is responsible for ensuring that it is carried out in accordance with the appointed person's Lift Plan.	Supervisor Lifting Operations (SLO)	Supervisor The Supervisor must have the ME418(S) and ME418(F) JPA competencies. Personnel with the Stevedore qualification cannot hold these roles.	Service domain allocated personnel competent for the functional role.
Signaller	Person responsible for directing the operator to ensure safe movement of the lifting equipment and load.	Slinger/Signaller Lifting Operations (SSLO)	Slinger/Signaller Requires the ME418(S) and ME418(F) JPA competencies. The Stevedore qualification, but personnel holding this qualification can only be a Slinger/Signaller, they cannot hold any other roles.	Service domain allocated personnel competent for the functional role.
Slinger/Signaller	Person responsible for: a) attaching and detaching the load to and from the lifting equipment; b) correct identification and use of lifting accessories in accordance with the specifications of the appointed person; c) initiating the movement of the load; and	Slinger/Signaller Lifting Operations (SSLO)	Slinger/ Signaller Requires the ME418(S) and ME418(F) JPA competencies. The Stevedore qualification, but personnel holding this qualification can only be a Slinger/Signaller, they cannot hold any other roles.	Service domain allocated personnel competent for the functional role.

Role (Civil Designation)	Function	Army	Royal Navy (including Royal Fleet Auxiliary)	Royal Air Force
	d) directing the operator to ensure safe movement of the lifting equipment and load.			

ANNEX J – Ranks – Pan-Services Definitions

The following references enable an understanding to be obtained of equivalency, regarding ranks specified within the body of this document, for other Services.

Reference:

BRd2 - The Queens Regulations for the Royal Navy

Chapter 3 – Rank and Command

SECTION VI - COMMAND AND CORRESPONDING RANK

0381. Naval, Military and Air Forces Acting Together

Table 3-1

ANNEX K – Examination Schemes

Thorough Examinations

1. Lifting equipment (as per the LOLER, regulation 9(3)) is to be thoroughly examined by a competent person at prescribed intervals during its service life (based on an assessment of the risks associated with the type of equipment, its use and the prevailing operating environment).

Examination Scheme

2. The thorough examination periodicity should primarily comply with the minimum stated within the regulation. However, where a periodicity has been determined within an overall risk assessment for the facility in excess of the minimum stated then this periodicity extension shall be both justified and documented within an Examination scheme and must be referenced within the report of thorough examination.

The aforementioned periodicity extension relates solely to that associated with a thorough examination and no other lifting equipment interactive activity periodicity.

Justification for any such periodicity extension must be based on a sound and verifiable engineering judgement. The process of engineering judgement will include (but not be limited to):

a. Lifting equipment type.
b. Lifting equipment condition.
c. Defined utilisation.
d. Defined duty.
e. Schedule of defined interventions necessary to support the periodicity extension (i.e. additional maintenance scrutiny, pre-use and intermediate inspections, non-destructive testing, pre-determined component replacement, etc.).
f. Implementation of defined enhanced component rejection and equipment quarantine protocols.
g. Specific materials usage and operational limitations.

3. An Examination Scheme would be normally compiled by the competent person (assessor) undertaking the thorough examination (or their chosen representative), document the aforementioned engineering judgement process and define the periodicity of thorough examination.

4. Where the Examination Scheme is compiled by others, it can only be applied with the agreement of the competent person (assessor) undertaking the thorough examination and must be clearly referenced on the report of thorough examination.

Retention of Records

5. All records related to lifting operations and inspections and thorough examinations of lifting equipment should be retained in accordance with the requirements of The Lifting Operations and Lifting Equipment Regulations and the requirements of JSP 375, Volume 1, Chapter 39 (Retention of Records).

ANNEX L – The Supply Specification and Provision for Use Requirements for Power Driven Lifting Equipment Handling Conventional and Nuclear Armaments

Summary of Contents

1 Supply Specification Requirements

Scope of Supply for Armaments Lifting

1. This JSP 975 Part 2: Code of Practice and Guidance Annex L provides the MOD requirements for the design, construction, testing, assessment and safe use of the main types of power driven lifting equipment used for the handling of conventional and nuclear armaments.

2. It is to be used in conjunction with the references, as appropriate, to ensure, so far as is reasonably practicable, that procured, existing and hired items of lifting equipment are competently specified to prevent uncontrolled loss of load incidents during lifting operations.

3. The requirements primarily cover lifting equipment which lifts and lowers a load whilst directly suspended. Lifting equipment relating to this JSP 975 Part 2: Code of Practice and Guidance Annex L is deemed as including:

- Overhead Travelling Cranes.
- Dockside Cranes.
- Floating Cranes (Barge, Vessel and Ship mounted).
- Mobile Cranes (Chassis, Truck mounted, Crawler).

NOTE: Accessories for lifting are to be included, in the context of securing the load(s).

This JSP 975 Part 2: Code of Practice and Guidance Annex does not specifically cover the supply specification requirements for mechanical handling equipment and conventional lifts. However, where required for the movement of conventional and/or nuclear armaments, either solely or in support of other equipment, the principles of safe provision and use stipulated within this JSP 975 Part 2: Code of Practice and Guidance Annex L should be applied. Mechanical handling equipment and conventional lifts relating to this document are deemed as including (but not limited to):

- Fork (Lift) Trucks.
- Telescopic Handlers (including Reach Stackers, Container Handlers).
- Lorry Loading Cranes.
- Hydraulic Excavators, used for lifting (when configured for Fork, Slinging and/or Grabbing Duties).
- Loading Shovels, used for lifting (when configured for Fork Duties).
- Mobile Elevating Work Platforms.
- Scissor Lifts (Static and Mobile).
- Conventional Lifts (Passenger/Goods) & Hoists (Goods).
- Other Machines, Appliances, Apparatus, Tools and/or Installations, for the lifting and lowering of loads (Pallet Trucks operating in excess of 300 mm height of lift).

4. Whilst this document is not intended to detail operation or maintenance procedures, due to the hazardous nature of the loads being lifted and the requirements attributable to a safety case, significant issues have been highlighted to prompt the inclusion of safety-related requirements in the specification of power driven lifting equipment.

Safety

5. New designs should have satisfied appropriate safety assessment and verification. In conjunction with the overall safety requirements of JSP 975 Parts 1 and 2, when proposing alternative solutions, suppliers should consider historical equipment and human failings, suitably and sufficiently addressing fail-safe systems.

References to Legislation, Approved Codes of Practice, Standards & Design Codes

Standards

6. The terms, ‘or equivalent specification’ and ‘or suitable equivalent’ mean a specification that is equal to or more stringent than the British Standard. Such specifications include publications by:

a. The ‘European Committee for Standardisation’ (CEN)

b. The ‘International Standards Organisation’ (ISO)

c. ‘Deutches Institut Fur Normung’ (DIN)

d. The Federation Europeenne de la Manutention (FEM)

e. The ‘American National Standards Institute’ (ANSI)

f. The ‘American Society of Mechanical Engineers’ (ASME)

7. Where there is a conflict between the British Standard and the ‘equivalent specification’, the most onerous requirement should take precedence, unless otherwise directed by the Project Technical Authority.

8. Due regard is to be taken of all current amendments to, or revisions of, any part of the publications referenced, ensuring only the latest versions are used within the technical specification for new lifting equipment, unless otherwise stated by the Project Technical Authority.

Lifting Equipment Specification and Supply

9. The correct procedure is to be followed by Sponsors when considering the requirement to procure new lifting equipment or change the use of an existing lifting equipment to handle MoD Weapons, Ordnance, Munitions, or Explosive (WOME) stores.

10. The Project Technical Authority should be competent to perform their defined tasks and be formally appointed and instructed by the future ‘Providing Authority’ of the lifting equipment.

11. The preparation of Technical Specifications for new lifting equipment or for modifications to existing lifting equipment should be undertaken under the control of a Competent Specifier, appointed by the Project Technical Authority, and should include the following:

a. A Safety and Reliability Plan called for by the Competent Specifier. The plan should detail safety Availability, Reliability, and Maintainability (ARM) and should state the programme of work, analysis methodologies and management structure of the potential Contractor.

NOTE: It is recommended that maintenance personnel are involved early on in the project to aid designing out reliability and maintainability issues.

b. Contractors/Design Authorities operating to ISO 9001 for determining the reliability content of their plan.

c. The Contractor/Design Authority to state for each of the ARM aspects, the level that the proposed lifting equipment will attain and detail how this will be proven.

d. The ARM plan in each tender response. Where accepted, by the Project Technical Authority, the ARM plan will form part of any subsequent contract.

e. The chosen Contractor to submit the documentation required by the safety and reliability plan with a copy of the latest version of the plan for audit by the Project Technical Authority.

f. Definition of the standards and implementation method to be applied, agreed between the Project Technical Authority and Contractor.

12. The Contractor should be directed to provide proven and commercially available equipment, in the design and processes of manufacture of the lifting equipment, where reasonably practicable. Proven designs and processes should enable readily traceable assessment of the reliability and maintainability, in order to verify the safety of the load. Such an approach should enhance safety for the end user, security of the load, availability of the equipment and guide in the provision of cost-effective solutions.

13. Where the Contractor is not the supplier or manufacturer, they should provide assurances that the proposed specification is technically feasible, enabling manufacture and construction by a competent build authority. The Contractor should liaise with relevant bodies, both internal and external to the MOD, in order to ascertain the essential requirements necessary to justify the assurances provided.

14. The requirements for explosive and nuclear armament lifting equipment include, but may not be limited to, the environment in which the equipment operates and the consequence of a failure during lifting or lowering. It is the responsibility of the Project Technical Authority to supply information relevant to the specific lifting equipment and site, in the contractual documentation.

15. Lifting equipment used in the nuclear industry is referred to as ‘High Integrity Lifting Equipment’. JSP 975 Part 2: Code of Practice and Guidance Annex L, Chapter 4 details the MOD requirements specific to Lifting Equipment for Handling Nuclear Armaments, taking into account nuclear armament safety implications. The design criteria developed by the nuclear industry, and its specialist equipment suppliers, are to be applied.

NOTE: The absolute necessity for the provision of high integrity lifting equipment to handle MOD Armaments, Weapons, Munitions and Ordnance should be assessed by the relevant authorities, considering the suitability and sufficiency of overall safeguard measures for the given handling solutions.

16. The design of ‘High Integrity Lifting Equipment’ must be such that all components and systems, essential for the security of the load, have either load path redundancy or additional protection to prevent a Dropped Load (DL) or an Uncontrolled Load Lowering (ULL). Where these approaches cannot be achieved by a practical method, a conservative design approach must be followed to ensure the required enhanced safety level.

17. A nuclear armaments lifting equipment, Electrical Control System necessitates the provision of a one fault safe system, having redundancy, consideration of enhanced design and quality requirements, with classification of control systems detailed in the Glossary (JSP 975 Part 2: Code of Practice and Guidance Annex A).

18. A relevant Conformance Matrix (JSP 975 Part 2: Code of Practice and Guidance Annex L, Appendix A) should be compiled during the lifting equipment design or upgrade phase, in order to verify the degree of compliance claimed, in conjunction with documented judgements relating to areas of non-compliance. A matrix should tabulate all requirements and be cross-referenced to specific sections of the design documentation.

Classification of Lifting Equipment

19. All lifting equipment assessed for compliance with JSP 975 Part 2: Code of Practice and Guidance Annex L, Parts 1 and 2 and the relevant supplementary part are to relate to the classifications defined in Table 2.

The Definition in Table 2 relates to this document (JSP 975 Part 2: Code of Practice and Guidance Annex L).

NOTE: The limited provenance of Classification A or B1 for handling nuclear armaments.

Classification	Definition
A	Satisfies the requirements of Annex L, Chapter 4. (Note: Nuclear armament handling equipment meeting the provisions of Chapter 4 does not necessarily mean that an adequate safety case could be presented. See Chapter 4, clause 4).
B1	Satisfies the requirements of Annex L, Chapter 3, and partially meets the requirements of Annex L, Chapter 4. (This applies to Lifting Equipment built and/or modified to handle nuclear armaments prior to the requirements of Classification A. The safety case caveat for Classification A equally applies).
C1	Partially satisfies the requirements of Annex L, Chapter 3. (Also applies to Lifting Equipment built and/or modified to handle conventional explosive ordnance and previously identified as Classification B2).
C2	Satisfies only regulatory compliance.
D	Non-compliant with regulatory requirements and requires minor work to achieve compliance.
E	Non-compliant with regulatory requirements and requires major work to achieve compliance.

Classification	Definition
	(Equipment may be beyond economic repair)
F	No classification allocated. (Equipment not assessed)

Table 2: Classification Definition of Lifting Equipment

20. ASME NOG 1 – Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder) is an appropriate High Integrity (HI) crane code currently available, from which much of the UK HI cranes specification is taken. 'High Integrity' cranes are required to exhibit dropped load failure frequencies of between 10^{-5} & 10^{-7} per year.

NOTE: Standard industrial cranes tend to offer a serious failure frequency of circa 10^{-3} per year and Incredibility of Failure (IOF) $<10^{-7}$ per year.

21. An overall risk reduction strategy can incorporate safeguards employing one or more safety functions (JSP 975 Part 2: Code of Practice and Guidance Annex B, Reference ISO 13849-1).

22. Safety-related parts of control systems (SRP/CS) can consist of hardware and software and can either be separate from the machine control system or an integral part of it (JSP 975 Part 2: Code of Practice and Guidance Annex B, Reference IEC 61508).

23. The ability of safety-related parts of control systems to perform a safety function under foreseeable conditions is allocated a performance level (PL), expressed through five levels ('a', 'b', 'c', 'd', 'e') with increasing reliability.

24. The probability of dangerous failure of the safety function depends on several factors, including hardware and software structure, the extent of fault detection mechanisms, reliability of components (mean time to dangerous failure – $MTTF_D$), common cause failure (CCF), design process, operating stress, environmental conditions and operation procedures.

2 Provision for Use Requirements

Introduction

1. The following stipulates the minimum MOD requirements for the supply and provision of Land and Ship Based Lifting Equipment for handling weapons; ordnance; munitions; explosives (WOME).

Risk/Safety Analysis

2. The introduction of a Probabilistic Risk Assessment within a Safety Case requires the quantifying of the associated risks, highlighting potential weaknesses and indicating the potential need for any additional safety measures. However, this does not remove the requirement for the provider or designer to generate a reasoned Deterministic Safety Case based on sound engineering principles and best practice.

3. Appropriate Safety/Risk Assessments in accordance with Def Stan 00-056 (Safety Management for Defence Systems), in conjunction with supporting standards will be required for the equipment. JSP 975 JSP 975 Part 2: Code of Practice and Guidance Annex B includes the standards applicable to the lifting equipment covered by this document.

4. A Safety Case is required:

   a. for new lifting equipment;

   b. to be updated, when significant modifications to existing lifting equipment are undertaken; and

   c. to be updated, where there is a significant change to any lifting operation or procedure.

5. A Safety Analysis should identify hazards and their associated accident sequences, calculate safety targets for each hazard, and analyse the system to determine whether the safety targets have been met. The Safety Analysis should be appropriately adapted to suit the overall project risk.

6. A Hazard Analysis Report should contain the probability targets for each hazard. It may be possible that lifting equipment will meet the required probability targets with certain requirements of this specification relaxed. However, any relaxation in the requirements must be approved by the Project Technical Authority, fully justified, suitably and sufficiently considered within the risk assessments and shown not to jeopardise safety. The report should also identify those areas that need periodic inspection to identify any deterioration and wear that, if not detected and/or satisfactorily remedied, could result in unacceptable risks.

7. Alternative solutions to the requirements contained within this document may be proposed where they do not compromise safety. However, any alternative designs and solutions employed should:

   a. provide a level of safety that is equal to or better than that which could be achieved by the prescribed method, ensuring the risks to safety remain as low as reasonably practicable;

   b. be supported by a suitable and sufficient Risk Analysis. This should include the effect external influences may have on the safety of operations (e.g. lightning strikes, ground instability, flood risk, rock fall, etc.) and the solutions incorporated, to ensure the risks are kept as low as reasonably practicable;

c. be formally approved in writing by the Project Technical Authority for the lifting equipment;

d. avoid the possibility of Common Mode Failures where duplicate systems are proposed; and

e. avoid dependency on human factors to achieve the required level of safety.

8. Realistic requirements should be set and an agreed management strategy followed in accordance with the requirements of Def Stan 00-056 Part 1. This strategy should reflect a continuous and evolutionary approach to the achievement of safety, with the management of the safety tasks being an integral part of the design, manufacture, operation and maintenance of all lifting equipment.

Marking

9. The lifting equipment should be either clearly marked with the SWL (or WLL) or provided with rated capacity data available to the operator.

10. For defined hazardous duties, requiring capacity limitation, it is essential that only lifting equipment with an appropriately de-rated SWL (or WLL) is used. Systems should be implemented to prevent equipment with a SWL (or WLL) equivalent to a hazardous payload being used in error. Whilst it is the responsibility of the user to take such steps, the following should be considered:

a. For installations undertaking tasks requiring equipment to have a reduced safe working load, the equipment should be appropriately marked with the reduced SWL (or WLL) corresponding to the most hazardous duty.

b. For installations where the equipment is portable, the user should provide instructions to the operative. This should include a clear indication of the SWL (or WLL) reduced, as required, for each equipment configuration, in conjunction with an instruction to use equipment with an appropriate higher capacity (i.e. SWL or WLL), in order to achieve the required de-rating.

Safe Working Load (or Working Load Limit) and Armaments Rated Capacity

11. The Armaments Rated Capacity (ARC) equates to a 50% de-rate of the commercial SWL (or WLL), corresponding to the maximum weight of armaments that can be lifted by the lifting equipment.

NOTE:

(1) It is to be applied to all lifting operations involving Nuclear Armaments.

(2) Thereafter, it should be applied in relation to the JSP 975 compliance level of the lifting equipment, specific armament type and lift height limitations (see Fig 4).

(3) OMESI – Ordnance, Munitions and Explosives Safety Instruction.

(4) SEXSSI – Ship Explosives Stores Safety Instruction.

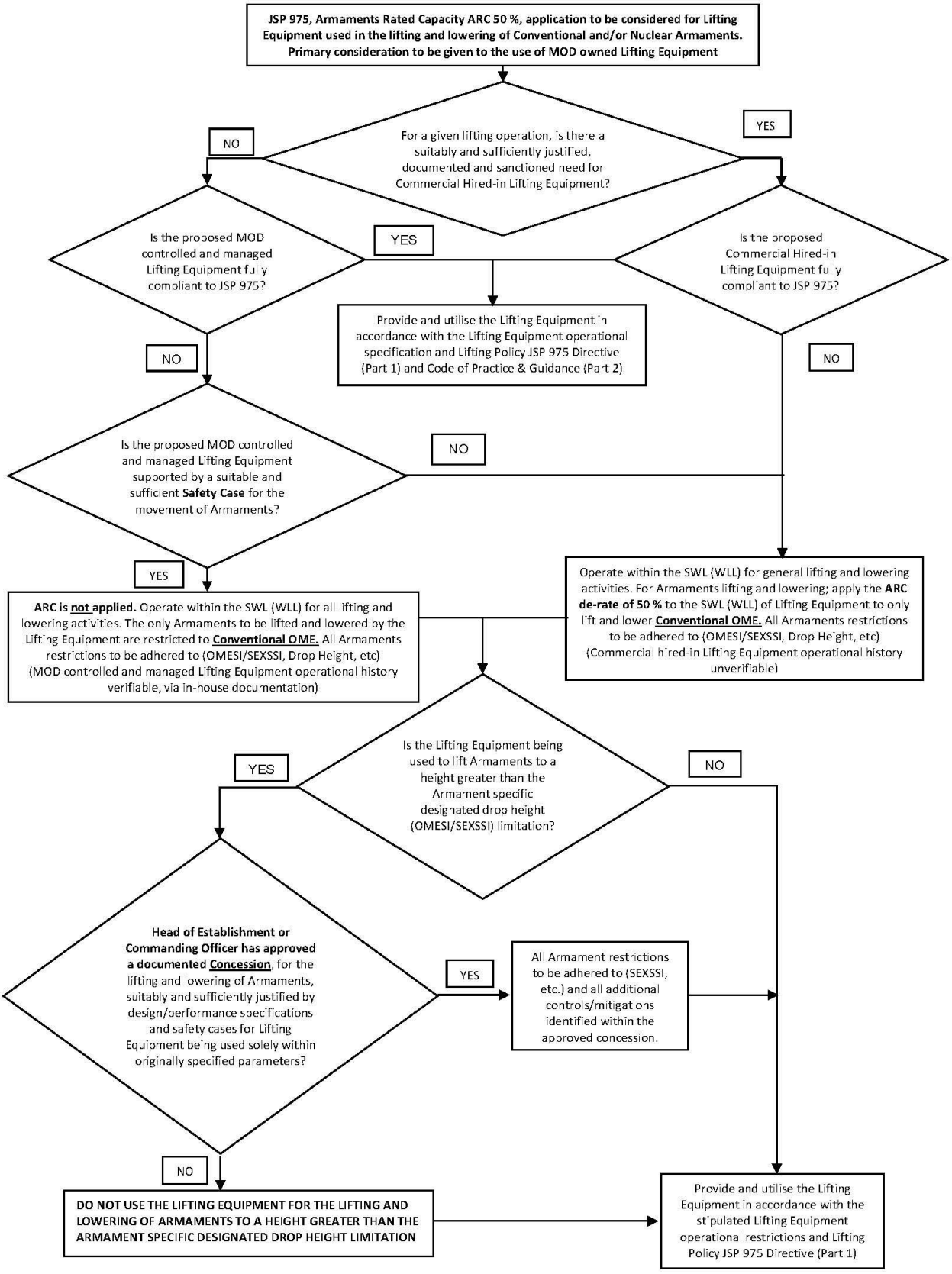


Figure 4: ARC Application

Concessions to the Application of the ARC

12. A concession, with regard to the lifting and lowering of armaments to a height greater than the armament specific designated drop height limitation, will require approval by a Head of Establishment or Commanding Officer, due to the enhanced level of risk associated with such a lifting operation. The concession is to include approvals gained for the Activity Site/Ship: from ODH, NAG Exp, WESCOE, IE Royal Navy, Royal Navy Command SURFLOT ENG Exp or formally appointed authoritative representative, Equipment and/or Design Authority, as deemed appropriate.

13. The process of concession will require a suitable and sufficient risk assessment of the capability of the specific lifting equipment(s) to safely complete the proposed lifting operation. This will involve detailed appraisal of the design and performance of the lifting equipment by specialists, in order to compile a comprehensive and appropriate safety case to substantiate the capability of the lifting equipment to safely complete the required lifting operation.

14. Any such appraisal should be documented and appropriately stored for traceability, with comprehensive justification, including:

a. the absolute operational need to lift and lower the armament to a height greater than its specific designated drop height limitation;

b. reference to an appropriate , compiled in accordance with JSP 975 Directive (Part 1);

c. design and performance specification(s) of the lifting equipment, in order to ascertain the adequacy of capabilities for the proposed lifting operation;

d. operational, maintenance and repair history for the specifically proposed lifting equipment, in order to ascertain the satisfactory reliability and availability for the proposed lifting operation; and

e. a suitable and sufficient safety case for the specifically proposed lifting equipment.

15. Where required, external expertise in terms of lifting equipment specific technical design and analysis authorities should be utilised to supplement in-house technical capability, in order to ensure that the overall appraisal is undertaken in sufficient detail with appropriately verified conclusions.

Control of Load

16. Each mechanism should be rated to sustain its minimum (creep) velocity, whilst loaded to its SWL (or WLL), for three continuous periods of five minutes in each direction, allowing a 30 second pause between consecutive cycles. The preferred solution is for hoist motors to not be oversized, but satisfy operational requirements by virtue of motor cooling fan upgrade. This should be discussed with the Design Authority at the design stage.

17. Manually operated mechanisms and controls should be designed in accordance with Def Stan 00-251 (Human Factors Integration for Defence Systems), supported by relevant standards. JSP 975 Part 2: Code of Practice and Guidance Annex B includes the standards applicable to the lifting equipment covered by this document.

Documentation Requirements

18. The documentation required is to be in accordance with relevant regulation (including the Supply of Machinery (Safety) Regulations, PUWER, LOLER and MHSWR) and should include the following:

a. Operators' Manual. The information and instructions given are to be readily comprehensible to all those concerned. The manual should include:

(1) Methods of installation and assembly.

(2) Instructions for the safe use of the equipment (including warning notices and technical bulletins).

(3) Foreseeable abnormal situations and the actions to be taken if such a situation were to occur.

(4) Conclusions drawn from past experience in using the equipment in consideration with its specialised use.

b. Maintenance schedules to support the in-service use of the equipment.

c. For equipment other than new supply, the last report of Thorough Examination (including those for the previous two years, where applicable), confirming that the equipment is safe for continued use.

d. For equipment other than new supply, inspection records complete with maintenance records/log and relevant incident, repair and refurbishment records.

19. The certification required to be available, includes the following:

a. Declaration of Conformity, complying with the relevant equipment regulations.

b. Test Certificate(s), either issued at the time of original installation/manufacture/supply or subsequently in-service.

c. Ropes - Hoist and Luffing (as applicable) Test Certificate(s). The minimum Factor of Safety of the rope is to be stated on the certificate (6:1 minimum for lifting).

d. Hook Assembly – Load Test Certificate(s).

e. Periodic Test Certificate(s) (relevant to Ship/Barge mounted and waterborne cranes).

f. Non-destructive Test certification, as applicable.

g. Internal Periodic Review (5/10 year intervals) where a structural and mechanical survey is performed to inform any decisions with regard to life extension, or down-rating.

h. Reports of Inspection and/or Thorough Examination.

NOTE: The above documentation could be provided via systems including JAMES, MITER Fleet Information System (MFIS) or equivalent.

3 Lifting Equipment for Handling Conventional Armaments – General Requirements

General

1. Lifting equipment used for handling conventional armaments is required to meet the requirements as stated in JSP 975 Part 2: Code of Practice and Guidance Annex L, Parts 1 and 2, in conjunction with the additional requirements given in the following.

2. Primarily, the following relates to new lifting equipment irrespective of the conventional armament being handled, but should also be referenced for existing lifting equipment compliance.

Design and Manufacture

3. All equipment should be designed to facilitate ease of inspection and servicing. This is essential to monitor safety critical components and areas identified in the Risk/Safety Analysis. Periodic inspections identify defects which if left undetected and remedied could result in unacceptable risks.

4. The design of structural and mechanical components, essential for the security of the load, should avoid stress concentration details likely to result in excessive reduction of fatigue strength or brittle failure resistance. Any deviations from design specifications should be assessed by the Design Authority, to ensure they do not introduce unacceptable stress concentrations.

5. Stress concentration arises from discontinuities and irregularities within a component brought about by the introduction of sharp corners, holes, grooves, notches, weld details, etc. Such details should be avoided, where possible, within highly stressed tensile areas. Where this is not possible, such details should be suitably theoretically assessed in terms of both applied stress and fatigue life, in accordance with BS 7608 or BS 5400 Part 10.

6. Corrosion Allowances, for structures and mechanisms, should be determined by the Project Technical Authority. Unless stated within a given standard, a corrosion allowance of 5% of the structure thickness for any structure exposed to external conditions.

7. Due attention should be made to the selection of materials, to ensure they are compatible with the operational environment and the nature of loading to which they will be subjected.

8. A Risk Analysis (Hazard and Operability (HAZOP)/Failure Mode and Effects Analysis (FMEA)) in accordance with Def Stan 00-056, in conjunction with BS 8444-3 and BS EN ISO 12100 should be undertaken.

Known and Proven Design

9. Lifting equipment should be of known and proven design and within production capabilities. Unproven design and technology should be subjected to an independent safety assessment, including reliability analysis, to identify all components whose functional failure or performance degradation would result in a failure to danger. Measures are to be taken to either eliminate the possibilities of such failures or provide safety procedures to ensure the risk of such failures are kept as low as reasonably practicable.

Mechanical Handling Equipment

10. When considering the use of Mechanical Handling Equipment (MHE) either solely or in support of other equipment for lifting operations involving armaments, the suitability (PUWER, regulation 4) for the enhanced risk should be appropriately addressed. Supply and provision for such use of MHE would need to consider the adequacy of both strength and stability (LOLER, regulation 4), in order to ensure the safe and secure lifting and lowering of the load.

11. Adequate strength of MHE should be attained by either an inherent duality (redundancy) or enhanced safety factor of components within the critical load path of the equipment. Approaches (justified by a suitable and sufficient supporting safety assessment) that would minimise the potential for the loss and/or uncontrolled lowering of a load, in the event of failure of a primary load path element, include:

a. at least two lifting ropes or chains, independently anchored;

b. at least two lifting cylinders;

c. safety gear;

d. ropes and chains with an enhanced factor of safety;

e. hydraulic pipework with an enhanced duty factor; and

f. strategic placement of load holding and burst valves.

12. Where such additional elements are not present within the design, relevant to the MHE, or not possible to reasonably practicably retro-fit, for the purposes of an armament lifting operation, safety and security of the load can be enhanced by sufficiently de-rating the rated capacity of the MHE.

13. Fundamentally, MHE should operate on firm level ground, ascertained and confirmed prior to the commencement of any lifting operation. However, in normal operational duty the stability of MHE is often dependent on many factors, including:

a. the capacity of the ground, upon which the lifting operation is to be undertaken, to sustain the cumulative weight of the MHE and load;

b. the firmness of the ground and its capability to remain stable for the duration of the lifting operation, when un-compacted, uneven and with the possibility of steady subsidence or rapid collapse;

c. whether the lifting operation is to be undertaken on ground which has an inherent slope, imposing secondary horizontal forces on the MHE;

d. the nature, size and stability of the load;

e. the exact manner in which the load is to be lifted and lowered;

f. the magnitude (maxima) and nature (buffeting) of wind loading; and

g. the potential of the load snagging and/or interacting with adjacent equipment or structures.

The stability of MHE used for lifting operations can be enhanced by:

h. de-rating the maximum operational speeds for lifting, lowering and transit of the load;

i. utilising equipment with a stable wheelbase (e.g. using a four wheel Fork Truck, as opposed to a three wheel variant) or outriggers and stabilising blocks.

j. the provision of ground preparation, temporary anchoring and additional ballast of equipment.

Lifts (Passenger/Goods, Goods and Service)

14. Passenger/Goods, Goods and Service Lifts used within specification will be covered by location health and safety risk assessment and standard operating procedures and should not necessarily require specific training, supervision and lift plans, for general vertical transportation use. However, where the risk is enhanced, due to the manner of use and/or the load(s) carried, consideration should be given to the completion of a specific lift plan, in order to facilitate safe completion of the proposed lifting operation. The necessity for specific training and supervision would then be determined on the basis of risk assessment, lift plan complexity and lifting operation hazard(s).

15. When considering the use of lifts for lifting operations involving armaments, the suitability (PUWER, regulation 4) for the enhanced risk should be appropriately addressed, with regard to the installation specification and adequacy for the purpose (see Annex L for further relevant guidance).

16. The use of a given lift installation should consider the adequacy of strength and stability (LOLER, regulation 4), in order to ensure the safe and secure raising and lowering of the load in terms of:

a. Undue susceptibility to foreseeable failure modes likely to arise in service.

b. The provision of appropriate margins of safety against failure under foreseeable failure modes.

17. The load should be stable and secure upon the lift platform or within the lift car, during travel. Where all or part of the load may become insecure, dislodged or displaced, either the lift platform or lift car should be fully enclosed or suitable edge protection fitted to restrain the load within the periphery of the lift platform or lift car; ensuring uninhibited running clearances within the travel path (lift shaft).

18. Due to the enhanced risks associated with the lifting of armaments, lift platforms or cars should be fitted with devices to prevent free fall, in the event of malfunction, which are independent of the means of suspension or drive.

19. Where devices to prevent free fall are not fitted, adequate strength of lifts (for the raising and lowering of goods and armaments) should be attained by either an inherent duality (redundancy) or enhanced safety factor of components within the critical load path of the equipment. Approaches (justified by a suitable and sufficient supporting safety assessment) that would minimise the potential for the loss and/or uncontrolled lowering of a load, in the event of failure of a primary load path element, include:

a. at least two lifting ropes, chains or means of suspension, independently anchored;

b. ropes, chains and means of suspension with an enhanced factor of safety;

c. hydraulic lifting cylinders, pipework with an enhanced duty factor and strategic placement of counterbalance, load holding and burst valves.

20. Where such additional elements are not present within the design, relevant to the type of lift or not possible to reasonably practicably retro-fit, for the purposes of an armament lifting operation, an alternative means of completing the activity should be sought.

Service and Out-of-Service Conditions (Outdoor Use)

21. Unless otherwise stated by the Project Technical Authority, lifting equipment operating outdoors is to be designed to include the following service and out-of-service conditions:

a. **Operating environment:** Highly saline atmospheres such as those found at exposed harbour or offshore locations.

b. **Ambient operating temperatures (still air conditions):** Structure and components must not be susceptible to brittle fracture within this temperature range, Max 35°C to Min -17°C.

c. **In-service design wind pressures:** Table 2 (consideration to be given to the corresponding wind forces acting on the suspended load).

d. **Out-of-service design wind pressures:** To be in accordance with BE EN 13001-2, BS ISO 4302, BS 2573: Part 1 or equivalent specification.

e. **Snow and Ice Loads:** The effect of snow and ice loads acting on the equipment structure to be considered where a particular application indicates that these loads may be significant.

f. **Explosive Area Requirements:** In accordance with the explosive area requirements derived by a method equivalent to DSA03 OME Part 2: In-Service and Operational Safety Management of OME, appropriate to the highest category and zone of the area(s) in which the lifting equipment is to be used.

In service design wind pressure N/m^2	Approximate equivalent in-service wind speed m/s (knots)
450	27 (52)

Table 3: In-Service Design Wind Pressures

Service and Out-of-Service Conditions (Indoor Use)

22. Unless otherwise stated by the Project Technical Authority, lifting equipment operating indoors is to be designed to include the following service and out-of-service conditions:

a. **Operating Environment:** Use in highly saline atmosphere.

b. **Ambient Operating Temperatures:** Max 50°C to Min -20°C.

c. Where the working location is such that the lifting equipment may be subjected to wind loading (e.g. operation in a building with large open doors or between buildings) then such wind loading must be taken into account during the design phase.

d. **Explosive Building Requirements:** In accordance with the explosive area requirements derived by a method equivalent to DSA03 OME Part 2: In-Service and Operational Safety Management of OME**,** appropriate to the highest category and zone of the area(s) in which the lifting equipment is to be used.

Noise Levels

23. The noise levels of lifting equipment should not exceed a Daily Personal Exposure Level (LEP,d), excluding the use of PPE – ear defenders, of 80 dB(A) or an Action Value, Peak Sound Pressure Level (LCpeak) of 135dB. Lifting equipment designs should be such that risks from noise emissions are reduced to as low as reasonably practicable.

24. Noise assessment of lifting equipment should ensure the above levels are not exceeded such that those working with, or in the vicinity of, the equipment in whatever capacity are not adversely affected.

Lighting

25. Suitable and sufficient lighting is to be provided to facilitate safe operation of, and safe access to and from, the lifting equipment. The lighting provided may form part of the overall work place lighting arrangements.

Operator's View of the Load

26. Where the operator may have limited view of the load during normal operations, consideration should be given to the installation of CCTV with a monitor to provide operators with a clear and unrestricted view of the load.

27. The monitor should remain usable in all lighting conditions from bright sun to night, providing the operator with a clear visual display and an uninterrupted line of sight.

Structural

Stresses and Design

28. The permissible stresses and design of the lifting equipment structure should comply with BS EN 13001, BS 2573: Part 1, or equivalent specification, based on the SWL (or WLL), unless otherwise stated. All structural calculations should be submitted to an approved independent Safety Auditor for checking and to ensure adequate safety margins exist.

NOTE: BS 7608 requires enhanced fatigue stress range to be used for structures exposed to saline atmospheres.

Water Ingress

29. Where applicable, precautions are to be taken to avoid the ingress of water into the structure of lifting equipment. Adequate drainage should be provided, in locations where water may accumulate. Drain holes should not create stresses in excess of those stipulated by the relevant standard.

Accidental Damage

30. Special consideration should be given to the thickness of members that are likely to be exposed to reasonably foreseeable operational and/or accidental damage. Any increase of thickness required for this purpose is to be additional to any corrosion allowance.

Operator's Position

31. Consideration should be given to the ergonomic design of the operating position and controls to ensure no undue strain is placed on the operator. The operator should not be expected to exert undue force or stretch and reach beyond normal physical limitations to carry out tasks.

32. Where an Operator's Cab is fitted, it should be designed to the appropriate standard and include:

a. A heater, air conditioning and a means of ventilation such that a temperature of 19°C and relative humidity of 50% can be maintained within the cab.

b. Windscreens and windows fitted with safety glass complying with the requirements of ISO 3537 or equivalent specification, with provision to prevent the driver being dazzled by sunlight.

c. Windscreen wipers, windscreen washers and de-misters, on all windows through which the driver views the load or moving parts of the lifting equipment.

d. A permanent system to allow continuous two-way oral communication between operator and ground level supervision is to be provided when the cab is elevated.

e. Fire extinguishers appropriate to the hazards pertaining to the particular lifting equipment, including types suitable for fuel fires.

f. A lock fitted to the door to prevent unauthorised entry when lifting equipment is not in use.

g. A securely fixed, adjustable, ergonomically designed seat for the operator.

h. Sufficient natural and/or artificial illumination to ensure that all charts, controls and indicators are clearly visible to the operator.

i. Have the following documents:

(1) A Safe Working Load Chart in accordance with the appropriate design specification.

(2) An Operator's Manual.

(3) A schedule detailing periodic checks that the operator is responsible for and provision for storage and display of permit to operate documentation.

j. Sound proofing where necessary to minimise driver exposure to excessive noise levels.

k. Where necessary, an appropriate Operator's Cab emergency escape system.

l. Clearly marked controls, in accordance with BS EN 13557 and manufacturer specification.

m. Where fitted with CCTV, the visual display should remain clearly discernible in all lighting conditions from bright sun to night without causing visual fatigue or obstruction of key sight lines. Touch screens are permissible where they cannot be accidentally operated.

n. Access to the cab should normally be by means of stairs, ladders and platforms providing collective protection to operators and users. The use of fall restraint and associated systems would need to be authorised (see JSP 375, Volume 3, Chapter 7).

Fire Precautions

General

33. The Project Technical Authority should determine the degree of fire hazard for all areas and buildings in which the lifting equipment is to be used.

34. Fire prevention and fighting equipment, appropriate to the hazards identified, should be provided.

35. Where necessary, specific advice should be sought from specialist fire prevention officers.

Confined Spaces

36. All paints, other surface finishes, cable insulation and sheathing used in confined spaces should be fire resistant and, so far as reasonably practicable, are not to produce asphyxiates or toxic fumes when ignited. Cable insulation and sheathing should be low smoke and fume (LSF) type.

37. The likely need for access to confined spaces for inspection and maintenance should be considered, as per JSP 375 Volume 1, Chapter 28.

Mechanisms

Stresses and Design

38. The permissible stresses and design of the lifting equipment mechanisms should comply with BS EN 13001, BS 2573: Part 2 or equivalent specification, unless otherwise stated.

39. All mechanisms should be rated to take account of the stresses caused by in-service conditions including in-service wind, rapid acceleration/deceleration, emergency braking, and motion reversal.

Wire Ropes

40. Wire ropes should conform to BS EN 13001-3-2, BS EN 12385-4, BS ISO 2408 or equivalent specification and selected on the basis of the group classification of the mechanism, as per the requirements of BS EN13001, BS 2573: Part 2 or equivalent specification. Wire ropes should subsequently be maintained, as per BS ISO 4309.

41. The minimum factor of safety of all ropes used should be 6:1 for Shore Side and 8:1 for Ship Board equipment.

NOTE: Rope reeving should be taken into account when calculating the rope factor of safety using the methods given in BS 2573: Part 2: Clause 8.5 and, as applicable, BS MA 48.

42. Hoist ropes that operate in single fall or can be re-reeved from multi fall to single fall, should be rotation resistant.

43. All wire ropes should be supplied with test certificates and identified in accordance with BS EN 12385-1.

44. Rope anchorages or terminations should be designed to minimise the effects of corrosion. Once fitted, they should not be changed without the approval of the Project Technical Authority.

Lifting Hooks

45. Lifting Hooks should comply with the requirements of BS EN 13001-3-5, BS EN 1677-5 or equivalent specification.

46. Lifting hooks should be of the point hook type, unless otherwise stated, have an integral forged nose and be fitted with a gravity or spring applied safety catch (see Fig 5).

Figure 5: Lifting Hook of the Point Hook Type with Gravity Safety Catch and Spring Safety Catch

47. Lifting hooks should be free to swivel. Lifting equipment, lifting hook designs may require the inclusion of ball or roller bearings, to enable free rotation.

48. Hook Blocks, Overhaul (Ponder) Balls and/or other devices are to be fitted to ensure that hoist ropes remain taut and correctly seated within their sheaves during all in-service and out-of service conditions. Where fitted, account is to be taken of the effect of the weight of the Hook Block, Overhaul Ball and/or device, on the SWL (or WLL) of the lifting equipment.

49. Shackles should comply with BS EN 13889 or equivalent specification and should be zinc coated or manufactured from stainless steel.

Braking Systems

50. Braking systems are to be designed to fail-safe with the specification in accordance with BS EN 60204-32, BS EN 13135, BS EN 13557 and BS EN 14985.

51. Brake solenoids should be sufficiently rated for their duty cycle. Hoist and Luffing brake solenoids should be provided on the basis of continuous rating.

52. The design of emergency stop equipment, including functional aspects, should be in accordance with BS EN ISO 13850.

53. Lifting equipment should have an emergency stop function which overrides all functional and operational modes and removes power to the drive motors, in a manner that avoids the development of hazardous conditions. The emergency stop should function either as a:

a. Stop category 0 – disconnection, with immediate removal of power to the drive motors.

b. Stop category 1 – controlled stop, with power available to the drive motors enabling the lifting equipment to cease motions in a controlled manner to achieve a safe stop, with subsequent removal of power when the stop is achieved.

54. Service brakes should apply a progressive force and not instantaneous shock loading.

55. Hoist, Luffing and other rope actuated mechanisms should be fitted with automatic emergency brakes. An emergency brake is to be mechanically and operationally independent with separate control circuits. Where an alternative approach is proposed, the manufacturer should provide the Project Technical Authority with justification that any alternative will provide a similar level of safety, preventing uncontrolled motions of the load, with a risk of failure is as low as reasonably practicable.

Automatic Emergency Brakes

56. Automatic emergency brakes should comply with the following requirements:

a. Be completely independent of all other brakes.

b. Where reasonably practicable, to be located on the rope drum(s).

c. The brake should be actuated under the following trip conditions:

(1) Automatically, whenever the maximum nominal demanded hoisting, lowering, luffing (raise or lower) or other velocity is exceeded by 30% (within +5/-10%) (see Fig 6).

(2) Automatically, within 1/10th of a second of any failure resulting in the rope drum becoming disconnected from the service brake.

(3) Automatically, within 1/10th of a second of any manual operation of any emergency stop button.

d. The probability of the automatic emergency brake(s) failing to operate when any one of the above conditions occurs is to be less than one failure to operate in every 10,000 occurrences of a trip condition. The probability of the automatic emergency brake(s) 'nuisance tripping', due to any other condition not specified above is to be less than one 'nuisance trip' in every 600 operating cycles.

e. The automatic emergency brakes control system should be independent of the control system for the service brakes.

f. The automatic emergency brake(s) should be capable of independently arresting the specification test load over a maximum distance of 300 mm from the time when the brake is automatically or manually actuated, without imparting impact loads which could result in structural or mechanical damage to the lifting equipment.

g. At no time should the velocity of the lifting hook be allowed to exceed 1.5 m/sec.

h. In cases where an Automatic Emergency Brake is fitted:

(1) Automatic emergency brakes should not induce excessive shock. The complete Hoisting or Luffing mechanism should be rated to take account of the torsional shock loads generated. The resulting stresses should not exceed the permissible stresses specified by BS EN 13001 or BS 2573: Part 2: Clause 5.3.5 and Table 4, defined as an exceptional loading condition.

(2) Provision should be made to allow the brake to be reset in a safe manner and the method is to be described in the Technical Manual for the lifting equipment.

(3) Automatic emergency brakes should be fitted with mechanical or electrical brake wear indicators.

(4) Means should be provided for the user to conduct an individual test of the secondary brake.

(5) Where not acting directly on the rope drum(s); a fully independent load path should be incorporated.

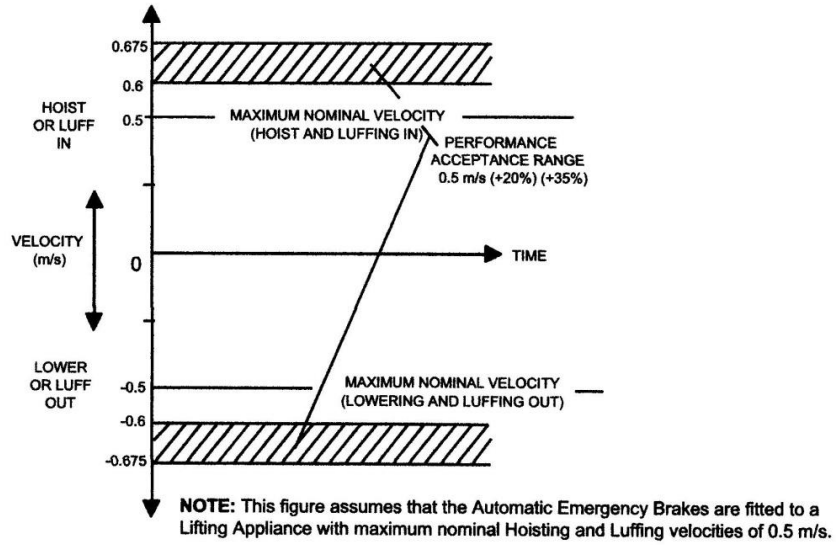


Figure 6: Range of Acceptance Performance for the Automatic Emergency Brakes for the Hoist and Luffing Motion

Hoist and Luffing Mechanisms

57. Hoist and Luffing mechanisms should not be fitted with a change-speed gear, clutch or similar device that allows the rope drum(s) to free spool and be disconnected from the service brake.

58. Rope operated hoist and luffing mechanisms should, in the event of failure of their service brake, prevent the load from exceeding an average acceleration rate of 2.4 m/s^2 for a minimum period of five seconds.

NOTE: This may be achieved by the use of gear-train designs that resist reversing drive torque.

59. Rope drums should meet the requirements of BS ISO 16625 and be appropriately grooved to support the rope; enabling an orderly lay of the rope. Where multi-layering is adopted, efficient and effective spooling on to rope drums should be achieved.

60. A minimum of three full turns of rope should remain on rope drums when ropes/hook block are fully payed out.

Hoist Mechanism

61. The hoist velocity of the lifting hook should be variable, with the exception of pendant operated overhead travelling cranes, between the following limits:

a. Minimum (Creep): No greater than 0.05 m/s in either direction.

b. Maximum: No greater than 0.5 m/s in either direction.

c. Hoist motors should be sized such that blocking inertias and forces are sustainable by the entire hoist load path.

NOTE: Pendant operated lifting equipment should be fitted with two step speed functionality, for slow and normal operation, in order to control the load.

62. Hoist motors, service brakes, independent brakes, manually applied brakes and standby brakes are to be independently rated, should arrest and hold the lifting hook, whilst loaded to the lifting equipment SWL (or WLL). This should be within a maximum distance of 25 mm from its minimum (creep) speed to zero velocity, without imparting impact loads which could result in structural or mechanical damage to the lifting equipment.

63. Hoist mechanism shock absorbers: Where it is proposed to install a motion compensator or shock absorber device to reduce the impact load applied to the lifting equipment, the device should comply with Lloyd's Register of Shipping: Code for Lifting Appliances in a Marine Environment Chapter 4, Section 3, Clause 3.10. The device should be approved by Lloyd's Register and should not affect the minimum (creep) performance of the lifting equipment.

Luffing Mechanism (where applicable)

64. Luffing mechanisms should level to within a tolerance of ±300 mm, measured from the lifting hook.

65. The nominal luffing velocity of the lifting hook should be variable between the following limits:

a. Minimum (creep): No greater than 0.05 m/s in either direction.

b. Maximum: No greater than 0.5 m/s in either direction.

c. Luffing motors should be sized such that blocking inertias and forces are sustainable by the entire luffing load path.

66. Jib luffing cylinders, luffing motors, service brakes, independent brakes and associated controls are to be independently rated, should arrest and hold the lifting hook whilst loaded to the lifting equipment SWL (or WLL). This is to take account of the Jib at its worst balance position, and should be within a maximum distance of 50 mm from its minimum (creep) speed to zero velocity, without imparting impact loads which could result in structural or mechanical damage to the lifting equipment.

67. Where cylinders are used for luffing, folding or telescoping, they should be provided with a mechanical brake/holding system. Alternatively, each motion should have two independent cylinders where each individual cylinder is capable of holding the rated capacity for armament lifting.

68. Where there is the possibility of the jib free luffing, due to unbalanced forces (as in counterweighted systems), an additional automatic emergency brake should be provided, in accordance with the requirements of the 'Automatic Emergency Brakes' sub-section.

69. Lifting equipment with rope luffing systems should be fitted with a means of arresting the Jib in the event of a luffing rope failure.

Slew Mechanisms (where applicable)

70. The nominal horizontal slew velocity at the jib head (at maximum working radius) should not exceed 1.5 m/s.

71. The minimum (creep) horizontal slew velocity at the average working radius should not exceed 0.15 m/s.

72. In addition to the electro-mechanical service brake, a manually applied Slew Brake should be provided in accordance with BS EN 60204-32, BS EN 14985. However, an alternative, such as electrical braking controlled by the control system, is considered acceptable.

73. Slew motors, service brakes, and manual brakes are to be independently rated for arresting and holding the jib whilst loaded to the lifting equipment SWL (or WLL). This should be within a maximum distance of 75 mm at the average working radius from its minimum (creep) speed to zero velocity, without imparting impact loads which could result in structural or mechanical damage to the lifting equipment.

74. The rotating part of the lifting equipment should be supported by a bearing system. This should be designed to withstand the load and moment from the rotating part under both service and test load conditions. Design and selection should have regard to the potentially serious consequences of failure.

75. A fail-safe type of slew bearing should be incorporated. Where a fail-safe slew bearing cannot be utilised, an auxiliary device to restrain the upper frame against separation from the pedestal should be incorporated in the event of a slew ring assembly failure.

76. Where reasonably practicable, this bearing system should be selected to give a L10 life, in accordance with BS ISO 281 or equivalent specification, in excess of the service life of the lifting equipment.

77. The slew mechanism should be rated to take account of the stresses caused by in service wind, rapid acceleration/deceleration, emergency braking, and reversal of the motion without the use of a torque-limiting device.

78. The slew mechanism should be capable of continuous rotation in both directions, unless otherwise stipulated within the lifting equipment specification.

79. Provision is to be made for periodic inspection of the slew bearing, with the method and required periodicity stipulated within the Technical Manual for the lifting equipment.

Telescope Mechanism (where applicable)

80. The nominal velocity of the lifting hook caused by operation of the telescope mechanism should be proportionally variable between the following limits:

a. Minimum (creep): No greater than 0.05 m/s in either direction.

b. Maximum: No greater than 0.5 m/s in either direction.

Travel Mechanisms

81. An audible warning device and flashing indicator warning light(s) should be provided, for operation when the lifting equipment is in travel motion.

Load Retrieval Systems

82. Load retrieval should be provided for hoist, luffing, long travel, cross travel, or slew mechanisms, as applicable. These should enable the safe and controlled movement and lowering of the load in the event of a power failure, or any other fault condition and be limited to sufficient motions for safe retrieval of the load. The systems employed are to be described in the Technical Manual for the lifting equipment.

NOTE: Manual systems are preferred, where reasonably practicable.

Limit (Position) Switches

83. Limit switches on all motions are to be fitted which cut off the power/drive, preventing over travel in any mode of operation and transgression of pre-determined operational envelope limits.

84. Operations to safety should still be possible following activation of a motion limit switch; however, thereafter, motion to danger should be inhibited.

85. When activated, a limit switch should prevent further movement to danger by restricting all motions that would result in a collision (e.g. hoist, luffing, telescope, cross travel, long travel).

86. Limit switches should not be used as an aid for normal lifting equipment operation.

87. An over-hoist limit switch to prevent the Hook Block colliding with the lifting equipment structure is to be fitted.

88. Type of Limit Switch:

a. Limit switches should comply with BS EN 60947-5-1 or equivalent specification. They should be directly actuated mechanically as described in PD 5304. Limit switches are to be connected such that the open circuit configuration relates to the limiting or more hazardous condition. Contacts used in safety circuits should be a positive break contact element coupled to a switch actuator by a positive linkage. The movement of the actuator should separate the contacts.

b. Other types of switch, including proximity switches, high safety integrity level (SIL) self-monitoring devices should be used only when the system's safety integrity will be equivalent to that achieved if using positive mechanical break limit switches and when approved by the Project Technical Authority.

c. All limit switches should, so far as is reasonably practicable, be designed to fail-safe.

Additional Limit Switches

89. Where normal operation of the lifting equipment necessitates frequent approach to the over-hoist limit, an additional operational Upper Limit Switch should be provided that operates independently and prevents impact of the hook block, lifting beam/frame and/or load with the lifting equipment.

90. Slow-down limit switches, which cause the hoist mechanism to automatically decelerate to creep speed when the lifting hook crosses pre-determined load heights, should be provided for:

a. Over-hoist.

b. Over-lower.

91. Additional limit switches should be provided restricting motions, where operation of the lifting equipment and manoeuvring of the load necessitates frequent approaches to physical obstructions and be capable of manual reset.

Lubrication

92. Provision should be made to ensure that all bearing surfaces including ball and roller bearings can be adequately lubricated for the in-service conditions defined for the specific lifting equipment.

93. Plain bearings or their shafts should have oil or grease grooves to distribute the lubricant over the bearing surfaces.

94. Lubricating nipples should be of single standard size and type and be readily accessible.

95. Where access is difficult, bearings should be of a type requiring infrequent lubrication and provided with facilities for centralised lubrication from a remote position, where reasonably practicable.

96. Sumps and oil baths should be provided with sight glasses, or another means of ascertaining oil level. Where necessary, oil, and condensation drain plugs of the magnetic type should be provided (reference PD ISO/TR 18792).

97. Hoist and luffing ropes should be lubricated using a Pressurised Rope Lubrication System. A typical device is illustrated in Fig 7.

Figure 7: Typical Arrangement of Proprietary Pressurised Rope Lubrication Device

Controls and Indicators

98. The lifting equipment should be fitted with controls and indicators as specified by the appropriate design code and/or as follows:

NOTE: Attention is drawn to PD 5304, Safe use of machinery.

a. **Location:** In accordance with best ergonomic practice, all controls and indicators should be placed so as to allow the operator when in their normal position:

   (1) Suitable and sufficient room for operation.

   (2) As far as reasonably practicable, unrestricted view of the load and all indicators.

   (3) As far as reasonably practicable, unrestricted view of the immediate surroundings.

b. **Methods of Control:** The primary method of control of the lifting equipment should be manual, but additional remote control, connected by a hard wired wandering lead, may be provided when considered necessary by the Project Technical Authority. All methods of control should be straightforward and responsive in operation.

Non-conductive Controls

99. No form of non-conductive control, that operates the lifting equipment by radio, induction, infra-red or other non-conductive means is to be used.

Type of Primary Controls

100. Primary controls for hoist, luffing, slew, cross travel, long travel and telescope, should be by individual hold-to-run hand levers and/or push buttons, for each motion.

101. Operation of the hold-to-run levers and/or push buttons should not cause operator fatigue e.

102. Direction of motion of the primary controls (hand levers):

a. Hoist, Luffing and Telescope (as applicable):

(1) Hoist raise, luff-in, and telescope-in should be by movement of the hand lever from the central stop position towards the operator.

(2) Hoist lower, luff-out, and telescope-out should be by movement of the hand lever away from the operator.

b. Slewing:

(1) Slew left should be by movement of the lever from the central stop position to the left.

(2) Slew right should be by movement of the lever from the central stop position to the right.

c. Cross Travel (where applicable):

(1) The controls should be laid out so that movement of the lever from the central position in a given direction will cause cross travel movement in that direction.

d. Long Travel (where applicable):

(1) For non-slewing lifting equipment, the controls should be laid out so that movement of the lever from the central stop position in a given direction will cause long travel movement in that direction.

(2) For slewing lifting equipment, the controls should be laid out and clearly marked so that movement of the lever from the central stop position in a given direction will cause long travel movement in a known direction.

NOTE: It should be highlighted within the Operator's Manual of the potential for becoming disorientated by slewing of the lifting equipment.

103. Primary controls and their operation should be in accordance with BS EN 60204-32.

Identification

104. All individual controls should be clearly identified by marking with either words or symbol decals to identify the functional mode of the control that the operator can readily comprehend.

105. Stop controls should be coloured red and in accordance with BS EN 60204-1 and BS 3641-1.

Pendant Controls

106. Where a Pendant Control is used, it should comply with the requirements of BS EN 13557 Cranes - Controls and control stations.

Emergency Stop Buttons

107. All lifting equipment should be fitted with Emergency Stop Buttons, clearly marked within direct and accessible reach of the operator, in the Operator's Cab and on remote control stations. The number and location of emergency stop buttons are outlined in the relevant chapters for each type of lifting equipment. These requirements should not preclude the fitting of additional emergency stop buttons in locations, when deemed appropriate to keep risks as low as reasonably practicable.

108. All emergency stop buttons are to be in accordance with PD 5304:

a. Of the 'mushroom head' type (see Fig 8).

b. Coloured red, with a yellow background.

c. Of the 'lock in' type such that the lifting equipment cannot be started until the button has been reset.

d. Un-shrouded.

e. Actuation should:

(1) Remove motive power from all motions without stopping the prime mover.

(2) Apply all braking systems including the automatic emergency brakes, within 1/10th of a second of engagement.

f. Measures are to be taken to ensure that the re-connection of power will not expose any person using the equipment to any risk to their health or safety.

g. The probability of the Emergency Stop System failing to arrest all motions is to be less than one failure in every 10,000 actuations of any emergency stop button.

Figure 8: Mushroom Head Type Emergency Stop Button

Audible Warning Device

109. A device should be fitted to all lifting equipment enabling the operator to warn of approach.

Anemometer

110. Where lifting equipment is operating outdoors, an Anemometer should be used at a suitably elevated position to gauge the prevalent wind speed. The indicator of the instrument should display the horizontal wind speed in metric units and indicate wind direction.

111. Where the wind speed exceeds the maximum allowable for the lifting equipment and/or that considered acceptable for the load, an audible and visual alarm should activate in the Operator's cab (for installed Anemometer units).

Hoist Rope Speed Indicator

112. A hoist rope speed indicator should be provided that, so far as reasonably practicable, indicates the raise or lower velocity of the load.

NOTE: An indicator that works on the principle of the operator activating/sensing speed changes by tactile means is preferred (i.e. through the hoist hold-to-run lever).

Brake Wear Indicators

113. Mechanical or electrical brake wear indicators should be fitted, on all brakes.

Load, Radius and Jib Angle Indicator

114. An Automatic Safe Load Indicator (ASLI) should be provided on relevant lifting equipment, except pendant operated Overhead Travelling Cranes, and should:

a. Incorporate radius and jib angle indicators (where appropriate).

b. Be designed and constructed to BS 7262 or equivalent specification.

c. Be provided with independent third party certification of conformity, calibration and setting data.

d. Automatically and continuously weigh the load being carried, with all loads in excess of 0.25 tonnes being weighed to an accuracy of ±5%.

115. The ASLI may be of the type that uses a programmable electronic system.

NOTE: Rated Capacity Indicator (RCI) is an equivalent term for ASLI.

Data-logging

116. A Data-logger should be supplied and configured to record the following operating data:

a. **Maintenance information:** The Data-logger should be capable of monitoring and automatically recording the following operational data as a minimum for a period of not less than 40 days, from the time that the lifting equipment was last used:

(1) Number of operating hours.

(2) Number of lifts.

(3) Average load lifted (excluding 'no load' condition).

(4) Maximum load lifted.

(5) Date at start and end of the record.

b. **Accident investigation information:** The Data-logger should be capable of monitoring and recording the following operating data as a minimum for a period of not less than 24 hours from the time that the lifting equipment was last used:

(1) Maximum load lifted and the actual time when this occurred.

(2) Maximum load vertical velocity including direction and the actual time when this occurred.

(3) Date and time at the start and end of the record.

c. The Data-logger and its associated systems should be capable of producing the above data in both hard and electronic copy formats, allowing down-load onto external devices.

d. Data-loggers should be capable of recording additional operating parameters such as currents drawn for all motions and self-monitoring data for protection devices. This information can be used for condition monitoring and life extension justifications.

Internal Combustion Engines

Internal Combustion Engines used to Power Lifting Equipment in Explosive Buildings or Areas

117. Internal combustion engines (ICE) should only be used to power lifting equipment that are continuously located within explosive buildings or areas where there is no other practical power source available.

118. Where used, ICEs are to be of the compression ignition type.

119. The Project Technical Authority should determine the categories and zoning of all areas and buildings in which the lifting equipment is to be used. This is to be undertaken, based on the nature of explosive hazard presented by the explosives contained therein, either in accordance with DSA03 OME Part 2: In-Service and Operational Safety Management of OME, DSA03 DMR, Def Stan 00-101 Part 1 & 3 or an equivalent method.

120. Internal Combustion Engines on lifting equipment for use in explosive buildings or areas, should be specified, designed, constructed, and tested in accordance with the requirements of DSA03 OME Part 2, DSA03 DMR, Def Stan 00-101 Part 1 & 3 or an equivalent method. The requirements should be appropriate to the categories and zones of all areas and buildings in which the lifting equipment will be used.

Electrical

Installations: General

121. Electrical installations should function safely for all in-service and out-of-service conditions. (Reference to be made to the appropriate parts of BS 7430, BS 7671, BS EN 13135, BS EN 13557, BS EN 60079, BS EN 60204 Pts 1 & 32, BS EN 60529 BS EN 60801 BS EN 60947, BS EN 61000 and BS EN 61340-5-1).

122. The following parameters should be considered:

a. Current capacity for normal and fault conditions.

b. Voltage drop.

c. Earthing.

d. Under-voltage.

e. Application.

f. Lightning Protection.

Installations on Lifting Equipment for use in Explosive Buildings/Areas

123. The Project Technical Authority should determine the categories and zoning of all areas, buildings and ships compartments, in which the lifting equipment is to be used. This should be undertaken, based on the nature of the explosive hazard presented by the explosives/environment contained therein, either in accordance with DSA03 OME Part 2 (particularly Chapter 8 - Safety Standards for Electrical Installations and Equipment in Explosives Facilities, and Chapter 16 - Vehicles and Mobile Mechanical Handling Equipment (MHE) in Explosives Facilities), or by an equivalent method. For ships compartments the requirements of Def Stan 00-101 Part 1 and 3, Def Stan 08-160, Def Stan 02-157, or BR 1754 should also be applied.

124. Electrical installations for lifting equipment installed or for use in explosive buildings and areas should be specified, designed, constructed and tested in accordance with the requirements of DSA03 OME Part 2. The requirements should be appropriate to the categories and zones of all areas, compartments and buildings in which the lifting equipment will be used. Due note should be taken of the requirements contained in the HSE Approved Code of Practice and guidance – Dangerous substances and explosive atmospheres (L138).

125. Electrical and electronic systems design and build should be intrinsically safe, in accordance with BS EN 60079-11 (Explosive atmospheres – Equipment protection by intrinsic safety “i”).

Control Systems

126. Control systems should be designed in accordance with the requirements of BS EN 60204-1 and 32, BS EN 60947 and IEC 61508 or equivalent specification.

127. Control systems should be designed and built to be one fault safe or better.

128. Control systems should be designed to fail-safe.

129. Control systems should be designed to eliminate the possibility of common mode failure which could lead to Uncontrolled Load Lower (ULL)/ Dropped Load (DL).

130. Where primary safety critical protection systems are Logic/Software controlled they should either be confirmed as compliant to IEC 61508 (SIL 2) or backed-up by a secondary protection system that contains a hardwired by-pass, to the logic/software system, to ensure a minimum “one fault” safe operation.

131. Equipment that forms part of the essential control system operated by firmware should be identified within the maintenance manuals with any software change being strictly controlled. An appropriate means of ensuring that there is no adverse effect on user safety and impact on the safety case should be implemented.

NOTE: Certain equipment may have firmware that is not obvious, e.g. Anemometer instrument, which may be automatically updated during calibration.

132. Type B and C systems (see JSP 975 Part 2: Code of Practice and Guidance Annex A – Electrical Control Systems) should consider the necessity for the installation of an Uninterruptable Power Supply (UPS), to ensure adequate control in the event of an electrical failure.

133. Due to security restrictions, connection to the MOD intranet and public internet is not permitted. A closed network within a facility may be considered.

NOTE: The utilisation by a Contractor of remote diagnostics to achieve expected maintenance/repair response is to be approved by the Project Technical Authority.

134. Where hardware and/or software are used for control functions, the manufacturer should operate a quality system in compliance with ISO 9001 or suitable equivalent.

135. Control systems for motion, and overload cut-out devices should automatically cut-out all motions without shock or removal of power to the prime mover, in the following circumstances:

a. Whenever a Limit Switch is actuated at:

(1) Maximum raise (Hoist).

(2) Maximum lower (Hoist).

(3) Maximum and minimum luffing, where applicable.

(4) Long Travel maxima.

(5) Cross Travel maxima.

b. In the event of the operator releasing the motion control lever or button.

c. Immediately prior to the hook block colliding with the Jib.

d. Whenever the load reaches the SWL (or WLL), or the lifting equipment specification limit.

e. If a motion is detected which is not demanded by operation of the controller.

NOTE: Only motions that permit the lifting equipment to be returned to a safe condition should remain operative.

Electromagnetic Interference and Electrostatic Discharge

Electromagnetic Compatibility

136. Electrical and electronic equipment within the motion control systems for hoist, and where applicable, luffing, slewing, cross travel, long travel, telescope, and emergency stop are to be in accordance with BS EN 61000. Systems, should also comply with the requirements of Def Stan 59-411, with respect to:

a. Conducted emissions.

b. Conducted susceptibility.

c. Radiated emissions.

d. Radiated susceptibility.

137. The equipment should be tested in accordance with Def Stan 59-411.

Electrostatic Discharge

138. Electrical and electronic equipment within the motion control systems for hoisting, and where applicable, luffing, slewing, cross travel, long travel, telescope, and emergency stop should possess sufficient immunity to electrostatic discharge, in accordance with BS EN 60801-2.

139. Electrostatic sensitive devices used in the manufacture of the equipment should be handled and protected in accordance with BS EN 61340-5-1.

Electric Motors

140. Electric motors should comply with the requirements of BS EN 13135 and BS EN 60204-1 & 32. Hoist motors are to be sized such that blocking inertias and forces are sustainable by the entire hoist load path.

Enclosures

141. Enclosures should provide suitable and sufficient protection against the lifting equipment operational service conditions. The Project Technical Authority should be cognisant of the environment in which the lifting equipment will operate, including use in explosive buildings or explosive areas on land, ship or within ship magazines.

NOTE: Attention is drawn to BS EN 60529.

142. For enclosures on lifting equipment that will be used in an explosive building or land area, but the classification of that area does not exceed that specified by DSA03 OME Part 2 requirements, the minimum degree of protection should be as per Table 4.

For enclosures on Ships, Maritime applications, or in Ship Magazines the minimum degree of Protection required by Def Stan 00-101 Part 1, 3, and 6 is to be IP65.

Description of Specific Electrical Installation	**Requirements for Minimum Protection in Accordance with BS EN 60529**	
	Parts of Installation not exposed to outdoor use or use in areas exceeding Category 'C' to DSA03 OME Part 2 Requirements	**Parts of Installation exposed to outdoor use but not used in areas exceeding Category 'C' to DSA03 OME Part 2 Requirements**
Motion and Overload cut-out devices including Limit Switches.	IP54 (Note (1))	IP65
Load, Radius and Jib Angle Indicators.	IP54 (Note (1))	IP65
Anemometer.	IP54 (Note (1))	IP65
Other Indicators.	IP44	IP55 (Note (2))
Datalogger.	IP44	IP55 (Note (2))
Primary controls for hoist and where applicable for luffing, slewing, cross Travel and long travel.	IP44	IP55 (Note (2))
Controls for Emergency Stop Systems.	IP54 (Note (1))	IP65
All other Installations, including panels.	IP44	IP55 (Note (2))

Table 4: Minimum protection - Lifting Equipment used in explosive building or area

NOTES

(1) IP55 should be considered, where feasible.

(2) IP56 should be considered for parts of installations subjected to particularly onerous environments such as heavy sea spray.

143. For lifting equipment enclosures that will not be used in explosive buildings or areas, the minimum degree of protection should be as per Table 5.

Description of Specific Electrical Installation	**Requirements for Minimum Protection in Accordance with BS EN 60529**	
	Parts of Installation not exposed to outdoor use or use in areas exceeding Category 'C' to DSA03 OME Part 2 Requirements	**Parts of Installation exposed to outdoor use but not used in areas exceeding Category 'C' to DSA03 OME Part 2 Requirements**
Motion and Overload cut-out devices including Limit Switches.	IP54 (Note (1))	IP65
Load, Radius and Jib Angle Indicators.	IP54 (Note (1))	IP65
Anemometer.	IP54 (Note (1))	IP65
Other Indicators.	IP44	IP55 (Note (2))
Datalogger.	IP44	IP55 (Note (2))
Primary controls for hoist and where applicable for luffing, slewing, cross Travel and long travel.	IP44	IP55 (Note (2))
Controls for Emergency Stop Systems.	IP54 (Note (1))	IP65
Electric motors.	IP33	IP55 (Note (2))
Resistors.	IP31	IP55 (Note (2))
All other Installations, including panels.	IP44	IP55 (Note (2))

Table 5: Minimum protection - Lifting Equipment not used in explosive building or area

NOTES

(1) IP55 should be considered, where feasible.

(2) IP56 should be considered for parts of installations subjected to particularly onerous environments such as heavy sea spray.

144. The applied cable entry method for incoming cables and circuits should not impair the degree of protection of the enclosure.

Radio Interference

145. Provision should be made to prevent power units (where applicable) and electrical equipment giving rise to radio interference, in accordance with ISO 13766-1.

146. For ship borne lifting equipment, Radiated Emissions need to meet the requirements of Def Stan 59-411.

Hydraulic Equipment and Systems

147. Hydraulic equipment and systems should be specified, designed, constructed, and commissioned in accordance with BS ISO 4413, Def Stan 02-324 or equivalent specification.

148. For ship borne lifting equipment, or those in Magazines, the requirements of Def Stan 00-101 Part 1, 3, and 6 are to be met.

149. Fire-resistant hydraulic fluids, appropriate to the fire hazards present within the buildings and areas where the lifting equipment operates are to be used.

150. The hydraulic system should be designed to limit the possible loss of oil to the environment with appropriate bunding, capture and draining systems built into the equipment.

Pneumatic Equipment and Systems

151. Pneumatic equipment and systems should be specified, designed, constructed, tested and commissioned in accordance with BS ISO 4414 or equivalent specification.

152. For ship borne lifting equipment, or those in Magazines the requirements of Def Stan 00-101 Part 1 and 6 are to be met.

NOTE: Pneumatic equipment and systems are non-preferred unless necessary for magazine safety. Project Technical Authority approval must be obtained before installation.

Documentation

153. Documentation should be supplied, recording the ‘As Commissioned’ standard of the lifting equipment.

Technical Manuals

154. Technical Manuals and detailed schedules are to contain all relevant documentation pertaining to the design specification, in accordance with the relevant Supply regulations. The manuals and schedules should provide suitable and sufficient detail for the safe installation/assembly (as required), operation and planned periodic maintenance of the lifting equipment. Due consideration should be given of the hazards pertaining to the loads to be lifted. The documentation should also clearly identify those components that are not ‘one fault safe’ and in the event of failure could result in an uncontrolled motion. Digital manuals are to be supplied in accordance with BS ISO 21600.

155. The Technical Manuals supplied for lifting equipment equipped with software based control systems, should contain information which fully describes the function and operation of the programme, including fault finding protocols, fault code definitions and reset procedures.

156. All procedures documented in the Technical Manuals and specifically operation and maintenance procedures should be one fault safe or better.

Charts and Schedules

157. The lifting equipment should be either clearly marked with the Rated Capacity (SWL or WLL) or be supplied with a Load Chart representative of its lifting capacity and operational envelope.

158. Schedules detailing operator periodic checks are to be supplied and should be available in a readily accessible location for the Operator.

Technical Drawings

159. A set of drawings (BS 5070-1) and associated component lists should be provided which include:

a. A general arrangement drawing.

b. Assembly drawings.

c. Sub-assembly drawings.

d. Item lists which include, as appropriate, item quantities, item part numbers, sub-assembly part numbers, descriptions, specifications and any proprietary item manufacturer references, necessary to fully identify the original equipment.

e. Wiring and Schematic diagrams.

f. Drawing packages in both hard and electronic copy formats. The exact format is to be agreed with the Providing Authority. A minimum of three copies of any file should be provided.

NOTE: Circuit symbols should be drawn in accordance with IEC 60617.

g. Wiring schedules and lists.

h. Hydraulic circuit diagrams (where appropriate).

i. Pneumatic circuit diagrams (where appropriate).

j. Lubrication diagrams.

Performance Statement

160. A statement is to be made upon handover of the ‘As Commissioned’ performance of the lifting equipment, including confirmation of the Rated Capacity (SWL or WLL) or Load Chart duties, by the Contractor to the Project Technical Authority.

Supporting Documentation

161. Supporting documentation not specified herein but stipulated within the lifting equipment design specification should be retained within the equipment file, such as safety device verification.

Illustrated Spare Parts Lists

162. A complete, illustrated, spare parts lists should be provided and supplied in either hard copy or electronic format, as per the technical drawings above.

Configuration Control

163. The lifting equipment manufacturer should operate a configuration management control system for software changes, in accordance with ISO 9001 or suitable equivalent.

Testing

164. Where the strength and stability of lifting equipment (either newly supplied or an existing equipment item moved to a new location) depends on installation and/or assembly subsequent to supply, a suitable and sufficient load test (as per manufacturer's specification), followed by a thorough examination, should be carried out prior to being put into service.

165. Additional tests are to be undertaken on lifting equipment used in explosive buildings or areas. These tests are to be in accordance with the requirements of DSA03 OME Part 2 or equivalent methods appropriate to the highest category or zone of the area(s) in which the lifting equipment is to be used.

166. Where the lifting of a conventional armament is to be classified as a Nuclear Lift (over or in close proximity to nuclear facilities), the lifting equipment should have its own Nuclear Safety Case suite of documentation to ensure that sufficient consideration has been given to protect against the consequences of a dropped load. It will be subjected to a Nuclear Test Lift, with an applied test load of 110% of the heaviest Nuclear Lift to be undertaken. This should not exceed the SWL (or WLL) of the lifting equipment.

Test Procedure and Results

167. A procedure should be prepared and approval to proceed granted, by the Project Technical Authority, before undertaking any test(s). The procedure should clearly identify the attributes required of the lifting equipment, including pass/fail criteria.

168. The test results should be formally recorded in detail and provided to the Providing Authority on completion of testing, in support of single certification.

NOTE: A Test Certificate or Declaration of Conformity alone does not satisfy this requirement.

169. Tests should be undertaken under the control of a competent person (assessor), and on satisfactory completion, a test certificate is to be supplied detailing the performed test(s).

Marking

170. Subsequent to third party assessment and Project Technical Authority approval and confirmation, lifting equipment complying with this document should be prominently and permanently marked with the following information:

a. Markings required by the design specification for the particular lifting equipment concerned.

b. The build Standard or equivalent Specification reference relating to the particular lifting equipment concerned.

c. The term 'JSP 975' and the specific level of compliance as per the classifications, in Table 2.

d. Markings for ship board equipment, in accordance with BR 3027 to be included, where necessary.

f. The Armaments Rated Capacity specified upon the Data plate, together with the SWL (or WLL) where the lifting equipment also undertakes general lifting duties.

4 Lifting Equipment for Handling Nuclear Armaments – General Requirements

General

1. Lifting equipment used for handling nuclear armaments should meet the requirements, as stated in JSP 975 Part 2: Code of Practice and Guidance Annex L, Parts 1, 2 and 3, in conjunction with the additional requirements given in the following. This chapter specifies general design requirements and features intended to enhance the integrity and reliability for nuclear armament handling.

2. The acceptability of the design specifications for lifting equipment handling Nuclear Armaments will ultimately be judged through provision of a suitable and sufficient safety case. The scope and contents of such safety cases will be guided by reference to appropriate safety principles with the acceptability of the safety case being judged by the Nuclear Weapons Regulator.

3. The following includes guidance as to the minimum criteria for consideration when formulating the requirements for lifting equipment predominantly used for handling nuclear armaments. This is not to be considered as set definitive of requirements, as all relevant stakeholders will be responsible for ensuring that the necessary criteria for their specific purpose have been satisfactorily identified. Stakeholders, in conjunction with the nuclear regulator, will then agree the requirements for the facility that will enable compilation of the technical specification.

Specification

4. The Project Technical Authority is responsible for investigating and defining any special conditions that may need to be taken into account in the preparation of the technical specification.

5. The following criteria should be supplied; however, this is not to be considered definitive and it remains the responsibility of the Project Technical Authority to provide all necessary technical information in respect of Lifting Equipment, including:

a. Service life.

b. Classification (BS EN 13000 & BS EN 13001 as applicable).

c. Class of utilisation of the structure (BS EN 13001 & BS 2573).

d. Class of utilisation of each mechanism (BS EN 13001 & BS 2573).

e. Average number of operating cycles per year.

f. Average number of Nuclear Armament Test lifts per year.

g. State of loading of the structure (BS EN 13000, BS EN 13001 & BS 2573: Pt 1).

h. State of loading of each mechanism (BS EN 13000, BS EN 13001 & BS 2573: Pt 2).

i. Impact factor (BS EN 13001 & BS 2573: Pt 1).

NOTE: Alternatively, a theoretical impact factor relating to the specific build requirements can be submitted with appropriate justification for approval by the Project Technical Authority.

j. Duty factor (BS EN 13001 & BS 2573: Pt 1).

k. Service conditions (indoor or outdoor use).

l. Group classification of each mechanism (BS EN 13001, BS EN 13000 & BS 2573: Pt 2).

m. Site (geographical location).

n. Maximum non-armament load to be lifted (excluding test weights).

o. Maximum nuclear weapon load to be lifted.

NOTES

(1) For group classification of mechanisms, attention is drawn to BS 2573: Part 2: Clause 8.5 which states, 'When a hoisting appliance is used for dangerous handling operations (e.g. molten materials, highly radioactive or corrosive products, etc.) the choice of ropes and winding diameters should be based on the mechanism group next above that of the mechanism concerned, and only groups M5 to M8 inclusive should be used. For a mechanism that is classified in group M8, the choice of ropes and winding diameters should be based on group M8'.

(2) The classes of utilisation should only include additional testing requirements should the lifting equipment be subject to low usage.

Safe Working Load and Application of the Armament Rated Capacity (ARC)

6. The lifting equipment safe working load should be appropriately defined for the required lift, having applied the ARC requirements:

a. Where subjected to Nuclear Armament Test Lifts, the lifting equipment applied test load should be at least 125% of the heaviest nuclear armament, to verify mechanism functionality.

b. Where lifting equipment is not to be used exclusively for nuclear armament lifts, it may be possible to establish a second (higher) SWL (or WLL) for conventional armament lifts, in agreement with the Project Technical Authority.

NOTE: Attention is drawn to the necessity of providing safe load indication and warning of overload for each lifting mode, for certain nuclear armaments and conventional armament storage facilities.

c. Where two SWLs (or WLLs) are established, the duty to handle conventional armaments should be clearly differentiated, marked and discernible to the operator, in order to maintain the safety of the nuclear armament lifts.

Design and Manufacture

7. The lifting equipment is required to be of high integrity design with high availability and reliability. The design should be such that all components and systems essential for the security of the load will have either load path redundancy or protection. Where these approaches cannot be achieved by a practicable method, a conservative design approach should be followed to ensure enhanced safety.

8. Load path redundancy can be provided by duplication of assembly on condition that:

a. Each load path is capable of maintaining full load, and any transitional fault loads, resulting from single load path failure or other fault condition.

b. A system for the detection of a single load path failure is provided.

c. The load drop and fault load conditions are fully complied with.

9. Protection of the load path is to be verified on the basis of:

   a. Sufficient reliability data for the protection and recovery systems being provided.

   b. Load drop and fault load conditions specified within the functional requirements of the safety case being fully complied with.

10. Where reasonably practicable the components of lifting equipment should be of proven design.

Service and Out-of-Service Conditions

11. Unless otherwise stated by the Project Technical Authority, lifting equipment should be designed for the environment, in conjunction with the following additional 'Fault/Hazard Condition' requirements, for the lifting of nuclear armaments.

Seismic Loads

REDACTED contact Defence Functional Authority - DES EngSfty-EG DefAuth-Pol

Wire Ropes

27. The minimum factor of safety for ropes should be 6:1. For lifting equipment with load path redundancy or protection, the minimum factor of safety for ropes is to be 6:1 for each load path.

Braking Systems

28. Service and standby brakes should be provided for each hoist motor. The service brake may be located between the hoist motor and the hoist gearbox; however, the standby brake should be located on an extension to the first motion pinion shaft on the opposite side of the gearbox. Where the design of the hoist mechanism is such that it will prevent an uncontrolled drop of the load, a standby brake may not be required.

29. Standby brakes should release simultaneously with service brakes, but should be fitted with a time delay to apply them automatically, marginally after the service brake.

30. Automatic emergency brakes should be provided on main and auxiliary hoists, in addition to service brakes.

Automatic Emergency Brakes

31. The Automatic Emergency Brakes should comply with the requirements for 'Automatic Emergency Brakes' section contained in JSP 975 Part 2: Code of Practice and Guidance Annex L, Part 3, including the following:

   a. They should be held in the off position during normal lifting equipment operations, but should be applied when the hoist malfunctions.

   b. Automatic emergency brakes are to be located on the rope drum(s). During creep speed operation, the speed detection device should automatically reset to operate at not more than 15% of full speed.

   c. Suitable interlocks should be fitted to ensure automatic emergency brakes are in the 'Service Condition' before the hoist motion circuit can be made operative.

   d. Automatic emergency brakes should be capable of independently arresting the test load over a maximum distance of 75 mm from the time the brake is automatically actuated, without excessive shock.

e. Automatic emergency brakes should be fitted with a time delay to apply them automatically, marginally after the service brake.

Hoist and Luffing Mechanisms

NOTE: The following paragraphs are only applicable to Luffing mechanisms where fitted.

32. The control system is to measure the differential between drum rotational speed and motor speed, and activate an alarm when this exceeds safe limits for both normal and creep speed, as predetermined by the Project Technical Authority.

33. A device is to be incorporated to verify the hoist motion operates in the direction selected by the operator.

34. To reduce the risk of rope damage, a device should be fitted to each rope drum to detect if the rope is correctly paying on to the rope drum.

35. Cut-out devices should be fitted which automatically arrest the hoist and luffing motions of the lifting equipment, where the SWL (or WLL) is exceeded by 10%, at the particular operational radius, where applicable. The design should enable the lifting equipment excessive load-radius to be brought back to within the operational envelope.

36. The hoist drum should be provided with structural or mechanical safety devices to limit its displacement and prevent it from disengaging from, or rendering inoperative its emergency brake system, should the drum shaft or bearings fail or fracture.

Load, Radius and Jib Angle Indicator

37. Lifting equipment supported by a safety case and very high load retention reliability (defined within the supply specification), should incorporate two diverse ASLI systems.

Slew Mechanism

NOTE: The following paragraphs are only applicable where slew mechanisms are fitted.

38. The nominal horizontal slewing velocity at the jib head (at a maximum working radius) should not exceed 0.83 m/s.

39. The minimum (creep) horizontal slewing velocity (at a maximum working radius) should not exceed 0.083 m/s.

40. The slew ring should incorporate one of the following:

a. An auxiliary device to restrain the upper frame against separation from the superstructure, in the event of slew ring assembly failure. The properties of materials employed in design and manufacture of the auxiliary device should be selected to resist fracture under impact loading.

b. Alternatively, the slew ring is to be constructed of a material having an average Charpy - V notch value of 42 J (joules) minimum. Three specimens are to be tested with no specimen having a Charpy - V notch value of less than 27 J (joules). Charpy testing should be carried out with the specimens at -20°C.

c. The design criteria of the slew ring assembly, including fastenings, should be the maximum calculated stress, with a load of 3.75 times the SWL (or WLL), being equal to or less than the material’s specified minimum Ultimate Tensile Strength.

Travel Mechanism

NOTE: The following paragraphs are applicable where Travel Mechanisms are fitted.

41. The nominal carriage velocity should be variable between the following limits:

    a. Minimum (Creep): no greater than 0.005 m/s in either direction.

    b. Maximum: No greater than 0.1 m/s.

42. Provision should be made for the prevention of crabbing between the end carriages and bogies, especially when the lifting equipment may be subjected to external weather conditions.

43. The system should incorporate closed loop speed control to ensure smooth acceleration between speeds.

Limit (Position) Switches

44. Multiple limit switches should be provided as inputs to the control system. See also the ‘Electrical’ sub-section ‘Redundancy’.

45. Limit switches should not be in the operated position during periods of non-use.

Controls and Indicators

Emergency Stop Buttons

46. The emergency stop system should be designed and constructed to be one fault safe.

Brake Wear Indicators

47. Multiple brake wear indicators should be provided as inputs to the control system. See also the ‘Electrical’ sub-section ‘Redundancy’.

48. The brake wear indication system should be designed and constructed to be one fault safe.

Electrical

Control Systems

49. The electrical control systems for High Integrity handling systems should be one fault safe.

50. Control systems should be either Electrical (Type A) or Electrical/Electronic (Type B) (see Glossary definitions of ‘Electrical Control Systems’ Type A, Type B and Type C). A combination of categories can be used.

NOTE: Type C control systems are non-preferred.

51. The control system should be designed to take into consideration all pertinent aspects for compliance with the following:

a. BS EN 13849-1 which requires the designated architecture design for systems from Category B to 4 and further requires that systems defined as ‘One Fault Safe’ are considered as follows:

(1) The system behaviour for a category 3 within table 10 of BS EN 13849-1 identifies that ‘some, but not all faults will be detected’. It further identifies that ‘accumulation of undetected faults can lead to the loss of the safety function’.

(2) Category 4 systems are identified where ‘the faults will be detected in time to prevent the loss of the safety function’. Annex F of the standard ‘Estimates for Common Cause Failure (CCF)’ makes reference to IEC 61508-6 and further identifies a ‘scoring process and quantification of measure against CCF’. This includes identification of the ‘first channel programmable electronic and second channel hardwired’.

(3) The minimum requirements of the control system design should be to IEC 61508, SIL 2 or relevant equivalent where logic/software is used.

Component Reliability

52. To improve the reliability of electrical systems, selection of components should be based on a process of enhanced rating. The operating and environmental stress levels that will be ‘experienced’ by each component are to be reduced, with component selection and enhanced rating being compatible with the following operating and environmental stress level reduction factors:

a. Fixed Resistors – 80% rated power dissipation

b. Capacitors – 75% rated working voltage, 85% rated ripple current

c. Transformers – 80% VA load rating

d. Rectifier Diodes – 50% VRRM

e. Linear ICs – 80% rated max supply volts, 85% rated current

f. MOS Digital ICs – 80% rated max supply volts, 80% fan out

g. Relay Contacts – 50% max rated switching current for type of load being switched

h. Switches – 50% max rated switching current for type of load being switched

Burn In

53. Burn in of electrical components should be carried out to detect and remove infant mortality in components.

Component Life

54. The Design Authority should consider the necessity and required schedule of replacement of items with limiting service life.

Redundancy

55. The design of systems employing redundant limit switches, sensors or inputs for interlocks should incorporate the diversity and/or redundancy necessary to meet the levels of integrity determined by the overall Availability, Reliability and Maintainability (ARM) requirement.

Environmental Testing

56. All electrical and electronic equipment, whether designed for indoor or outdoor use, should be environmentally tested in accordance with BS EN 60068. The Project Technical Authority should specify applicable tests and their level of severity.

57. Seismic testing of electrical and electronic equipment should be as outlined in BS EN IEC/IEEE 60980-344.

Hydraulic Equipment

58. Suitable redundant sensors are to be provided to inform the control system of faults within the hydraulic system. The following parameters should be monitored:

a. Over temperature.

b. Low level reservoir.

c. Low pressures when on load.

d. Contamination/filter blockage.

Pneumatic Equipment and Systems

59. Suitable redundant sensors are to be provided to inform the control system of faults within the pneumatic system. The parameter to be monitored being ‘Low pressure when on Load’.

Manufacture

Material Requirements

60. The Contractor should submit, with their tender, a preliminary list of materials proposed for use in the equipment. The Contractor should confirm this list prior to the start of manufacture. Any change of material from the tender should be justified and subjected to approval by the Project Technical Authority.

61. When choosing materials, consideration should be given to the environmental operating conditions. Materials to British Standards are preferred, with recognition taken of the requirements of:

a. BS EN 13000, BS EN 13001 or BS EN 14985 depending on the type of Lifting Equipment.

b. BS 2573: Part 2: Clause 8

c. BS 2573: Part 1: Clause 4.1 and Clause 4.2

62. All gears, couplings, rail wheels and axles should be manufactured from forged steel.

63. Brake drums should be manufactured from forged steel showing a minimum hardness of 200 BHN (Brinell) with the braking surface finished smooth and polished to between Ra 0.4 to Ra 0.8.

64. Materials of construction should not be contaminated by incompatible materials, which could affect either their properties or the integrity of the component.

65. All material should be new and no repaired material should be used in the manufacture.

66. No cast iron or cast steel material should be used for any components in the hoist drive train. Their use elsewhere is permitted only with approval by the Project Technical Authority.

Material Testing Requirements

67. All materials used for items in the main load path should be subject to full testing, to demonstrate compliance with the relevant standards, as per the specification.

68. All plate material used in load carrying components should undergo chemical analysis. Tensile and impact tests from each end of the individual plate should be taken, one set in line of rolling and one set at 90° to the rolling line.

69. Rolled steel sections and bars (including material for nuts and bolts) should undergo chemical analysis. Tensile and impact tests at each end of the bar should be taken in the direction of rolling.

70. All forgings and steel castings should undergo chemical, tensile and impact tests. The Charpy - V notch acceptance criterion should be 34 J (joules) minimum (average). No individual value should be less than 75% of the minimum average and 0.5 mm lateral expansion at a test temperature of -18°C, unless otherwise specified in this publication.

71. Additionally, test specimens for the main hoist hook should be taken from an extension to the shank of the hook forgings. The length of the extension should be sufficient to accommodate the following requirements:

a. Test coupons should be taken so that the specimens have their longitudinal axis at least one quarter ‘t’ from any surface, and the mid length of the specimen is at least ‘t’ from any second surface (‘t’ being the maximum heat treated thickness or the ruling section, whichever is the greater). The extension for specimens should be identified before removal from the forging.

b. A thermal buffer may be used to achieve these conditions. Materials should be removed for testing after all forging and heat treatment is completed.

c. There should be three test specimens for Charpy impact test to BS EN ISO 148-1, and two test specimens for tensile test to BS EN ISO 6892-1.

d. Proof loading of the hooks should be conducted in accordance with BS EN 1 3001-3-5, BS 2573: Part 2. The proof load should be the full rating of the hook or the worst case fault load plus a designated margin, whichever is the greater.

Rope Testing

72. Ropes should be tested to provide the following data:

a. Breaking load and torsion to BS EN 10264-3.

b. Elongation and yield load.

c. Graphical representation of load to extension from zero to failure.

d. Chemical analysis.

e. Defects record.

f. Heat treatment record.

73. A set of test specimens should be taken from each end of each individual rope and identified on the test certificate.

74. The rope attachment at each end of the ropes should be tested with the rope and to the same proof load.

75. Acceptance standards for defects should be in accordance with BS ISO 4309.

Plate Material and Wrought Sections

76. Plate (greater than 6mm in thickness) material and wrought sections should be ultrasonically examined by the straight beam method in accordance with the requirements of BS EN 10160, together with the following requirements:

a. Scanning patterns for materials to be used in the manufacture of items in the main load path should be such as to ensure 100% volumetric cover.

b. All components should be scanned with the first ‘back wall echo’ adjusted to full screen height.

c. All indications exceeding 50% of the reduced ‘back wall echo’ at the same location, and all areas producing a 50% or greater loss of ‘back wall echo’ should be recorded for assessment as discontinuities.

d. Any single discontinuity exceeding 300 mm^2 with a minimum length of 35 mm and a minimum width of 15 mm should be considered relevant. The maximum allowable imperfection area should be no greater than 1000 mm^2 and there should be no more than ten (10) areas of between 300 mm^2 and 1000 mm^2 in any 1 m x 1 m area.

e. BS EN 10160, Class S_2, should be considered as being the testing methodology and basic acceptance standard for plate material.

f. Any indication showing a measurable through-thickness dimension in any plate or wrought section is unacceptable.

g. Plate material and wrought sections should be cut so that significant parent material defects, which could affect the strength of welded joints, do not occur in the weld preparation areas. This requirement is particularly important to the uncut components of tee butt welds.

Wrought Sections

77. Wrought steel sections should be subject to 100% magnetic particle inspection, in accordance with BS EN ISO 9934-1. The following should be unacceptable:

a. Any linear indication greater than 3 mm in length.

b. Four or more indications greater than 1.5 mm positioned in a line and separated by 1.5 mm or less edge to edge.

c. Ten or more indications greater than 1.5 mm in any 4,000 mm^2 area whose major dimension is no greater than 150 mm.

d. Any lapping or cracks.

Forged Material

78. All forged material should be ultrasonically tested, in accordance with the requirements of BS EN 10228-3. This should be by using a 3 mm Side Drilled Hole (SDH) Distance Attenuation Curve (DAC) for angle probes, and a 3 mm Flat Bottom Hole (FBH) DAC for 0 probes, as the reference sensitivity.

a. The following conditions should be unacceptable:

(1) Any non-planar defect.

(2) Any flaw which gives a signal in excess of the reference sensitivity.

b. All forged material should be subject to 100% magnetic particle inspection, in accordance with BS EN ISO 9934-1. The acceptance criteria for wrought sections should be applied, with exception for hooks, where all linear indications should be unacceptable.

c. Hooks should be subject to magnetic particle inspection, in accordance with BS EN ISO 9934-1 at the following stages:

(1) Rough machined forging.

(2) Finished machined forging.

(3) After proof load testing.

Bar Material

79. Bar material, including material for bolts, studs and nuts, in excess of 50 mm diameter should be ultrasonically tested, in accordance with the requirements of BS EN 10228-3 and the criteria as stated in Para 78 above, regardless of whether forged, rolled or drawn.

80. Bars forming structural steel components, bolts, nuts and studs in excess of 25 mm diameter, should be subject to 100% magnetic particle inspection, in accordance with BS EN ISO 9934-1 and the criteria as stated in Para 77 above, for wrought sections.

Non-destructive Examination Qualification

81. All non-destructive examination (NDE) personnel should be trained to a nationally or internationally recognised scheme, minimum qualification level, e.g. the British Institute of Non-Destructive Testing (BINDT) – Personnel Certification in Non-destructive Testing

(PCN Level 2) or the American Society for Non-destructive Testing (ASNT) – Personnel Qualification and Certification in Non-destructive Testing (SNT-TC-1A Level II).

Reporting

82. The Contractor or their designated sub-contractor should prepare a report for each non-destructive examination carried out. All reports should, as a minimum, contain the following information:

a. All procedural, equipment, and calibration parameters should be identified sufficiently to provide a basis for comparison with later examinations, including the date of the test and the name(s) of the operator(s).

b. A marked-up drawing indicating the weld or examined part, the item or piece number, the datum points and co-ordinate conventions used for locations and other identification information deemed necessary.

c. A record of all recordable ultrasonic indications, their maximum obtained amplitudes, their location within the part, and their size or extent, presented in sufficient detail to permit evaluation.

d. A record of the repair areas, including locations, size, and the results of the final examinations of the repair areas.

Welding

83. All welding symbols should comply with BS EN 499-1.

84. All welding processes should comply with BS EN 1011-1 & 2.

85. All welding procedures should be to BS EN ISO 15614-1 and submitted for approval to the Project Technical Authority prior to commencement of manufacture.

86. All welders should be qualified, in accordance with BS EN ISO 9606-1 (Steel) and, where applicable, BS EN ISO 9606-2 (Aluminium).

87. All welds are to be ground to enhance fatigue life using a small wheel parallel to the major axis of the weld. The minimum radius of wheel form should be 10 mm.

Inspection of Welds

88. Where stress relieving is specified, all non-destructive testing (NDT) should be performed after stress relieving. Butt welds should be 100% visually examined, as recommended by BS EN ISO 17637; 100% radiographically and have 100% Magnetic Particle Inspection (MPI) for steel. Where radiography is impractical, this should be substituted with ultrasonic inspection. All fillet welds should be 100% visually examined as recommended by BS EN ISO 17637; and receive 100% MPI for steel.

Butt weld specific requirements include:

a. Radiography of structural butt welds should be carried out, in accordance with BS EN ISO 17636-1 & 2, as relevant to the material thickness. The required technique should be specified by the Contractor and approved by the Project Technical Authority.

b. Radiography should be carried out to BS EN ISO 17636-1 & 2, for circumferential butt joints in steel pipework. The required technique should be specified by the Contractor and approved by the Project Technical Authority prior to use.

89. Ultrasonic testing should be carried out in accordance with BS EN ISO 17640.

90. Acceptance levels for visual inspection and NDT should be in accordance with:

    a. Radiography – BS EN ISO 10675-1 (Steel) & BS EN ISO 10675-2 (Aluminium)

    b. Ultrasonic – BS EN ISO 11666

    c. MPI – BS EN ISO 23278

    d. Penetrant – BS EN ISO 23277

91. No rectification, repair, or modification of structural welds, due to defects, should be undertaken, without the approval of the Project Technical Authority.

Documentation

92. Supporting documentation should include a Spares Policy Document, based on a critical items list, special to type and long lead parts and probability of obsolescent items.

93. Software documentation should be in accordance with BS ISO/IEC/IEEE 26531, IEC 61508 and Def Stan 00-600, where applicable.

Traceability and Certification

94. Full traceability records (via certificates, inspection reports, cutting sheets or drawings and testing reports) for all permanent materials should be provided.

Technical Manuals

95. Software Technical Manuals should be in accordance with BS ISO/IEC/IEEE 26531 and Def Stan 00- 600, where applicable. Technical Manuals for software systems should be in accordance with BS ISO/IEC/IEEE 26514.

Critical Sensor Check Verification

96. Where the single fault control system incorporates multiple sensors for redundancy, periodic checks should be undertaken for correct operation of the sensor with results appropriately recorded.

Quality

97. Organisations undertaking equipment supply are to be third party assessed and accredited by the United Kingdom Accreditation Service (UKAS), to the requirements of ISO 9001. Where software forms part of the supply, Software Quality Management should be included under the requirements of the ‘TickIT’ scheme.

98. A Contract Quality Plan (programme) should be supplied to the Project Technical Authority for approval. A draft version of the Quality Plan should be included in the Contractors proposal, with a formal version provided within four weeks of the contract let. The Quality Plan should include a review and reissue schedule.

Availability, Reliability and Maintainability (ARM)

Service Life

99. The overall service life and period between major overhauls of the lifting equipment is to be as documented within the Technical Specification, as agreed with the Project Technical Authority.

Usage

100. Lifting equipment will be required to operate a number of lifts per year, which include nuclear armament lifts, nuclear lifts, conventional armament lifts and non-explosive lifts (Refer to JSP 975 Part 2: Code of Practice and Guidance Annex E for the recording of the number of each type of lift).

101. In addition, during an operational duty period of eight hours, the lifting equipment will be required to be in a continuous standby state and operate a minimum of 50 lifting cycles.

Notice for Use

102. The time required to bring the lifting equipment to full operational use should not exceed:

a. 45 minutes from a non-operational state.

b. 10 minutes from a standby state.

Availability

Intrinsic Availability

103. For its service life, at the defined usage rate and during an operational duty period of eight hours (i.e. not undergoing corrective maintenance), the lifting equipment should have a probability of Intrinsic Availability greater than 99.5%, unless otherwise stated by the Project Technical Authority.

Reliability

Reliability - Catastrophic Failures

104. Unless otherwise stated by the Project Technical Authority, for its service life and at the defined usage rate, the probability of a catastrophic failure occurring during a five minute lifting cycle, should not exceed the Safety Case's overall probability of failure target. The duration of five minutes for the lifting cycle is to be used for the purposes of reliability calculation only.

Reliability - Operational Failures

105. Unless otherwise stated by the Project Technical Authority, for its service life and at the defined usage rate, the probability of an operational failure occurring during a five minute lifting cycle should not exceed the overall Safety Case's probability target. The duration of five minutes for the lifting cycle is to be used for the purposes of reliability calculation only.

Maintainability

Corrective Maintenance - Control System and Bolt-on Assemblies

106. The mean active time to repair the equipment, after a failure has occurred, using specified procedures and resources should be no greater than 1 hour.

107. The maximum (95th percentile) active time to repair the equipment, after a failure has occurred, using specified procedures and resources should be no greater than 4 hours.

Corrective Maintenance - Mechanical/Structure

108. The mean active time to repair the equipment, after a failure has occurred, using specified procedures and resources should be no greater than 4 hours.

109. The maximum (95th percentile) active time to repair the equipment, after a failure has occurred, using specified procedures and resources should be no greater than 12 hours.

Preventive Maintenance

110. A design aim for the lifting equipment is to minimise the need for any preventive maintenance during an operational duty period of eight hours. Any preventive maintenance required during the period of operational duty should be classified as downtime.

Availability, Reliability and Maintainability Programme Plan

111. The ARM requirements are to be the subject of an ARM Programme Plan in accordance with Def Stan 00-40 and should include details of the ARM verification and demonstration programme.

112. The maintainability demonstration should be in accordance with Def Stan 00-42 Part 6.

Safety

113. The principal objectives of the safety programme for the design and construction of the lifting equipment are as follows:

a. The requirements of Def Stan 00-056 should be met.

b. Hazards are to be identified, evaluated and either eliminated or reduced to an acceptable level of risk in accordance with the requirements of Def Stan 00-056 together with BS 8444-3 and BS EN ISO 12100.

114. Where lifting equipment is to be controlled by safety critical software, the software should be produced in accordance with BS ISO/IEC/IEEE 26514, BS ISO/IEC 90003, IEC 61508 or exhibit equivalent reliability. The safety plan should include a justification statement as to why the software is safety critical, or not as appropriate.

115. The Contractor should submit a detailed Safety Management Plan, in accordance with Def Stan 00-056, as part of the tender response.

116. Where not defined by legislation or a safety authority (e.g. Nuclear Installations Inspectorate, Health and Safety Executive), the Contractor should identify in the Safety Plan, appropriate safety targets or risk criteria which can be met or bettered. Against these, the safety of lifting equipment should be assessed. During the contract phase, these should be agreed in accordance with the requirements of Def Stan 00-056, together with BS 8444-3 and BS EN ISO 12100.

117. All structural calculations should be submitted to the Independent Safety Auditor (as defined in Def Stan 00-056) for checking and to ensure adequate safety margins exist.

118. The Contractor should submit with their tender the cost of the safety element as an individual identified article. This should be broken down to show the Independent Safety Auditor the cost associated with an individual item.

119. To verify that Safety Case target probabilities of failure are met, a HAZOP, or other appropriate risk analysis as directed by the Project Technical Authority, should be undertaken on the lifting equipment.

120. Should any Contractor be non-compliant in any area of the above safety requirements, they should propose an alternative, a justification for that alternative, and the cost benefits to the customer. This should be detailed in the Safety Plan.

121. Where required by Def Stan 00-056, the Contractor (Design Authority) should appoint an Independent Safety Auditor in accordance with Def Stan 00-056.

Test and Inspection

Testing

122. Where lifting equipment is to be used exclusively for nuclear armament lifts, then it should be subjected to Nuclear Armament Test Lifts throughout its service life. Where lifting equipment is not to be used for nuclear armament lifts exclusively, Nuclear Armament Test Lifts will only be undertaken prior to a nuclear armament lift.

NOTE: Suppliers should note such testing may significantly increase the number of operating cycles of the lifting equipment, with the consequence that the fatigue stresses and service life expectation, as defined in BS EN 13001, BS 2573 or BS 7608, may be adversely affected.

123. Subsequent to a Nuclear Armament Test Lift, lifting equipment should be thoroughly examined in order to ensure that the test has not incurred damage. Procedures used are to be compiled in agreement between the Competent Person (Assessor) and the Project Technical Authority.

Reliability Demonstration

124. The Contractor should detail a Reliability Demonstration to be performed on the lifting equipment prior to acceptance. The demonstration should be carried out on the system after the completion of all testing and setting to work activities and not commence until the complete system is fully operational with no known defects.

125. Test plans given in Def Stan 00-40 are the preferred methodology for conducting the reliability demonstration.

126. Should the system fail the Reliability Demonstration, the Contractor should carry out, at their cost, remedial work, acceptance trials and a further demonstration to establish compliance with the reliability requirements.

127. The Project Technical Authority will reserve the right to demand the full Reliability Demonstration be restarted with any new system configuration.

Maintainability Demonstration

128. The Contractor should detail a Maintainability Demonstration to be performed on the lifting equipment prior to acceptance. The demonstration should be carried out on the system after the completion of all testing and setting to work activities.

129. Test Plans given in Def Stan 00-40 are the preferred methodology for conducting the Maintainability Demonstration.

130. Should the system fail the Maintainability Demonstration, the Contractor should carry out, at their cost, remedial work, acceptance trials and a further demonstration to establish compliance with the maintainability requirements.

131. The Project Technical Authority will reserve the right to demand the full Maintainability Demonstration be restarted with any new system configuration.

Availability, Reliability and Maintainability Verification

132. The ARM parameters of the lifting equipment should be verified using procedures given in Def Stan 00-40 and Def Stan 00-42. Details of the methodologies and associated implementation procedures are to be included in the ARM Programme Plan.

133. Following system acceptance, the Contractor should gather Reliability and Maintainability data, using procedures given in Def Stan 00-40 and Def Stan 00-42. This data should be used to establish the ARM of the lifting equipment under actual operating conditions.

134. The Contractor should propose a system for the gathering and analysis of data for the first three years of operation. A joint MoD/Contractor Failure Review Board should be established to monitor the data gathering and analysis being undertaken.

135. Should the levels of achieved operational ARM be below those required of the Operational System, the Contractor should undertake remedial work at their expense to correct the deficiencies. Following such remedial work a further extended period of data gathering and analysis should be undertaken.

Procedures and Results

136. Test procedures should clearly identify the performance attributes required from the lifting equipment, including acceptance and rejection criteria. The results should be formally recorded in detail.

NOTE: Thorough Examination Reports and Test Certificates alone will not satisfy this requirement.

Marking

137. Lifting equipment for the handling of nuclear armaments should be prominently and permanently marked with the following information:

a. The lifting equipment specification and classification e.g. JSP 975 Part 2: Code of Practice and Guidance Annex L, Class ‘A’.

b. The Armaments Rated Capacity specified upon the Data plate, together with the conventional SWL (or WLL), where the lifting equipment also undertakes general lifting duties.

5 High Pedestal or Portal Jib Dockside Cranes for Handling Conventional and Nuclear Armaments – Specific Requirements

General

1. Lifting equipment used for handling both conventional and nuclear armaments should meet the JSP 975 Part 2: Code of Practice and Guidance Annex L, Parts 1, 2, 3 and 4 requirements, in conjunction with the additional requirements given in the following. This chapter specifies general design requirements and features, applicable to High Pedestal and Portal Jib Dockside Cranes, when used for handling conventional armaments and to enhance the integrity and reliability for nuclear armament handling.

Requirements for Conventional Armament Handling

Specification

2. The lifting equipment should be electrically powered from either:

    a. A mains supply (preferred option).

    b. A secondary external supply.

3. The lifting equipment and its specification should comply with the requirements of BS EN 13001, BS EN 60204-32, BS EN 13852 or BS EN 14985, BS 2573, BSI PD ISO/TR 25599.

4. Unless otherwise stated by the Project Technical Authority the crane should be designed for a service life of 30 years.

Structural

5. The design of 4-legged portal travelling structures should recognise the inherent flexure within such lifting equipment and be appropriately considered within the standard limiting constraints of long travel rail alignment.

Mechanisms

Wire Ropes

6. Where lifting equipment is sited in locations with a saline atmosphere (e.g. Jetty, Dockside or ship mounted), consideration should be given to the specification of zinc coated ropes.

Brake System

7. Where failure of the Service Braking System could result in uncontrolled motion, an independent secondary Stand-by Braking System should be provided, in accordance with BS EN 13001, BS EN 60204-32, BS EN 13852 or BS EN 14985 or equivalent specification.

Slewing Mechanisms

8. A Service Brake should be provided and capable of being locked in the ‘off position’ when the lifting equipment is out of service.

9. Provision should be made to either allow the Jib to ‘weather vane’ downwind when out-of-service, or be designed such that the structure can withstand the maximum applied wind forces and reactions. Provision of weather vane capability may take the form of a torque-limiting device that operates in out-of-service wind conditions. However, this device should not operate under the in-service conditions specified for the lifting equipment.

Consideration should be given to the potential for Jib clash/strike with objects in the vicinity, when the lifting equipment 'weather vanes' in its parked location.

Travel Mechanisms

10. Service Brakes should be provided in accordance with BS EN 60204-32, BS EN 14985 and are to operate without imparting impact loads which could result in structural or mechanical damage to the Lifting Equipment.

11. To prevent tipping and excessive dropping of the lifting equipment, in the event of main travel axle, wheel, or bearing failure, the design should include fixed stops which normally run just above the long travel rails. In the event of a failure, the stops will limit the vertical displacement of the lifting equipment and support it on the long travel rails. The vertical distance between the bottom of the fixed stops and the top of the long travel rail is to be such that any drop is kept to a minimum, whilst maintaining sufficient running clearances.

Crane Anchoring

12. Provisions should be made for the lifting equipment to be anchored when out-of-service. These are to be located at each corner of the long travel superstructure (end carriages/bogies) and be one of the following:

(1) Screw-down, locking pins that positively locate in holes at predetermined storm parking positions on the long travel rails; or

(2) A chain anchor on each long travel rail; or

(3) A Rail Clamp (i.e. Storm Brake) which should be independent of the Service Brake.

Electrical

Earthing

13. Lifting equipment should be earthed by means of at least one earthing slip ring and at least one earth core of the trailing power supply cable, in accordance with the requirements of BS 7430: Code of Practice for Earthing.

Controls and Indicators

Emergency Stop Buttons

14. Additional Emergency Stop Buttons should be fitted in the following locations:

a. In the Machinery House.

b. At each corner of the long travel superstructure (end carriages/bogies) in easily accessible positions from ground level.

Alternative Power Supply

15. An alternative, independent, power supply should be provided to power all safety equipment such as anti-collision, aircraft warning beacons, anti-condensation heaters, load retrieval systems and other systems which may require power when the mains supply or generator are not available.

Anti-condensation Heaters

16. Anti-condensation heaters should be fitted in all motion control panels (including emergency stop controls) and enclosures containing electrical control equipment and capable of being powered by both the main power supply, and alternative power supply. The exact nature of supply is to be defined within the specification.

Testing

17. Lifting equipment should be tested, in accordance with the requirements of BS EN 13001, ISO 4310, BS 7121 (including stability), BS EN 13852, BS EN 60204-32, BS EN 14985, to verify the performance, including all emergency systems under:

a. Specified test conditions.

b. In-service conditions at Safe Working Load.

c. Out-of-service conditions.

NOTE: Attention should be paid to the lifting equipment storm anchoring arrangement functionality.

Additional Requirements for Nuclear Armament Handling

Seismic

18. Where the Project Technical Authority has defined a seismic requirement, the lifting equipment should be analysed in the most arduous configurations, for both seismic and static loadings. Where these conditions are not readily identifiable, analysis should be carried out on a range of luffing, slew, and hoist configurations, to determine the worst case loading scenario. The seismic criteria against which the lifting equipment has been assessed should be recorded in the Technical Manuals.

Mechanisms

Stability

19. Stability of the lifting equipment should not be compromised and comply with the requirements of ISO 4310 under all normal loading. In addition, under seismic loading a stability factor of 1.1 should be applied.

20. Seismic clamps should be provided and be capable of restraining the lifting equipment in the operating position, during a seismic event.

6 Mobile Lifting Equipment and Mobile Cranes for Handling Conventional and Nuclear Armaments – Specific Requirements

General

1. Lifting equipment used for handling both conventional and nuclear armaments should meet the JSP 975 Part 2: Code of Practice and Guidance Annex L, Parts 1, 2, 3 and 4 requirements, in conjunction with the additional requirements given in the following. This chapter specifies general design requirements and features, applicable to Mobile Cranes, when used for handling conventional armaments and to enhance the integrity and reliability for nuclear armament handling.

Specific Legislative Requirement

2. Where the lifting equipment is to be operated on a public highway, it should satisfy the requirements of the Road Traffic Act, as applicable for the various categories of Mobile Crane.

Requirements for Conventional Armament Handling

Specification

3. Unless otherwise stated, the lifting equipment and the method of its specification should comply with BS EN 13000, BS EN 13001 or equivalent specifications.

4. The lifting equipment motions should be powered by hydraulic drive using an integral prime mover.

5. Unless otherwise stated by the Project Technical Authority, the lifting equipment should be designed to a minimum service life of 12 years.

Structural

Stability

6. It is essential that mobile lifting equipment is capable of maintaining stability throughout its operational envelope. Where required for the duty, this should be aided via the provision of suitable outriggers and, where applicable, additional counter balance weights or overturning restraints.

Mechanisms

Hoist Mechanism

7. Hoist drums should meet the requirements of BS EN 13000 and be appropriately grooved to support the hoist rope; enabling an orderly lay of the rope.

8. The primary means of arresting the hoist motion should be by hydraulically decelerating and locking of the hoist motor.

Luffing Mechanism

9. Luffing motion is to be achieved by the use of at least one double acting hydraulic cylinder (two cylinders where reasonably practicable, see Fig 9), with level luffing as a preferred capability.

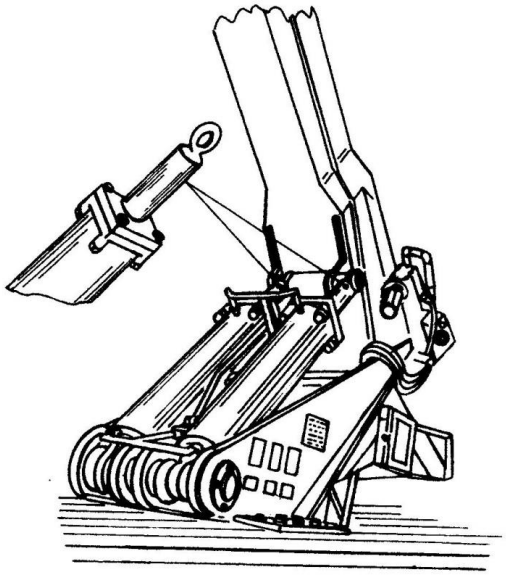


Figure 9: Typical Arrangement of Luffing Mechanism Actuated by Two Cylinders Mounted in Parallel

10. The cylinder(s) and associated controls should be independently rated for arresting and holding the Jib and load.

11. Fly Jibs are not to be used. Additional Jibs are only to be used when approved by the Project Technical Authority, where there is no reasonably practicable alternative.

Slew Mechanism

12. The primary means of arresting the slew motion should be by hydraulically decelerating and locking of the slew motor.

13. The slew motion is not to be controlled by reversing clutches.

14. A Service Brake and Mechanical Slew Lock is to be provided.

Travel Mechanism

15. Dual-circuit brakes should be provided.

16. Automatic steering reversal should be provided.

Outrigger System

17. Outriggers comprising of hydraulic telescoping beams and end jacks should be provided at a minimum of four appropriately distributed points on the lifting equipment, for stabilisation.

18. Jacks are to be fitted with articulating feet to enable optimum adaptation to ground conditions.

19. Ground bearing mats/pads compatible with the lifting equipment duty, maximum outrigger loads are to be supplied.

Controls and Indicators

Emergency Stop Buttons

20. Additional Emergency Stop Buttons should be fitted on both sides of the chassis midway between the outriggers.

Tachometer

21. A Tachometer indicating the revolutions per minute of the internal combustion engine should be provided within the field of view of the operator.

Indicating Devices

22. Motion and performance limiting and indicating devices, in accordance with BS ISO 10245-2 should be provided within the field of view of the operator and at each control position.

Warning Devices

23. Additional audible warning devices and flashing indicators that automatically operate whenever the lifting equipment is operating in slew should be provided.

Electrical

Design Specification

24. The electrical installation should comply with BS EN 13000, BS EN 60204 -1 & 32, BS EN 13135, as appropriate unless otherwise stated.

25. The Control System should automatically cut out all motions, without imparting impact loads which could result in structural or mechanical damage, when the safe working envelope limit for the given duty has been attained. However, the system and devices should not inhibit those motions necessary to return the lifting equipment to within the safe working envelope.

Testing

26. For use in explosive storage areas, the lifting equipment should meet the requirements of DSA03 OME Part 2.

27. The test is to verify the performance of the lifting equipment, including all emergency systems under:

a. Specified test conditions.

b. In-service conditions at Safe Working Load/radius, safe working duty envelope.

c. Out-of-service conditions.

NOTES

(1) Particular attention should be paid to the stability of the lifting equipment during emergency braking.

Additional Requirements for Nuclear Armament Handling

28. Due to the stability characteristics of Mobile Cranes, their use for nuclear armament handling should be considered only as part of contingency plans; to cover instances where lifting equipment with greater inherent stability for a particular lifting operation is not available or experiences breakdown.

29. Ultimately the specification of Mobile Crane designs for the lifting of nuclear armaments will be judged by the acceptability of the safety justification presented to the Nuclear Weapons Regulator. Hence, the provision of additional requirements detailed below.

Seismic

30. Where the Project Technical Authority has defined a seismic requirement, the lifting equipment should be analysed in the most arduous configurations, for both seismic and static loadings. Where these conditions are not readily identifiable, analysis should be carried out on a range of telescoping, luffing, slew, and hoist configurations, to determine the worst case loading scenario. The seismic criteria against which the lifting equipment has been assessed should be recorded in the Technical Manuals.

Mechanisms

Telescope Mechanism

31. The nominal velocity of the hook, under the operation of the telescope mechanism, should be proportionally variable between the following limits:

    a. Minimum (Creep): No greater than 0.005 m/s in either direction.

    b. Maximum: No greater than 0.05 m/s in either direction.

Stability

32. The stability of the Mobile Crane should comply with the requirements of BS EN 13000 or ISO 4310, as appropriate. In addition, under seismic loading, a stability factor of 1.1 is to be applied. Where reasonably practicable, consideration should be given to the provision of additional fixing attachments for an anchorage system.

Electrical

Grounding

33. Satisfactory electrical bonding of the cabin controls to the vehicle chassis should be demonstrated. In particular, the bond between the Automatic Safe Load Indicator and the chassis should not exceed a resistance of 0.05 Ohm (Refer to BE EN 60204-32).

AVAILABILITY, RELIABILITY AND MAINTAINABILITY

Notice for Use

34. The time required to bring the lifting equipment to full operational use should not exceed 60 minutes from a non-operational state.

7 Overhead Travelling Cranes (including Dockside Cranes) for Handling Conventional and Nuclear Armaments – Specific Requirements

General

1. Lifting equipment used for handling both conventional and nuclear armaments should meet the JSP 975 Part 2: Code of Practice and Guidance Annex L, Parts 1, 2, 3 and 4 requirements, in conjunction with the additional requirements given in the following. This chapter specifies general design requirements and features, applicable to Overhead Travelling Cranes (OHT), when used for handling conventional armaments and to enhance the integrity and reliability for nuclear armament handling.

Requirements for Conventional Armament Handling

Specification

2. The lifting equipment specification should comply with the requirements of BS EN 13001, BS EN 60204, BS 2573 or equivalent specification, and include the following:

a. Be electrically powered from a mains supply.

b. Unless otherwise stated by the Project Technical Authority, the lifting equipment should be designed for a service life of 25 years.

Mechanisms

Hoist Mechanism Braking

3. An Automatic Emergency Brake shall be provided in accordance with the requirements of the ‘Mechanisms’, ‘Braking Systems’, ‘Automatic Emergency Brakes’ section on:

a. All OHT Cranes used for the handling of Guided or Underwater Weapons.

b. All OHT Cranes with a height of lift above ground / installed deck level of more than 4 metres.

Cross Travel Mechanism

4. The nominal cross travel velocity of the trolley should be variable between the following limits:

a. Minimum (creep): No greater than 0.05 m/s in either direction.

b. Maximum: No greater than 0.5 m/s in either direction.

5. A Service Brake should be provided, in accordance with BS EN 60204-32 or equivalent specification.

6. The cross travel motor and service brake should be independently rated to arrest and hold the lifting equipment, whilst the hook is loaded to the safe working load. The arrest is to be within a maximum distance of 25 mm from its minimum cross travel (creep) speed to zero velocity, without imparting impact loads which could result in structural or mechanical damage.

Long Travel Mechanism

7. The nominal long travel velocity of the lifting equipment should be variable between the following limits:

a. Minimum (creep): No greater than 0.05 m/s in either direction.

b. Maximum: No greater than 0.67 m/s in either direction.

8. Service and Parking Brakes (which may be combined) should be provided, in accordance with BS EN 60204-32 or equivalent specification.

9. The long travel motor and service brake should be independently rated to arrest and hold the lifting equipment, whilst the hook is loaded to the safe working load. This is to be within a maximum distance of 50 mm from its minimum travel (creep) speed to zero velocity, without imparting impact loads which could result in structural or mechanical damage.

Crane Anchoring

10. Provision should be made for anchoring the lifting equipment when it is out of service.

Controls and Indicators

Emergency Stop Buttons

11. Additional Emergency Stop Buttons should be fitted at a minimum of two locations within the building/ships compartment in positions readily accessible from ground/deck level.

Testing

12. The lifting equipment should be tested and verified, in accordance with the requirements of BS EN 13001, ISO 4310, BS 7121, BS EN 13852, BS EN 60204-32.

13. The testing is to verify the performance of the Lifting Equipment, including all emergency systems under:

a. Specified test conditions.

b. In-service conditions at Safe Working Load.

c. Out-of-service conditions.

NOTE: Attention should be paid to the storm anchoring arrangement functionality.

Additional Requirements for Nuclear Armament Handling

Seismic

14. Where the Project Technical Authority has defined a seismic requirement the following additional points should be considered:

a. For a response spectrum analysis, the envelope of the spectra at the support should be used as the input to the analysis.

b. The lifting equipment should be analysed for a range of trolley and bridge positions, in order to identify the most arduous configurations, for both seismic and static loadings. Where these conditions are not readily identifiable, analysis should be carried out on a range of trolley and bridge configurations, to determine the worst case loading scenario. The seismic criteria against which the lifting equipment has been assessed should be recorded in the Technical Manuals.

c. The integrity of the lifting equipment should be checked for the maximum relative displacement of the main long travel beams.

Mechanisms

Cross Travel Mechanism

15. The nominal cross travel velocity of the hook should be variable between the following limits:

a. Minimum (Creep): No greater than 0.005 m/s in either direction.

b. Maximum: No greater than 0.1 m/s in either direction.

16. Where failure of the Service Brake System could result in uncontrolled motion an independent Standby Brake system should be provided in accordance with BS EN 60204 or equivalent specification.

Long Travel Mechanism

17. The nominal long travel velocity of the hook should be variable between the following limits:

a. Minimum (Creep): No greater than 0.005 m/s in either direction.

b. Maximum: No greater than 0.1 m/s in either direction.

18. Where failure of the Service Brake System could result in uncontrolled motion, an independent Standby Brake System should be provided in accordance with BS EN 60204 or equivalent specification.

Stability

19. Stability of the lifting equipment should not be compromised and comply with the requirements of ISO 4310 under all normal loading. In addition, under seismic loading a stability factor of 1.1 should be applied.

20. To prevent derailment and excessive dropping of the lifting equipment in the event of kick-roller, runner flange, main travel axle, wheel or bearing failure, the design should include fixed stops which normally run just above the long travel rails. In the event of a failure, the stops will limit the vertical displacement of the lifting equipment and support it on the long travel rails. The vertical distance between the bottom of the fixed stops and the top of the long travel rail is to be such that any drop is kept to a minimum, whilst maintaining sufficient running clearances.

21. Seismic clamps should be provided and be capable of restraining the lifting equipment in the operating position, during a seismic event.

8 Floating Cranes and Ship or Barge Mounted Lifting Equipment for Handling Conventional Armaments – Specific Requirements

General

1. Lifting equipment used for handling conventional armaments should meet the JSP 975 Part 2: Code of Practice and Guidance Annex L, Part 1, 2 and 3 requirements, in conjunction with the additional requirements given in the following. This chapter specifies general design requirements and features, applicable to Ship and Barge mounted and floating lifting equipment, when used for handling conventional armaments.

Specific Legislative, Guidance and Standards Requirements

2. Where lifting equipment is waterborne, additional requirements are to be applied including:

a. Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 (SI 1997, No 2962).

b. The Merchant Shipping (Guarding of Machinery and Safety of Electrical Equipment) Regulations 1988 (SI 1988, No 1636).

c. The Docks Regulations 1988 (SI 1988, No 1655).

d. Lloyd's Register – Code for Lifting Appliances in a Marine Environment (CLAME).

e. Code of Safe Working Practices for Merchant Seafarer.

f. Def Stan 02-113: Requirements for Mechanical Handling. Lifting Equipment used on Royal Navy vessels.

g. Def Stan 08-101: Requirements for the Construction and System Arrangements in Magazines and Weapon Storage Compartments (Category 1).

h. Def Stan 00-101: Design Standards for Explosives Safety in MOD Ships and Submarines: Part 1.

i. FEM Rules 1.001: Rules for the design of hoisting appliances.

j. BS EN 13852-1: Offshore Cranes – General purpose offshore cranes.

k. BS EN 13852-2: Offshore Cranes – Floating cranes.

l. BS 7121-3: Code of practice for safe use of cranes – Part 3: Mobile cranes.

NOTE: Care should be taken to ensure that the appropriate BS EN 13852 part is used for the given lifting equipment design, as each part is nominally similar, with some key exceptions. Where doubt exists, the more conservative criteria of EN 13852-1 should be applied.

Specification

3. Derrick Boom lifting equipment should be designed in compliance with the Lloyd's Register – CLAME requirements.

4. Electric/Hydraulic lifting equipment should be designed in compliance with the relevant part of BS EN 13852.

5. The lifting equipment should be electrically or hydraulically powered by one of the following:

a. The mains supply on the vessel (preferred option).

b. A secondary external supply.

6. Ships compressed air system may only be used for powering lifting equipment required for magazine use.

7. Unless otherwise stated by the Project Technical Authority the lifting equipment should be designed to the following minimum criteria:

a. Service life: 30 years.

b. Category requirements defined by Lloyd's Register – Code for Lifting Appliances in a Marine Environment.

NOTE: Vessel mounted lifting equipment should comply with the Heel and Trim (Freeboard) requirements defined by this standard service category, taking into account slewing of the load.

c. Safety of machinery should comply with BS EN ISO 12100 and PD 5304.

Structural

Stresses and Design

8. The permissible stresses and design of the structure should comply with BS EN 13001, BS 2573, BS EN 13852 or Lloyd's Register: Code for Lifting Appliances in a Marine Environment.

9. The pedestal and foundation for the lifting equipment should be designed in accordance with Lloyd's Register: Code for Lifting Appliances in a Marine Environment, BS EN 13852 or equivalent specification.

Mechanisms

Stresses and Design

10. The permissible stresses and design of the mechanisms should comply with BS EN 13001 or BS 2573.

Wire Ropes

11. All wire ropes should be zinc coated in accordance with BS EN 12385-1.

Hoist Mechanism

12. The nominal hoist velocity of the hook should be variable between the following limits:

a. Minimum (Creep): No greater than 0.075 m/s in either direction.

b. Maximum: No less than 0.64 m/s, and no greater than 0.75 m/s, in either direction.

13. Hoist mechanisms should be fitted with a protection device to prevent a slack rope occurring due to wave action (Reference Lloyd's Register: Code for Lifting Appliances in a Marine Environment, BS EN 13852-2 or equivalent).

Luffing Mechanism

14. Luffing is to be achieved by use of at least one double acting hydraulic cylinder.

NOTE: Two cylinders fitted in parallel are preferred.

15. The cylinder(s) and associated controls, motors, and Service Brake should be independently rated to arrest and hold the load.

Slew Mechanism

16. In all instances a Service Brake should be provided.

17. Where the slew mechanism is operated by an electric motor, an additional Mechanical Brake operated by hand or foot lever from the Operator's Cabin should be provided.

18. Where the slew mechanism is operated by a hydraulic motor, the primary means of arresting the motion is to be by hydraulically decelerating and locking of the slew motor.

19. The hydraulic motor, or electric motor and associated brake(s), should be independently rated to arrest and hold the jib, hook and load.

20. The slewing arc (hazard zone) of the lifting equipment structure (excluding the Jib) should be marked on the vessel's deck, to signify the hazard zone of potential collision and or crushing.

Crane Anchoring

21. Provision should be made for anchoring the lifting equipment and supporting the Jib when out of service.

Controls and Indicators

Stop Buttons

22. Emergency Stop Buttons should be fitted in the following locations:

a. In the Machinery compartment.

b. In two positions on the lifting equipment external superstructure, in easily accessible positions from deck level.

Audible Warning Device

23. Additional audible warning devices and flashing indicators are to be provided, to be activated whenever the lifting equipment is operating in slewing motion, as requirements dictate.

NOTE: Where lifting equipment is to be fitted to Royal Fleet Auxiliary (RFA) and Naval vessels, Contractors should obtain confirmation of the absolute necessity for this feature, from the Providing Authority.

Electrical

Alternative Power Supply

24. An alternative, independent, power supply should be provided to power all safety equipment such as anti-collision beacons, anti-condensation heaters, load retrieval systems and other systems which may require power when the mains supply or generator are not available.

25. Ship mounted lifting equipment should be fitted with an earth monitoring system.

Anti-condensation Heaters

26. Anti-condensation heaters should be fitted in all motion control panels (including emergency stop controls) and enclosures containing electrical control equipment and capable of being powered by both the main power supply, and alternative power supply. The exact nature of supply is to be defined within the specification.

Testing

27. The lifting equipment should be tested with regard to the requirements of the Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations & Amendment Regulations; Code of Safe Working Practice for Merchant Seamen, or equivalent specification.

28. For Naval Vessels the testing should also comply with the requirements of Def Stan 02-113 & BR 3027(1).

29. The testing is to verify the performance of the Lifting Equipment and Vessel configuration including all emergency systems under:

a. Specified test conditions (and regulatory requirements where applicable to the vessel).

b. In-service conditions at Safe Working Load (including the ARC, where applicable).

NOTE: Safe Working Load will be re-defined by the maximum capacity that can be lifted at the most onerous radius of operation, ensuring vessel stability. The duty chart should then be amended to reflect the specific lifting equipment – vessel configuration.

c. Out-of-service conditions.

NOTES

(1) Particular attention should be paid to lifting equipment performance at all angles of the vessel's heel up to 5°. The vessel's design parameters should also be taken into account, where appropriate.

(2) BR 3027(1) should be referenced for specific testing requirements for lifting equipment installed on Royal Navy vessels and Royal Fleet Auxiliary vessels used in aid of Royal Navy vessel support for handling armaments and are to be used beyond the bounds of a harbour or sheltered environment.

9 Existing Lifting Equipment for Handling Conventional Armaments – Upgrading Requirements

General

1. Lifting equipment used for handling conventional armaments should meet the JSP 975 Part 2: Code of Practice and Guidance Annex L, Parts 1, 2 and 3 requirements, in conjunction with the additional requirements given in the following. This chapter details the specific upgrade requirements and use limitations for existing lifting equipment, which may be required to satisfactorily handle conventional armaments.

Assessment/Use Limitations

2. Lifting equipment classified, in accordance with JSP 975 Part 2: Code of Practice and Guidance Annex L, Table 2 – Classification Definition of Lifting Equipment, as being partially compliant for a particular use will require further assessment to ensure it is safe for the intended lifting operation. A Risk Analysis in accordance with Def Stan 00-056 together with BS 8444-3 and BS EN ISO 12100 should be undertaken to underpin any Safety Justification, Statement or Case pertaining to the use of the lifting equipment. JSP 975, Appendix A – Conformance Matrices and Severity of Failure Definitions should assist in ascertaining compliance shortfalls to be addressed.

3. Existing lifting equipment may continue in service providing its assigned armament lifting task remains unchanged, a Safety Assessment in accordance with DSA02-DMR has been completed and unacceptable risks eliminated or reduced.

Features Required for JSP 975 Annex L C1 Classification

4. The following identifies the specific compliance requirements, for lifting equipment, before it can be considered for a classification of C1, as defined in JSP 975 Part 2: Code of Practice and Guidance Annex L, Table 2 Classification Definition of Lifting Equipment.

Indicators and Controls

Emergency Stop Buttons

5. Emergency Stop Buttons should be provided in accordance with the requirements of the ‘Indicators and Controls’, ‘Emergency Stop Button’ section in JSP 975 Part 2: Code of Practice and Guidance Annex L, Part 3, positioned as follows:

a. **Portal Jib Appliances:** in the Driver’s Cabin within reach of the operator, in the Machinery House, and at the base of all four portal legs.

b. **Pedestal Appliances:** in the Driver’s Cabin within reach of the operator at the controls, and at suitable and accessible locations at the base of the pedestal.

c. **Overhead Travelling Cranes:** within easy reach of the driver at the controls (in Drivers Cabin or on Pendant Control), in a minimum of two places within the building, or where located outside, at positions readily accessible from ground level.

d. **Ship Mounted Pedestal Cranes:** in the Driver’s Cabin within easy reach of the operator, in the Machinery Compartment, and in two positions on the external superstructure in readily accessible positions from the deck.

e. **Mobile Cranes:** in Driver’s Cabin within easy reach of the operator; both sides of the chassis midway between the outriggers.

Over-speed and Reverse Motion Detection Systems

6. Over-speed and reverse motion detection systems are to be fitted to the hoist and luffing motions, as applicable. They are to actuate the main contactor, in the event of a motion not demanded by the operator being detected. Motion cut out devices should automatically apply all Service and Standby Brakes.

7. A modern solid state control system providing a proportional infinitely variable speed range of known and proven design may be installed providing it embodies the above characteristics.

Rated Capacity Indicator and Limiter

8. Maritime regulations do not require ship mounted lifting equipment to be fitted with a Rated Capacity Indicator (RCI). However, this authority advises that suitable RCIs should be fitted to all ship mounted lifting equipment to enhance overall operating safety. The fitted device should provide readings of load, radius, percentage of load-moment and warnings when load-moment limit is being approached and subsequently attained.

NOTE: The device should also incorporate a Rated Capacity Limiter (RCL) which inhibits motion, when the operational load-moment limit has been exceeded. However, consideration should be given to the potential for nuisance tripping and the adverse affects this may cause, during a lifting operation.

Failure Modes and Effects Analysis

9. An exercise should be undertaken both before and after upgrade to enable severity classifications to be compared. All electrical Severity 1 failure modes and common mode failures should be eliminated. There should also be a significant improvement in most of the intermediate classifications. Where mechanical Severity 1 classifications remain these should be of minimal consequence to load security.

Risk/Safety Analysis

10. Where the use of the lifting equipment to lift armaments constitutes a significant operational variation of use, or where significant modifications to the lifting equipment are required, then a Safety Case in accordance with DSA02-DMR should be produced.

NOTE: Where modifications to exiting lifting equipment constitute a fundamental change, from the original supply specification, a re-assessment and re-certification may be required, under the Supply of Machinery (Safety) Regulations, Essential Health and Safety Requirements, prior to putting the modified lifting equipment into service. The requirement and capability (both internal and external) for such re-assessment and re-certification should be confirmed, prior to commencement of any such modification.

Thorough Examination and Testing

11. Significant modifications to the lifting equipment are considered as being exceptional circumstances which adversely affect the safety of lifting equipment, as designated by the LOLER, regulation 9(3)(a). Therefore, a thorough examination should be undertaken and, at the discretion of the competent person (assessor), appropriate testing applied to support the thorough examination.

Stability

12. Where applicable, an assessment of the subject lifting equipment ability to remain stable in both maximum service and storm conditions must be undertaken. The assessment should include relevant calculations and stability test documentation and certification.

10 Existing Mobile Cranes for Handling Conventional Armaments – Guidance

General

1. Lifting equipment used for handling conventional armaments should meet the JSP 975 Part 2: Code of Practice and Guidance Annex L, Parts 1, 2 and 3 requirements, in conjunction with the additional requirements given in the following. This chapter covers aspects to be considered when using an existing Mobile Crane for handling conventional armaments. It applies equally to Mobile Cranes owned by the MoD and those hired in for the task. It is to be considered as a guide for pre-existing lifting equipment, rather than new purchase.

2. Requirements are also provided on aspects to be considered when contemplating taking on charge a pre-owned Mobile Crane for handling armaments.

3. Mobile Cranes used for lifting operations involving explosive ordnance should preferably meet the Classifications B1 or C1, as specified in JSP 975 Part 2: Code of Practice and Guidance Annex L, Table 2.

NOTE: Mobile Cranes should only be used for lifting operations involving explosive ordnance, in the absence of more suitable types of lifting equipment (i.e. Pedestal, Portal Jib, Overhead Travelling or Ship Mounted).

Existing Mobile Cranes for Handling Conventional Armaments

4. Mobile Cranes which do not fully meet the classification requirements, but are required to handle conventional armaments, may only be used for such a purpose on a temporary basis (on the basis of a granted concession, see JSP 975 Part 2: Code of Practice and Guidance Annex L, Appendix A) and are to be compliant with the remainder of this section. Suitability for use must be determined on a case by case basis and by analysing the safety aspects and risks involved for the proposed operation. The results of a satisfactory Risk Analysis should be appropriately acted upon, prior to use.

5. No armament lift is to exceed 50% of the cranes commercial rated capacity for the working radius to be used. The Mobile Crane Operator/Supervisor/Appointed Person must ensure that the crane has satisfactory load-radius capacity for the operation to be undertaken.

Documentation

6. The following documentation should be available for use with the Mobile Crane:

   a. Rated Capacity Indicator/Limiter calibration certification.

   b. Test Certificates (Complete crane, Hook Assembly and Hoist Rope).

   c. Current and previous 2 years Reports of Thorough Examination.

   d. Log Book providing a record of maintenance.

   e. Maintenance Manuals.

   f. Load Charts (to be found in the Driver’s Cabin).

   g. Mobile Crane incident records.

   h. Operator’s Manuals.

7. Mobile Cranes used on the public highway will be subject to the Road Traffic Act. Therefore, all vehicle documents i.e. Licences, Keeper Documents and Thorough Examination reports are to be in date, compliant with the appropriate legislation and available for audit purposes.

Risk/Safety Analysis

8. The use of Mobile Cranes to handle armaments is a significant enhancement of risk based duty. Therefore, a suitable and sufficient Safety/Risk Analysis, considering age and condition, should be undertaken to ensure its suitability to undertake the required lifting operations in a safe manner.

9. Details of armaments to be handled are to be made available, including Defence Ordnance Safety Group (DOSG) Safety Statements identifying WOME withstand criteria and risks associated with the WOME, etc.

10. The Safety/Risk Analysis should be in accordance with Def Stan 00-056 (Safety Management for Defence Systems).

11. Such an assessment should include, but not be restricted to the aspects covered in the following ‘Crane Condition’ and ‘Required Duty’ sections.

Crane Condition

12. Historical information available regarding usage, maintenance, repairs, thorough examination and tests is to be taken into consideration when assessing the overall condition of the Mobile Crane. Where the Mobile Crane has a meter, which records the number of lift cycles undertaken or hours of crane operation, a competent person should make a comparison of the metered information against the design classification of the Mobile Crane, for service life confirmation.

13. DES Ships MPS MES-MCH recommends a maximum life of 12 years be applied to Mobile Cranes used for handling explosive stores. Extension to this may be possible following completion of a suitable and sufficient risk assessment and required refurbishment, where necessary.

Required Duty

14. An assessment is required to ensure that the Mobile Crane is capable of performing the necessary duties in a safe manner.

Lifting Operation

15. Prior to using a Mobile Crane, an assessment should be made of the operating location to ensure that such equipment will enable that the lifting operation to be undertaken in a safe manner.

Testing

16. Prior to undertaking handling duties, the Mobile Crane is to be pre-positioned and subjected to a series of pre-use tests as identified in DSA03 OME Part 2.

17. The tests are to be undertaken by the operator, the slinger(s), and overseen by a competent person (assessor). Subsequent to a test, a thorough examination is to be carried out to confirm integrity.

Mobile Cranes to be Taken on Charge

18. This section outlines the points to be considered before accepting, into full MOD service for handling armaments, an existing Mobile Crane that may not be fully JSP 975 compliant.

General

19. An assessment should be undertaken to ensure that the Mobile Crane can:

a. Safely perform the tasks required.

b. Meet the requirements in the preceding sections of this chapter (Existing Mobile Cranes for Handling Conventional Armaments).

20. All Mobile Cranes ‘Taken on Charge’ should be included on the establishment’s maintenance system, establishing a process of scheduled maintenance, appropriately documented.

21. The Mobile Crane should be free of any evident critical repairs (e.g. plates welded to the jib, structure or chassis) or signs of damage (e.g. impact, buckling on load bearing members).

22. The Mobile Crane and support chassis structure should be free from severe corrosion.

APPENDIX A – Conformance Matrices and Concession Process

The following are the process documents to be used when conducting a conformance assessment and compliance evaluation of a given supplied item of power driven lifting equipment, with regard to the requirements of JSP 975 Part 2: Code of Practice and Guidance Annex L.

JSP 975 CONFORMANCE MATRIX – HIGH PEDESTAL OR PORTAL JIB DOCKSIDE LIFTING EQUIPMENT (CONVENTIONAL ARMAMENTS HANDLING ONLY)

JSP 975 CONFORMANCE MATRIX – MOBILE LIFTING EQUIPMENT MOBILE CRANES and EXISTING MOBILE CRANES (including relevant aspects of Mechanical Handling Equipment) (CONVENTIONAL ARMAMENTS HANDLING ONLY)

JSP 975 CONFORMANCE MATRIX – ELECTRIC OVERHEAD TRAVELLING (EOHT) LIFTING EQUIPMENT (CONVENTIONAL ARMAMENTS HANDLING ONLY)

JSP 975 CONFORMANCE MATRIX – FLOATING CRANES and SHIP or BARGE MOUNTED LIFTING EQUIPMENT (Including relevant aspects of Mechanical Handling Equipment) (CONVENTIONAL ARMAMENTS HANDLING ONLY)

JSP 975 CONFORMANCE MATRIX – EXISTING LIFTING EQUIPMENT (Including relevant aspects of Lifts – Passenger/Goods, Goods and Service) (CONVENTIONAL ARMAMENTS HANDLING ONLY)

SEVERITY OF FAILURE

Definition

The following is the definition of the failure modes applicable to any Lifting Equipment, based on the consequence of the failure.

Severity 1

A failure which immediately results in a dropped load or uncontrolled motion, such that an imminent danger to load safety exists.

Severity 2

A failure which could result in a dropped load or uncontrolled motion if the Lifting Equipment operator is unaware of the failure, or fails to take immediate action, such that a potential danger to load safety exists.

Severity 3

A failure which results in a load not being readily recoverable to a safe position; e.g. load hung up or slew motion unavailable.

Severity 4

A failure which prevents further use of the Lifting Equipment or requires unscheduled maintenance, but does not in itself result in an unsafe condition.

Concessions to Lifting Equipment NOT in Full Compliance with JSP 975

1. A concession, with regard to the acceptance of lifting equipment not fully compliant with JSP 975 Part 2: Code of Practice and Guidance Annex L will require approval by a Head of Establishment or Commanding Officer, due to the enhanced level of risk associated with the nature of use of such lifting equipment.

2. The process of concession will require a suitable and sufficient risk assessment of the capability of the specific lifting equipment(s) to safely complete the proposed lifting operation. This will involve detailed appraisal of the design and performance of the lifting equipment by specialists, in order to compile a comprehensive and appropriate safety case to substantiate the capability of the lifting equipment to safely complete the required lifting operation.

3. Any such appraisal should be documented and appropriately stored for traceability, with comprehensive justification, including:

a. the absolute operational need to lift and lower the armament with the proposed lifting equipment;

b. design and performance specification(s) of the lifting equipment, in order to ascertain the adequacy of capabilities for the proposed lifting operation;

c. operational, maintenance and repair history for the specifically proposed lifting equipment, in order to ascertain the satisfactory reliability and availability for the proposed lifting operation; and

d. a suitable and sufficient safety case for the specifically proposed lifting equipment;

e. reference to an appropriate , compiled in accordance with JSP 975 Directive (Part 1); and

f. the safeguards and measures required to compensate for the lifting equipment specific JSP 975 compliance shortfalls, in order to minimise risks to a tolerable level, as low as reasonably practicable.

4. Where required, external expertise in terms of lifting equipment specific technical design and analysis authorities should be utilised to supplement in-house technical capability, in order to ensure that the overall appraisal is undertaken in sufficient detail with appropriately verified conclusions.

APPENDIX B – Test Records and Example Pro-forma

A Test Record in accordance with the requirements of JSP 975 (and to comply with the requirements of the Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations & Amendment Regulations, where applicable) should be supplied. The Competent Person (Assessor) signing the record should take due consideration of the fact that the Lifting Equipment will be used for the handling of Explosive Ordnance, as defined within the glossary of this JSP.

Record No:

RECORD OF TEST, TEST AND EXAMINATION OF PLANT AND EQUIPMENT

Description of Equipment

Make/Model:

Date of Manufacture:

Details of Equipment and Test

Owner:

Location of Test:

Identification of Equipment

Serial No:

Item No:

Safe Working Load or Loads and corresponding radii, jib lengths and counterweights (where applicable)

Details of Rating or Duty:

Details of Tests and Examination (including)

Loads Applied:

Deflections (where applicable):

Date(s) of completion

Date:

Authentication of satisfactory completion of test and examination, declaring that the item is free of defect likely to affect safety to persons

Name (Printed): Signature:

Organisation: Date of Record:

NOTE

(1) The format, layout, and particulars used in the example above are offered as guidance regarding the information necessary to document the acceptability (or otherwise) of the Lifting Equipment, subsequent to a test.

(2) Reports for both the First and Regular periodic thorough examinations should include the prescribed particulars contained with the LOLER, Schedule 1. The above format does **not** provide sufficient detail to comply with this requirement.

APPENDIX C – Hard Ground Response Spectrum – Horizontal Direction

REDACTED contact Defence Functional Authority - DES EngSfty-EG DefAuth-Pol

APPENDIX D – Hard Ground Response Spectrum – Vertical Direction

REDACTED contact Defence Functional Authority - DES EngSfty-EG DefAuth-Pol

APPENDIX E – Definition of Operational Role of Lifting Equipment

1. Definition of Lifting Equipment: (Manufacturer, type, serial number and location)

2. So far as is reasonably practicable, the Providing Authority defines the operational role of this Lifting Equipment as follows:

DESCRIPTION	**LOAD MASS (kg)**	**APPROX MAX HEIGHT OF LIFT (m)**	**APPROX OPERATING CYCLE TIME (mins)**	**AVERAGE NUMBER OF OPERATING CYCLES PER YEAR**	**ADDITIONAL INFORMATIONAND REFERENCES**
A. Nuclear Armaments					DSA03 OME Part 2
AVERAGE USAGE RATE (OPERATING CYCLES PER YEAR) FOR NUCLEAR ARMAMENTS =					
B. Nuclear Lifts					DSA02-DNSR & DSA03-DNSR
AVERAGE USAGE RATE (OPERATING CYCLES PER YEAR) FOR NUCLEAR LIFTS =					
A. Conventional Armaments					
AVERAGE USAGE RATE (OPERATING CYCLES PER YEAR) FOR CONVENTIONAL ARMAMENTS =					
B. Non Explosive Lifts					To include test lifts and examination, pre-use checks and Nuclear Armament test lifts (reference DSA03 OME Part 2)
AVERAGE USAGE RATE (OPERATING CYCLES PER YEAR) FOR NON EXPLOSIVE LIFTS =					
OVERALL USAGE RATE (OPERATING CYCLES PER YEAR) FOR ALL LOADS COMBINED = PEREPARED BY: APPROVED BY: NAME AND POST: NAMES AND POST: ON BEHALF OF:.....PROVIDING AUTHORITY					

ANNEX M – Equality Analysis Impact Assessment

1. An Equality Analysis Impact Assessment has been undertaken for the policy contained within JSP 975 and associated guidance.

2. The result of the assessment is **NO IMPACT** on protected groups.