BS 7121-2-9:2013

BSI Standards Publication

Code of practice for the safe use of cranes

Part 2-9: Inspection, maintenance and thorough examination – Cargo handling and container cranes

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Contents

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Foreword

Publishing information

This sub-part of BS 7121-2 is published by BSI Standards Limited, under license from the British Standards Institution and came into effect on 30 September 2013. It was prepared by Subcommittee MHE/3/11, *Crane safety and testing*, under the authority of Technical Committee MHE/3, *Cranes and derricks*. A list of organizations represented on these committees can be obtained on request to their secretary.

Relationship with other publications

The BS 7121 series is being revised. The following new sub-parts of BS 7121-2 have been published or are in preparation.

- Part 2-1: *Inspection, maintenance and thorough examination – General;*
- Part 2-3: *Inspection, maintenance and thorough examination – Mobile cranes;*
- Part 2-4: *Inspection, maintenance and thorough examination – Loader cranes;*
- Part 2-5: *Inspection, maintenance and thorough examination – Tower cranes;*
- Part 2-7: *Inspection, maintenance and thorough examination – Overhead travelling cranes including portal and semi-portal cranes, hoists, and their supporting structures;*
- Part 2-9; *Inspection, maintenance and thorough examination – Cargo handling and container cranes*.

When all sub-parts of BS 7121-2 have been published, it is intended that CP 3010 will be withdrawn and BS 5744 will be revised to cover manually operated and light cranes only.

This sub-part of BS 7121-2 is intended to be used in conjunction with BS 7121-2-1.

Information about this document

The Health and Safety Executive (HSE) commends the use of this British Standard to those who have duties under the Health and Safety at Work etc. Act 1974 [1]. This standard was drawn up with the participation of HSE representatives and it will be referred to in the relevant HSE publications.

The BS 7121-2 series has been accepted by the HSE as representing the consensus of opinion based on practical experience for safety of cranes.

Hazard warnings

WARNING. This British Standard calls for the use of procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Use of this document

As a code of practice, this sub-part of BS 7121-2 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this sub-part of BS 7121-2 is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Particular attention is drawn to the following specific regulations:

- Health and Safety at Work etc. Act 1974 [1];
- Lifting Operations and Lifting Equipment Regulations (LOLER) 1998 [2];
- Provision and Use of Work Equipment Regulations (PUWER) 1998 [3];
- Supply of Machinery (Safety) Regulations 2008 (as amended) [4].

NOTE Details of the Lifting Operations and Lifting Equipment Regulations 1998 [2] and the Provision and Use of Work Equipment Regulations 1998 [3], together with an HSE Approved Code of Practice and HSE Guidance, are given in HSE publications Safe use of lifting equipment *[5] and* Safe use of work equipment *[6].*

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Introduction

Cargo handling and container cranes are used to load and unload vessels, internal transfer vehicles, road vehicles and trains. They can also be used to lift containers or materials to and from temporary storage. The cranes can be installed in a static location, or on rails or wheels such that the crane can traverse a quay or storage area. They can handle containers, unit loads or bulk materials using specialist grabs.

1 Scope

This sub-part of BS 7121-2 gives recommendations for the pre-use checks, in-service inspection, maintenance, thorough examination (in service and following exceptional circumstances) and supplementary testing of cargo handling and container cranes used in ports and inland facilities. This sub-part of BS 7121-2 is applicable to the following types of cranes:

- ship to shore or quay cranes;
- slewing jib cranes, including mobile harbour cranes;
- level luffing slewing jib cranes;
- rail mounted gantry cranes;
- rubber tyred gantry cranes;
- straddle carrier cranes;
- scotch derricks;
- boat hoists.

This sub-part of BS 7121-2 also covers lifting attachments for use in conjunction with the cranes, including container spreaders, overheight frames, rotators, grabs, magnets and crane baskets used to access containers on ships.

This sub-part of BS 7121-2 is not applicable to permanently installed cranes on marine and other water-borne vessels.

This sub-part of BS 7121-2 is not applicable to loader cranes permanently installed on quays or in other static locations (see BS 7121-2-4).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 7121-2-1:2012, *Code of practice for the safe use of cranes – Part 2-1: Inspection, maintenance and thorough examination – General*

BS ISO 4309:2010, *Cranes – Wire ropes – Care and maintenance, inspection and discard*

3 Terms and definitions

For the purposes of this sub-part of BS 7121-2, the terms and definitions given in BS 7121-2-1:2012 apply.

4 General

Regular pre-use checking, in-service inspection, maintenance and thorough examination of cranes are essential if cranes are to function safely and reliably. The nature of these activities can be summarized as follows.

- Pre-use checks are visual checks which are carried out to ensure that the crane has not suffered any damage or failure, and is safe to use.
- In-service inspections and maintenance are carried out to ensure that components are repaired or replaced before they deteriorate to a point at which they would become unsafe.
- Thorough examinations are carried out at specified intervals, after installation on a new site, after major alteration or repair or after the occurrence of exceptional circumstances which could jeopardize the safety of the crane.
- Supplementary testing is carried out in support of thorough examination and the extent and nature of any testing are specified by the competent person carrying out the thorough examination.

5 Personnel carrying out pre-use checks, in-service inspections, maintenance and thorough examinations

Attributes, competencies, competency assessment, training plans and training records of personnel should be in accordance with BS 7121-2-1:2012, Clause **5**.

6 Pre-use checks and in-service inspections

6.1 General

Pre-use checks and in-service inspection of cranes, together with a system to rectify any defects disclosed, are required by the Health and Safety at Work etc. Act 1974 [1] Section 2(2)(a), and LOLER 1998 [2] Regulation 9(3)(b) to ensure that the crane is safe to use and that any deterioration is detected and rectified before the crane becomes unsafe.

Checklists for pre-use checks and in-service inspection should be drawn up for each individual crane. These should be based on information from the manufacturer, crane usage, findings from previous in-service inspections and records of maintenance and thorough examination, as applicable. Examples of checklists for pre-use checking and in-service inspections of different types of cranes are given in Annexes A to D. Examples of checklists for pre-use checks and in-service inspections of crane container top safety frames used to access containers on ships, and container spreaders, are given in Annex E and Annex F, respectively.

Pre-use checks and in-service inspections should only be carried out by personnel who have been adequately trained and assessed as competent to carry out the required tasks (see Clause **5**). LOLER 1998 [2] requires that results of all in-service inspections are recorded. It is recommended that the results of all pre-use checks are also recorded.

The crane user should ensure that sufficient time is allowed for pre-use checks to be carried out before the crane starts work. The user should also ensure that a safe system of work is in place to prevent the person who is carrying out the checks/inspections from being exposed to danger.

6.2 Pre-use checks

Pre-use checks should be carried out at the start of each period during which the crane is to be used. These are to test the functionality of the crane and visually check for any obvious defects. It is essential that these are carried out from a position of safety.

Visual checks should normally be made from floor level unless a better permanent vantage point is available.

In the event that it does not pass the pre-use check, there should be a procedure to isolate and lock-off the crane to prevent further use until the problem has been resolved.

6.3 In-service inspection

A regular in-service inspection should be made to identify any defects which might not be detected by the pre-use checks. In-service inspections should be carried out at intervals which ensure that any deterioration is identified before there is a risk of failure of the crane or injury to persons. Further guidance is given in HSE document L113 [5].

It might be convenient to schedule the inspections concurrently with planned preventive maintenance (see **7.2.1**).

Steel structures suffer from fatigue, a process which can create cracks that propagate over time. Cracks can also develop from material or weld defects which were undetected during manufacture of the crane. If left unattended, cracks can cause serious failure of the crane structure. The in-service inspection regime should include measures to detect cracks before the safety of the crane is affected. Therefore, in-service inspections should include a structural inspection of highly stressed areas of the crane.

If there are any indications of cracking or excessive wear in pins, bearings or structural components, the crane should be taken out of use and a thorough examination should be carried out in accordance with Clause **8**, with NDT if considered necessary by the competent person.

The period between inspections should be decided on the basis of the duty of the crane and the environmental conditions and might need to vary between 1 week and 6 months. The period should be kept under review and adjusted according to the results of the inspections.

In the event that it does not pass the inspection, there should be a procedure to isolate and lock-off the crane to prevent further use until the problem has been resolved.

6.4 Reporting of defects

LOLER 1998 [2] requires that defects be reported immediately they are identified. There should be provision for the personnel carrying out the pre-use checks or in-service inspection(s) to make reports of defects or observations immediately they are identified.

6.5 Records of pre-use checks and in-service inspections

6.5.1 General

Records of all pre-use checks and in-service inspections should be kept.

6.5.2 Pre-use checks

The record of a pre-use check should include at least the following information:

- identity of the crane;
- date and time of inspection;
- result of the check, i.e. whether or not the crane passed;
- name and signature of person carrying out the check.

This may be kept to a minimum by, for example, completing a single line of a pro-forma record.

6.5.3 In-service inspections

The record of an in-service inspection should include at least the following information:

- date and time of the inspection;
- description and unique identification number of the equipment inspected;
- nature and extent of the inspection;
- results of the inspection, including details of the condition of critical components which need to be monitored, for example a wire rope showing signs of wear;
- name and signature of person carrying out the inspection.

The record should be related to the crane's historical records and made available to the competent person responsible for the thorough examination (see Clause **8**).

6.6 Inspection of second-hand cranes

When purchasing second-hand cranes, their condition should be inspected and assessed; nothing should be taken for granted. Second-hand cranes might contain latent defects which might otherwise only become apparent when the crane is put into service. They might have suffered significant damage and have been inadequately repaired. Second-hand cranes might also have been imported into the European Community without being modified to meet EU requirements, so called "Grey imports".

The assessment of a second-hand crane should include a review of the EC Declaration of Conformity, maintenance records and previous reports of thorough examination, together with consultation of the manufacturer to obtain details of any major repairs etc. The assessment should take into account the previous and the intended uses of the crane. The contents of any data logger should be downloaded and reviewed. The assessment might require the removal of access covers or stripdown of major assemblies to reveal parts that could not ordinarily be seen. Once the crane's condition has been fully assessed, any necessary repairs should be carried out and appropriate inspection and maintenance intervals established.

7 Maintenance of cargo handling and container cranes

7.1 General

Under the Provision and Use of Work Equipment Regulations (PUWER) 1998 [3] employers are required to ensure that cranes are maintained in an efficient state, in efficient working order and in good repair. To ensure adequate maintenance, an effective maintenance management system should be set up in accordance with BS 7121-2-1:2012, **7.1**.

7.2 Maintenance intervals

7.2.1 General

The Health and Safety at Work etc. Act 1974 [1] sets out a general duty requiring that work equipment is maintained so that it is safe.

For cargo handling and container cranes, planned preventive maintenance (see BS 7121-2-1:2012, **7.2.2** and **7.2.3**) should be carried out at intervals which ensure that worn and damaged components are replaced before the crane becomes unsafe, breaks down or fails.

NOTE Breakdown causes downtime and a consequent loss of production for the user, whilst a component failure could result in a partial or total collapse of the crane with potentially fatal consequences for the operator and persons in the vicinity of the crane.

7.2.2 In-service maintenance interval

A cargo handling or container crane should be maintained at regular intervals to avoid breakdown, failure or collapse. The frequency at which inspection and maintenance is carried out should be based on the recommendations contained in the manufacturer's manual for the crane. This should however generally be taken as the maximum interval as various factors, including the following, might require the interval to be reduced.

- *Usage* – The number of hours and/or cycles of operation and the type of loading to which the crane has been subjected. Frequent lifting at or near the rated capacity which might accelerate wear of all components.
- *Environment* – Handling of corrosive materials or exposure to extreme weather which might accelerate corrosion of structural components, fasteners and wire ropes.
- *Feedback* – Feedback from maintenance records and thorough examination reports which might indicate accelerated rates of wear and deterioration.
- *Age* – The crane structure and components might be subject to deterioration with age and additional maintenance might be required.

Once established the inspection and maintenance interval should be recorded in the machine history file (see **7.5**). It is essential that any variation from the manufacturer's recommended intervals is recorded and justified each time a change is made.

7.2.3 Maintenance of cranes that remain in service past their design life

Most cranes are likely to have been designed to a standard that includes an in-service design life. This could have been specified in terms of hours of operation, number of lifts or age. If a crane is to be used past the original design life, then at the end of the original design life an assessment of additional life expectancy should be undertaken in which an assessment is made of the integrity of the crane and its suitability to operate for a defined additional time period or number of load cycles. The person undertaking this assessment should take account of the crane operation, maintenance and thorough examination history. If the original design life of the crane cannot be obtained from the original manufacturer or insufficient information is available from current or previous owners then this assessment should be undertaken when the crane is 10 years old. Further assessments should be undertaken at intervals determined by the crane's anticipated usage.

For a crane that is to be used past the original design life, on completion of the assessment of additional life expectancy, the maintenance plan for the crane should be amended to take account of the findings of the assessment. The findings of the assessment should be provided to the competent person preparing the defined scope of thorough examination (see **8.5**).

7.3 Information for maintenance

The wide variation of designs and the increasing complexity of crane technology make it essential that all maintenance personnel are supplied with adequate information to enable them to carry out their duties effectively and safely. The recommendations given in BS 7121-2-1:2012, **7.8** should be followed.

7.4 Inspection during maintenance

This inspection is normally undertaken by maintenance personnel and is in addition to the in-service inspections undertaken in accordance with Clause **6**.

When inspections are being carried out as part of maintenance, it is important that maintenance personnel record all faults and do not omit to record faults that are then rectified as part of the maintenance process. Such masking of faults would invalidate the machine history and hinder the review process.

*NOTE There is a need to allocate time for routine inspection. It is unreasonable to expect this work to be undertaken in darkness. Time needs to be built into normal working hours for this work (see **7.7.1**).*

7.5 Machine history records

Each crane should have its own machine history records, in either paper or electronic format, which include records of maintenance activities. These records should include the following (as applicable):

- EC Declaration of Conformity;
- special maintenance procedures;
- installation and commissioning inspection reports;
- service reports and worksheets;
- breakdown reports and worksheets;
- daily and weekly inspection reports;
- records of component replacement;
- records of major overhaul;
- erection, reconfiguration and dismantling records;

- test reports;
- wire rope and hook test certificates;
- thorough examination reports;
- records of defect rectification;
- data logger records;
- records of supplementary tests;
- record of modifications and upgrades;
- safety alerts from manufacturers;
- records of extraordinary events;
- records of unusual applications.

NOTE Reports of thorough examination under LOLER 1998 [2] are not required to be kept for the life of the crane, unlike EC Declarations and test certificates; however, keeping these records for the life of the machine is regarded as best practice.

7.6 Management review of maintenance records and procedures

For the safe and efficient operation of a cargo handling and container crane fleet, a regular management review of crane maintenance records and procedures should be carried out by the managers responsible for the maintenance operation to enable them to be confident that a robust maintenance system is in place that can be relied upon rapidly to highlight any shortcomings and the need for corrective action. The review should include:

- checks that faults are being corrected and closed out appropriately and the maintenance schedule is being completed to plan;
- checks to determine if the regime and frequencies are appropriate and to analyse trends.

The reviews should be carried out initially at least monthly. Once a suitable level of confidence in the systems has been established the review frequency may be reduced in the light of experience.

7.7 Site issues for maintenance

7.7.1 Maintenance downtime

PUWER 1998 [3] Regulation 5 requires employers to ensure that cranes are maintained in an efficient state, in efficient working order and in good repair.

As the main purpose of a cargo handling or container crane is to carry out lifting operations, operations managers can be, understandably, reluctant to stop the crane while maintenance is carried out.

WARNING. It is essential that maintenance downtime is scheduled into the work programme, so that maintenance is not pushed to the back of the queue and does not end up being carried out hurriedly in unsafe conditions such as poor light.

7.7.2 Communication

Those planning and carrying out maintenance on cargo handling and container cranes should ensure that they have effective lines of communication with the site staff for both routine maintenance and attending to breakdowns. Maintenance personnel should always report their arrival at a crane, agree the programme of work to be carried out and report back once the tasks have been completed. This can avoid much frustration and misunderstanding on both sides.

7.7.3 Access for maintenance

NOTE Attention is drawn to the Work at Height Regulations 2005 (as amended) [7].

To maintain and repair cranes in a safe and efficient manner, employers and maintenance contractors should ensure that procedures are in place to enable the maintenance personnel to access all relevant parts as and when required. Where it is important to gain access within a limited time, e.g. to repair a breakdown, contingency plans should be put in place.

In drawing up plans, consideration should be given to the following. Some parts might be accessible by using permanent facilities such as access ladders to the gantry combined with gantry and cross-bridge walkways. However, such facilities do not always provide access to all parts, and maintenance personnel might need to use personal protective equipment (PPE) to protect against the risk of a fall. Use of PPE requires suitable anchor points and a recovery plan in the event that a fall occurs. See BS 8437 for details on the selection and use of PPE for personal fall protection.

Temporary access facilities, such as a mobile elevating work platform (MEWP) or scaffolding, might be required to reach some parts. Such temporary facilities usually stand on the ground or floor of a building and require a suitable surface, space for access, space to operate in and time to deploy. The personnel who deploy and use such facilities should be trained for the purpose, and the equipment used should be in a serviceable condition.

Whilst planned maintenance should be carried out at a convenient time and with the crane in a position of choice, consideration should be given to repair in the event of a breakdown with the crane in an inconvenient position. The possibility of a breakdown with a load in the air should also be considered.

Where maintenance or repair is contracted out, the employer and contractor should agree in advance who is responsible for providing any PPE and its use, or providing temporary access facilities.

7.8 Spare parts

Maintenance operations on cranes can only be fully effective if the correct spare parts are available at the correct location in a timely manner. A robust spare parts management system should be put in place to avoid any unnecessary additional direct and indirect costs and any adverse effects on the safety of the crane.

Where spare parts are not obtained from the crane manufacturer, parts should be obtained that meet the original manufacturer's specification. Where necessary, a full engineering assessment of the part(s) should be carried out to ensure that this is the case.

7.9 Use of special materials in crane construction

Modern cranes make extensive use of high tensile steels. When repairs are carried out to any parts of the crane structure, the correct procedure laid down by the manufacturer should be strictly followed to avoid changing the properties of the material.

8 Thorough examination of cargo handling and container cranes

8.1 General

8.1.1 Thorough examination of cargo handling cranes and container cranes is required by LOLER 1998 [2] Regulation 9 in the following circumstances (see BS 7121-2-1:2012, **8.3.1**):

- before being put into use for the first time, unless the crane is new and the owner has an EC Declaration of Conformity dated not more than twelve months prior to the crane being used for the first time, LOLER Regulation 9(1);
- where safety depends on the installation conditions:
  - after installation and before being put into service for the first time, LOLER Regulation 9(2)(a);
  - after assembly and before being put into service at a new site or in a new location, LOLER Regulation 9(2)(b);
- periodically whilst in service, at maximum intervals of 6 months for cranes that lift people and 12 months for cranes that lift goods only, LOLER Regulation 9(3)(a)(i) and (ii);
- after exceptional circumstances have occurred, LOLER Regulation 9(3)(a)(iv).

8.1.2 The competent person should normally work to a defined scope of thorough examination (see **8.6**). However, the examination scheme approach (see BS 7121-2-1:2012, **8.9**) may be used for certain cranes.

8.2 Selection of the inspection body and competent person to undertake thorough examination

The crane owner should select the inspection body to undertake thorough examination, giving consideration to the experience, knowledge, competency and size of the provider. It is recommended that a long term relationship is built up with the provider rather than having too frequent changes in provider.

It is essential that the provider and competent person undertaking the thorough examination of a crane are sufficiently independent to be able to make decisions without fear or favour.

Where thorough examinations of cargo handling and container cranes are undertaken by external providers, it is strongly recommended that the competent person undertaking through examination does not examine a crane on which they have recently carried out maintenance.

Where a user organization carries out maintenance of its own cranes, it is recommended that thorough examination is carried out by a third party external provider who is suitably independent.

In the case where a third party external provider is used for both maintenance and thorough examination, it is recommended that the employer of the competent person has an audit trail in place to demonstrate that the thorough examinations are being carried out with impartiality and integrity. This should include periodic auditing of the process by a senior engineer or manager of the company employing the competent person.

Where maintenance and thorough examination are to be undertaken by a single person, whether on a user's premises or elsewhere, the crane owner should ensure that the thorough examination is undertaken first before any maintenance work is undertaken. In such cases, any defects found at the time of the thorough examination should be declared on the report of thorough examination even if they were immediately rectified.

8.3 Exchange of information prior to thorough examination

8.3.1 In advance of the thorough examination, the crane owner should prepare all relevant information regarding the crane to be examined. This information should be supplied to the competent person undertaking thorough examination and should include, but not be limited to, the following:

- EC Declaration of Conformity;
- rated capacity charts and information;
- rated capacity indicator/load limiter calibration certificate/settings;
- the last report of thorough examination;
- in-service inspection reports;
- maintenance records relating rectification of defects, malfunctions and modifications since the last thorough examination;
- original design codes including the design life of the crane;
- information on the number of lifts, type of lifts and hours the crane has been used since first installation and since the last thorough examination, and the calculated or estimated remaining design life;
- information on any overloads, dropping of loads or collisions with the crane;
- records of any supplementary tests or inspections requested at the previous thorough examination;
- general arrangement drawings;
- wire rope certificates.

8.3.2 The competent person should request any further information they might require prior to undertaking the thorough examination. Discussion and agreement should be reached as to assistance that will be provided to the competent person and the safe system of work to be followed during the examination. The scope of the discussions should include the following:

- the date and time the examination is to take place;
- the timing, sequence and extents of the examination. It is essential that the time required by the competent person undertaking thorough examination is discussed and agreed with the crane owner. It is important that sufficient time is allocated and that the competent person is not put under undue time constraints and pressure;
- arrangements for the isolation of sources of power and establishment of a safe system of work;
- access arrangements for work at height (see **7.7.3**);

  NOTE Attention is drawn to the Work at Height Regulations 2005 (as amended) [7].

- arrangement for the removal of inspection covers and hatches;
- arrangements for parts of the crane to be cleaned prior to thorough

examination by appropriate means, e.g. pressure washed, to remove all spoil/dirt that would otherwise conceal the structure or mechanisms and prevent an effective examination;

- provision of supplementary lighting;
- provision of specialist instruments, tools and equipment;
- arrangements for functional checks of the crane;
- communication methods between the competent person, crane operators and maintenance personnel during examination of the crane. i.e. radio communication.

8.3.3 If the competent person has not examined the crane on a previous occasion it is strongly recommended that they are given the opportunity to view the crane prior to the thorough examination commencing.

8.3.4 Prior to the examination commencing the competent person should hold a briefing with all operational or maintenance personnel who will be providing assistance. At this briefing they should:

- explain and confirm the safe system of work they will be following;
- provide information as to the extents and sequence of the examination they will be undertaking;
- confirm the assistance they will require from each individual;
- confirm and check communication methods within the team.

8.4 Scope of thorough examination before the crane is put into use for the first time

The competent person who undertakes the thorough examination should decide the scope of the examination. The extent of the thorough examination should reflect the likelihood of failure and the actual risk which could arise from any such failure. It should also take into account when the crane was made and the likely deterioration since manufacture, which could increase risks in use. Records of tests and inspections carried out by the manufacturer should also be taken into account.

8.5 Scope of thorough examination following installation

For cargo handling cranes and container cranes for which thorough examination after installation is required (see **8.1.1**), the competent person who undertakes the thorough examination should decide the scope of the examination. LOLER 1998 [2] Regulation 9(2)(a) and (b) requires that this establishes that the crane has been installed correctly and is safe to use.

As a minimum, the examination should ensure the crane has been installed, checked and tested in accordance with the manufacturer's instructions.

The scope of the thorough examination should be proportional to the complexity of the installation and the reports of previous thorough examinations, where applicable.

8.6 Scope of periodic thorough examination

8.6.1 General

The competent person carrying out a periodic thorough examination should work to a defined scope of thorough examination that has been drawn up specifically for the crane they are required to examine (see BS 7121-2-1:2012, **8.6**).

The defined scope of thorough examination should be drawn up in advance of the examination by a competent person and should identify those parts of the crane that should be thorough examined, together with required supplementary reports and tests and the extent to which they should be witnessed, and details of any required non-destructive testing of the crane structure and mechanisms.

The competent person carrying out the thorough examination may add to the defined scope but is not permitted to reduce it.

It is essential that the defined scope of thorough examination includes all components that may be used with the crane in different configurations, together with any dedicated ancillary equipment. Particular attention should be paid to wire ropes (see Clause **11**). Components that are regularly used with the crane should be included in every thorough examination of the crane. Other components should be thoroughly examined prior to use. Precautions, for example quarantining, should be taken to ensure that such components are not used unless there is a current thorough examination report for the component.

The competent person who prepared the defined scope of thorough examination should periodically review it to take account of changes in usage of equipment, findings of previous thorough examinations, supporting supplementary reports and tests, together with any information from maintenance activities, manufacturers or other sources. A copy of the defined scope of thorough examination should be kept in the machine history records.

The defined scope of thorough examination should, as a minimum, include the components listed in **8.6.2**. These components should be assessed against the relevant criteria listed in **8.6.3**, taking into account the path of the load through the crane's structure and mechanisms. It is essential that the scope is risk based and takes into account the consequences of failure of the crane.

8.6.2 Components to be included

The following components should be included in the defined scope of thorough examination for a cargo handling or container crane (as applicable):

NOTE 1 This list is not exhaustive.

- base structure, legs and outriggers;
- base information board;
- crane travelling base, wheels, tyres, drive system, brakes, steering and rail track including fasteners, storm anchors and ties and end stops;
- access ladders, stairs, rest platforms, guard rails and interlocked safety gates;
- personnel access lift;
- slew section structure, including fasteners and slew ring;
- slewing mechanism (examination throughout its full range of movement);

  NOTE 2 Luffing jib cranes should be at maximum radius.
- power supply cables, and cable reeling systems (visual examination);
- luffing jib or boom structure, pendants, pivots, walkway sheaves, bolts, pins and other fastenings;
- cab, including controls, indicators, seating, windows, heating, security bars, wipers and load charts;
- vision systems, e.g. for monitoring gantry travel, boom latch position and that trolley reverse is clear;
- dedicated audible communication systems, e.g. intercom, telephone, radio;

- counterjib and counterweights, including pendants, fasteners, guard rails and signage;
- hoist, luffing and boom mechanisms and brakes, trolley drives and brakes, including hydraulic systems;
- hydraulic luffing systems and locking mechanisms;
- control cabinets and wiring;
- ″A″ frame, including sheaves, fasteners, boom latches, return springs and access ladders;
- emergency escape equipment and anchor points;
- limiting and indicating devices (operational and ultimate) including:
  - rated capacity system (measurement of load, moment and radius);
  - anemometer;
  - devices indicating:
    - over hoist limits;
    - trolley limits;
    - luffing or boom limits;
    - slack rope limits;
    - rail travel limits;
  - overspeed devices;
  - devices provided to ensure stability (outrigger interlocks, speed or steering angle limiters, tilt monitors, etc.);
- hook block, including sheaves, hook and fall change system;
- running wire ropes, including terminations;
- lightning protection system.

8.6.3 Assessment criteria

The following assessment criteria should be included in the defined scope of thorough examination for a cargo handling or container crane:

NOTE This list is not exhaustive.

- adjustment – as specified by manufacturer;
- alignment – within manufacturer's tolerance;
- backlash – within manufacturer's tolerance;
- bearing play – within manufacturer's tolerance;
- brake performance – within manufacturer's tolerance;
- corrosion – affecting strength or functionality;
- cracks – affecting strength or functionality;
- cylinder creep – within manufacturer's tolerance;
- damage – affecting strength or functionality;
- distortion – affecting strength or functionality;
- fluid levels – within manufacturer's limits;
- functionality – as intended by manufacturer;
- guards – presence and condition;

- limit accuracy – as specified by manufacturer or designer;
- leaks – affecting strength, functionality and slips;
- lubrication – adequacy;
- markings – presence, accuracy and condition;
- mode of operation – as intended by manufacturer;
- obstructions – impeding safe access;
- rope condition – (see Clause **11**);
- rope fit – as specified by manufacturer;
- rope reeving – as specified by manufacturer;
- rope specification – as specified by manufacturer;
- security – attachment of components and sub-structures, fasteners, welds etc.;
- seizure – full or partial seizure of rotating components;
- tidiness – general housekeeping;
- wear – affecting strength or functionality.

8.6.4 Scope of periodic thorough examination for cranes that remain in service past their design life

If a crane is to be used past the original design life (see **7.2.3**) then the defined scope of thorough examination should be reviewed and amended by the competent person, taking into account the crane service, maintenance and thorough examination history and the results of the assessment of additional life expectancy (see **7.2.3**).

8.7 Periodic thorough examination interval

The statutory maximum intervals of 6 months and 12 months may be reduced to take into account environmental factors or the general age and condition of the crane etc. The decision to reduce the interval between thorough examinations may be made by the competent person, the crane owner or the crane user.

Reasons for reduction of the interval between thorough examinations include the following:

- to take into account the findings of previous thorough examinations, inspections and maintenance procedures;
- to take into account the frequency and intensity of use of the crane and the environment in which it is used;
- to take account of the use of magnets or grabs on cranes that were not designed for this purpose.

8.8 Thorough examination after exceptional circumstances

LOLER 1998 [2] requires that if the crane is subjected to exceptional circumstances it has to be removed from service and subjected to a thorough examination to determine whether it is safe to be returned to service.

Exceptional circumstances include an unintended movement, overload, boom strike, collision, sudden loss of load, use for particularly arduous duties, failure of a structural component or being subjected to weather in excess of design parameters.

The scope of the thorough examination should be proportional to the nature of the exceptional circumstances and the extent of any repairs, and should take into account the reports of previous thorough examinations, where applicable.

8.9 Preparation for thorough examination

The crane should be checked to determine whether it is clean enough not to conceal the structure or mechanisms to an extent that would prevent an effective examination. If necessary the crane should be cleaned as required.

If the local lighting is not adequate for examination purposes it should be supplemented by portable lighting.

The identification and rated capacity marked on the crane should be checked against the records, for example the test certificate, declaration of conformity, the manufacturer's instructions for use and the report of the last thorough examination.

The competent person carrying out the thorough examination should determine if there is any history of defects or malfunctions, and whether any repairs, alterations or additions have been made. The last report of thorough examination and in-service inspection reports should be consulted (see **8.3**).

The crane should be made safe by isolating and locking-off the power supply when necessary and reinstating it as appropriate.

Where it is not possible to ascertain the condition of hidden mechanism parts, for example ropes, chains, sheaves, terminations or hydraulic cylinders, dismantling prior to thorough examination should be carried out as required by the competent person.

Additional means of safe access should also be provided as required by the competent person, e.g. scaffolding, working platforms or mobile elevating work platforms.

NOTE Attention is drawn to the Work at Height Regulations 2005 (as amended) [7].

8.10 Rated capacity indicator/rated capacity limiter (RCI/RCL) calibration check and functional test

The periodic thorough examination of a cargo handling or container crane should include a calibration check and functional test of the rated capacity indicator/rated capacity limiter (RCI/RCL) in accordance with BS 7121-2-1:2012, **10.15**.

9 Overload testing of cargo handling and container cranes

9.1 General

Overload testing of cargo handling and container cranes should be carried out to supplement the thorough examination after first installation and after each reinstallation. Cargo handling and container cranes should also be overload tested after major repairs or modifications.

9.2 Before testing

The competent person should seek advice from the crane manufacturer (or other suitable design authority) before deciding on the nature of the test and the method of carrying it out, including the magnitude of the overload to be applied.

A visual examination of the crane and the test area should be carried out prior to commencing the test.

Before application of a load, a thorough examination of the crane should be carried out to determine whether it is in a safe state and condition to be overload tested.

The competent person should check the rated capacity specified on the manufacturer's certificate of test, the load radius indicator, that used by the rated capacity indicator/rated capacity limiter, and that specified on the table of rated capacities displayed in the operator's cab. The rated capacities should all be identical. Any anomalies should be investigated and resolved before commencing any test. This might require consultation with the manufacturer.

A functional test with no load applied should be carried out to determine whether the controls, switches, contactors and other devices operate correctly. The adjustments of the brakes and limit switches should be checked and tests carried out to determine whether they are operating correctly. These tests should be repeated with a load that is within the rated capacity of the crane.

9.3 Lifting capacities

The load ratings marked on cranes and shown on the manufacturer's rated capacity charts can be different for different types of crane and different suppliers. They can indicate the gross or the net load, i.e. the load quoted might or might not include the load imposed by the hook block and any attachments supplied with the crane. Therefore, before the crane is tested, the rated capacity charts should be scrutinised closely to determine how the rated capacity has been expressed and, if necessary, allowance made for the hook block and any attachments.

9.4 Overload testing

9.4.1 Preparation

When testing a rail mounted crane, at the start of testing the crane should be positioned on a straight and level track with firm foundations and free from obstructions.

When testing a rubber tyred gantry crane, a straddle carrier, or a mobile harbour crane, the crane should be positioned on firm, level ground free from obstructions.

9.4.2 Test procedure

NOTE 1 During the raising of any load it might be necessary to luff-in the jib, or trolley-in the load so that the radius is not exceeded owing to deflection of the slewing jib.

With the trolley or jib positioned at the maximum radius or outreach of the crane , a load equivalent to the rated capacity of the crane should be raised until every tooth in the train of gears has been subjected to the load, and the crane operated through all its permitted motions to determine whether the crane is safe to proceed with the test.

The load should then be increased by the amount specified by the manufacturer and this load hoisted until each tooth in the train of gears has been subjected to the overload, and the crane operated through its permitted motions.

With the trolley or jib positioned at the maximum radius or outreach corresponding to the maximum rated capacity, a load equivalent to the rated capacity should then be raised until each tooth in the train of gears has been subjected to the load, and the crane operated throughout all its permitted motions, to determine whether the crane is safe to proceed with the test.

The load should then be increased to the test load specified by the manufacturer and hoisted until each tooth in the train of hoist gears has been subjected to the overload, and the crane operated throughout its permitted motions to ensure the overload is applied to all parts.

NOTE 2 On cranes with variable radius or outreach it might be necessary to repeat the test at different radii or outreach positions, or with more than one test load.

Where the loaded crane can travel on rail tracks the overload should be travelled the appropriate length of the track with the jib at right angles, at both sides and in line with it, where such duties are permitted.

During the overload test, the crane should be operated at speeds appropriate to the safe control of the load, for example the lowest possible speed of the crane.

During the overload test the crane should remain stable and structurally sound, and the brakes on each motion should function effectively.

9.5 Post-test examination

On completion of the test a further thorough examination of the crane should be carried out (see BS 7121-2-1:2012, **8.12**).

10 Non-destructive testing of cargo handling and container cranes to supplement thorough examination

Non-destructive testing (NDT) of cargo handling and container cranes is a valuable aid to the identification of cracks and other defects in crane structures damaged by fatigue, corrosion or overloading.

The competent person responsible for preparing the defined scope of thorough examination of the crane should determine the extent, frequency and nature of any non-destructive testing required to supplement thorough examination. The non-destructive testing should be applied to structural members, mechanisms and components that are critical to the structural integrity of the crane. When determining the non-destructive testing required, the competent person should take the following into account:

- the standard to which the crane was designed;
- the original design life given by the crane manufacturer;
- the number of lifts and magnitude of the lifts completed by the crane;
- the environment in which the crane has been used;
- the crane's maintenance history;
- repairs and alterations that have been carried out on the crane;
- any damage to the crane structure following collision with ships, fixed structures, vehicles or other cranes;
- the magnitude and frequency of overloads and shock loads on the crane;
- the results of previous non-destructive testing of the crane;
- any safety alerts issued by the crane manufacturer, trade associations and/or bodies, professional bodies and/or enforcing authorities.
- the results of any fatigue assessment undertaken by the manufacturer or by other persons, including the following information, where provided:
    - identification of all areas of the crane that might be subjected to frequent cyclic loading;

- the level and frequency of stress that the crane might be subjected to during normal and abnormal operation,
- the materials of construction and the areas of the crane structure that might act as stress raisers, such as welds and section changes.

After NDT any paint removed during testing should be made good to prevent corrosion.

NDT reports or test certificates should be appended to the thorough examination report.

NOTE When NDT is being considered, the crane owner might want to compare the cost of undertaking the testing against the cost of a replacement part. Often the cost of replacing a part with a new one can be less than the cost of NDT.

11 Assessment of wire rope condition and discard criteria

When carrying out examination of wire ropes as part of the thorough examination of a cargo handling crane or a container crane, the competent person should examine the rope in accordance with BS ISO 4309:2010, Clause **5** and Clause **6**. See BS 7121-2-1:2012, Clause **14**.

Annex A (informative) Container cranes – Examples of checklists for pre-use checking and in-service inspection

A.1 Pre-use checking

The following is an example of a checklist for pre-use checking of a container crane:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check that the crane has not been removed from service for maintenance;

b) check that the storm pins have been lifted;

c) check operation of emergency stop controls;

d) check operation of all crane motion controls;

e) check that the work areas on the crane are tidy and free from any item which might fall, that access to and egress from the cab are adequate and that the appropriate fire-fighting equipment is available;

f) check that there are no obstructions in the path of travel of the crane or that adequate precautions are in place to prevent collisions;

g) check condition of ladders, steps, guard rails, hand holds and working platforms on route to operator's cab;

h) check for presence and legibility of markings, including marking of controls and warning and safety notices;

i) check that the container spreader flippers function correctly and are not damaged;

j) check operation of motion limiting devices, exercising caution whilst making checks in case of malfunctions;

NOTE 3 When it is impractical, due to speed or distance, to check long travel limiting devices on every occasion, a check need only be made when the crane is to be used in their vicinity.

k) check the function of the upper and lower operational hoist limits;

l) check the function of the trolley limits at the end of the boom (front and back);

m) check operation of audible warning devices where fitted;

n) check function of gantry lights and alarms;

o) carry out a visual check of the condition of the cab controls and remote control station, as appropriate;

p) check instruments in operator's cab;

q) check operator's seat is secure;

r) check operator's seat belt;

s) check cab windows are clean and not damaged;

t) check function of windscreen wipers;

u) check function of radio;

v) check operation of rated capacity limiter or weighloader device, if fitted.

A.2 In-service inspection

The following is an example of a checklist for in-service inspection of a container crane:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) carry out a visual inspection of all wire ropes for broken wires, flattening, basket distortion or other signs of damage, excessive wear and surface corrosion;

b) carry out a visual inspection of all rope terminations, pins and retaining devices, and an inspection of all sheaves, for damage, worn bushes or seizure;

c) carry out a visual inspection of the headblock, twistlocks, safety catches and other load lifting devices for damage;

d) carry out a visual inspection of the structure for damage, for example cracked welds and loose bolts and fasteners, including trolley rails, clips and the driving mechanism;

e) check that the gantry long travel warning beacons are not damaged or loose;

f) check for the presence of any fluid leaks (including spreader frame);

g) check whether all moving parts are adequately lubricated with an appropriate lubricant;

h) check whether all controls are clearly marked and operate correctly;

i) operate the crane through all its motions while checking for any unusual noises or erratic movement during operation;

j) check the operation of all motion limiting devices, anti-collision devices and emergency stops;

k) carry out a visual inspection of any load limiter/weighloader/load cells. This should at least comprise a physical check of the load limiter components, paying particular attention to cables, connectors and mountings;

l) check the functional effectiveness of the load limiter/weighloader/load cells;

m) carry out a visual inspection of the electrical equipment and check for exposure to contamination by oil, grease, water or dirt;

n) check the functional effectiveness of the braking system and that it is correctly maintained;

o) carry out a visual inspection of trolley rails and end stops;

p) check the operation of all wind monitoring equipment, indicator lamps and alarms;

q) check the functional effectiveness of the wind monitoring equipment, where fitted;

r) check the operation of all communications equipment, intercoms, tannoys and loudspeakers;

s) check the operation and condition of all ancillary equipment, maintenance equipment and reeving equipment;

t) check the festoon cable and tow chains, or condition and function of energy chains;

u) check general condition and security of primary motion electric motors;

v) check lubricant levels and condition of transmission system, including gearboxes and drive couplings, tram and trolley wheels;

w) lubricate sheaves and active linkages;

x) check condition of rope lubrication and re-dress as appropriate;

y) check hydraulic oil levels;

z) check brake and clutch reservoir levels, brake discs and thrusters;

aa) check hydraulic hose for leaks/damage and operation/security of snag load/overload protection;

bb) check operation of boom, securing latches, thrusters, guides and stops;

cc) check crane lighting:

- access/egress;
- main floodlights;
- navigation and warning;
- internal and emergency;

dd) check crane structure, including counterweight, forestays, backstays and guides;

ee) check lubrication of slew ring assembly, gears and drive path, where fitted;

ff) check operator's/driver's cab, including mountings and fixings to the crane;

gg) check spreader/headblock downcable controls and cable reeving and collection systems;

hh) check crane access and egress walkways for security of floor gratings, handrails, access gates, guarding and safety interlocks;

ii) check crane access personnel lifts for in-service condition and correct operation.

Annex B (informative) Mobile harbour cranes – Examples of checklists for pre-use checking and in-service inspection

B.1 Pre-use checking

The following is an example of a checklist for pre-use checking of a mobile harbour crane:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check that the crane has not been removed from service for maintenance;

b) check for the presence of any fluid leaks (including spreader frame);

c) check engine oil level;

d) check fuel level;

e) check coolant level;

f) check ropes for obvious signs of spooling and kinks;

g) inspect tyres for obvious signs of damage;

h) check out-riggers and mats for obvious signs of damage;

i) check for debris between twin wheels;

j) check condition of ladders, steps, guard rails, hand holds and working platforms;

k) check cleanliness of crane and decking;

l) check cab controls for correct operation;

m) check cab gauges and warning lights;

n) check the function of the upper and lower operational hoist limits;

o) check function of magnet or grab attachment, if applicable;

p) check the container spreader functions correctly, if applicable;

q) check for presence and legibility of markings, including marking of controls, and warning and safety notices;

r) check cab windows are clean and not damaged;

s) check function of windscreen wipers;

t) check function of radio;

u) check function of seat and seatbelt;

v) check cab operated lights;

w) check fire extinguishers are present and serviceable.

B.2 In-service inspection

The following is an example of a checklist for in-service inspection of a mobile harbour crane:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check availability of the current report of thorough examination;

b) visually examine the crane structure for physical damage;

c) check for the presence of any fluid leaks (including spreader frame);

d) check condition of ladders, steps, guard rails, hand holds and working platforms;

e) examine any trailing cable, plugs and sockets for damage;

f) inspect tyres for obvious signs of damage;

g) check condition of wheel studs;

h) check security of all retaining pins;

i) check gantry travel function;

j) check for correct function of gantry lights and alarm, if applicable;

k) check the rope is correctly positioned on the hoist drum;

l) check visible condition of the hoist rope;

m) check condition of luffing ropes/cylinders;

n) check operation of rated capacity limiter;

o) check operation of rated capacity indicator and check code is correct;

p) check operation of motion indicating and limiting devices;

q) check operation of slew lock pin and slewing brakes;

r) check operation of hoist/derrick brakes;

s) check luffing motor/gearbox for excessive vibration and noise;

t) check hoist motor/gearbox for excessive vibration and noise;

u) check slew motor/gearbox/ring for excessive vibration and noise;

v) check correct function of hoist, slew and luff controllers;

w) check the function of the upper and lower hoist limits;

x) check security and condition of hook block and safety catches;

y) check solenoid brakes for correct adjustment;

z) check hoist foot brake for correct operation, if applicable;

aa) check function of cab operated lights;

bb) check function of hook swivel;

cc) check cab door and platform gates are operational;

dd) check cab mountings and fixings to the crane, and cab elevating system, if applicable.

Annex C (informative) Straddle carrier cranes and rubber tyred gantry cranes – Examples of checklists for pre-use checking and in-service inspection

C.1 Pre-use checking

The following is an example of a checklist for pre-use checking of a straddle carrier crane or a rubber tyred gantry crane:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check that the crane has not been removed from service for maintenance;

b) check that there are no obstructions in the path of travel of the crane or that adequate precautions are in place to prevent collisions;

c) check operation of rated capacity limiter and indicator;

d) check controls for correct operation;

e) check cab gauges and warning lights;

f) check operation of emergency stop controls;

g) check operation of all crane motion controls;

h) check operation of motion limiting devices, exercising caution whilst making checks in case of malfunction;

NOTE 3 When it is impractical, due to speed or distance, to check long travel limiting devices on every occasion, a check need only be made when the crane is being used in their vicinity.

i) check operation of audible warning devices, where fitted;

j) check that the work areas on the crane are tidy and free from any item which might fall, that access to and egress from the cab are adequate and that the appropriate fire-fighting equipment is available;

k) check function of upper and lower operational hoist limits;

l) check function of trolley limits at the end of the girder (front and back);

m) check function of gantry lights and alarms;

n) check operation of steering;

o) check tyre pressures and inspect tyres for damage;

p) check wheel studs;

q) check function and condition of container spreader frame;

r) check that the container spreader flippers are not damaged;

s) check condition of ladders, steps, guard rails, hand holds and access platforms on route to the operator's cab;

t) check for presence and legibility of markings, including marking of controls, and warning and safety notices;

u) check cab windows are clean and not damaged;

v) check function of windscreen wipers;

w) check function of radio;

x) check operator's seat is secure;

y) check operator's seat belt.

C.2 In-service inspection

The following is an example of a checklist for in-service inspection of a straddle carrier crane or a rubber tyred gantry crane:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check availability of the current report of thorough examination and the operator's manual;

b) carry out a visual inspection of all wire ropes for broken wires, flattening, basket distortion, or other signs of damage, excessive wear and surface corrosion;

c) carry out a visual inspection of all rope terminations, pins and retaining devices and inspection of all sheaves, for damage, worn bushes or seizure;

d) carry out a visual inspection of the headblock, twislocks, safety catches and other load lifting attachments for damage;

e) carry out a visual inspection of the structure for damage, for example cracked welds and loose bolts and other fasteners, including trolley rails, clips and driving mechanism;

f) check engine oil level;

g) check fuel level;

h) check coolant level;

i) check torque converter level;

j) check whether all moving parts are adequately lubricated with an appropriate lubricant;

k) check whether all controls are clearly marked and operate correctly;

l) operate the crane through all its motions while checking for any unusual noises or erratic movement during operation;

m) check the operation of all motion limiting devices, anti-collision devices and emergency stops;

n) carry out a visual inspection of any load limiter/weighloader/load cells. This should at least comprise a physical check of the load limiter components, paying particular attention to cables, connectors and mountings;

o) check the functional effectiveness of the load limiter/weighloader/load cells;

p) carry out a visual inspection of the electrical equipment and a check for exposure to contamination by oil, grease, water or dirt;

q) check the functional effectiveness of the braking system and that it is correctly maintained;

r) check the operation of all wind monitoring equipment, indicator lamps and alarms;

s) check the functional effectiveness of the wind monitoring equipment, where fitted;

t) check the operation of all communications equipment, intercoms, tannoys and loudspeakers;

u) check the operation and condition of all ancillary equipment, maintenance hoists and reeving equipment;

v) check that the gantry long travel warning beacons are not damaged or loose;

w) check for the presence of any fluid leaks (including spreader frame);

x) check the festoon cable and tow chains, or condition and function of energy chain;

y) check general condition and security of primary motion and electric motors;

z) check lubricant levels and condition of transmission system, including gearboxes and drive couplings, tram and trolley wheels;

aa) lubricate sheaves and active linkages;

bb) check condition of rope lubrication and re-dress as appropriate;

cc) check hydraulic oil levels;

dd) check brake and clutch reservoir levels, brake discs and thrusters;

ee) check hydraulic hose for leaks/damage;

ff) check crane lighting:

- access/egress;
- main floodlights;
- navigation and warning;
- internal and emergency;

gg) check lubrication of slew ring assembly, gear and drive path, where fitted;

hh) check operator's/driver's cab, including mountings and fixings to the crane;

ii) check spreader/headblock downcable controls and cable reeving and collection systems;

jj) check crane access and egress walkways for security of floor gratings, handrails, access gates, guarding and safety interlocks.

Annex D (informative) Level luffing and slewing jib cranes – Examples of checklists for pre-use checking and in-service inspection

D.1 Pre-use checking

The following is an example of a checklist for pre-use checking of a level luffing crane or a slewing jib crane:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check availability of the operator's manual;

b) check that the crane has not been removed from service for maintenance;

c) check for the presence of any fluid leaks;

d) check ropes for obvious signs of spooling and kinks;

e) check out-riggers and mats for obvious signs of damage, if applicable;

f) check condition of ladders, steps, guard rails, hand holds and working platforms;

g) check cleanliness of crane and decking;

h) check cab controls for correct operation;

i) check cab gauges and warning lights;

j) check the function of the upper and lower operational hoist limits;

k) check function of magnet or grab attachment, if applicable;

l) check the container spreader functions correctly, if applicable;

m) check for presence and legibility of markings, including marking of controls, and warning and safety notices;

n) check cab windows are clean and not damaged;

o) check function of windscreen wipers;

p) check function of radio;

q) check function of seat and seatbelt;

r) check cab operated lights;

s) check fire extinguishers are present and serviceable.

D.2 In-service inspection

The following is an example of a checklist for in-service inspection of a level luffing crane or a slewing jib crane:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check availability of the current report of thorough examination;

b) visually examine the crane structure for physical damage;

c) check for the presence of any fluid leaks;

d) check condition of ladders, steps, guard rails, hand holds and working platforms;

e) examine any trailing cable, plugs and sockets for damage;
f) inspect travel gantry for obvious signs of damage;
g) check condition of gantry wheels;
h) check gantry travel function;
i) check security of all retaining pins;
j) check for correct function of gantry lights and alarm, if applicable;
k) check the rope is correctly positioned on the hoist drum;
l) check visible condition of the hoist rope;
m) check condition of luffing ropes/cylinders;
n) check operation of rated capacity limiter;
o) check operation of rated capacity indicator and check code is correct;
p) check operation of motion indicating and limiting devices;
q) check operation of slew lock pin and slewing brakes;
r) check operation of hoist/derrick brakes;
s) check luffing motor/gearbox for excessive vibration and noise;
t) check hoist motor/gearbox for excessive vibration and noise;
u) check slew motor/gearbox/ring for excessive vibration and noise;
v) check correct function of hoist, slew and luff controllers;
w) check the function of the upper and lower hoist limits;
x) check security and condition of hook block and safety catches;
y) check solenoid brakes for correct adjustment, if applicable;
z) check hoist foot brake for correct operation, if applicable;
aa) check function of cab operated lights;
bb) check function of hook swivel;
cc) check cab door and platform gates are operational.

Annex E (informative) Crane container top safety frames (man riding cages) used to access containers on ships – Examples of checklists for pre-use checking and in-service inspection

E.1 Pre-use checking

The following is an example of a checklist for pre-use checking of a crane container top safety frame used to access containers on ships:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check all information signs are in place and legible;
b) check general structure for damage;
c) check roof for damage;
d) check floor for damage;

e) check secondary fixings for correct operation;

f) check gate for damage and security;

g) check gate closes and latch works correctly;

h) check fall arrest blocks, if fitted, are in good condition and indicator shows safe zone, if applicable;

i) check condition of all hand and grab rails;

j) check operation and condition of kneeling flaps, if fitted;

k) check kneeling rubber is in place and secure;

l) check condition of suspension chains, if fitted;

m) check condition of toe boards and intermediate rails, where fitted.

E.2 In-service inspection

The following is an example of a checklist for in-service inspection of a crane container top safety frame used to access containers on ships:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check condition of main structure including all welded connections;

b) check security and condition of main suspension parts;

c) check security and condition of secondary fixing connections;

d) check security and condition of roof and floor panels;

e) check condition of twin twenty mimic plate on the roof;

f) check security and operation of all gates, hinges and latches;

g) check condition of all side panel mesh and frames;

h) check condition of all signs and markings;

i) check security of kneeling flaps and their operation;

j) check condition of harness anchor points;

k) check fall arrest equipment, if fitted;

l) check suspension chains, if fitted;

m) check condition of hand rails and grab rails.

Annex F (informative) Container spreaders – Examples of checklists for pre-use checking and in-service inspection

F.1 Pre-use checking

The following is an example of a checklist for pre-use checking of a container spreader:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check main frame body for damage;

b) check end beams for damage;

c) check multi-pin plugs, sockets and leads for damage;

d) check hydraulic pipework and valves for damage, security and leaks;

e) check expand function and operation;

f) check expand energy chains, pipes and cables for leaks and damage;

g) check flipper assemblies for security, damage and leaks;

h) check the functional effectiveness of the flipper guide assemblies;

i) check twistlock assemblies;

j) check condition and security of signal lamp assemblies;

k) check security and condition of all electrical panels, mounting rails and relays.

F.2 In-service inspection

The following is an example of a checklist for in-service inspection of a container spreader:

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions.

NOTE 2 This list is not exhaustive.

a) check main frame body for damage;

b) check end beams for damage;

c) check multi-pin plugs, sockets and leads for damage;

d) check hydraulic pump and drive coupling for security;

e) check hydraulic tank and filler for security and damage;

f) check hydraulic oil level and sight glass condition;

g) check hydraulic pipework and valves for damage, security and leaks;

h) check expand chain and adjuster for tension and condition;

i) check expand energy chains, pipes and cables for leaks and damage;

j) check expand motor and gearbox for leaks and security;

k) lubricate expand chain;

l) lubricate expand sprocket bearings;

m) check expand wear pad and rollers for wear and security;

n) lubricate expand beams;

o) check security of encoder and expand proximity switches;

p) check spreader expand positions and station switches;

q) check flipper assemblies for security, damage and leaks;

r) lubricate flipper gearboxes and check that nord lock washers are fitted;

s) check twistlock assemblies for wear and damage;

t) check security of twistlock collars, caps, nuts, pins and hoses;

u) check twistlock cylinder pins for security;

v) check functionality of twistlock lock and unlock proximity switches;

w) check probe pins and springs for security and functionality;

x) check functionality of probe pin proximity switches individually;

y) clear out oil and debris from all twistlock pockets;

z) lubricate twistlock assemblies;

aa) check condition and security of signal lamp assemblies;

bb) check security and condition of all electrical panels, mounting rails and relays;

cc) check security of all programmable logic controller (PLC) mountings and terminations;

dd) check security and functionality of twin twenty detection systems, where fitted;

ee) check overload settings;

ff) check operation of twin pick assemblies;

gg) check twin pick assembly for security/leaks;

hh) check twin pick lock/unlock functionality;

ii) check functionality of twin pick proximity switches;

jj) lubricate twin pick assemblies, including all rams, hooks and linkages.

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