

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When all sub-parts of BS 7121-2 have been published, it is intended that CP 3010 will be withdrawn and BS 5744 will be revised to cover manually operated and light cranes only.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

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;