

BS 7121-2-1:2012



BSI Standards Publication

Code of practice for the safe use of cranes

Part 2-1: Inspection, maintenance and thorough examination – General

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Published by BSI Standards Limited 2012

ISBN 978 0 580 77745 5

ICS 53.020.20

The following BSI references relate to the work on this standard:

Committee reference MHE/3/11

Draft for comment 12/30258064 DC

Publication history

First published November 2012

Amendments issued since publication

Date	Text affected
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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 November 2012. 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.

Supersession

Together with BS 7121-2-3, BS 7121-2-4, BS 7121-2-5 and BS 7121-2-7, this sub-part of BS 7121-2 supersedes BS 7121-2:2003, which will be withdrawn when all these sub-parts have been published.

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When all sub-parts of BS 7121-2 have been published, it is intended that CP 3010 will be withdrawn and BS 5744 will be revised to cover manually operated and light cranes only.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 read in conjunction with the appropriate sub-part(s) of BS 7121-2 dealing with the relevant crane type(s).

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 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];
- Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 [5];
- Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations (MCA LOLER) 2006 [6];
- Merchant Shipping and Fishing Vessels (Provision and Use of Work Equipment) Regulations (MCA PUWER) 2006 [7];
- Road Vehicles (Construction and Use) Regulations 1986 (as amended) [8].

NOTE 1 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 [9] and Safe use of work equipment [10].

NOTE 2 Details of the Merchant Shipping and Fishing Vessels Regulations [5], [6] and [7] are given in Maritime and Coastguard Agency Marine Guidance Notes MGN 20 (M+F) The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 [11], MGN 331 (M+F) The Merchant Shipping and Fishing Vessels (Provision and Use of Work Equipment) Regulations 2006 [12] and MGN 332 (M+F) The Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations 2006 [13].

1 Scope

This sub-part of BS 7121-2 gives general recommendations for the pre-use checks, in-service inspection, maintenance, thorough examination (following installation, in service and following exceptional circumstances) and supplementary testing of cranes and associated equipment, including gantries, runways and other supporting structures.

This sub-part of BS 7121-2 is also applicable to hoists, derricks, telehandlers, fork lift trucks and excavators when used to lift suspended loads. For the purposes of this standard all these are included under the term “cranes”.

It is not applicable to construction hoists, mast climbing work platforms, mobile elevating work platforms, jacks and suspended access equipment.

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 7121-1:2006, *Code of practice for safe use of cranes – General*

BS 7262, *Specification of automatic safe load indicators*

BS 7671, *Requirements for electrical installations – IET Wiring Regulations – Seventeenth edition*

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 following terms and definitions apply.

3.1 competent person

person who has such practical and theoretical knowledge and experience of the lifting equipment to be thoroughly examined which enables them to detect defects or weaknesses and to assess and report on their importance in relation to the safety and use of the lifting equipment

NOTE The competent person may be a member of the organization's staff. See 5.3.

3.2 continuing professional development (CPD)

conscious updating of technical knowledge and the improvement of skills throughout a person's working life

3.3 crane

lifting machine for suspended loads

3.4 crane operator

person who is operating the crane for the purpose of positioning loads or for erection of the crane

3.5 inspection body

employer of the competent person(s) who provide examination and testing services

NOTE BS EN ISO/IEC 17020 gives definitions of different types of inspection body.

3.6 lifting

movement of loads or persons necessitating, at a given moment, a change of level

3.7 load radius indicator

device fitted to a crane that shows the radius at which the crane is operating and its corresponding rated capacity

3.8 radius

horizontal distance between the point at which the centre of rotation of the crane meets the ground and the vertical centreline passing through the load lifting attachment

NOTE In the case of a non-slewing crane, the horizontal distance from the centreline of a load lifting attachment to the centreline of the nearest axle, bogie or track, measured at ground level, may be assumed to be the radius.

3.9 rated capacity

maximum load that can be safely handled by a crane in a specified configuration and under specified conditions

NOTE The rated capacity is also known as "safe working load" or "working load limit".

3.10 rated capacity indicator (RCI)

device that gives a warning when the crane is approaching its rated capacity

NOTE This was previously known as an "automatic safe load indicator".

3.11 rated capacity limiter (RCL)

device that prevents the crane from being overloaded

NOTE This was previously known as an "overload protector".

3.12 testing**3.12.1 functional testing**

operation of each motion of the crane without a load

3.12.2 performance testing

operation of each motion of the crane with a load equal to or less than the rated capacity to determine whether the crane performs to the manufacturer's specification

3.12.3 overload testing

operation of the crane with a load exceeding the rated capacity

3.12.4 non-destructive testing (NDT)

application of measurement techniques to parts of the crane to check for the presence, location and extent of any defects that could affect the integrity of the crane

NOTE The techniques employed for non-destructive testing are such that they do not damage or alter the material under test. NDT is also known as non-destructive examination (NDE).

3.13 thorough examination

examination by a competent person in such depth and detail as the competent person considers necessary to enable them to determine whether the equipment being examined is safe to take into use or continue in use

NOTE The thorough examination is not part of the maintenance regime for the equipment but provides owners with information which could be used to determine the effectiveness of the regime.

3.14 user

person or organization that has control of the crane

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

5.1 Personnel carrying out pre-use checks

It is essential that the pre-use checks of cranes are always carried out by personnel who have been assessed by their employer as competent. This competence should be achieved through a training and assessment scheme consisting of the following:

- initial training and assessment of competence;
- periodic re-assessment of that competence.

Crane operators may perform pre-use checks provided that they meet these criteria.

5.2 Personnel carrying out in-service inspections and maintenance

5.2.1 General

It is essential that the in-service inspection and maintenance of cranes is always carried out by personnel who have been assessed by their employer as competent and have adequate training and information to carry out the work required.

NOTE Attention is drawn to the Provision and Use of Work Equipment Regulations 1998 [3] which require maintenance work only to be done by those who are competent to do the work.

5.2.2 Attributes

Maintenance personnel and those carrying out in-service inspections should:

- be physically fit for the tasks they are to undertake;
- have adequate eyesight (with correction if needed);
- be comfortable working at height, over water or in a confined space (if required);
- have a responsible attitude;
- be able to communicate clearly with other personnel in the location where maintenance or inspection is taking place;
- be able to demonstrate adequate literacy and numeracy;
- be aware of their own limitations in knowledge and experience.

5.2.3 Competencies

Maintenance personnel and those carrying out in-service inspections should be:

- fully conversant with the machinery they are required to maintain and its hazards, including operation necessary for maintenance activities;
- properly instructed and trained. Where special machinery is involved this should include attending appropriate courses given by the manufacturer/supplier of the equipment;
- familiar with the procedures and precautions required for safe work at height, over water or in a confined space (where required);
- fully conversant with the appropriate sections of the manufacturer's instruction manual;
- familiar with the use of permit to work systems where they are required by the safe system of work, and able to operate them correctly;
- familiar with site specific safety requirements (e.g. manufacturing, construction, process plant, nuclear, docks, airports, railways);
- trained and competent in the selection, pre-use inspection and correct use of their personal protective equipment.

5.2.4 Competency assessment and training

5.2.4.1 Basic skills

All crane maintenance personnel and those carrying out in-service inspections should be trained in a set of basic skills to enable them to work safely and participate effectively in the maintenance and inspection processes. They should not be required to undertake tasks for which they have not been trained and assessed as competent to carry out. These basic skills should include the following:

- understanding basic health and safety requirements, including the risk assessment process, together with need for location/site specific safety;
- slinging and signalling;
- tool skills, including the selection and use of tools;
- identification, selection and fitting of fasteners (including threaded fasteners);
- selection, use, inspection and maintenance of personal protective equipment for working at height, over water or in a confined space (if required);
- interpretation of technical information, use of manuals;
- basic assessment of weather and ground conditions;
- generic skills in maintaining cranes within a safe system of work;
- product familiarity, including installation, rigging and other relevant operational aspects, on all makes and models of crane on which maintenance and/or inspection is being carried out;
- preparing the crane for maintenance or inspection (isolation of power sources, etc.);
- effective communication (including the use of radio equipment);
- carrying out basic adjustments to the crane;
- identifying and rectifying basic faults in the crane;
- functional testing;
- identifying proximity hazards.

5.2.4.2 Additional skills

The basic skills should be augmented by the following as required:

- wire rope inspection and termination;
- chain inspection and termination;
- webbing inspection and termination;
- use of specialist tools and equipment appropriate to the work being carried out (including torque wrenches, multipliers and hydraulic tensioning equipment);
- checking and setting of safety devices, including RCIs and RCLs;
- downloading data from data acquisition systems;
- carrying out complex adjustments;
- electrical testing;

- identifying and rectifying electrical faults;
- identifying and rectifying complex faults in equipment (including pneumatic and hydraulic equipment);
- welding and repair techniques.

5.2.4.3 Training plans

An individual training plan should be drawn up for each person carrying out maintenance and/or in-service inspections on cranes. This plan should take into account previous experience, qualifications and underpinning knowledge. Persons undergoing training should be closely supervised, where appropriate.

Achievement of this plan, and continuing professional development (see 5.2.5), should be monitored at frequent intervals and included in any quality system (e.g. BS EN ISO 9001) auditing process.

It is important that all maintenance personnel and those carrying out in-service inspections are regularly assessed to ensure that they can carry out their duties safely and effectively. An assessment should be undertaken of all maintenance personnel and those carrying out in-service inspections on appointment and at regular intervals thereafter. Assessment should form part of any training.

5.2.4.4 Training records

A comprehensive individual training record should be established for all maintenance personnel and those carrying out in-service inspections. This should be updated as training is undertaken and as a minimum should include:

- when the training took place;
- where the training took place;
- the scope of the training;
- the duration of the training;
- who delivered the training;
- the result of any assessment;
- when refresher training is required.

5.2.5 Continuing professional development

Continuing professional development (CPD) is a joint responsibility between the maintenance person or the person carrying out in-service inspections and their employer.

The employer should maintain a CPD record for each maintenance person and each person carrying out in-service inspections. The record should include details of how CPD is being achieved and should include for example:

- specific training towards enhancements/additions to skills;
- familiarization/re-familiarization, and ongoing training and mentoring;
- training on changes in legislation and working practices;
- updating of product knowledge;
- attendance at seminars and refresher training courses.

5.3 Personnel carrying out thorough examinations

5.3.1 General

LOLER 1998 [2] and MCA LOLER 2006 [6] require that thorough examination is carried out by “competent persons”.

Competent persons should have the necessary attributes, competencies, knowledge and experience to enable them to carry out effective thorough examinations of cranes. The nature and extent of these will depend on the purpose of the examination to be undertaken, the complexity of the cranes to be examined and the consequences of failure of those cranes.

It is essential that such persons have adequate training, information and independence to carry out the work required.

5.3.2 Attributes

Competent persons should:

- be physically fit for the tasks they are to undertake;
- have adequate eyesight (with correction if needed);
- be comfortable working at height, over water or in a confined space (if required);
- have a responsible attitude;
- be able to communicate clearly with other personnel in the location where thorough examination is taking place, including the need to take the crane out of service if it is unsafe to use;
- be able to demonstrate adequate literacy and numeracy;
- be aware of their own limitations in knowledge and experience.

5.3.3 Competencies

Competent persons should be:

- fully conversant with the machinery they are required to examine and its hazards, including operation necessary for thorough examination activities;
- properly instructed and trained;
- familiar with the procedures and precautions required for safe work at height, over water or in a confined space (where required);
- fully conversant with the appropriate sections of the manufacturer's instruction manual;
- familiar with the use of permit to work systems where they are required by the safe system of work, and able to operate them correctly;
- familiar with site specific safety requirements (e.g. manufacturing, construction, process plant, nuclear, docks, airports, railways);
- trained and competent in the selection, pre-use inspection and correct use of their personal protective equipment.

5.3.4 Knowledge base

NOTE Attention is drawn to LOLER 1998 [2] and MCA LOLER 2006 [6] which set out the legislative requirements for thorough examination.

Competent persons should have:

- an understanding of the applicable crane design standards and codes of practice for the selection and use of the relevant cranes, together with the applicable examination criteria;
- an understanding of the safety rules and associated codes of practice that are applicable to the relevant cranes;
- an understanding of the inspection and maintenance requirements of cranes;
- knowledge of appropriate test procedures which may be employed and the interpretation and limitations of those techniques;
- an understanding of drawings and manufacturing literature relevant to the cranes to be examined;
- knowledge of the materials and techniques used in the manufacture and assembly of the type of cranes to be examined.

5.3.5 Practical skills

Competent persons should:

- be capable of detecting defects or weaknesses in cranes which could compromise the safety of the crane;
- have sufficient knowledge and experience to assess the importance of defects or weaknesses in the crane and identify what actions need to be taken in order to rectify them. In particular they should be able to:
 - determine whether the crane is operating as intended;
 - specify the appropriate time-scales within which identified defects or weaknesses need to be rectified;
 - determine whether defects identified in the previous report of thorough examination have received attention;
 - determine whether all safety devices are functioning correctly;
 - check whether warning notices are correctly fixed and legible, and where necessary specify any limitations on the use of the crane;
 - witness any testing required as part of the thorough examination and evaluate the results;
 - report on the findings of the thorough examination.

5.3.6 Assessment of competence

Employers should determine through a formally documented assessment process the competence of each individual person, both existing employees and new entrants, based on the attributes, competencies, knowledge and skills listed in 5.3.2 to 5.3.5. A shortfall in attainment level does not necessarily preclude employment in this role but it is essential that such shortfalls are addressed before the person is allowed to carry out unsupervised thorough examinations of cranes.

5.3.7 Training plans

An individual training plan should be drawn up for each person who is to carry out the thorough examination of cranes. Achievement of this plan, and continuing professional development (see 5.3.11), should be monitored at frequent intervals and included in any quality system (e.g. BS EN ISO 9001) auditing process.

5.3.8 Technical product information

Before carrying out the thorough examination of a specific make and model of crane, the competent person should be provided with access to all relevant product specific technical information. This may be supplemented by information provided at briefing or training sessions delivered by the crane manufacturer or the employer. It is recommended that in-house training is carried out by a trainer who has received model-specific technical training directly from the manufacturer.

5.3.9 Assessment intervals

All competent persons should be assessed on appointment, again within their first 12 months, and at regular intervals (not exceeding 4 years) thereafter. Assessment should form part of any training.

5.3.10 Training records

A comprehensive individual training record should be established for all personnel carrying out thorough examinations. This should be updated as training is undertaken and as a minimum should include:

- when the training, refresher training, assessment or re-assessment took place;
- where the training took place;
- the scope of the training, including types and models of crane;
- the duration of the training;
- the outcome of the training;
- who delivered the training;
- when refresher training is required.

5.3.11 Continuing professional development

Continuing professional development is a joint responsibility between the competent person and their employer.

The employer should maintain a CPD record for each competent person. The record should include details of how CPD is being achieved and should include for example:

- specific training towards enhancements/additions to competency;
- familiarization/re-familiarization, ongoing training and mentoring;
- any alterations and/or withdrawals of competency;
- enhancements to qualifications;
- membership of professional bodies/institutions;
- attendance at seminars and refresher training courses;
- visits to manufacturers and trade shows.