BS 7121-2-7:2012+A2:2022

BSI Standards Publication

BS 7121-2-7:2012+A2:2022 — Code of practice for the safe use of cranes

Part 2-7: Inspection, maintenance and thorough examination – Bridge and gantry cranes, including light crane systems

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Published by BSI Standards Limited 2022

ISBN 978 0 539 17520 2

ICS 53.020.20

The following BSI references relate to the work on this document:
Committee reference MHE/3/11
Draft for comment 21/30436515 DC

Amendments/corrigenda issued since publication

Date	Text affected
30 September 2015	A.1. See Foreword.
28 February 2022	Changes through text relating to testing requirements.

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Foreword

Publishing information

This sub-part of BS 7121-2 is published by BSI Standards Limited, under licence 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 the committee manager.

Supersession

Together with BS 7121-2-1, BS 7121-2-3, BS 7121-2-4 and BS 7121-2-5, this sub-part of BS 7121-2 superseded BS 7121-2:2003, which has been withdrawn.

BS 7121-2-7:2012+A2:2022 supersedes BS 7121-2-7:2012+A1:2015, which is withdrawn.

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When all sub-parts of BS 7121-2 have been published, it is intended that CP 3010 will be withdrawn and BS 5744 will be revised to cover manually operated and light cranes only.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

Text introduced or altered by Amendments No. 1 and No. 2 respectively is indicated in the text by tags A1 〈A1 and A2 〈A2. Minor editorial changes are not tagged.

The principal changes introduced by Amendment A1 are to remove conflict with BS EN 15011 with regard to load testing.

The principal changes introduced by Amendment A2 are in relation to the testing requirements. The traditional industry practice of testing cranes through the drive train of the hoisting mechanism using the static overload value can be detrimental in modern cranes designed to the EN 13001 series. The maximum permissible deflection limit is now a variable due to the EN 13001 series of design codes.

To take account of the requirements for modern cranes, new testing requirements have been added to BS 7121-2-7 for the overload test and verification following first installation.

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.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. “organization” rather than “organisation”).

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

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The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute 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].

1 Scope

This sub-part of BS 7121-2 gives recommendations for the pre-use checks, in-service inspection, maintenance, thorough examination (〚A2〛 after installation, 〈A2〉 in service and following exceptional circumstances) and supplementary testing of 〚A2〛 bridge and gantry cranes, including light crane systems 〈A2〉.

〚A2〛 *text deleted* 〈A2〉

For the purposes of this standard 〚A2〛 bridge and gantry cranes, including light crane systems, are 〈A2〉 included under the term "cranes".

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

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*

〚A2〛 BS 7127-7:2019, *Code of practice for safe use of cranes – Bridge and gantry cranes, including light crane systems* 〈A2〉

BS EN 15011, *Cranes – Bridge and gantry cranes*

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.

Examples of checklists for pre-use checking and in-service inspections are given in Annex A.

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 in writing. A2 Results of all pre-use checks should also be recorded in writing. A2

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 shift 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 are 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 **7.3**).

Steel structures suffer from fatigue, a process which can create cracks that propagate over time. If left unattended, cracks can cause serious failure of the crane structure, so the in-service inspection regime should include measures to detect cracks before the safety of the crane is affected.

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 written reports of defects or observations immediately they are identified.

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

6.5.1 General

Written 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:

a) A2 information on the type and model of equipment;

b) any identification mark or number;

c) its normal location;

d) the date and time that the inspection was carried out;

e) who carried out the inspection;

f) any faults;

g) any action taken;

h) to whom the faults have been reported;

i) the date when repairs or other necessary action were carried out. A2

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

6.5.3 In-service inspections

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

a) A2 information on the type and model of equipment;

b) any identification mark or number;

c) its normal location;

d) the date and time that the inspection was carried out;

e) who carried out the inspection;

f) any faults;

g) any action taken;

h) to whom the faults have been reported;

i) the date when repairs or other necessary action were carried out. A2

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 maintenance records and previous reports of thorough examination, together with consultation of the manufacturer to obtain details of any major repairs etc. 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 cranes and supporting structures

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 Access for maintenance

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

To maintain and repair cranes and their supporting structures 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 positioned at any point along the gantry and the crab or hoist positioned at any point across the crane bridge. 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.

7.3 Planned preventive maintenance

Planned preventive maintenance should be carried out in accordance with the manufacturer's instructions (see also BS 7121-2-1:2012, **7.2.2** and **7.2.3**). It might be convenient to schedule in-service inspections (see **6.3**) concurrently with the planned preventive maintenance.

8 Thorough examination of cranes and supporting structures

8.1 General

LOLER 1998 [2] Regulation 9 requires cranes and supporting structures to be examined 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 12 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);

  NOTE 1 This does not apply to a portable gantry crane which is moved from one location to another to perform a lifting operation, is not fixed in position, and is operating within the scope of the current report of thorough examination.
- 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);

  *NOTE 2 These maximum intervals may be reduced to take into account environmental factors or the general age and condition of the crane etc., (see BS 7121-2-1:2012, **8.7**).*
- after exceptional circumstances have occurred, LOLER Regulation 9(3)(a)(iv).

8.2 Selection of competent person

It is essential that the competent person undertaking the thorough examination of a crane has not been involved in the maintenance of the crane.

8.3 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.

8.4 Scope of thorough examination following installation

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 take into account the reports of previous thorough examinations, where applicable.

8.5 Scope of periodic thorough examination

8.5.1 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 thoroughly 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 any dedicated ancillary equipment. Particular attention should be paid to wire ropes (see Clause **10**).

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 file.

The defined scope of thorough examination should, as a minimum, include operation of the crane through all the motions while listening for any sounds that might indicate defects and observing any other malfunctions, and inspection of the components listed in **8.5.2**. These components should be assessed against the relevant criteria listed in **8.5.3**, 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. The examination should be undertaken in a systematic manner to ensure that all components and structures, including the supporting structures, are examined.

Those parts of the supporting structure which are solely for the support of the crane should be included in the defined scope of thorough examination.

Those parts of the supporting structure which are not solely for the support of the crane gantry or track are outside the scope of the thorough examination.

8.5.2 Components to be included

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

NOTE This list is not exhaustive.

- end carriage structures;
- long travel drive, wheels, axles, bearings and brakes;
- bridge girders;
- crab structure;
- cross travel drive, wheels, axles, bearings and brakes;
- cross travel rails;
- hoist mechanism including motor, brake, couplings, gearbox, drum and bearings;

- wire rope(s), their terminations and anchorages, guides, sheaves/pins, bearings, bottom block and hook(s);
- electrical control panel and wiring;
- operator cab and seating;
- operator controls, whether cab, pendant or cable-less;
- limit switches;
- platforms and access ladders;
- supporting structures;
- gantry beams, rails and fixings;
- end stops and buffers;
- down shop conductor system.

8.5.3 Assessment criteria

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

NOTE This list is not exhaustive.

- alignment – within manufacturer's tolerance [A2] or in accordance with the standard to which the crane was made [A2];
- corrosion – affecting strength or functionality;
- cracks – affecting strength or functionality;
- damage – affecting strength or functionality;
- distortion – affecting strength or functionality;
- functionality – as intended by manufacturer;
- leaks – affecting strength, functionality and slips;
- lubrication – adequacy;
- markings – presence, accuracy and condition;
- mode of operation – as intended by manufacturer;
- rope fit – as specified by manufacturer;
- rope reeving – as specified by manufacturer;
- rope specification – as specified by manufacturer;
- rope condition (see Clause **10**);
- obstructions – impeding safe access;
- 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.

[A2] Supporting structures are integral to the safe functioning of the crane and should be thoroughly examined. Structures can be examined separately to the crane but they cannot be used together unless both have a current report of thorough examination stating that they are safe to operate.

NOTE 1 For cranes designed to BS 2573, BS 466:1984 Appendix F provides guidance to alignment of supporting structures.

NOTE 2 For cranes designed to BS EN 15011, BS ISO 12488-1:2012 provides general guidance for wheels and travel and travelling tracks. A2

8.6 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:

- if the crane frequently works above or near people;
- if the crane might be used for lifting of persons in exceptional circumstances, including rescue, even if it is not initially planned;
- to take into account the intensity of use of the crane and the environment in which it is used;
- following a review by the competent person of the in-service lift plan (risk assessment, method statement and schedule of lifts) to ascertain the likely load spectrum and frequency of use of the crane.

8.7 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 overload, collision, 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.

8.8 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.

The crane should be positioned in a suitable area to enable the thorough examination to be undertaken safely.

To enable thorough examination of cranes and their supporting structures in a safe and efficient manner it is essential that safe means of access are provided (see **7.2**).

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.

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 or terminations, dismantling prior to thorough examination should 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].

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

There are many different types of RCI/RCL fitted to cranes and some older cranes might not have an RCI or RCL at all.

Where it is reasonably practicable to carry out a calibration check and functional test of the RCI/RCL, this should be undertaken in accordance with BS 7121-2-1:2012, **10.15** as part of the periodic thorough examination (see **8.5**). Where it is not reasonably practicable, the individual parts and components of the RCI/RCL system should be checked individually.

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9 A1 Load testing A1 of cranes and supporting structures

9.1 General

A1 Overload testing of cranes should be carried out to supplement thorough examination after each A2 installation, A2 re-installation and after major repairs or modifications. 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.

The supporting structure should be load tested after major repairs or modifications and after any changes to the loading conditions due to changes in the crane(s) installed on the structure. It might be necessary to treat the crane(s) and the supporting structure as separate entities, for example where a structure supports more than one crane. Load testing of supporting structures should be carried out in accordance with **9.3**.

The extent of the testing should be clearly stated in the test report. A1

9.2 A1 Load testing A1 of cranes

9.2.1 Thorough examination and functional testing

Before overload testing, the crane and the part of the supporting structure within the test area should be thoroughly examined to determine whether it is in a safe state and condition to be overload tested.

The crane should be functionally tested without a load applied to determine whether the controls, switches, contactors, relays and other devices operate correctly. The operation and correct adjustment of the brakes and limit switches should be checked and tests carried out to determine whether primary safety and emergency systems are operating correctly.

9.2.2 A1 Load test A1 at rated capacity

After the functional tests, the crane should be tested with a load equivalent to the rated capacity. At the start of the test, the crane should be positioned over a supporting stanchion or column of the gantry or beneath the connection point of a suspended track, as appropriate, with the crab or hoist positioned adjacent to the end carriage. With the crane in this position, provision should be made for measuring the deflection of the crane main girders at the centre span.

The load should then be raised until each tooth of the train of gears has been subjected to the load, then the load should be lowered to [A2] between 〈A2〉 100 mm to 200 mm above the ground. The load should be held in this position for 10 min to check the brake. The load should then be raised from the suspended position by a further 200 mm to check the ability to re-hoist and then lowered to [A2] between 〈A2〉 100 mm to 200 mm above the ground. The crab should be traversed to mid-span and the deflection measured [A1] and recorded 〈A1〉. The load should be lowered to the ground to relieve the structure and then raised to determine whether the deflection remains constant.

The load should be traversed to the opposite gantry, and the crane should be travelled along the track until each tooth of the train of gears of the long travel motion has been subjected to the load. The load should be traversed across the bridge to the opposite [A2] side of the supporting structure 〈A2〉 and the crane should be returned to its original lift position.

[A1] The deflection of the main bridge with the crab and load at the centre of the bridge should not exceed the maximum deflection permitted in the standard to which the crane was manufactured. [A2] The measured deflection should be recorded and compared to the calculated design value. Conformance within 10 % or 5 mm, whichever is greater, is considered acceptable. 〈A2〉 The measured value should be retained in the machine history file to provide a baseline for comparison with any future measurements.

NOTE Cranes manufactured to BS 466:1984 have a maximum permissible deflection of 1/750 of the span, cranes manufactured to BS 466:1960 have a maximum permissible deflection of 1/900 of the span. 〈A1〉

[A2] For cranes manufactured to BS EN 15011:2011, subclause **7.3.2** states that the crane manufacturer should specify the deflection limits to be used in the tests. 〈A2〉

9.2.3 Overload test

[A2] The load should then be increased to at least 110 % of the rated capacity. The test load should include repeated starting and stopping of each motion, including all combined movements as provided by the intended use over the whole sequence and range of movements. Emergency stop button and collision with buffers should not be tested during this test.

The load should then be lowered to between 100 mm to 200 mm above the ground. The load should then be increased to 125 % of the rated capacity without the use of the hoist drives, e.g. by external means.

For cranes built in accordance with BS 2573, the load can be lifted to between 100 mm to 200 mm using the hoist mechanism. For all other cranes, consult the manufacturer for guidance or apply the above.

The test should be carried out in the critical trolley positions, such as the middle span, extreme positions of traverse, including any cantilevers. Where movements are performed during the test, they should be made separately; a new movement should not be initiated until vibrations caused by the preceding movements have dampened out.

The test load should be applied for a period necessary to make the observations and measurements to evaluate the crane. 〈A2〉

During the overload test the crane should remain stable and structurally sound and the brakes on each motion should function effectively. The traverse and travel braking systems should also function effectively with the overload applied.

[A1] Text deleted. 〈A1〉

9.2.4 Testing of cranes with two or more hoists

[A2] Where cranes are equipped with more than one hoist mechanism that can be used separately, they should be tested individually prior to the crane test unless previously tested by the manufacturer. The crane should be tested with the most unfavorable loading combinations of the hoist mechanisms in the specified use. [A2]

9.2.5 Post test thorough examination of the crane

On completion of the tests, a further thorough examination of the crane should be carried out by the competent person (see BS 7121-2-1:2012, **8.12**) and any overload protection devices should be reset and their correct operation checked.

9.3 [A1] Load testing [A1] of supporting structures

9.3.1 Assessment and thorough examination

Cranes can be supported in a variety of different ways. This could include a free-standing structure, or a gantry or track supported by the structure of the building or an engineering structure.

Those parts of the supporting structure which are not solely for the support of the crane gantry or track should be assessed by a structural engineer before any [A1] load test [A1] is carried out. Those parts of the supporting structure which are solely for the support of the crane should be subjected to [A1] a load test [A1].

Prior to the application of the test loads, the competent person should carry out a thorough examination of the structure to determine whether it is in a safe condition to be [A1] load tested [A1].

An unloaded crane should then be travelled the full length of the supporting structure to check the alignment.

NOTE BS ISO 12488-1 contains detailed information about the alignment of gantries.

9.3.2 Testing

9.3.2.1 General

Testing should be carried out using the combination of loadings, cranes and crane positions that imposes the maximum loadings on the structure under test. This includes cranes in an adjacent bay.

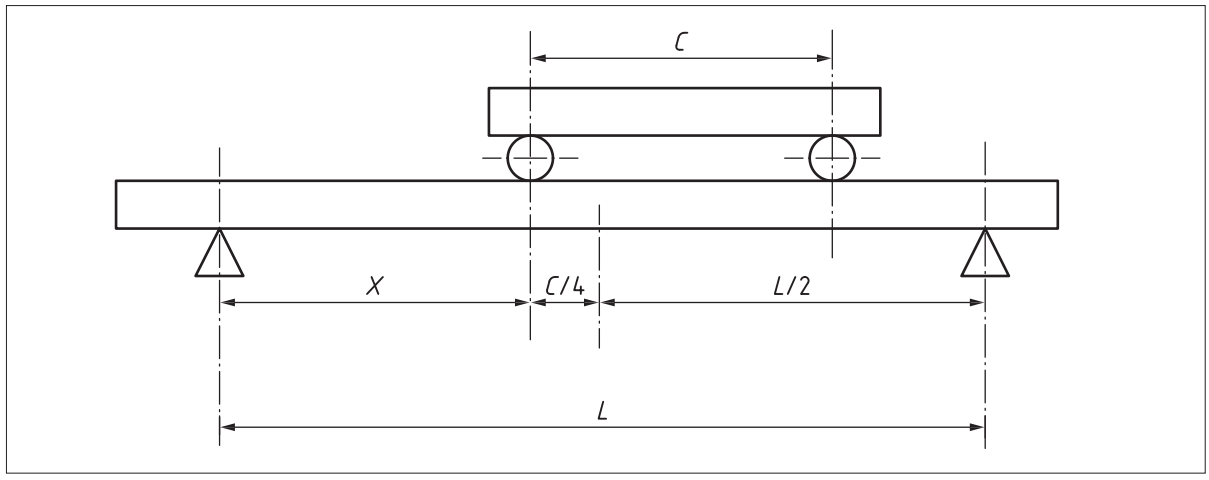
9.3.2.2 Test at rated capacity

Each crane involved should lift a load equivalent to its rated capacity 100 mm to 200 mm above the ground. The load lifted by each crane should be traversed to the end of the crane bridge nearest the side of the structure being tested. The cranes should be positioned along the span of the structure so as to provide the maximum deflection at the span centre. The deflection should be measured. The deflection measurement should be made on the longest span of the gantry. Where the gantry has more than one beam section, it should be made on the longest span of each section. Where the gantry beams are supported by a structure which is solely for the support of the crane, if there is any variation of design or construction of the structure, the test should be repeated for each variation.

For structures built in accordance with BS 449-2, the maximum deflection should not exceed 1/360 of the span. For structures built in accordance with BS 5950-1 or BS EN 1993-6, the maximum deflection should not exceed 1/600 of the span.

NOTE For a single crane where the end carriage wheel centres are less than half the span of the structure, the maximum stress will occur when the end carriage is offset, as shown in Figure 1. The maximum deflection will occur at the span centre, L/2. If it is possible for more than one crane to be on the same span of the structure, the position of maximum stress will depend upon the wheel loadings and wheel centres when the cranes are in their closest possible proximity.

Figure 1 — *End carriage offset*



9.3.2.3 Overload test

[A1] The overload test load on each crane should be that determined [A2] and positioned [/A2] in accordance with 9.2.3. [/A1]

[A2] *text deleted* [/A2] The load lifted by each crane should be traversed to the end of the crane bridge nearest the side of the structure being tested. The cranes should be travelled the full length of the structure in such relative positions as to impose the maximum combined loading. The procedure should be repeated for the other side of the structure.

[A2] Where movements are performed during the test, they should be made separately; a new movement should not be initiated until vibrations caused by the preceding movement have dampened out. [/A2]

9.3.3 Post-test thorough examination of the supporting structure

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

10 Assessment of wire rope condition and discard criteria

When carrying out examination of wire ropes as part of the thorough examination of a 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)
Examples of checklists for pre-use checking and in-service inspections of cranes

A.1 Pre-use checking

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

NOTE 1 These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions. This list is not exhaustive.

a) check whether the report of thorough examination is current;

b) check operation of emergency stop controls;

c) check operation of all crane motion controls;

d) check operation of electrical isolator switch;

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

NOTE 2 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.

f) check operation of brakes;

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

h) check the general condition of the crane structure and mechanisms paying particular attention to the ropes, the sheaves and the hook and check for the occurrence of any unusual noises or erratic movement during operation;

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

j) carry out a visual check on the condition of the cab controls, the pendant and associated cables or remote control station as appropriate; in particular, check the condition of the casings and seals of pendant and remote controls, as damage can lead to false commands;

k) check that there are no obstructions in the path of travel of the crane or that adequate precautions are in place to prevent collisions; in particular, for goliath and semi-goliath cranes check for any debris or other track obstructions.

A.2 In-service inspections

The following is an example of a checklist for in-service inspections:

NOTE These checks are in addition to any checks needed in accordance with the crane manufacturer's instructions. 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 inspection of all sheaves, for damage, worn bushes or seizure;

c) carry out a visual inspection of hooks, safety catches and other load lifting attachments for damage, free movement or wear and a visual inspection of the hook shank thread and securing nut for undue movement, which might indicate wear or corrosion;

d) carry out a visual inspection of the structure for damage, for example cracked welds and loose bolts and other fasteners;

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

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

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

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

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

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

k) check the functional effectiveness of the braking system and that it is suitable for the application. This might need to include seeking confirmation from the crane operator;

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

m) check for the presence of, and the condition of, all guards.

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BS 8437, *Code of practice for selection, use and maintenance of personal fall protection systems and equipment for use in the workplace*

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〖A2〗 BS EN 15011, *Cranes – Bridge and gantry cranes* 〈A2〉

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