

Code of practice for

Safe use of cranes —

Part 1: General

Committees responsible for this British Standard

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 British Steel Corporation
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 Department of Trade and Industry (Mechanical Engineering and Manufacturing Technology Division)
 Electricity Supply Industry in England and Wales
 Engineering Equipment and Materials Users' Association
 Federation of Civil Engineering Contractors
 Federation of Manufacturers of Construction Equipment and Cranes
 Federation of Wire Rope Manufacturers of Great Britain
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 Independent Engineering Insurers Committee
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Foreword

This Part of BS 7121 has been prepared under the direction of the Mechanical Handling Standards Policy Committee. It should be used in conjunction with other Parts of BS 7121 to ensure, so far as is reasonably practicable, that lifting operations are carried out safely.

It is in the interest of all parties involved in lifting operations to ensure that they are carried out efficiently and safely. CP 3010 and BS 5744 have for many years provided advice to assist crane users to achieve these objectives.

During the review of CP 3010 it was decided that it was essential to broaden the scope to recognize the need for planning the operation and for the adoption of safe systems of work as these are the foundation stones on which the successful operation should be built. It became clear that these foundation stones were essential to all operations regardless of the type of crane to be used, and the committee came to the conclusion that CP 3010 and BS 5744 should therefore be combined into one standard. This Part of BS 7121 deals with common features and subsequent Parts will deal specifically with each crane type as follows.

- *Part 2: Testing and inspection;*
- *Part 3: Mobile cranes;*
- *Part 4: Lorry loaders;*
- *Part 5: Tower cranes;*
- *Part 6: Derrick cranes;*
- *Part 7: Overhead/underhung travelling and goliath cranes;*
- *Part 8: High pedestal and portal jib dockside cranes;*
- *Part 9: Container handling cranes;*
- *Part 10: Rail mounted cranes.*

Amendments to CP 3010 and BS 5744 will be published to delete section 1 from each publication and to amend the references to BS 7121-1. When all Parts of BS 7121 have been published, CP 3010 will be withdrawn. BS 5744 will be revised to cover manually operated and light cranes only.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 36, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 7121 gives recommendations for the safe use of cranes. It does not cover manually operated and light cranes or cranes mounted on water-borne vessels, except in those circumstances where a land-based crane is temporarily affixed to a vessel. Subjects covered include safe systems of work, management, planning, selection, erection and dismantling, testing, operation and maintenance of cranes and the selection of drivers, slingers and signallers.

Reference is also made to legislation and attention is drawn to statutory requirements for the testing and examination of cranes.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 7121 the following definitions apply.

2.1

automatic safe load indicator

a device that when fitted to a crane automatically gives, within specified tolerance limits, a warning of the approach to the safe working load on the crane and a further warning when the safe working load has been exceeded

2.2

competent person

a person who has such practical and theoretical knowledge and such experience of the crane and the equipment used in the lifting operation as is necessary to carry out the function to which the term relates in each particular context

2.3

crane driver (operator)

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

2.4

load radius indicator

a device fitted to a crane that shows the radius at which the crane is operating and its corresponding safe working load

2.5

radius

the 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 (see Figure 1)

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, can be assumed to be the radius for the purpose of this definition.

2.6

safe working load

the maximum load that can be safely handled by a crane at a specified position and under specified conditions

2.7 service conditions

2.7.1

in-service

with the crane handling loads up to the safe working loads in permissible wind speeds and other conditions as specified by the manufacturer

2.7.2

out-of-service

with the crane either not required for use or out of use, without load on the load lifting attachment and in conditions as specified by the manufacturer

NOTE These conditions may include a higher wind speed than that permitted for the in-service conditions.

2.8

light crane

a crane in which at least one of its motions is manually operated

3 Management of the lifting operation

3.1 Safe system of work

A safe system of work should be established and this should be followed for every lifting operation whether it be an individual lift or a group of repetitive operations. The same principles should be applied when the lifting operations are carried out at a site or when the crane is a permanent fixture, e.g. in a factory or at a dock.

The safe system of work should include the following:

- a) planning of the operation;
 - b) selection, provision and use of a suitable crane(s) and equipment;
 - c) maintenance, examination and where necessary testing of the crane(s) and equipment;
 - d) the provision of properly trained and competent personnel who have been made aware of their relevant responsibilities under the Health and Safety at Work etc. Act 1974;
- NOTE** It is essential for the safety of the operation to ensure that all personnel can communicate clearly in the same language.
- e) adequate supervision by properly trained and competent personnel having the necessary authority;
 - f) ensuring that all necessary test certificates and other documents are available;
 - g) preventing unauthorized movement or use at all times;

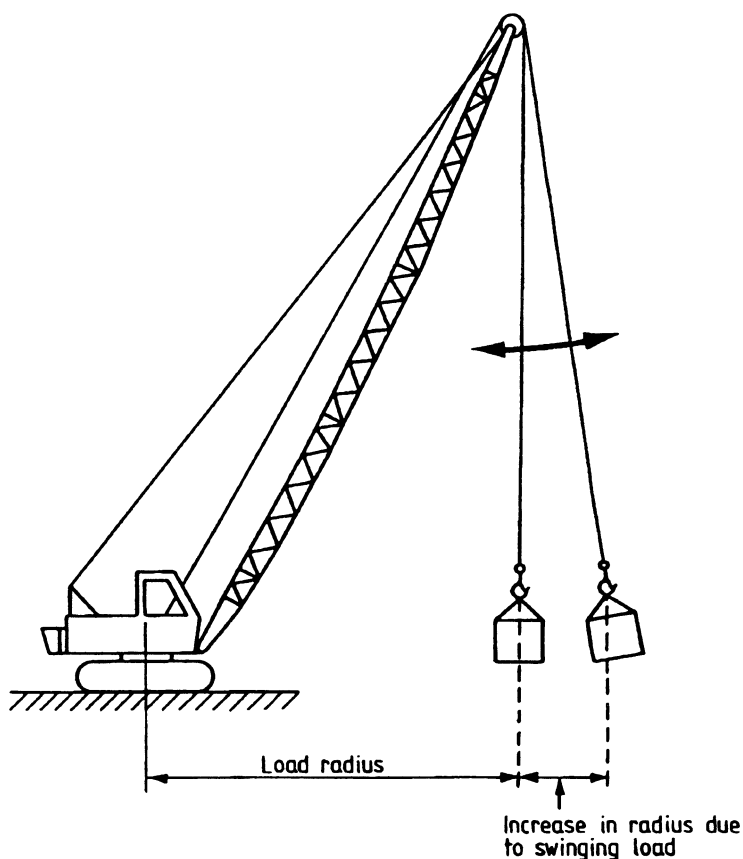
h) the safety of persons not involved in the lifting operation.

The lifting operation should be taken to include any necessary preparation of a site and erection and dismantling of the crane(s).

The safe system of work should be effectively communicated to all parties concerned.

3.2 Control of the lifting operation

To ensure the implementation of the safe system of work, one person should be appointed to have overall control of the lifting operation to act on behalf of the management of the organization requiring the load to be moved (the "Employing Organization"). The appointment of the person does not remove any legal responsibility from the management but enables them to use his expertise the better to fulfil their responsibilities. The person appointed may have other duties and need not be an employee of the Employing Organization. The appointed person should have adequate training and experience to enable these duties to be carried out competently.



NOTE. Loads should always be lifted gently and crane motions should be operated smoothly to avoid loads swinging (a swinging load will increase the overturning moment of the cranes). Steady lines should be used where necessary and where the load presents a wind catching area. Travel should always take place with the load near to ground level so load swinging can be controlled.

KEEP THE LOAD UNDER CONTROL

Figure 1 — Adverse effect of a swinging load on load radius (see 12.1)

3.3 Duties of the person appointed to control the lifting operation

The appointed person's duties should include the following.

- a) The assessment of the lifting operation to provide such planning, selection of crane(s), lifting gear and equipment, instruction and supervision as is necessary for the task to be undertaken safely. This should include consultation with other responsible bodies if necessary and ensuring that where different organizations are involved they collaborate as necessary.
- b) Ensuring that adequate inspection and maintenance of the equipment has been carried out.
- c) Ensuring that there is an effective procedure for reporting defects and incidents and taking any necessary corrective action.
- d) Responsibility for the organization and control of the lifting operation.

The appointed person should be given the necessary authority for the performance of all these duties and, in particular, authority to stop the operation whenever he considers that danger is likely to arise if the operation were to continue.

Duties, but not responsibilities, may be delegated to another person where considered appropriate.

As the crane driver is required to be at the controls of the crane when it is handling loads, it would not be appropriate to appoint the driver to be in control of the lifting operation. For a simple lifting operation, the management of the Employing Organization may consider it appropriate to appoint the slinger to be in control.

3.4 Contractual considerations

3.4.1 Contract lifting operations. The Employing Organization (see 3.2) may enter into a contract with another party (the "Contractor") who will undertake the work on their behalf.

The contract should state the following:

- a) that all work should be carried out in accordance with this Part of BS 7121;
- b) that the Contractor should appoint a person, in accordance with 3.2, to the satisfaction of the Employing Organization;
- c) that all information or services provided by the Employing Organization to facilitate compliance with this Part of BS 7121 should be notified to the Contractor in writing.

All other recommendations given in this Part of BS 7121 should be followed by the Contractor. The Contractor should be given full authority to fulfil his obligations relating to this Part of BS 7121 including, where appropriate, authority to control and instruct the Employing Organization's personnel.

NOTE Although this Part of BS 7121 is intended to assist organizations to comply with their statutory and common law obligations, it does not relieve them from these obligations.

Before entering into a contract, Employing Organizations have a duty to satisfy themselves that the Contractor has the necessary competence to carry out the work in accordance with this Part of BS 7121.

3.4.2 User's duties when using hired cranes. When a crane is hired out together with a driver to the organization requiring the load to be moved (the "User Organization"), the crane owner has a duty to provide a competent driver (see 5.2.1 and 6.1) and a crane that is properly maintained and inspected, thoroughly examined, tested and certified (see 8.7, 8.8, 11.2.2, 11.3, 11.5 and clauses 13 to 15). The User Organization retains the responsibility for appointing the competent person in accordance with 3.2, for those matters for which the appointed person is expressly made responsible and for following the recommendations given in this Part of BS 7121. Notwithstanding any advice the crane owner may have offered concerning the selection of a particular crane or any other relevant matter, the responsibility for ensuring that the crane is of a suitable type, size and capacity for the task being undertaken and for planning the operation remains with the User Organization.

It is therefore clear that if an individual or organization does not have expertise in lifting operations, they should not hire cranes but should enter into contracts of the type described in 3.4.1.

4 Planning of the lifting operation

All lifting operations should be planned to ensure that they are carried out safely and that all foreseeable risks have been taken into account. Planning should be carried out by personnel who have the appropriate expertise and have been appointed for this purpose.

In cases of repetitive or routine operations, this planning may only be necessary in the first instance, with periodic reviews to ensure that no factors have changed.

Planning should include consideration of the following:

- a) the load, its characteristics and the method of lifting;

NOTE It may also be necessary to make allowance for any adhesion between the load and its support.

- b) the selection of a suitable crane(s) appropriate to the operation ensuring that adequate clearances are maintained between the load(s) and the crane structure (see clause 7);
- c) the selection of lifting gear, the weight of which should be taken into account when assessing the load on the crane(s);
- d) the position of the crane(s) and of the load before, during and after the operation;
- e) the site of the operation taking into account proximity hazards, space availability and suitability of the ground or foundations;
- f) any necessary erection and dismantling of the crane(s);
- g) the environmental conditions that exist or may occur at the site of the operation, which may necessitate stopping the operation when conditions are unsuitable.

5 Selection and duties of personnel

5.1 Selection

Safe lifting depends on the selection of suitable personnel who are competent to carry out the required duties. Records of training and experience of persons such as the crane driver will assist in the selection of suitable personnel. Guidance on the training of crane drivers and slingers can be found in HSE Guidance Note GS 39. Those responsible for the selection should ensure that the personnel involved in the operation are efficiently organized in order to ensure good team work in the working situation. No person should be a member of the team if his efficiency is impaired by alcohol, drugs or other influences. All personnel in the team should be aware of their duties (see 5.2). Where personnel are under training they should be adequately supervised.

NOTE In some circumstances it may be appropriate for one person to undertake more than one of the duties described in 5.2.

5.2 Duties of personnel

5.2.1 Crane driver. The crane driver should be responsible for the correct operation of the crane in accordance with the manufacturer's instructions and within the safe system of work (see 3.1). The crane driver should at any one time only respond to the signals from one slinger/signaller who should be clearly identified (see 8.2).

5.2.2 Slinger. The slinger should be responsible for attaching and detaching the load to and from the crane load lifting attachment and for the use of the correct lifting gear and equipment in accordance with the planning of the operation.

The slinger is responsible for initiating and directing the safe movement of the crane [see 6.2 j)]. If there is more than one slinger, only one of them should have this responsibility at any one time, depending on their positions relative to the crane.

Where continuity of signalling is required and this slinger is not visible to the crane driver, another slinger or signaller may be necessary to relay the signals to the crane driver. Alternatively, other audio or visual methods may be used.

Where audio or visual methods are used, the equipment or its means of use should be such that the driver will be immediately aware of failure of the equipment, to enable him to stop crane movements.

Typical examples are as follows:

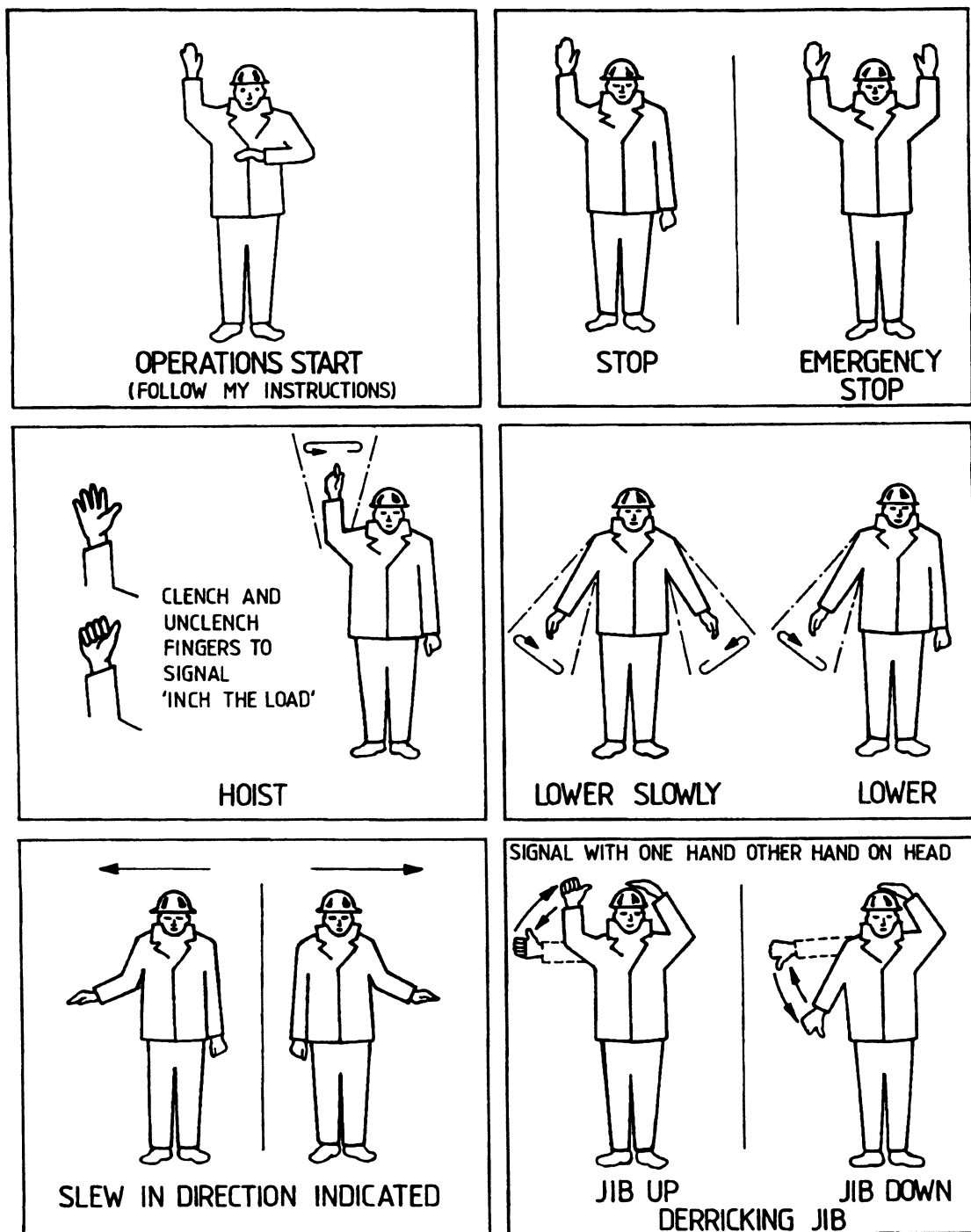
- a) a blank screen on a television monitor should immediately require a driver to stop all crane movements;
- b) a slinger using a radio should continuously instruct the driver to lower a load, e.g. by saying "Lower-lower-lower...", and failure of this continuous instruction from the slinger should require the driver to halt all crane movements.

If, during the lifting operation, responsibility for directing the crane and load is to be transferred to another nominated person, the slinger should clearly indicate to the crane driver that this responsibility is being transferred and to whom, and the slinger should clearly indicate to the new nominated person that this transfer is taking place. Furthermore, the driver and the new nominated person should clearly indicate that they accept the transfer of responsibility.

5.2.3 Signaller. The signaller should be responsible for relaying the signal from the slinger to the crane driver. The signaller may be given the responsibility for directing movement of the crane and load instead of the slinger, provided that only one person has the responsibility.

5.2.4 Crane erector. The crane erector is responsible for the erection of the crane in accordance with the manufacturer's instructions (see clause 10). Where two or more crane erectors are required, one should be nominated as "erector in charge" to control this operation.

5.2.5 Maintenance personnel. The maintenance personnel should be responsible for maintaining the crane and ensuring its safe and satisfactory operation. They should carry out all necessary maintenance in accordance with the manufacturer's maintenance manual and within the safe system of work (see 3.1).



NOTE. The signaller should stand in a secure position where he can see the load and can be seen clearly by the driver and should face the driver if possible. Each signal should be distinct and clear.

Figure 2 — Recommended crane signals

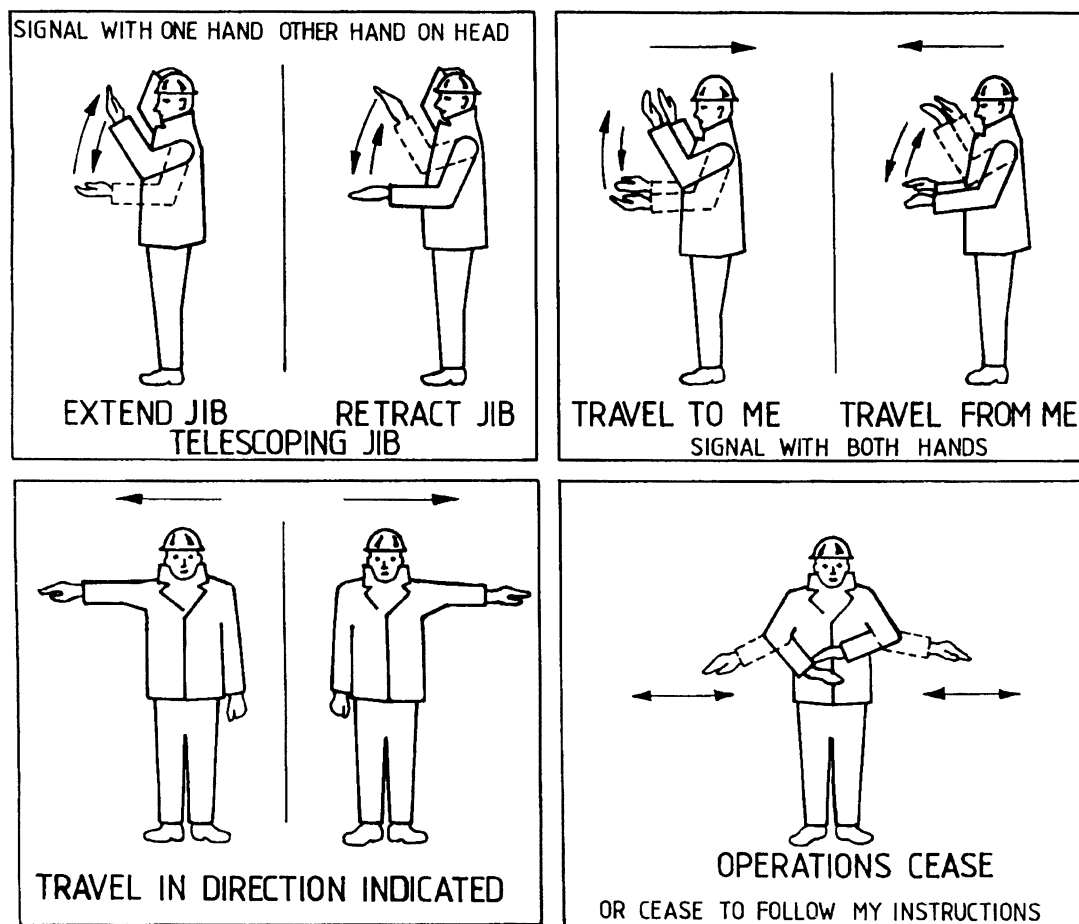


Figure 2 — Recommended crane signals (concluded)

6 Minimum attributes of personnel

6.1 Crane driver

The crane driver should be:

- a) competent;
- b) over 18 years of age unless under the direct supervision of a person competent for the purpose of training;
- c) fit, with particular regard to eyesight, hearing and reflexes;
- d) physically able to operate the crane safely;
- e) able to judge distances, heights and clearances;
- f) adequately trained for the type of crane being driven and have sufficient knowledge of the crane and its safety devices;

g) fully conversant with the duties of the slinger and signaller and should understand the signal code shown in Figure 2 and any alternative methods of relaying the signals that are to be used, in order to implement safely the instruction of the slinger or signaller;

h) familiar with the fire appliances on the crane and trained in their use;

i) familiar with any means provided for escape in case of emergency;

j) authorized to operate the crane.

NOTE Evidence that the driver is medically fit to drive a crane should be obtained at not more than 5 yearly intervals.

6.2 Slinger

The slinger should be:

- a) competent;
- b) over 18 years of age unless under the direct supervision of a person competent for the purpose of training;
- c) fit, with particular regard to eyesight, hearing, reflexes and agility;
- d) physically able to handle lifting gear and equipment;
- e) able to establish weights, balance loads and judge distances, heights and clearances;
- f) trained in the techniques of slinging;
- g) capable of selecting lifting gear and equipment in suitable condition for the load to be lifted;
- h) trained in the techniques of signalling and should understand the signal code shown in Figure 2;
- i) capable of giving precise and clear verbal instructions where audio equipment (e.g. radio) is used and capable of operating the equipment;
- j) capable of initiating and directing the safe movement of the crane and load;
- k) nominated to carry out slinging duties.

6.3 Signaller

The signaller should be:

- a) competent;
- b) over 18 years of age unless under the direct supervision of a person competent for the purpose of training;
- c) fit, with particular regard to eyesight, hearing, reflexes and mobility;
- d) able to judge distances, heights and clearances;
- e) trained in the techniques of signalling and should understand the signal code shown in Figure 2;
- f) capable of giving precise and clear verbal instructions where audio equipment (e.g. radio) is employed and capable of operating the equipment;
- g) capable of directing the safe movement of the crane and load;
- h) nominated to carry out signalling duties;
- i) aware of the responsibilities allocated by the appointed person (see 3.2) to the crane driver and slinger.

6.4 Crane erector

The crane erector should be:

- a) competent;
- b) over 18 years of age unless under the direct supervision of a person competent for the purpose of training;
- c) fit, with particular regard to eyesight, hearing, reflexes and agility;
- d) physically able to handle safely the loads involved in crane erection;
- e) able to work confidently and safely at heights;
- f) able to establish weights, balance loads and judge distances, heights and clearances;
- g) trained in the techniques of slinging;
- h) capable of selecting lifting gear and equipment that is suitable for the load to be lifted;
- i) adequately trained in the erection, dismantling and working of the type of crane being erected, and in the safe use and setting up of any lifting appliance used in the course of these duties;
- j) adequately trained in the setting and testing of the safety devices fitted to the crane being erected and those on any lifting appliance being used for the erection.

6.5 Maintenance personnel

The maintenance personnel should be:

- a) competent;
- b) fully conversant with the machinery they are required to maintain and its hazards;
- c) properly instructed and trained (where special machinery is involved this should include attending appropriate courses given by the supplier of the equipment);
- d) familiar with the procedures and precautions recommended in clause 11.

7 Selection of cranes

Reference should be made to the relevant Parts of BS 7121 for details of the different types of crane and their operational characteristics.

Cranes are available in a number of forms and the characteristics of the various machines should be considered in relation to the job requirements. Having decided upon the type of crane and knowing the overall requirements involved, a crane that will safely meet all the requirements of the planned lift should be selected. Points to be considered in making the selection include the following:

- a) weights, dimensions and characteristics of loads;
- b) operational speeds, radii, heights of lifts and areas of movement;

- c) number, frequency and types of lifting operations;
- d) length of time for which the crane will be required or anticipated life expectancy for a permanently installed crane;
- e) site, ground and environmental conditions, or restrictions arising from the use of existing buildings;
- f) space available for crane access, erection, travelling, operation and dismantling;
- g) any special operational requirements or limitations imposed.

8 Safety

8.1 General

The person or organization having overall control of the place of work and the employers of personnel involved in the lifting operation have responsibility for safety. In order that this responsibility may be effectively discharged, the appointed person (see 3.2) should be given the necessary authority to ensure that adequate systems to achieve safety are in operation. Safety matters relating to lifting operations will include the use, maintenance, repair and renewal of safety equipment and the instruction of, and allocation of responsibilities to, the various personnel in relation to the equipment.

8.2 Identification of person directing crane movements

The person directing crane movements (slinger or signaller) should be easily identifiable to the crane driver, e.g. by wearing high visibility clothing or by using radio call signs.

NOTE When choosing high visibility clothing, backgrounds, type of illumination and other relevant factors should be considered.

8.3 Personal safety equipment

The appointed person should ensure the following:

- a) that personal safety equipment that is appropriate for the conditions of the location is available, such as helmets, safety spectacles, safety harness, safety boots and ear defenders;
- b) that equipment is inspected before and after use and maintained in good working order or replaced where appropriate;
- c) that a record of inspection and repairs is maintained where appropriate.

Certain safety equipment (e.g. helmets and safety harnesses) may deteriorate with age and should therefore be considered for renewal periodically. Safety equipment damaged by impact should be replaced immediately.

8.4 Use of personal safety equipment

All personnel working on, visiting or in the vicinity of the crane should be made aware of the requirements relating to their personal safety and to the use of the personal safety equipment provided.

Personnel should be instructed in the correct use of the appropriate personal safety equipment provided and should be required to use it.

8.5 Access and emergency escape

8.5.1 General. Safe access and means of emergency escape should be provided and maintained in good condition for the driving position(s) of the crane and for inspection, maintenance, repair, erection and dismantling of the crane.

NOTE The Health and Safety Executive have published Guidance Notes in connection with access to certain cranes, e.g. Plant and Machinery Series PM 9.

8.5.2 Boarding and leaving the crane. No person(s) should be permitted to board or leave the crane without first obtaining the driver's permission. The driver should be aware of the precautions that are necessary while the person(s) is boarding or leaving and should take them.

If the boarding or leaving point is out of sight of the driver, means should be provided to ensure that the driver is aware of the other person(s) whereabouts, and a notice advising of the boarding procedure should be posted at the boarding point.

8.5.3 Instruction of personnel. Personnel should be instructed to use (and should use) only the proper access and means of emergency escape.

8.6 Fire extinguishers

Any fire extinguishers selected should be appropriate to the hazards involved on the particular crane. Any fire extinguishers mounted on the crane or at the location should be scheduled for periodic inspection and renewed as necessary.

NOTE Attention is drawn to BS 5306-3.

8.7 Crane safety equipment

NOTE The items in this subclause are some of the items fitted to cranes.

8.7.1 Automatic safe load indicator. An automatic safe load indicator is required on certain jib cranes to give warning of an approach to the safe working load and a further warning when an overload occurs. The warnings should be clearly evident to the driver.

8.7.2 Load radius indicator. A load radius indicator is required on jib cranes having variable safe working loads according to the radius at which they are operated. It should be clearly visible to the driver and indicate accurately the safe working load and radius for whatever configuration of the crane is used.

8.7.3 Motion limit devices. Where motion limit devices are fitted to limit hoisting, derricking, travelling, slewing, traversing, climbing or any other crane motion, they should be regularly inspected and maintained in good working order.

8.7.4 Overload cut out devices. Switches or other devices may be fitted to cut out crane motions when the crane is in an overload situation. This should not be achieved by stopping the prime mover. Only motions that permit the crane to be returned to a safe condition should remain operative. The devices should be maintained in good working order.

8.7.5 Level indicator. Where fitted, crane level indicators should be used in accordance with the instruction manual and maintained in good working order.

8.7.6 Anemometer. Where fitted, anemometers or other wind-speed measuring devices should have their indicators mounted in clear view of the crane driver or, if appropriate, the person controlling the lift. The correct operation of these devices should be regularly verified and they should be maintained in good working order.

8.7.7 Machinery guarding. All guarding should be properly fitted whenever the crane is in motion or use and maintained in good condition.

NOTE Attention is drawn to BS 5304.

8.8 Documentation

8.8.1 Safe working load charts. Readily understandable safe working load charts applicable to the various specified operating conditions of the crane, with appropriate derating for special applications such as magnet or grabbing duties, should be prominently displayed to the driver. Operation of the crane outside these parameters even in an unloaded situation may cause danger.

8.8.2 Instruction manuals. Instruction manuals in English containing adequate information on the erection, use and dismantling of the crane should be kept readily available at the location of the crane.

8.8.3 Test and examination certificates. All current certificates of test and examination for cranes and lifting gear should be kept readily available.

8.8.4 Records. Records should be maintained for each crane that are sufficient to enable the condition of the crane to be determined and its fitness for further operation to be properly assessed.

The records should include the following:

- a) technical information including maintenance instructions and performance data provided by the manufacturer;
- b) test certificates, records of thorough examinations and inspections, including ropes (see 15.7), carried out on the crane (whether statutory or not);
- c) records of significant repairs and modifications to the crane including renewal of major parts and confirmation of completion including signatures of responsible person(s);
- d) details of occurrences that are of more than short-term relevance [see 11.3 c), d) and e)];
- e) hours worked.

Except where specific forms are required by legislation, the format in which records are kept is not important. Whatever method is used should be adequate to ensure that the records allow a relevant and coherent history of the crane to be readily retrieved. The records should be clearly identifiable with the crane to which they refer.

9 Siting of cranes

9.1 General

Siting of the crane should take account of all the factors that may affect its safe operation, particularly the following:

- a) the crane standing and support conditions;
- b) the presence and proximity of other hazards;
- c) the effect of wind during in-service and out-of-service conditions;
- d) the adequacy of access to allow the placing or erection of the crane in its working position and for dismantling and removing the crane following completion of lifting operations.

9.2 Crane standing or support conditions

The appointed person should ensure that the loads imposed by the crane can be sustained by the ground or any means of support, by obtaining the assessment of a competent person.

The loads imposed by the crane should be obtained from the crane manufacturer or other authority on crane design and construction. The loadings shall include the combined effects of the following:

- a) the dead weight of the crane (including any counterweight, ballasting or foundation where appropriate);
- b) the dead weight of the load(s) and any lifting attachment(s);
- c) dynamic forces caused by movements of the crane;