

Code of practice for safe use of cranes —

Part 3: Mobile cranes

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Committees responsible for this British Standard

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- Association of Lorry Loaders, Manufacturers and Importers
- Construction Confederation
- Construction Health and Safety Group
- Construction Plant-Hire Association
- Electricity Association
- Federation of Manufacturers of Construction Equipment and Cranes
- Health and Safety Executive
- Institution of Mechanical Engineers
- Institution of Occupational Safety and Health
- Institution of Plant Engineers
- Institution of Structural Engineers
- Lloyd's Register of Shipping
- Low Power Radio Association
- Offshore Contractors' Association
- Safety Assessment Federation Ltd.

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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, as far as 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 is essential to broaden the scope to recognize the need for planning the lifting operation, and for adoption of safety systems of work, as these are essential to a successful operation, regardless of the type of crane. It was decided that CP 3010 and BS 5744 should be combined into a single standard. BS 7121-1 covers common features and BS 7121-2 covers in-service inspection, testing and examination. This part of BS 7121 covers safe use of mobile cranes.

Subsequent parts of BS 7121 will cover each crane type as follows:

- *Part 4: Lorry loaders;*
- *Part 5: Tower cranes;*
- *Part 6: Derrick cranes;*
- *Part 7: Overhead/underslung travelling and Goliath cranes;*
- *Part 8: High pedestal and portal jib dockside cranes;*
- *Part 9: Container handling cranes;*
- *Part 10: Rail mounted cranes;*
- *Part 11: Pontoon cranes.*

BS 7121-1, -2 and -3 supersede the corresponding sections of CP 3010 and BS 5744.

Amendments to CP 3010 and BS 5744 will be published to remove the relevant sections from each publication and to amend the references to BS 7121. When all parts of BS 7121 have been published, CP 3010 will be withdrawn. BS 7544 will be revised to cover manually operated and light cranes only.

The Health and Safety Executive (HSE) commend the use of this British Standard code of practice to those who have duties under the Health and Safety at Work etc. Act 1974 and other relevant health and safety legislation. This code of practice was prepared with the participation of HSE representatives and will be included in the list of “standards significant to health and safety at work” available from HMSO.

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 this code of practice 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 34, an inside back cover and a back cover.

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1 Scope

This part of BS 7121 provides recommendations for the safe use of mobile cranes and should be used in conjunction with BS 7121-2, which gives general guidance on inspection, testing and examination of all types of cranes.

Mobile cranes are manufactured in many different forms. Mobility is either by means of road wheels or crawler tracks. Rail-mounted cranes are not covered by this part of BS 7121. Cranes may be fully mobile and able to travel with rated capacity loads suspended (pick and carry), or may be semi-mobile and not permitted to travel with suspended loads. Semi-mobile cranes include wheeled and crawler-mounted cranes, fitted with stabilizers or outriggers; and cranes that, due to size and weight, are taken to the work site in parts and assembled at the site. Cranes that are assembled on site to work from a fixed base with outriggers are also covered by this part of BS 7121.

Because of their mobility, the cranes covered by this part of BS 7121 can be used for a wide variety of lifting operations in numerous locations. BS 7121-1 provides general advice on planning, management, selection of equipment and personnel, etc., for safe lifting with all types of cranes. This part of BS 7121 provides specific guidance on safety when dealing with the hazards caused by mobility and the diversity of locations for mobile crane lifting operations.

2 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 4-1:1993, *Structural steel sections — Specification for hot-rolled sections*.

BS 5306-3:1985, *Fire extinguishing installations and equipment on premises — Code of practice for selection, installation and maintenance of portable fire extinguishers*.

BS 6187:1982, *Code of practice for demolition*.

BS 7121-2:1991, *Code of practice for safe use of cranes — Inspection, testing and examination*.

BS 7262:1990, *Specification for automatic safe load indicators*.

CP 3:Chapter V-2:1972, *Code of basic data for the design of buildings — Wind loads*.

ISO 12482-1:1999, *Cranes — Condition monitoring — Part 1: General*.

HSE Guidance Note GS 6, *Avoidance of Danger from Overhead Electric Lines*, 1990. HMSO.

HSE Guidance Note GS 39, *Training of Crane Drivers and Slingers*, 1986. HMSO.

HS[G] 118, *Electrical Safety in Arc Welding*, 1994. HMSO.

Code of Practice for the Safe Use of Lifting Equipment, 1994. Lifting Equipment Engineers' Association.

Crane Stability on Site, 1996. CIRIA Special Publication 131. Construction Industry Research and Information Association.

Lifting Operations and Lifting Equipment Regulations (LOLER) 1998. Statutory Instrument 1998, No. 2307. HMSO.

The Management of Health, Safety and Welfare Regulations 1999. Statutory Instrument 1999, No. 3242. HMSO.

Provision and Use of Work Equipment Regulations (PUWER '98) 1998. Statutory Instrument 1998, No. 2306. HMSO.

The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995. Statutory Instrument 1995, No. 3163. HMSO.

The Supply of Machinery (Safety) Regulations (SMR) 1992. Statutory Instrument 1992, No. 3073. HMSO.

3 Definitions

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

3.1

rated capacity

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

NOTE The rated capacity is the "safe working load".

3.2

rated capacity indicator

device that automatically provides, within a specified tolerance, warning that the load is approaching rated capacity, and another warning when rated capacity is exceeded

NOTE Rated capacity indicators are also known as automatic safe load indicators.

3.3

rated capacity limiter

device that automatically prevents, within a specified tolerance, motions that could increase risks, if the rated capacity is exceeded

3.4**radius**

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

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

3.5**radius indicator**

device that shows the radius at which the crane is operating and the corresponding rated capacity

3.6**lifting accessory**

component or equipment, that is not part of the crane, placed between the crane and the load, or on the load, to attach the load to the crane

NOTE Lifting accessories are also known as lifting tackle or lifting gear.

3.7**appointed person**

person with training, practical and theoretical knowledge and experience required to comply with 4.7

3.8**crane supervisor**

person who controls the lifting operation, and ensures that it is carried out in accordance with the appointed person's safe system of work

3.9**crane driver**

person who operates the crane to position loads or to assemble the crane

NOTE The crane driver is also known as the crane operator.

3.10**slinger**

person responsible for attaching and detaching the load to and from the crane and for correct selection and use of lifting accessories

3.11**signaller**

person responsible for directing the crane driver to ensure safe movement of the crane and load

3.12**competent person**

person with appropriate practical and theoretical knowledge and experience to examine lifting equipment and to detect defects or weaknesses in the equipment, and to assess these in relation to safety and to continued use of the equipment

3.13**in-service**

handling loads up to rated capacity in permissible wind speeds and other conditions specified by the manufacturer

3.14**out-of-service**

out of use, without load on the lifting attachment and in conditions specified by the manufacturer

NOTE The manufacturer may specify a higher wind speed and other conditions different to conditions permitted in-service.

3.15**rough terrain crane**

telescopic jib, wheeled crane, primarily designed for working on sites and able to travel on site between lifting operations over dry, firm, uncompacted ground

NOTE The manufacturer's manual should specify the conditions that apply to free-on-wheels and pick and carry operations.

3.16**all-terrain crane**

telescopic jib, wheeled crane with a specially designed chassis that allows travel on the highway at normal road speeds, and incorporates features, such as additional steering and driven axles, to give it better manoeuvrability on site

NOTE The term "all-terrain" should not be taken to mean that the crane can travel over rough, uncompacted ground.

3.17**free-on-wheels**

able to lift loads with a wheeled crane without the use of outriggers or stabilizers

3.18**load enhancing equipment**

equipment fitted to a mobile crane to increase the margin of stability or to reduce the structural stress within the loaded members, allowing the rated capacities for the crane configuration to be increased.

NOTE Load enhancing equipment may be known by a proprietary name (e.g. "Superlift").

3.19**method statement**

document produced for or by the appointed person to describe how the lifting operation should be carried out, including any contingency plan if the operation becomes interrupted (e.g. because of weather change, break down, etc.)

3.20**employing organization**

person or organization who requires a lifting operation to be carried out and who has responsibility for safe use of the crane



4 Management of the lifting operation

4.1 Safe system of work

A safe system of work should be established and complied with for each lifting operation, whether it is an individual lift or a group of repetitive operations. A safe system of work should be applied if the lifting operations are carried out at a site or if 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) risk assessment;
 - b) planning of the operation;
 - c) preparation of a method statement;
 - d) selection, provision and use of a suitable crane(s) and equipment, including:
 - 1) maintenance;
 - 2) inspection;
 - 3) examination, and testing if required;
 - e) preparation of the site, if required;
 - f) provision of properly trained and competent personnel aware of their statutory responsibilities;
- NOTE It is essential for the safety of the operation to ensure that all personnel can communicate clearly.
- g) supervision by properly trained and competent personnel with authority;
 - h) ensuring that all test certificates and other documents are available;
 - i) preventing unauthorized movement or use of the crane at all times;
 - j) consideration for the safety of persons in the danger zone but not involved in the lifting operation.

Erection and dismantling of the crane(s) should also be covered by a safe system of work (and may be a separate lifting operation).

Safe systems of work should be effectively communicated to all parties concerned.

4.2 Control of the lifting operation

The employing organization (3.20) should contract an appointed person (3.7) prior to each specific lifting operation. The appointed person should ensure that the safe system of work is implemented.

NOTE Provision of an appointed person does not lessen the legal responsibility of the employing organization for ensuring safety. The appointed person may have other duties and is not necessarily a direct employee of the employing organization.

The appointed person should have sufficient training and experience to carry out all duties competently (see 4.8).

4.3 Planning of the lifting operation

All lifting operations should be planned to ensure that they are carried out safely and that all foreseeable risks are taken into account. Planning should be carried out by an appointed person.

NOTE 1 Guidance on carrying out risk assessments is given in HSE publication *Five Steps to Risk Assessment*.

NOTE 2 For repetitive or routine operations, planning may only be required in the first instance, with periodic reviews to ensure that no factors change.

Planning should include consideration of the following:

- a) the load characteristics and the method of lifting;
- NOTE It may also be necessary to allow for any adhesion between the load and its support.
- b) selection of an appropriate crane(s) for the operation, ensuring that sufficient clearances are maintained between the load(s) and the crane structure (see clause 7);
 - c) selection of lifting accessories, including taking into account the weight of accessories on the total load on the crane(s);
 - d) the position of the crane(s) and 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) erection and dismantling of the crane(s);
 - g) present and foreseeable environmental conditions at the site, that could entail interruptions to the operation.

4.4 Method statement

A method statement should be prepared, by the appointed person, including a step-by-step description of the safe system of work for the entire lifting operation. The method statement should include at least the following:

- a) the schedule of responsibilities (e.g. type of hire, road closures, base preparation, isolation of live services);
- b) full details of the crane(s);
- c) details of ancillary equipment;
- d) details of the lifting accessories;
- e) the name of the appointed person;
- f) the name of the crane supervisor (who may be the appointed person);
- g) a complete plan including the sequence of the operation [from site preparation, arrival of the equipment on site, any necessary erection, positioning of the crane(s), lifting and placing of the load(s), and dismantling the crane(s), to moving off site].

NOTE 1 This list is not exhaustive and in some circumstances further information may be required.

During preparation of the method statement the appointed person should consult with any persons with specialized knowledge and experience, as appropriate, to ensure that all hazards that may be caused by, or to, the crane(s), are taken into consideration.

The method statement should give details of the steps to be taken to eliminate danger to personnel not involved in the lifting operation, and if required, to prevent entry into the danger zone.

NOTE 2 Mobile cranes are used in a wide variety of locations. On large construction sites, a number of different lifting operations can be carried out each day (from straightforward and repetitive to complex and unique). On these sites there can be sufficient people with knowledge and experience to control all lifting operations. At other locations there can be a single lifting operation required, and no one with prior knowledge and experience of using a crane (e.g. if a factory takes delivery of a new machine, and, on arrival, the machine is lifted from the delivery transport). Other locations include petro-chemical plants, where cranes may be required for maintenance operations, and docks that can require loads to be lifted that are outside the capacity of their own cranes. At other sites, a mobile crane can be required where it can be moved into position, the lift carried out, and the crane moved out again to leave the site clear for other operations.

4.5 Insurance

The monetary value of cranes and ancillary equipment can be very high, and there is always some potential for serious personal injury and damage to property during lifting operations. It is essential that sufficient, appropriate insurance cover is obtained for all liabilities. Full details of insurance cover should be agreed and documented between all parties, before any lifting operations are carried out.

NOTE For operations in live plant, see 9.3.6.

4.6 Contracts

The employing organization may enter into a contract with another party to carry out the lifting operation on behalf of the employing organization. If so, the employing organization should be satisfied that the other party is competent to carry out the lifting operation.

A contract should be made between the employing organization and the other party, including at least the following:

- a) an agreement that an appointed person (3.7) is provided;
- b) an agreement that the employing organization provides accurate information on the locations of all services (e.g. drains), as requested by the appointed person.

The appointed person should have sufficient authority to carry out the recommendations of this part of BS 7121.

The employing organization may hire a crane and crane driver from a crane owner without entering a contract for the crane owner to carry out the lifting operation. In this case, the employing organization should obtain the personnel and expertise to comply with this part of BS 7121 from another source.

4.7 Selection of appointed person

When selecting and assessing an appointed person the employing organization should consider the variety and complexity of the operation, as well as all the problems that could arise from proximity hazards and environmental causes. The appointed person should be notified formally in writing. The appointed person should be given authority to carry out the duties involved, including consulting others with specialist knowledge and experience, and should be able to delegate duties and tasks for any part of the safe system of work to suitably qualified individuals.

NOTE To assist in selection of an appointed person, some examples of lifting operations that require different levels of expertise, training and experience, and that impose different duties on the appointed person, are given in 4.8.

The employing organization should review the performance of the appointed person periodically. Different lifting operations may entail selection of a new appointed person, as appropriate, or provision of additional training to the existing appointed person.

4.8 Duties of appointed persons for mobile crane operations

4.8.1 General

The duties of appointed persons for mobile crane operations can vary in accordance with the complexity of the operation. The duties for a “basic lift” are considerably fewer and less demanding than for a lift at a hazardous location. An appointed person employed for a “basic lift” may not be suitably trained or experienced for a more complicated operation, and another appointment may be required for this. Subclauses 4.8.2 to 4.8.4 should assist in ensuring that an appropriate appointment is made and a suitable method statement produced for each lifting operation.

4.8.2 Basic lift

If the weight of the load(s) can be simply established, and there are no hazards or obstructions within the area of the operation, then the duties of the appointed person should include the following:

- a) Establishing the weight. This can be by a reliable source of information, weighing the load, or calculation (with allowance for possible inaccuracies).
- b) Selection of the crane, based on the weight of the load, including the crane hook block and any lifting tackle; the maximum height of lift and the maximum radius required. The rated capacity of the crane should be specified by the manufacturer in the information for use supplied with the crane, or else on the current report of thorough examination issued by the competent person as required by statutory requirements. Manufacturer’s sales leaflets should not be relied on for the rated capacity for a specific crane.

- c) Consideration of the location of the operation, taking into account the access and egress required for the crane, and the suitability of the ground to take the loads imposed on the crane during preparation for the lift and during the lift itself.
 - d) Ensuring that the crane has been thoroughly examined (including testing where appropriate), and inspected and checked, before use.
 - e) Ensuring that a system for reporting defects is in place.
 - f) Selecting appropriate lifting accessories, including their method of attachment to the load, and any protection used to prevent damage.
 - g) Ensuring that lifting accessories are thoroughly examined, inspected and checked, before use.
 - h) Designating a person to check the lifting accessories and any lifting points that are provided on the load to ensure they are free from any obvious defect before attaching the load to the crane.
 - i) Briefing all persons involved in the lifting operation to ensure that the safe system of work described in the method statement is understood. (This should include a recommendation for all persons involved in the lifting operation to seek advice from the appointed person if any change is required to the lifting operation, or if any doubts about safety arise.)
- NOTE If one or more handlines/taglines are required to give more control of the load, the appointed person should designate persons to handle the lines.
- j) Checking, if numerous loads are to be lifted over a long period, to ensure that no changes are required in the safe system of work.
 - k) Ensuring that there is a crane supervisor (see 5.2.3) designated to direct personnel and to ensure that the operation is carried out in accordance with the method statement.

The appointed person and crane supervisor should be aware of the limits of their knowledge and experience concerning lifting operations, and should understand that when conditions exceed these limits, that further advice should be sought.

4.8.3 Standard lift

NOTE Normally lifting of persons is a standard lift.

If there are hazards, either within the working area of the crane or on the access route to the working area, but no multiple crane lifting is required, the duties of the appointed person should include, in addition to the duties listed in 4.8.2:

- a) Investigating all hazards in the operating area, including any areas required for access or erection/dismantling of the crane. (Hazards can be from surrounding buildings, or overground or underground services.)
- b) Taking account of increased risks if the load is lifted from a structure at a height above the

standing position of the crane. (Additional risks can arise from the crane driver not being able to observe the load while taking the initial strain, and movements due to deflections as the load is lifted clear of the supporting structure, making it not possible to put the load back down.)

- c) Liaison with any other person or authority, as required to overcome any hazard, by including any necessary corrective action or special measures in the safe system of work.
- d) Consideration of the effect of the lifting operation on surrounding property or persons, including the general public. This should lead to arranging for appropriate action to minimize any adverse effects, and to giving appropriate notice to all persons concerned, including any required by statute.

4.8.4 Complex lift

If the lifting operation requires more than one crane to lift the load, or cranes using load enhancement attachments, or if the lift is at a location with exceptional hazards (e.g. at a chemical plant), then the appointed person should ensure, in addition to the duties listed in 4.8.2 and 4.8.3, that:

- a) The weight of the load is known.
- b) Any lifting points provided on the load are adequate for the loads applied.
- c) The proportion of the weight taken by each crane throughout the lifting operation is known accurately to within $\pm 2\%$.
- d) The cranes are compatible in lifting characteristics, with sufficient margins within the rated capacity of each crane to allow for any additional dynamic loading that could be transferred from one crane to another during movement of the load. [Load transfer can be minimized by accurate monitoring of the load magnitude, position and verticality of the hoist rope. If the appointed person is satisfied that all factors that can induce loads into each crane are accurately known, and that they are monitored by instruments (including side loads on the jibs, etc.), the cranes may be used up to their rated capacity. If all factors cannot be accurately evaluated, an appropriate down rating of at least 20 % should be applied to each of the cranes involved (e.g. a rated capacity of 125 t to lift a load of 100 t).]
- e) The lifting operation is planned so that there is no possibility of contact between the jibs of the cranes or jibs and load.
- f) The method statement includes access, ground conditions, erection, etc., as well as the sequence of operations when lifting the load.
- g) The suitability of the ground is investigated to withstand the forces applied during the lifting operation, and taking into account the effect of cranes standing in close proximity to each other.

h) During the load lifting phase of the operation, the hoist rope loads and inclinations are monitored, and that the information is displayed suitably and clearly to the crane supervisor directing the crane drivers. (It may also be appropriate to monitor the inclination of the load during the lifting operation.)

4.9 Supervision

Each lifting operation with a mobile crane should be properly supervised to ensure safety.

As it is not possible for a crane driver to observe, from position at the crane controls, all hazards that could be present during movement of the load, at least one other person should be present throughout a lifting operation, to supervise and direct the crane driver.

The appointed person should designate one person to act as crane supervisor (see 5.2.3) for the lifting operation. The supervisor should be fully briefed on the safe system of work as described in the method statement. The supervisor should have the authority to stop the lifting operation and report back for further guidance if the supervisor considers that it could be unsafe to continue.

5 Selection and minimum attributes of personnel

5.1 Selection

Suitable personnel who are competent to carry out all duties required should be selected to carry out the lifting operation safely. Records of training and experience of persons should be consulted to assist in selection.

NOTE 1 Guidance on training of personnel can be found in HSE Guidance Note GS 39.

Persons responsible for selection of personnel should ensure that personnel are efficiently organized to ensure good team work. Personnel should not be under the influence of alcohol, drugs or other impairments to efficiency. All personnel should be aware of their duties (see clause 6). Personnel undergoing training should be properly supervised. Young persons should be employed in accordance with The Management of Health, Safety and Welfare Regulations 1999.

5.2 Minimum attributes of personnel

5.2.1 General

All personnel should be:

- a) competent;
- b) trained and assessed;
- c) able to present a record of training and assessment;
- d) physically able to carry out the work.

5.2.2 Appointed person

The appointed person should be able to perform the duties described in 4.8.

5.2.3 Crane supervisor

The crane supervisor should be:

- a) authorized to carry out the duties listed in 6.2;
- b) fully conversant with the duties of all persons involved in the lifting operation;
- c) able to give clear, unambiguous instructions to all other members of the team;
- d) able to assess danger to the lifting operation, from changed circumstances on site, and to call a halt to the operation, if the risk becomes unacceptable, so that the appointed person should be referred to for further instructions.

If the crane supervisor is also a crane driver, then the crane supervisor should not operate any crane involved in the lifting operation being supervised.

5.2.4 Crane driver

The crane driver should be:

- a) trained on the specific model of crane used;
- b) able to assimilate and apply information contained in reports and duty charts relating to the range of duties and safe use of the crane;
- c) familiar with the manufacturer's instructions for the rigging operation and for maintenance of the crane;
- d) aware that the crane should be used on level ground or else set level on outriggers before any load is applied;
- e) fully conversant with the correct use of outriggers and where outriggers should be fitted, and aware of how to properly support the outrigger feet (this requires regular monitoring to ensure that no movement occurs throughout the operation);
- f) able to set and check the functioning of the rated capacity limiter and rated capacity indicator;
- g) aware of the effects of wind and other climatic effects on the crane and load;
- h) able to resist pressures from other persons to carry out unsafe operations;
- i) able to take the action to avoid dangerous situations, including stopping operations;
- j) able to operate fire suppressant equipment, if fitted.

5.2.5 Slinger

The slinger should be:

- a) able to establish weights and the effect of the centre of gravity, and to balance loads and judge distances and clearances;
- b) able to select the appropriate lifting accessories and check that they are in a suitable condition;
- c) able to initiate safe movement of the crane and load using the designated signalling method.

5.2.6 Signaller

The signaller should be able to:

- a) relay signals from the slinger to the crane driver;
- b) direct safe movement of the crane and load;
- c) give clear and precise verbal instructions where audio equipment (e.g. radio) is employed.

5.2.7 Crane erector

The crane erector should be able to:

- a) prepare the specific model of crane for use and subsequently for removal from the site, in accordance with the manufacturer's instructions;
- b) work safely and confidently at heights;
- c) set and check the functioning of the rated capacity indicator/rated capacity limiter and other safety devices;
- d) establish weights, balance loads and judge distances, heights and clearances;
- e) perform the techniques of slinging.

5.2.8 Maintenance personnel

Maintenance personnel should be able to:

- a) maintain the specific model of crane to be used, in accordance with the manufacturers instructions;
- b) follow the safe system of work, including any permit to work systems.

6 Duties of personnel

NOTE In some circumstances it may be appropriate for one person, other than the crane driver, to undertake more than one of the duties described in clause 6.

6.1 Appointed person

The appointed person should perform the duties described in 4.8.

6.2 Crane supervisor

The crane supervisor should direct and supervise the lifting operation, ensuring that these are carried out in accordance with the method statement. The crane supervisor should be competent and suitably trained and should have sufficient experience to carry out all relevant duties. The crane supervisor should have sufficient authority to stop the lifting operation if the supervisor considers it dangerous to proceed.

NOTE The appointed person may decide to undertake the duties of the crane supervisor or to delegate these to another person with appropriate expertise for the lifting operation.

6.3 Crane driver

The crane driver should be responsible for correct operation of the crane in accordance with the manufacturer's instructions and within the safe system of work. The crane driver should only respond to a signal from the slinger to carry out initial lifting of the load, and then only to signals from one slinger/signaller, who should be easily identified, during the remainder of the lifting operation.

WARNING It is essential that the crane driver does not tamper with any controls, mechanisms or other equipment, including the rated capacity indicator.

6.4 Slinger

The slinger should be responsible for attaching and detaching the load to and from the crane load lifting attachment, and for using the correct lifting accessories and equipment in accordance with the operation plan.

The slinger should direct initial movement of the crane. If there is more than one slinger, only one slinger should direct initial movement.

If continuous signalling is required and the slinger is not visible to the crane driver, another slinger or signaller should relay the signals to the crane driver.

NOTE Alternatively, other audio or visual methods may be used. If other audio or visual methods are used, the equipment or means of equipment use should be so that the crane driver can become immediately aware if the equipment fails, so that movement of the crane can be stopped.

The following indications of equipment failure should cause the crane driver to immediately stop movements of the crane:

- a) a blank screen on a television monitor;
- b) cessation of continuous instructions from a signaller using a radio, to e.g. "lower... lower... lower" etc.;

NOTE If radio is used as a means of signalling, the selected frequency should be kept clear of other communications. All personnel involved in signalling should be given a clear and unique call sign and all communications should be preceded by the call sign. The crane driver should not respond to signals not preceded by the call sign.

- c) during the lifting operation, hand signals and voice instructions to the crane driver(s) should be given by only one person at any time.

If, during the lifting operation, responsibility for directing the crane and load is transferred to another signaller, the first signaller should clearly indicate to the crane driver that this responsibility is transferred and to whom. The first signaller should clearly indicate to the second signaller that the transfer is taking place. The crane driver and the second signaller should clearly indicate that they accept the transfer.

6.5 Signaller

The signaller should be responsible for relaying the signal from the slinger to the crane driver. The signaller may be responsible for directing movement of the crane and load instead of the slinger, provided that only one person is responsible at any time.

NOTE It is common practice to train personnel to enable them to carry out duties of both slinger and signaller.

6.6 Crane erector

The crane erector should be responsible for erection of the crane in accordance with the manufacturer's instructions. If there are two or more crane erectors, one should be designated "erector in charge" and should control this operation.

6.7 Maintenance personnel

Maintenance personnel should be responsible for maintaining the crane in a safe condition. Maintenance personnel should carry out all maintenance in accordance with the manufacturer's maintenance manual and within the safe system of work.

7 Selection of cranes

7.1 General

Cranes are available in many forms and the various characteristics of these should be considered in relation to the requirements of the lifting operation. After deciding the type of crane and other overall requirements, a crane that can safely perform the planned lifting operation should be selected. The following should be considered when selecting a crane:

- weights, dimensions and characteristics of the loads;
- operational speeds, radii, heights of lifts, and areas of movement;
- number, frequency and types of lifting operations;
- length of time the crane is required for;
- site, ground and environmental conditions, or restrictions arising from existing buildings, etc.;
- space available for crane access/egress, erection, travelling, operation, and dismantling;
- any special operational requirements or limitations imposed.

NOTE Subclauses 7.2 to 7.8 give information on features and suitability of the types of mobile crane currently available. The list is not exhaustive, and could be extended as new types become available.

Economic factors may influence the choice of crane, but it is essential that the crane conforms to the safe system of work.

7.2 Truck-mounted crane

NOTE 1 A truck-mounted crane is a crane unit mounted on a road truck chassis. Truck-mounted cranes are able to travel on public highways at normal road speeds. The chassis may be of an ordinary commercial truck that has been adapted, or it may have been specially manufactured to carry the superstructure unit. In either case the chassis is fitted with a set of outriggers or stabilizers to provide improved stability when lifting loads. Truck-mounted cranes are subject to requirements for braking, steering, lighting, etc., specified in road traffic regulations. The crane travels at normal road speed to the site and can usually be used in a lifting operation without adaptation or addition, although separately transported, additional jib sections and/or counterweight may be fitted to increase the lifting range after arrival at the site.

Good access to the site should be provided if truck-mounted cranes are used, and the load-bearing ability of approach roads to the site should be assessed prior to selecting a truck-mounted crane.

NOTE 2 The wheel loads even of cranes with low nominal lifting capacity can be high.

The width of the truck-mounted crane, any overhead obstructions that reduce the clearance height, and the gradient of, and any tight bends or sharp corners in, approach roads should be considered prior to selecting a truck-mounted crane. The length and manoeuvrability of the truck-mounted crane should be considered in relation to the layout of the site.

7.3 Fixed-base crane

NOTE Fixed-base cranes are cranes with a very high nominal lifting capacity, that are usually transported to the site in several parts and assembled there. After assembly, these cranes may be able to make some limited travel, but work on a fixed base when lifting loads.

Fixed-base cranes are similar to truck-mounted cranes and 7.2 should be complied with when using these.

7.4 Rough-terrain crane

NOTE 1 A rough-terrain crane is a wheel-mounted crane intended for use on a site where a number of loads are lifted at different locations. The loads can be moved between the lift locations quickly, without damage to the site surface. "Rough-terrain" does not mean that this type of crane can travel over, and lift loads on, uneven ground with poor load-bearing ability. Rough-terrain cranes require the same ground conditions as other wheeled vehicles (i.e. ground firm enough for good traction without excessive sinking).

If rough-terrain cranes pick and carry loads on the crane hook (not necessarily up to the full rated capacity) careful consideration should be given to planning and use to ensure a safe system of work.

When lifting "free-on-wheels" the ground should be level within the limits specified by the crane manufacturer.

NOTE 2 Rough-terrain cranes are fitted with outriggers, and may be able to travel across moderate slopes without load, and jacked level for lifting loads.

7.5 All-terrain crane

NOTE An all-terrain crane is a hybrid of a truck-mounted crane and a rough-terrain crane. It is as compact as a rough-terrain crane, and able to travel on public highways at the same speeds as a truck-mounted crane. On some models of all-terrain crane, all axles can drive and steer, so that the crane has good traction and manoeuvrability on unmade-up ground. All-terrain cranes can often move into places where it is not possible for a truck-mounted crane to enter, and so an all-terrain crane of lower nominal lifting capacity may carry out a lifting operation with more safety than a larger capacity truck-mounted crane, if the truck-mounted crane is required to stand further from the load landing position. "All-terrain" does not mean that this type of crane can travel and lift loads on any surface.

The same ground conditions are required for all-terrain cranes as for truck-mounted cranes, with regard to load bearing and level. All-terrain cranes may have better ability to climb gradients, but the manufacturer's specification should be consulted to confirm this.