

BS 7121-1:2016



BSI Standards Publication

Code of practice for safe use of cranes – Part 1: General

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Contents

Foreword *iii*

1	Scope	1
2	Normative references	1
3	Terms and definitions	2
4	Management of installation and lifting operations	6
5	Planning of the lifting operation	14
6	Selection and duties of personnel other than the appointed person	20
7	Minimum attributes of personnel	23
8	Safety	27
9	Crane documentation	29
10	Erection and dismantling	30
11	Procedures and precautions	32
12	Maintenance	34
13	Operating conditions	34
14	Multiple lifting and lowering	38
15	Weather conditions	40
16	Slings and handling of loads	41
17	Signalling systems	45
18	Thorough examination, including testing	45
19	Ropes	46
20	Special applications of cranes	51

Annexes

Annex A (normative)	Training of appointed persons and crane supervisors for lifting operations	56
Annex B (normative)	Training of crane operators and slinger-signallers	63
Annex C (normative)	Contract lift or crane hire	73
Annex D (informative)	Effect of wind and down-rating	76
Annex E (normative)	Additional recommendations for operation of cranes on or adjacent to sites of exceptional hazards	78
Annex F (normative)	Radio communication for lifting operations	92

Bibliography 94

List of figures

Figure 1	Adverse effect of a swinging load on load radius	4
Figure 2	Relationship between complexity index and lift category	10
Figure 3	Example crane signals	25
Figure 3	Example crane signals	26
Figure 4	Out of vertical lifting	35
Figure 4	Out of vertical lifting	36
Figure 5	Paying out rope	47
Figure 6	Serving of ropes before cutting	48
Figure 7	Transferring rope for reel to reel	49
Figure C.1	Contract options	74
Figure D.1	Simplified method for determining the maximum allowed wind speed for mobile cranes	77
Figure E.1	Compound collapse radius	79
Figure E.2	Crawler crane collapse radius	80
Figure E.3	Saddle jib tower crane collapse radius	81
Figure E.4	Luffing jib tower crane collapse radius	82
Figure E.5	Wheeled mobile crane collapse radius	83
Figure E.6	Example calculations of load collapse radius	84
Figure E.7	Management of cranes leading indicator audit	91

List of tables

Table 1 – Example load and environmental hazards associated with lifting operations 9

Table 2 – Illustration of the categorization of lifts based on environmental and load complexities 11

Table 3 – Weight of materials 43

Table D.1 – Typical area/weight and drag factors for typical loads 76

Table D.2 – Typical area/weight and drag factors for typical loads 76

Table D.3 – Typical shapes and corresponding C_w values 78

Table E.1 – Recommendations for dynamic supplementary brake testing 89

Table F.1 – Voice commands for lifting operations 93

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 96, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 January 2016. It was prepared by Subcommittee MHE/3/11, *Crane safety and testing*, under the authority of Technical Committee MHE/3, *Cranes and derricks*. A list of organizations represented on these committees can be obtained on request to their secretary.

Supersession

This British Standard supersedes BS 7121-1:2006, which is withdrawn.

Relationship with other publications

BS 7121-1 provides general recommendations for crane types. BS 7121-2 covers in-service inspection, maintenance, thorough examination and testing for the safe use of all types of crane. Other parts of BS 7121 deal with the specific crane types as follows:

- Part 3: Mobile cranes;
- Part 4: Lorry loaders;
- Part 5: Tower cranes;
- Part 11: Offshore cranes;
- Part 12: Recovery vehicles and equipment;
- Part 13: Hydraulic gantry lifting systems;
- Part 14: Side boom pipelayers.

BS 7121 has been accepted as representing the consensus of practical experience for the safety of cranes.

Information about this document

This is a full revision of the standard. It is intended to 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.

Use of this document

As a code of practice, this British Standard 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 British Standard is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

In particular, attention is drawn to the following statutory regulations:

- The Health and Safety at Work etc. Act 1974 [1];
- The Lifting Operations and Lifting Equipment Regulations (LOLER) 1998 [2];
- The Provision and Use of Work Equipment Regulations (PUWER) 1998 [3];
- The Supply of Machinery (Safety) Regulations 2008, as amended [4];
- The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 [5];
- The Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations (MCA LOLER) 2006 [6];
- The Merchant Shipping and Fishing Vessels (Provision and Use of Work Equipment) Regulations (MCA PUWER) 2006 [7];
- The Road Vehicles (Construction and Use) Regulations 1986, as amended [8];
- The Manual Handling Operations Regulations 1992, as amended [9].

NOTE 1 Details of the Lifting Operations and Lifting Equipment Regulations 1998 [2] and the Provision and Use of Work Equipment Regulations 1998 [3], together with an HSE Approved Code of Practice and HSE Guidance, are given in HSE publications Safe use of lifting equipment [N2] and Safe use of work equipment [10].

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

1 Scope

This part of BS 7121 gives recommendations for the safe use of cranes permanently or temporarily installed in a work environment. Subjects covered include safe systems of work, selection, erection and dismantling, maintenance, inspection, thorough examination, operation, and the planning and management of lifting operations.

This standard is not applicable to the use of cranes:

- a) for bungee jumping or similar entertainment activities; or
- b) as part of a fully automated storage or production system.

NOTE Annex A and Annex B give recommendations for the training of appointed persons, crane supervisors, crane operators and slinger-signallers. Annex C outlines the features of contract lifts and crane hires. Information on the effect of wind and down-rating of the in-service lifting capacity is given in Annex D. Additional recommendations for the operation of cranes on or adjacent to sites of exceptional hazards are given in Annex E. Additional information on radio communication for lifting operations is given in Annex F.

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.

Standards publications

BS 5975:2008+A1:2011, *Code of practice for temporary works procedures and the permissible stress design of falsework*

BS 7121 (all parts), *Code of practice for safe use of cranes*

BS 7121-2, *Code of practice for the safe use of cranes – Part 2: Inspection, maintenance and thorough examination*

BS 7121-2-1:2012, *Code of practice for the safe use of cranes – Part 2-1: Inspection, maintenance and thorough examination – General*

BS 7121-3:2000, *Code of practice for safe use of cranes – Part 3: Mobile cranes*¹⁾

BS 7121-4, *Code of practice for safe use of cranes – Part 4: Lorry loaders*

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

BS EN 14439, *Cranes – Safety – Tower cranes*

BS EN 14502-1, *Cranes – Equipment for the lifting of persons – Part 1: Suspended baskets*

Other publications

[N1] HEALTH AND SAFETY EXECUTIVE (HSE). *Guidance Note GS6, Avoiding danger from overhead power lines*. Sudbury: HSE Books, 2013.

[N2] HEALTH AND SAFETY EXECUTIVE (HSE). *Safe use of lifting equipment. Lifting Operations and Lifting Equipment Regulations 1998*. Approved Code of Practice and guidance. L113 (Second edition). Sudbury: HSE Books, 2014.

[N3] HEALTH AND SAFETY EXECUTIVE (HSE). *Guidance Note HSG 141, Electrical installations on construction sites*. Sudbury: HSE Books, 1995.

¹⁾ Revision in preparation.

[N4]HEALTH AND SAFETY EXECUTIVE (HSE). Guidance Note HSG 118, *Electrical safety in arc welding*. Sudbury: HSE Books, 1994.

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1 appointed person

person nominated (typically by the employing organization) to plan, and to have overall control of, the lifting operations

3.2 carrier

device that supports persons during lifting and lowering

NOTE Also known as a “manrider” or “man riding basket”.

3.3 competent person

person who has such practical and theoretical knowledge and experience of the crane and the equipment used in the lifting operation as is necessary to carry out the function

3.4 configuration

combination of structural members, counterweights, support or outrigger position, hook block reeving and similar items assembled, positioned and erected according to manufacturers' instructions and ready for operation

3.5 control gear

switching devices in combination with associated control, measuring, protective and regulating equipment

3.6 crane coordinator

person responsible for planning and directing the sequence of operations of cranes to prevent collision with other cranes or loads and other equipment or structures (e.g. concrete placing booms, telehandlers, piling rigs)

3.7 crane operator

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

NOTE Sometimes referred to as “crane driver”.

3.8 crane supervisor

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

3.9 employing organization

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

NOTE In the case of a crane hire the degree of the employing organization's responsibility for the safe use of the crane depends on whether the crane is being supplied under a crane hire contract or as part of a contract lift (see Annex C).

3.10 indicator

device which provides warnings and/or data to facilitate the competent control of the crane within its design parameters

3.11 lift

movement of loads or persons that involves a change of height

3.12 Lift categories

3.12.1 basic lift

lifting operation where the load characteristics are considered straightforward and there are no significant hazards within the working area or on the access route for the crane to the working area

3.12.2 complex lift

lifting operation where significant hazards have been identified with the load or with the working area or access route of the crane, and the crane is used to lift complex loads or persons, or where two or more cranes are used to lift the load, or where the lifting operation is carried out at a location with exceptional hazards

NOTE An example of a location with exceptional hazards is a chemical plant.

3.12.3 intermediate lift

lifting operation where significant hazards have been identified with the load or with the working area or access route of the crane

NOTE Formally known as a "standard lift".

3.13 lift plan

information provided to the person supervising the lifting operation to enable them to complete the operation safely

NOTE This normally consists of at least the risk assessment, method statement and any relevant drawings.

3.14 lifting accessory

work equipment for attaching loads to machinery for lifting

NOTE Also known as "accessory for lifting".

3.15 lifting equipment

work equipment (crane) for lifting or lowering loads, including attachments used for anchoring, fixing or supporting the load

3.16 load

force on the crane arising from the weight lifted and any other forces, such as suction

NOTE If a crane is used to lift a load from water, the load could also include forces due to water flow or suction and the effect of loss of buoyancy.

3.17 method statement

document produced by the appointed person to describe how the lifting operation is to be carried out

3.18 motion limiting device

device which restricts a crane motion or initiates the stopping of a motion

3.19 multi-crane lift down-rating system

additional mode programmed into the crane's rated capacity indicator/limiter (RCI/RCL) (see 3.24) which down-rates the maximum lift capacity in all duties when the mode is selected (typically by 33%) and ensures that an external visual indicator indicates to those in the vicinity of the crane that the mode has been selected

3.20 performance limiting device

device which automatically prevents a design performance limit from being exceeded

3.21 pre-use checks

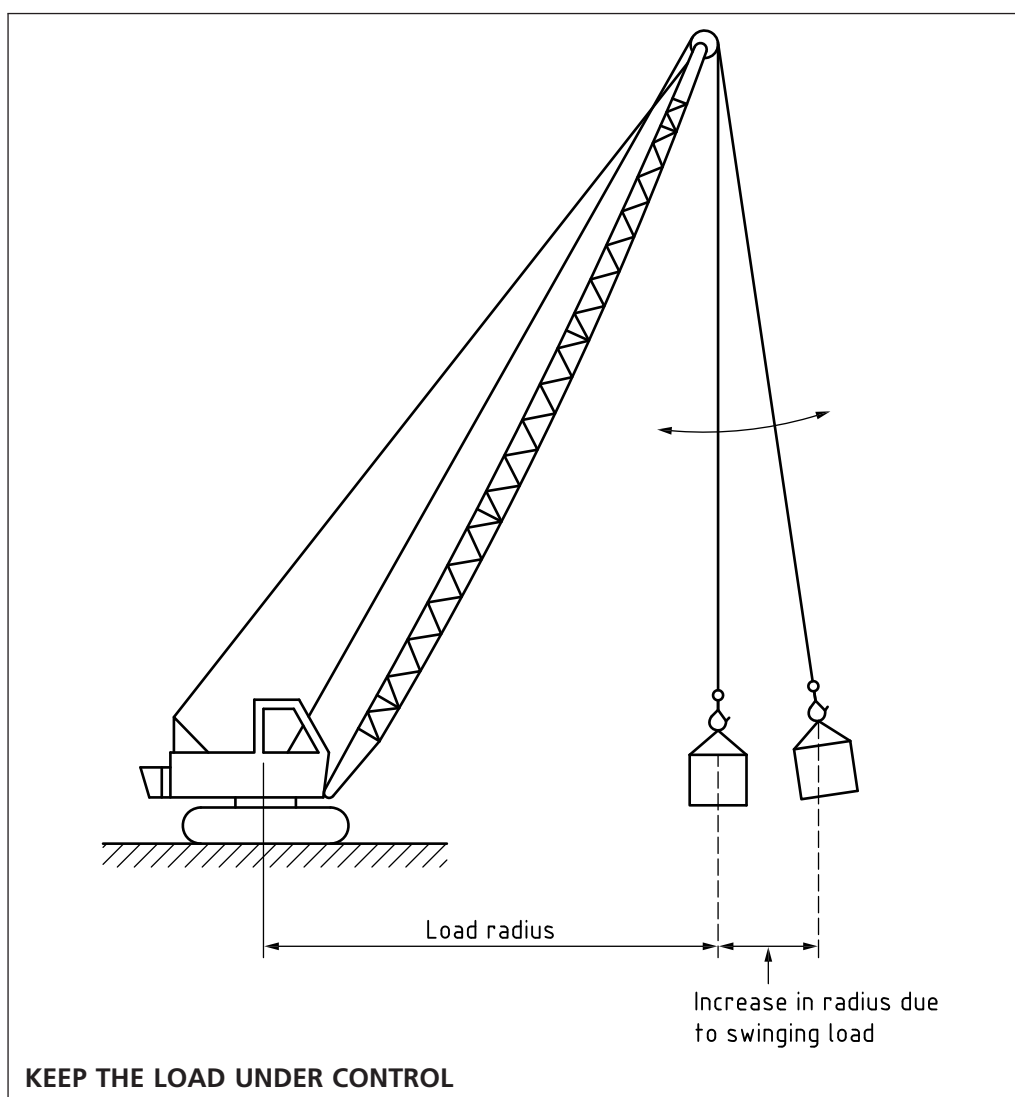
visual and functional checks carried out before the start of each shift or period of operation to ensure that the crane has not suffered any damage or failure and is safe to use

3.22 radius

horizontal distance between the axis of rotation of the crane and the vertical centreline passing through the centre of gravity of the load (see Figure 1)

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

Figure 1 **Adverse effect of a swinging load on load radius**

**3.23 rated capacity**

load that the crane is designed to lift for a given operating condition (e.g. configuration, position of the load)

NOTE The rated capacity was formerly known as "safe working load" (SWL).

3.24 rated capacity indicator/limiter**RCI/L**

device(s) that warns of the approach to overload and prevents the crane from being overloaded

NOTE See BS EN 12077-2. This was previously known as an “automatic safe load indicator” (ASLI) and “overload protection”. For information on ASLIs see BS 7262.

3.25 Service conditions**3.25.1 in-service**

condition where the crane is handling loads

3.25.2 out-of-service

condition where the crane is either not required for use or is out of use, without a load on the hook

NOTE Out-of-service conditions can include a higher wind speed than that permitted for the in-service conditions.

3.26 signaller

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

3.27 site operator

person or organization in overall control of the site

NOTE This may be the owner of the site or a person or organization operating the site on their behalf.

3.28 slinger-signaller

person responsible for:

- a) attaching and detaching the load to and from the crane;
- b) correct identification and use of lifting accessories in accordance with the specifications of the appointed person;
- c) initiating the movement of the load; and
- d) directing the crane operator to ensure safe movement of the crane and load

3.29 tag line

light rope attached to an object being lifted by a crane, used to guide the object while it is lifted or lowered

3.30 Testing**3.30.1 functional testing**

operation of each motion of the crane without a load applied in order to determine whether the crane performs in accordance with the manufacturer's specification

3.30.2 non-destructive testing (NDT)

testing carried out on the structure of the crane to establish the presence, location and extent of any defects that could affect the integrity of that structure, employing techniques that do not damage or alter the material under test

NOTE NDT is also known as “non-destructive examination” (NDE).

3.30.3 overload testing <dynamic>

operation of each motion of the crane with a load that exceeds the rated load applied in order to determine whether the equipment is structurally sound and fit for the use for which it was designed

3.30.4 overload testing <static>

application of a load exceeding the rated load to the crane to determine whether the equipment is structurally sound and fit for the use for which it was designed

3.30.5 performance testing

operation of each motion of the crane with the rated load applied in order to determine whether the equipment performs to the manufacturer's specification, including checking of the rated capacity indicator/limiter (RCI/RCL)

NOTE Not to be confused with calibration testing performed at $1.1 \times$ rated capacity, e.g. for lorry loaders (see BS 7121-2).

3.31 thorough examination

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

NOTE The thorough examination is not part of the maintenance regime for the equipment but provides owners with information which could be used to determine the effectiveness of the maintenance regime. The competent person might require supplementary tests as part of thorough examination. See BS 7121-2.

3.32 use <of work equipment>

activity of any kind involving work equipment

NOTE Includes starting, stopping, programming, setting, transporting, repairing, modifying, servicing and cleaning.

3.33 user

person or organization with control of both the lifting operation and the crane operator, and a responsibility to ensure that cranes and other equipment are properly maintained and are thoroughly examined by a competent person

3.34 weight

vertical force exerted by a mass as a result of gravity

3.35 working load limit (WLL)

maximum mass or force which a crane/lifting accessory is authorized to support in operation when the load is applied in-line, unless noted otherwise, with respect to its centreline

NOTE 1 The term is generally only applied to lifting accessories.

NOTE 2 The WLL of a lifting accessory is equivalent to its maximum safe working load (SWL); its actual SWL might be less due to configuration or operating conditions.

4 Management of installation and lifting operations

4.1 Safe system of work

4.1.1 A safe system of work should be established and followed for every crane installation operation or lifting operation, whether it is an individual lift or a group of repetitive operations.

4.1.2 The safe system of work should include:

- a) planning of the lifting operation, including preparation of the lift plan (see Clause 5);
- b) selection, provision and use of a suitable crane(s) and work equipment;
NOTE The appointed person has a duty to ensure that the crane selected has adequate capacity for the intended use. The crane user has a duty to ensure that a crane is used only for its intended purpose.
- c) any necessary preparation of a site for the lifting operation, including any entry or exit travel routes for the crane(s);
- d) any erection, dismantling or setting up of the crane(s), e.g. manual boom extensions, stabilizers, outriggers and counterweight;
- e) inspection, maintenance, thorough examination and, where necessary, testing of the crane(s) and equipment and ensuring reports are available;
- f) the provision of properly trained and competent personnel who have been made aware of their responsibilities under the Health and Safety at Work etc. Act 1974 [1];
- g) adequate supervision by properly trained and competent personnel having the necessary authority;
- h) preventing unauthorized movement or use at all times;
- i) coordination of crane movements to avoid collisions between cranes and other items of plant or structures;
- j) the safety of persons not involved in the installation or lifting operation; and
- k) the need for the operator, unless in imminent danger, to remain in control of the crane throughout the lifting operation.

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

NOTE It is essential for the safety of the operation to ensure that all personnel involved can communicate clearly in the same language.

4.2 Control of the lifting operation

4.2.1 General

4.2.1.1 In order to implement the safe system of work effectively, one person should be appointed to have overall control of the lifting operation to act on behalf of the management of the employing organization. The appointment of this person does not remove any legal responsibility from the management but enables them to use the appointed person's expertise. 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 them to carry out their duties (see **4.3.1**) competently.

4.2.1.2 On large construction sites where multiple lifting operations are carried out by various subcontractors, the principal contractor should appoint the appointed person for the site. Each of the subcontractors on site may employ individuals who have undergone appointed person training, but they should remain subservient to the principal contractor's appointed person. The principal contractor's appointed person should ensure that the crane coordinator is advised of all lifting operations, to allow them to perform their duties.

4.2.2 Selection of appointed person

4.2.2.1 When selecting and assessing an appointed person, the employing organization should take into account 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 of their appointment.

NOTE To assist in the 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 4.3.

4.2.2.2 An appointed person should be trained in accordance with Annex A.

4.2.2.3 The employing organization should review the performance of the appointed person at planned intervals.

NOTE The duties of an appointed person for crane operations can vary according to the complexity of the operation. The duties for a basic lift are considerably fewer and less demanding than for a complex lift. An appointed person employed for a basic lift might not be competent to carry out a more complicated operation, and another appointment could be required for this. 4.3.2 can be used to make an appropriate appointment and produce a suitable lift plan for each lifting operation.

4.3 Duties of the person appointed to control the lifting operation

4.3.1 General

4.3.1.1 The appointed person's duties should include:

- a) planning the lifting operation (including approval of all risk assessments, lift categorizations and method statements), selection of the crane(s) and lifting accessories, instruction and supervision, and consultation with other responsible bodies to ensure effective collaboration as is necessary for the work to be undertaken safely;
- b) ensuring that the outcomes of the planning process are recorded in a lift plan;
- c) ensuring that adequate pre-operational checks, intermediate inspections, maintenance and thorough examination of the equipment have been carried out;

NOTE 1 For further information see BS 7121-2.

- d) ensuring that there is an effective procedure for reporting defects and incidents and for taking any necessary corrective action;
- e) taking responsibility for the organization and control of the lifting operation;
- f) ensuring that the crane supervisor and other members of the lifting team are fully briefed on the contents, scope and limits of the method statement (see 5.3); and

NOTE 2 This is generally acknowledged by the recipients by signing the briefing document.

- g) being familiar with the relevant parts of the project health and safety plan where the lifting operation is being carried out on a site where the Construction (Design and Management) Regulations 2015 [14] apply, and following, where appropriate, the recommendations of Annex C.

NOTE 3 Further guidance on roles and responsibilities under the Construction (Design and Management) Regulations 2015 [14] is given in the HSE's Managing

health and safety in construction: Construction (Design and Management) Regulations 2015. Guidance on Regulations [15] and A short guide for clients on the Construction (Design and Management) Regulations 2015 [16].

4.3.1.2 The appointed person should be given the necessary authority for the performance of all these duties, including the authority to:

- a) stop the operation whenever they consider that danger is likely to arise if the operation were to continue;
- b) consult others with specialist knowledge and experience; and
- c) delegate duties and tasks, but not responsibilities, for any part of the safe system of work to suitably qualified individuals.

4.3.1.3 Where the appointed person requires the assistance of specialists such as crane suppliers, geotechnical engineers, structural engineers and the designer of the load, care should be taken to ensure that these specialists have the necessary competence for the specific task for which assistance is sought.

4.3.2 Lift category and control measures

4.3.2.1 General

COMMENTARY ON 4.3.2.1

The complexity of a lifting operation depends on the hazards associated with the load path, the load itself and the equipment lifting it, and the environment in which the lifting operation is being carried out. Table 1 lists examples of some load and environment hazards which can be encountered during lifting operations.

Table 1 Example load and environmental hazards associated with lifting operations

Load hazards	Environmental hazards
Position of centre of gravity, including unknown position	Rain
High-temperature load	Ice
Fluid load or unsecured elements within the load	Snow
Lifting of people	Wind
Location of lifting points	Sea state
Complex slinging arrangements	Railways
Uncertainty of weight of load	Roads
Use of more than one crane	Petrochemical plants
Integrity of load	Nuclear plants
Dynamics of the load, e.g. floating load	Corrosive atmospheres
High surface area and/or drag coefficient	Adjacent cranes or other plant
Aerial load transfer	Power lines: overhead and underground
Orientation of the load	Public places
Load stability	Partially-obscured load path
Fragility	Uneven ground (pick and carry)
Sharp edges	Ground suction
Load restraint	Partially-secured load (demolition)
	Lightning
	People (consequence of failure)
	Poor ground conditions

4.3.2.1.1 To enable a lift to be planned, supervised and carried out effectively, the appointed person should carry out the activities recommended in **4.3.2.2**, **4.3.2.3** and **4.3.2.4**, depending on whether an assessment of the hazards associated with the load, lifting equipment and the environment in which the crane is to be operated indicates that the lift is:

- a) basic, i.e. the weight of the load(s) can be simply established and there are no significant hazards within the working area or on the access route for the crane to the working area;
- b) intermediate, i.e. there are significant hazards, either within the working area of the crane or on the access route for the crane to the working area; or
- c) complex, i.e. the crane is used to lift complex loads or persons, where two or more cranes are used to lift the load, or where the lifting operation is carried out at a location with exceptional hazards.

NOTE 1 As demonstrated in Figure 2, increases in either or both environmental complexity or load complexity (the “complexity index”; see Table 2) lead to the lift being allocated a higher category.

NOTE 2 Consideration of environmental hazards at the location of the operation includes the access and egress required for the crane and the suitability of the ground to take the loads imposed by the crane during preparation for the lift and during the lift itself.

NOTE 3 Load complexity includes characteristics such as weight, centre of gravity and presence of suitable lifting points. This can be established by a reliable source of information, measuring and weighing the load, or calculation (with allowance for possible inaccuracies).

4.3.2.1.2 Having identified the hazards associated with a particular lift, a hierarchy of control measures should be applied to eliminate or control those hazards and reduce the risks.

Figure 2 Relationship between complexity index and lift category

Environmental complexity (E)	3	Complex	Complex	Complex
	2	Intermediate	Intermediate	Complex
	1	Basic	Intermediate	Complex
		1	2	3
Load complexity (L)				
Key 1 Low 2 Medium 3 High				
NOTE Table 2 shows how lifting the same load in differing environments and lifting different loads in the same environment can lead to different lift categories.				

Table 2 Illustration of the categorization of lifts based on environmental and load complexities

Complexity, variables and constants	Lift category		
	Basic	Intermediate	Complex
Increasing environmental complexity	The crane operator has clear sight of the load path and the load is lifted from and to the ground.	The load is to be placed over an obstruction such that the crane operator does not have clear sight of the landing area from the control position.	The load is to be placed on a structure at height, without line of sight and with overhead power lines in close proximity.
Constant low load complexity	A load of known weight with designated top lifting points and central centre of gravity. The load does not contain fluids, is not fragile and is inherently stable when landed.	A load of known weight with designated top lifting points and central centre of gravity. The load does not contain fluids, is not fragile and is inherently stable when landed.	A load of known weight with designated top lifting points and central centre of gravity. The load does not contain fluids, is not fragile and is inherently stable when landed.
	Complexity index E1:L1	Complexity index E2:L1	Complexity index E3:L1
Increasing load complexity	A load of known weight with designated top lifting points and central centre of gravity. The load does not contain fluids, is not fragile and is inherently stable when landed.	A load of estimated weight with an estimated centre of gravity and without designated lifting points. The load does not contain fluids, is not fragile and is inherently stable when landed.	A load of estimated weight and centre of gravity and without designated lifting points. The load contains fluids, is fragile and is not stable when landed.
Constant low environmental complexity	The crane operator has clear sight of the load path and the load is lifted from and to the ground.	The crane operator has clear sight of the load path and the load is lifted from and to the ground.	The crane operator has clear sight of the load path and the load is lifted from and to the ground.
	Complexity index E1:L1	Complexity index E1:L2	Complexity index E1:L3

4.3.2.2 Basic lift

4.3.2.2.1 For a basic lift, the duties of the appointed person should include:

- a) an assessment of the proposed location of the lifting operation as part of the planning process to check that there are no significant hazards in the operating area, including any areas required for access or setting up of the crane;

NOTE 1 The appointed person may make an assessment on the basis of information with which they have been provided, visit the site personally or delegate a competent person to undertake the visit on their behalf.

- b) selecting the crane, based on:
 - 1) the load characteristics, including weight of the load and any lifting accessories;
 - 2) the maximum height of lift;
 - 3) the maximum radius required and/or the reach and range of movement required; and
 - 4) the rated capacity of the crane, as specified by the manufacturer/installer in the information for use supplied with the crane, or the manufacturer's sales leaflets, which should not be relied on for the rated capacity for a specific crane; or

- 5) the down-rated capacity of the crane as stated on the current report of thorough examination if this has been changed by the competent person at the time of thorough examination;
- c) establishing the maximum permissible wind speed in which the lifting operation can be safely undertaken, taking account of the maximum permissible wind speed specified by the manufacturer for the crane and movement of the load in the wind, including any reduction in permissible wind speed or restrictions in rated capacity required for the wind area of the load, and ensuring that the crane is not operated in wind speeds in excess of that established;

NOTE 2 See Annex D for the effect of wind speed.

- d) ensuring that the crane has a current report of thorough examination stating that it is safe to use, with evidence that pre-use checks have been carried out, and confirming that the equipment is considered safe;
- e) ensuring that the crane has been adequately maintained and that records of the maintenance are available;
- f) selecting appropriate lifting accessories, including their method of attachment to the load, configuration, centre of gravity and any protection used to prevent damage;
- g) ensuring that lifting accessories are thoroughly examined at least within the previous six months, and inspected and checked before use, and that the report of thorough examination is available to confirm that the lifting accessories are safe to use;
- h) ensuring that a system for reporting and rectifying defects is in place;
- i) determining any requirement for personnel in addition to the crane operator, such as a slinger-signaller, signaller or dedicated crane supervisor;

NOTE 3 For guidance on the combination of roles during a basic lift, see 6.2.8.

- j) designating a suitable person to check that the lifting accessories and any lifting points on the load are free from any obvious defects before attaching the load to the crane;
- k) defining the extent of any exclusion zone required and how it is to be controlled;
- l) ensuring that the outcomes of the planning process, including the hazards identified (see Table 1) and the lift categorization (see Figure 2 and Table 2), are recorded in the lift plan which is signed by the appointed person;

NOTE 4 In many instances, a generic lift plan is suitable for basic lifts, provided that no additional hazards are identified on site.

NOTE 5 A risk assessment and method statement are parts of the lift plan.

- m) briefing all persons involved in the lifting operation about the safe system of work described in the method statement, and obtaining signed acknowledgement from those briefed that they have understood;
- n) instructing 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;
- o) if one or more hand lines/tag lines are required to give more control of the load, designating persons to handle the lines;
- p) checking that no changes are required in the safe system of work if numerous loads are to be lifted over a long period; and

- q) ensuring that a crane supervisor is designated to direct personnel and to identify any hazards not identified in the lift plan, and that the operation is carried out in accordance with the method statement.

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

4.3.2.3 Intermediate lift

For an intermediate lift, the duties of the appointed person should include the following, in addition to those in **4.3.2.2**:

- a) identifying all significant hazards in the operating area, including any areas required for access or setting up of the crane, which may involve an assessment of the proposed location of the lifting operation as part of the planning process, which itself may involve a visit to the site;

NOTE The appointed person may visit the site personally or delegate a competent person to undertake the visit on their behalf.

- b) ensuring that a site and/or task-specific risk assessment and method statement are prepared, detailing control measures for the identified risks;
- c) liaising 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; and
- d) considering the effect of the lifting operation on surrounding property or persons, including the general public, arranging for appropriate action to minimize any adverse effects and giving appropriate notice to all persons concerned.

4.3.2.4 Complex lift

For a complex lift, the duties of the appointed person should include the following, in addition to those in **4.3.2.2** and **4.3.2.3**:

- a) visiting the location of the planned lifting operation as part of the planning process and identifying all exceptional hazards in the operating area, including any areas required for access or setting up of the crane;
- b) ensuring that the method statement includes access, ground conditions, setting up, etc., as well as the exact sequence of operations when lifting the load;
- c) preparing a detailed and dimensioned drawing of the site, the crane and the load, identifying the load path, pick-up and set-down areas, together with the position of any exceptional hazards in the area, and including plan and side elevations as necessary to identify the position and extent of any hazards and to enable the operator to position the crane accurately;
- d) ensuring that, where persons are being lifted, the recommendations of **20.1** are followed;
- e) ensuring that, where the lifting operation requires more than one crane to lift the load, the recommendations of Clause **14** are followed; and
- f) being present on the site during a complex lift.

5 Planning of the lifting operation

5.1 General

5.1.1 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 the appointed person who has the appropriate knowledge for the lift being undertaken (see 4.3). The outcome of the planning process should be a written lift plan which includes risk assessments, method statements and supporting information, such as a schedule of lifts, drawings and photographs.

NOTE 1 For repetitive or routine basic lifting operations, this planning might only be necessary in the first instance, with periodic reviews to ensure that no factors have changed.

NOTE 2 For lifting operations carried out on construction projects, further information on the duties of personnel is given in 4.3.1.1g).

5.1.2 Planning of the lifting operation should take into account:

- a) the load, its characteristics and the method of lifting, particularly when loads are lifted out of water, e.g. flow, suction, loss of buoyancy, position of centre of gravity;
- b) any adhesion between the load and its support and any other forms of resistance to lifting;
- c) the stability of the load when being lifted and set down;
- d) maximum motion speeds, acceleration and deceleration;
- e) 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 5.5);
- f) the selection of lifting accessories/attachments, the weight to be taken into account when assessing the load on the crane(s);
- g) the position of the crane(s) and of the load before, during and after the operation;
- h) the site of the lifting operation, including proximity hazards, space availability and suitability of the ground or foundations and other environmental conditions;
- i) the proximity of other cranes and/or other plant/structures;
- j) zones where the crane and/or parts of the crane and load-lifting attachments are prohibited from entering or oversailing;

NOTE 1 See Annex E for precautions to be taken when using cranes close to or at sites with exceptional hazard potential, such as railways, chemical plant and nuclear installations.

- k) any necessary set-up (configuration) of the crane(s), including erection and dismantling;
- l) the identification and selection of personnel for the lifting operation; and
- m) the environmental conditions that exist or might occur at the site of the operation or the effect of the load on the crane, e.g. lifting with a floating crane might involve a change of angle of heel or trim of the supporting vessel if lifting on water, which could necessitate stopping the operation when conditions are unsuitable.

NOTE 2 Lone working is to be avoided wherever possible. Where this is not possible, it is essential that suitable measures are put in place to minimize risk to the lone worker.

5.2 Risk assessment

5.2.1 The risk assessment carried out by the appointed person as part of the planning process should identify the hazards associated with the proposed lifting operation. This should take account of any hazards that are present at the proposed lifting site. The assessment should evaluate the risks involved and the nature and extent of any measures required to mitigate those risks. The appointed person should also take into consideration hazards identified by the overall site risk assessments.

NOTE Attention is drawn to the Management of Health and Safety at Work Regulations 1999, as amended [17], which require a risk assessment to be carried out.

5.2.2 The results of the risk assessment should be recorded in writing and used in the preparation of the method statement (see 5.3) for that site.

NOTE The employing organization needs to inform the appointed person of hazards identified by the overall site risk assessments.

5.3 Method statement

5.3.1 The risk assessment(s), together with the manufacturer's instructions, should be used by the appointed person (see 4.3) to develop a method statement detailing the safe system of work (see 4.1) for the transportation, movement, assembly, erection, use and dismantling of the crane at the site.

5.3.2 The appointed person should, when necessary, consult others with specialized knowledge and experience.

5.3.3 The method statement should include:

- a) the tasks to be performed, together with the configuration of the crane at the end of each day's work;
- b) details of the control measures to be followed to eliminate or minimize risk to members of the lifting team;
- c) details of the steps to be taken to eliminate danger to personnel not involved in the lifting operation, and, where necessary, prevent their entry into danger zones, e.g. organizing road closures and segregation zones;

NOTE 1 Exclusion zones require the agreement of the employing organization (site owner or principal contractor) responsible for the enforcement of these zones.

- d) the requirement for pre-use checks to be completed;
- e) a clear statement of the allocation of tasks to all parties involved in the lifting operation;
- f) a description of the item(s) to be lifted, including its weight, dimensions and centre of gravity;
- g) lifting points/method;
- h) type of lifting accessories to be used and configuration;
- i) pick-up and landing points referenced to the site plan;
- j) the height of the lift and the maximum radius where applicable;
- k) the model and configuration of crane to be used;
- l) outrigger/stabilizer support arrangements, including assessment of ground or supporting structure;
- m) overhead hazards;

- n) underground hazards;
- o) personnel involved, together with information as to which roles if any may be combined;
- p) the sequence in which lifting operations are to be undertaken;
- q) control measures to be implemented to eliminate or minimize risk;
- r) method of communication, e.g. hand signals or radios;
- s) environmental limitations, such as maximum permitted wind speed for the lifting operation and sea state for lifting off a floating crane or lifting from the sea;
- t) arrangements for any working at height, including rescue plans;
- u) access to attach and remove slings; and
- v) measures to be taken to ensure that the load remains stable after slings or other lifting accessories have been released.

NOTE 2 The lifting operation will be under the control of a crane supervisor who has the authority to stop the work if local conditions are unsatisfactory.

5.3.4 The method statement should specify clear roles for each member of the lifting team. Arrangements for effective communication among the team (and, if necessary, with adjacent crane operators in case of danger) should be available.

5.4 Team briefing/induction

5.4.1 The crane supervisor should ensure that each member of the lifting team is briefed on the specific features of the planned lifting operation at the start of the job. The lift plan should provide the basis of this briefing. The team should also be briefed on the general site precautions. If the composition of the team changes during the work, new members should be briefed on the lift plan and any other relevant issues.

5.4.2 A copy of the lift plan and associated supporting documents should be made available to all those involved in the lifting operation. Lifting team members should sign a record to acknowledge their attendance at and understanding of the briefing.

5.4.3 During the site induction, the crane supervisor or principal contractor's representative should seek the views of the team about any arrangements for health and safety that might be relevant to them.

5.4.4 Arrangements for effective communication among the team (and, if necessary, with adjacent crane operators in case of danger) should be available.

5.4.5 The briefing should be given using a language common to all lifting team members.

5.5 Selection of cranes

COMMENTARY ON 5.5

See the appropriate part of BS 7121 for details of the different types of crane and their operational characteristics.

5.5.1 Cranes are available in a number of forms, and the characteristics of the various cranes should be considered in relation to the job requirements.

5.5.2 Having decided upon the type of crane and knowing the overall job requirements, a crane capable of safely carrying out the planned lift should be selected.

5.5.3 The following, as a minimum, should be taken into account when selecting a crane:

- a) weights, dimensions and characteristics of loads;
- b) operational speeds, radii, heights of lifts and areas of movement;
- c) crane type and lifting capacity (see **13.1**);
- d) number, frequency and types of lifting operations, with care taken to match the load spectrum and duty cycles of the application to the classification of the crane and to ensure that repeated loads do not exceed 70% to 80% of the crane's rated capacity appropriate to the configuration in which it is being used, unless the crane has a classification permitting repeated lifting at maximum load on every occasion;

NOTE 1 Details of crane classification are given in ISO 4301.

- e) length of time for which the crane is required;
- f) remaining life expectancy;
- g) site, ground and environmental conditions, or restrictions arising from the use of existing buildings;
- h) space available for crane access, erection, travelling, operation, dismantling and egress;
- i) the control type and operating position most suitable for the lifting operation, selected so that the crane operator has the best possible view of the load path and is adequately protected from crushing hazards; and

NOTE 2 Cranes are available with a range of fixed operator control stations and/or remote control.

- j) any special operational requirements or limitations imposed, e.g. the down-rated capacity of the crane as stated on the current report of thorough examination if this was changed by the competent person at the time of thorough examination.

5.6 Siting of crane

5.6.1 General

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

- a) the crane standing or support conditions;
- b) the presence and proximity of other hazards;
- c) hazards associated with working on or adjacent to a highway or railway;
- d) the effect of wind during in-service and out-of-service conditions as recommended in Annex E; and
- e) 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.

NOTE 1 Attention is drawn to the New Roads and Street Works Act 1991 [18].

NOTE 2 Further details regarding the siting of mobile and tower cranes are given in CIRIA publication C703 [19] which might also provide information on other types of cranes, and further details regarding the siting of loader cranes are given by ALLMI [20].

NOTE 3 Further information on the siting of cranes on or adjacent to sites of exceptional hazards is provided in Annex E.

5.6.2 Crane standing or support conditions

5.6.2.1 The appointed person should obtain an assessment by a competent person as to whether the loads imposed by a crane that is not permanently installed in a fixed position can be sustained by the ground or any means of support.

NOTE Guidance on the assessment of ground conditions is given in CIRIA publication C703 [19] and the SFC publication Ground Conditions for Construction Plant [21].

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

- a) the dead weight of the crane (including any counterweight, ballast or foundation and, where appropriate, boom extensions);
- b) the dead weight of the load(s) and any accessories for lifting;
- c) dynamic forces caused by movements of the crane and, for floating cranes, the sea state at the time of lifting; and
- d) wind loadings resulting from wind speeds up to the maximum permitted, taking into account the degree of exposure of the site (see BS EN 1991-1-4).

5.6.2.3 It is likely that in-service conditions produce the greater imposed loading, but out-of-service and erection/dismantling conditions should be taken into account.

5.6.2.4 The vertical and horizontal forces are unlikely to be uniformly distributed, so an allowance should be made for these and for any other unpredictable effects.

5.6.2.5 The appointed person should ensure that the ground or any means of support is such that the crane can operate within the levels and other parameters specified by the manufacturer.

5.6.3 Proximity hazards

5.6.3.1 General

5.6.3.1.1 As part of the risk assessment, any proximity hazards in the area, such as the following, should be identified:

- a) overhead electric lines or cables (see also 5.6.3.2);
- b) nearby structures;
- c) underground services, voids and structures, such as gas mains or electric cables;
- d) other cranes and plant/structures;
- e) for a permanently installed crane, temporary structures or equipment within the path of the crane or personnel not involved in crane operations working within the proximity of the crane or crane tracks;
- f) other vehicles or ships being loaded or unloaded;
- g) stacked goods; and
- h) public access areas, including highways, railways and rivers.

5.6.3.1.2 Suitable measures should be devised to address each of the hazards identified.

- a) Where any part of the crane or its load cannot be kept clear of such hazards, the appropriate authority should be consulted.
- b) Precautions should be taken to ensure that the crane is clear of any underground services or, where this is not possible, that the services are adequately protected against damage.
- c) At any place where a crane or its load passes an obstacle, the following steps should be taken.
 - 1) Where practicable, the crane path should be clearly defined by marking to ensure that it is kept free from obstruction, and a clearance of not less than 600 mm should be arranged between any moving part of the crane and any obstacle. Where it is not reasonably practicable to achieve this clearance, effective precautions should be taken to prevent access to any crush areas.
 - 2) Where goods are regularly stacked near a crane, boundary lines for the stacking of goods should be permanently marked on the ground.
 - 3) On sites where there is a possibility of collision between the crane and other plant/structures [e.g. tower cranes, mobile cranes, overhead travelling cranes, dockside cranes, loader cranes, mobile elevating work platforms (MEWPs) or concrete booms], the crane coordinator (see **6.2.5**) should plan the sequence of crane movements to prevent collisions. In such circumstances, the operators should obtain the agreement of the crane coordinator before carrying out any operation.
 - 4) During pauses in the lifting operation or on completion of the lifting operation, the crane and its components should be positioned to ensure that collisions cannot take place (see **14.2.6**).

5.6.3.2 Overhead electric lines and cables

5.6.3.2.1 Many fatal accidents have occurred due to some part of a crane, such as a rope, sling or load, touching, or even coming near to, overhead electric lines or cables. Where the crane or load can come within 10 m of electric lines or cables and it is reasonably practical to turn the power off, steps should be taken by the appointed person to isolate the power.

5.6.3.2.2 Where this cannot be done, the appointed person should ensure that HSE Guidance Note GS6 [N1] and ACOP L113 *Safe use of lifting equipment* [N2] are followed. All distances should be measured at ground level from a position estimated by eye to be vertically below the outermost conductor at a tower or pole position and should include an allowance for the load.

WARNING. All overhead lines and other electrical apparatus should be treated as live unless declared “dead” and “safe” by the line operator. If in doubt, seek advice.

5.6.3.2.3 Devices are available that are designed to be fitted to a crane to give warning when the crane comes within a predetermined distance of overhead electric lines and cables. Such devices are not recommended and should not be considered a substitute for a safe system of work.

5.6.3.2.4 Where cranes are frequently used in the vicinity of overhead power lines, consideration should be given to fitting height limiters.

5.6.3.3 Crane control in the vicinity of aerodromes/airfields

If a crane is to be used within 6 km of an aerodrome/airfield and its height exceeds 10 m or that of surrounding structures or trees if higher, the appointed person should consult the aerodrome/airfield manager for prior permission to work.

NOTE 1 Restrictions could be placed on the overall height of the crane and there could be a requirement to fit warning (obstacle) lights to the top of the crane. Further details are given in CAA document CAP 1096 Guidance to crane operators on aviation lighting and notification [22].

NOTE 2 The Air Navigation Order 2000 [23] makes it an offence to act recklessly or negligently in a manner likely to endanger aircraft.

6 Selection and duties of personnel other than the appointed person

COMMENTARY ON CLAUSE 6

See 4.3 for the selection and duties of the appointed person.

6.1 Selection of personnel

COMMENTARY ON 6.1

Safe lifting operations (including installation) depend upon the selection of suitable personnel who are competent to carry out the required duties. Records of training and experience assist in the selection of suitable personnel as crane supervisors, crane operators and slinger-signallers.

6.1.1 Crane supervisors, crane operators and slinger-signallers should be trained in accordance with Annex A and Annex B.

6.1.2 Those responsible for the selection of personnel should ensure that the personnel involved in the operation are efficiently organized in order to ensure good teamwork during the lifting operation.

6.1.3 Work associated with lifting operations should not be carried out by personnel whose efficiency is impaired by alcohol, drugs or other influences. All personnel in the team should be made aware of both this fact and their other duties (see 7.1).

6.1.4 Where personnel are undergoing training, they should be supervised by appropriate personnel.

NOTE For basic lifts it might be appropriate for one person to undertake more than one of the duties identified in 7.2, depending on the hazards identified by the risk assessment.

6.2 Roles and duties of personnel

6.2.1 Crane operator

6.2.1.1 The crane operator 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 4.1), as detailed in the method statement (see 5.3).

6.2.1.2 The crane operator should at any one time respond only to the signals from one signaller (where separate signallers are provided), who should be clearly identified (see 6.2.3).

NOTE It is essential that the crane operator responds immediately to an emergency stop signal from any person.

6.2.2 Slinger-signaller

6.2.2.1 The slinger-signaller should be properly trained in all aspects of slinging loads and signalling, and be authorized by the appointed person.

6.2.2.2 The slinger-signaller should be responsible for:

- a) carrying out pre-use and post-use checks of lifting accessories;
- b) attaching and detaching the load to and from the crane load-lifting attachment; and
- c) using the correct lifting accessories and other equipment in accordance with the lift plan.

6.2.2.3 The slinger-signaller should also be responsible for initiating and directing the safe movement of the crane [see 7.5h)]. If there is more than one slinger-signaller, only one of them should have this responsibility at any one time, depending on their positions relative to the crane.

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

6.2.2.4 Where audio or visual methods are used, the equipment or its means of use should be such that the operator is immediately aware of failure of the equipment, to enable them to stop crane movements.

NOTE Typical examples of audio or visual methods used are:

- a) a blank screen on a television monitor immediately indicates that the operator needs to stop all crane movements; and
- b) a slinger-signaller using a radio continuously instructs the operator to lower a load, e.g. by saying "Lower...lower...lower...", and failure of this continuous instruction from the slinger-signaller indicates that the operator needs to halt all crane movements.

6.2.2.5 If, during the lifting operation, responsibility for directing the crane and load is to be transferred to a signaller, the slinger-signaller should clearly explain this to the crane operator and indicate to whom responsibility is being transferred. The slinger-signaller should clearly indicate to the signaller that this transfer is taking place. Furthermore, the operator and the signaller should clearly indicate that they accept the transfer of responsibility. At the end of the operation, a slinger-signaller should disconnect the load and remove any lifting accessories.

6.2.3 Signaller

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

6.2.4 Crane supervisor

6.2.4.1 All lifting operations should be supervised by a crane supervisor. The crane supervisor should direct and supervise the lifting operation, ensuring that it is carried out in accordance with the lift plan. The crane supervisor should be competent and suitably trained, and should have sufficient experience to carry out all relevant duties.

NOTE Competence requirements for self-supervision might differ from those for supervising others.

6.2.4.2 The crane supervisor should also have sufficient authority to stop the lifting operation if they consider 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.

6.2.5 Crane coordinator

Where more than one crane is to operate on a site, the crane coordinator should plan and direct the sequence of operations of cranes so that they do not collide with other cranes, loads and other equipment (e.g. concrete placing booms, telehandlers, piling rigs).

NOTE The crane coordinator role is often taken on by one of the crane supervisors.

6.2.6 Crane erector

The crane erector should be responsible for erecting the crane in accordance with the manufacturer's instructions (see **10.2**). Where two or more crane erectors are required, one should be nominated by the appointed person or employing organization as "erector in charge" to control the operation.

NOTE 1 The personnel erecting (rigging) mobile cranes are often known as "crane riggers".

NOTE 2 Further information on the selection, appointment and control of tower crane erectors is given in BS 7121-5.

6.2.7 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 **4.1**).

NOTE Further information on the selection, appointment and maintenance personnel is given in BS 7121-2-1:2012.

6.2.8 Combination of roles

6.2.8.1 In certain circumstances, it might be possible to combine some of the roles of members of the lifting team. However, the combination of roles should only take place following a review of the lifting operation by the appointed person.

6.2.8.2 All lifting operations should be planned by an appointed person.

6.2.8.3 The combination of roles should only be considered if the person undertaking the combined role has achieved the necessary competence for each role.

NOTE Competence requirements for self-supervision might differ from those for supervising others.

7 Minimum attributes of personnel

NOTE See 4.3 for the duties of the appointed person in lifting operations.

7.1 General

All personnel appointed for a lifting operation should be:

- a) competent to perform the tasks required of them;
- b) adequately trained and/or successfully assessed;
- c) aware of the responsibilities allocated by the appointed person to all members of the lifting team (see Clause 6);
- d) able to present a record of training and assessment; and
- e) medically fit to the extent required by their role (see *Medical Fitness to Operate Construction Plant* [24]).

7.2 Crane supervisor

The crane supervisor should be:

- a) authorized to carry out the duties listed in 6.2.4;
- b) fully conversant with the duties of all personnel involved in the lifting operation;
- c) able to give clear, unambiguous instructions to all other members of the team; and
- 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 can be referred to for further instructions if necessary.

7.3 Crane coordinator

The crane coordinator should be:

- a) fit, with particular regard to eyesight, hearing, reflexes and agility; and
- b) capable of giving precise and clear verbal instructions where audio equipment (e.g. radio) is employed, and capable of operating such equipment in accordance with Clause 17.

7.4 Crane operator

7.4.1 The crane operator should be:

- a) fit, with particular regard to eyesight, hearing and reflexes;
- b) physically able to operate the crane safely;
- c) able to judge distances, heights and clearances;
- d) adequately trained for the type of crane being driven and have sufficient knowledge of the crane, its operating instructions and its safety devices;
- e) fully conversant with the duties of the slinger-signaller and signaller, and trained in the techniques of signalling and instructed in a common signal code, such as that shown in Figure 3, and any alternative methods of relaying the signals that are to be used;
- f) trained in the use of the fire extinguishing/firefighting equipment on the crane (where provided);

- g) trained in the use of any means provided for escape in case of emergency; and
- h) authorized to operate the crane.

7.4.2 Evidence that the operator is medically fit to operate a crane should be obtained on employment and subsequently at yearly intervals.

NOTE The type of evidence obtained, e.g. health questionnaire, medical examination, is dependent on the type of crane being operated and the risks to the operator and others involved in the operation.

7.5 Slinger-signaller

The slinger-signaller should be:

- a) fit, with particular regard to eyesight, hearing, reflexes and agility (see *Medical Fitness to Operate Construction Plant* [24]);
- b) physically able to handle lifting accessories and equipment;
- c) able to establish weights, balance loads and judge distances, heights and clearances;
- d) trained in the techniques of slinging;
- e) capable of selecting accessories that have been identified in the lift plan, assessing their condition and suitability prior to use and ensuring that they are within thorough examination period;
- f) trained in the techniques of signalling and instructed in a common signal code, such as that shown in Figure 3;
- g) capable of giving precise and clear verbal instructions where audio equipment (e.g. radio) is used and of operating the equipment in accordance with Clause 17;
- h) capable of initiating and directing the safe movement of the crane and load; and
- i) authorized to carry out slinging duties.

7.6 Signaller

7.6.1 The signaller should be:

- a) fit, with particular regard to eyesight, hearing, reflexes and agility;
- b) able to judge distances, heights and clearances;
- c) trained in the techniques of signalling and instructed in a common signal code, such as that shown in Figure 3;
- d) capable of giving precise and clear verbal instructions where audio equipment (e.g. radio) is employed and of operating the equipment in accordance with Clause 17;
- e) capable of directing the safe movement of the crane and load; and
- f) authorized to carry out signalling duties.

7.6.2 The signaller should stand in a secure position where they can see the load and can be clearly seen by the crane operator, and should face the operator if possible. Each signal should be distinct and clear.

Figure 3 Example crane signals

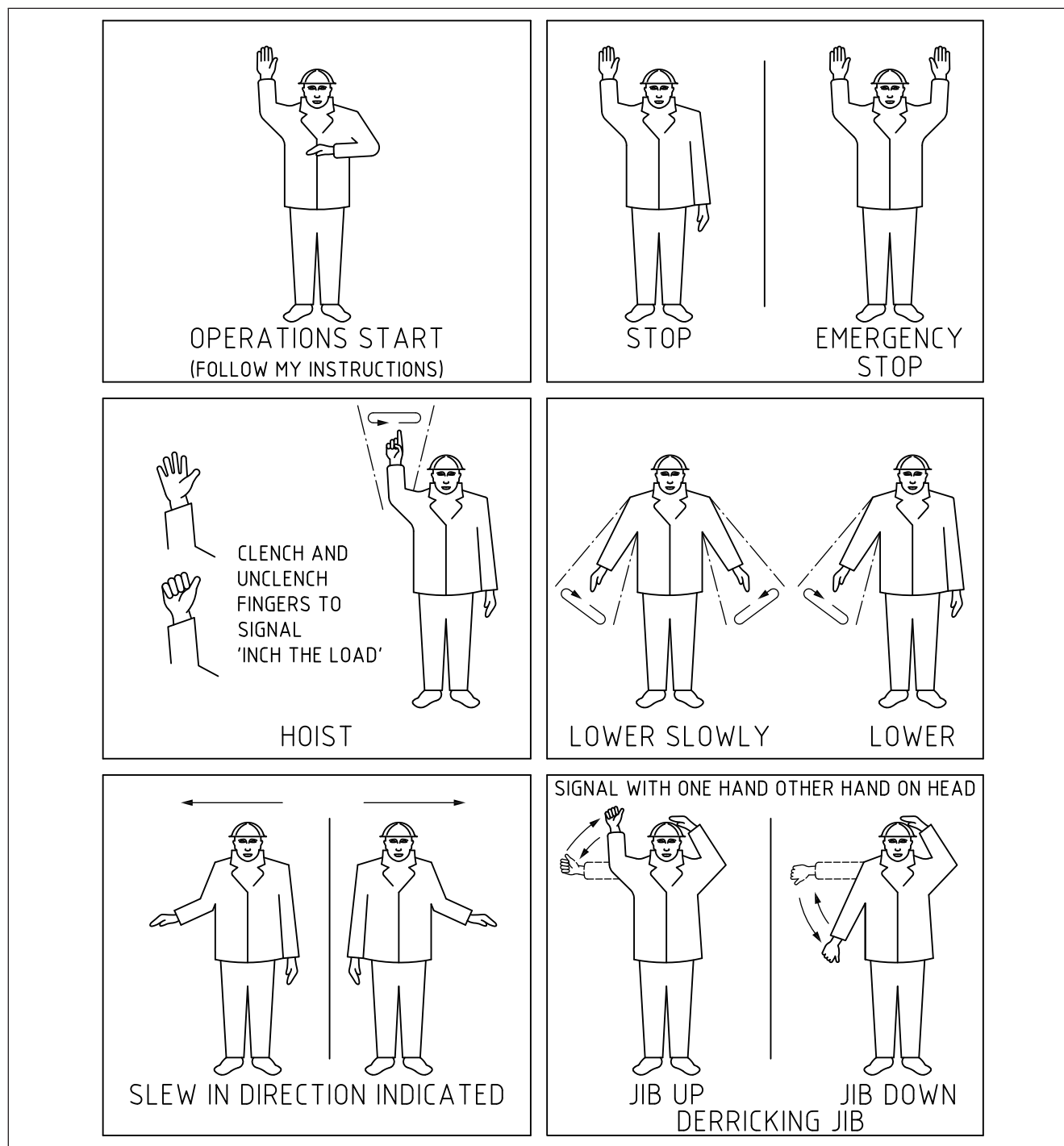
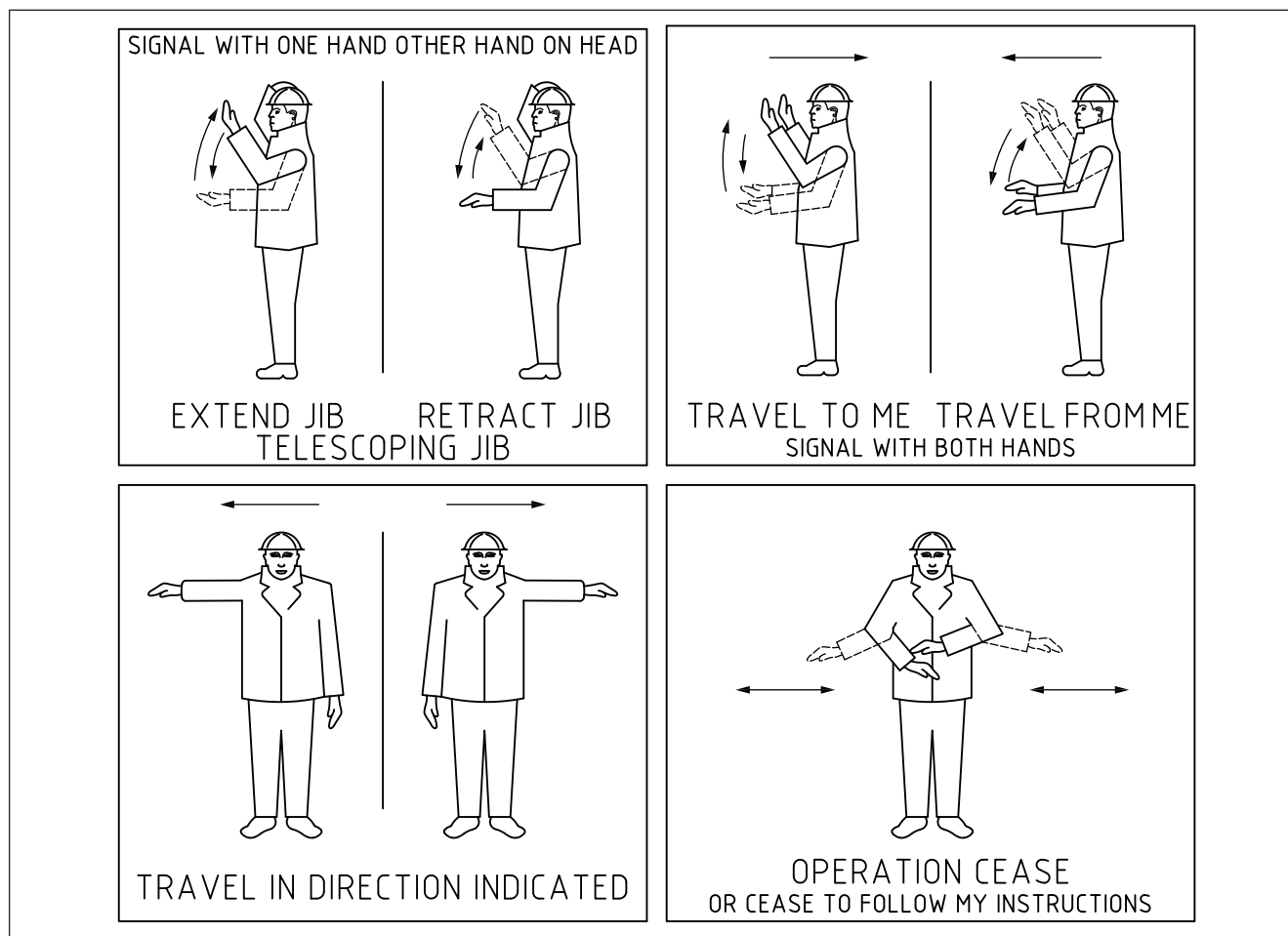


Figure 3 – Example crane signals



7.7 Crane erector

The crane erector should be:

- fit, with particular regard to eyesight, hearing, reflexes and agility;
- physically able to handle safely the loads involved in crane erection;
- able to work confidently and safely at heights;
- able to establish weights, balance loads and judge distances, heights and clearances;
- trained in the techniques of slinging;
- capable of selecting lifting gear and equipment that are suitable for the load to be lifted;
- adequately trained in the erection, dismantling and operation 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;
- capable of assessing that components and equipment are in a suitable condition for incorporation into the crane being assembled; and
- 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.