

Code of practice for

# Safe use of cranes —

Part 11: Offshore cranes

ICS 53.020.20

## Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee MHE/3, Cranes and derricks, upon which the following bodies were represented:

Associated British Ports  
 Association of Lorry Loader Manufacturers and Importers  
 British Iron and Steel Producers' Association  
 Building Employers' Confederation  
 Construction Plant-hire Federation  
 Electricity Association  
 Engineering Equipment and Materials Users' Association  
 Federation of Wire Rope Manufacturers of Great Britain  
 Health and Safety Executive  
 Institute of Logistics  
 Institute of Mechanical Engineers  
 Institute of Occupational Health and Safety  
 Institute of Plant Engineers  
 Institute of Structural Engineers  
 Lifting Equipment Engineers Association  
 Lloyd's Register of Shipping  
 Safety Assessment Federation

The following bodies were also represented in the drafting of the standard, through a subcommittee:

British Marine Equipment Council  
 Federation of Manufacturers of Construction Equipment and Cranes  
 Independent Engineering Insurers Committee  
 Institute of Petroleum  
 International Marine Contractors' Association  
 Ministry of Defence  
 Shipbuilders' and Shiprepairers' Association

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## Foreword

This part of BS 7121 has been prepared by subcommittee MHE/3/10 under the direction of Technical Committee MHE/3. The subcommittee wishes to acknowledge the contribution of the International Crane Forum to the preparation of this standard.

This part of BS 7121 provides recommendations for safe use of offshore cranes.

It is in the interest of all involved in lifting operations to ensure that these operations are carried out efficiently and safely. The offshore environment is sufficiently hostile that wave action can subject the crane and/or its load to motion, imposing demands on the crane and the crane operator that are more severe than in most other lifting operations. Accordingly, this part of BS 7121 provides guidance on understanding the crane's performance, and makes recommendations for the competence of operatives and other personnel.

This part of BS 7121 is directed to owners and users of offshore cranes, who are encouraged to implement all of the recommendations, and, if possible, upgrade existing equipment and operating procedures.

Whilst it is recognized that the recommendations do not relate to design and manufacture of offshore cranes, designers are strongly advised to take these into consideration.

This part of BS 7121 is one of a forthcoming series of standards, *Safe use of cranes*, consisting of the following:

- *Part 1: General;*
- *Part 2: Inspection, testing and examination;*
- *Part 3: Mobile cranes;*
- *Part 4: Lorry loaders;*
- *Part 5: Tower cranes;*
- *Part 6: Derrick cranes;*
- *Part 7: Overhead/underhung travelling and goliath cranes;*
- *Part 8: High pedestal and portal jib cranes;*
- *Part 9: Container handling cranes;*
- *Part 10: Rail mounted cranes;*
- *Part 11: Offshore cranes.*

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced personnel.

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.

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

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

### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 19 and a back cover.

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

## 1 Scope

This part of BS 7121 gives recommendations for safe use of offshore cranes (including supporting structures affixed to offshore installations), primarily operating in an open sea environment.

The following activities are not covered in this part of BS 7121:

- a) slinging practices;
- b) crane erection practices;
- c) use of all non-slewing cranes used offshore [e.g. blowout preventer (BOP) cranes, overhead travelling cranes, gantry cranes, hoists and davits].

## 2 References

The following normative documents contain provisions that, through reference in this text, constitute provisions of this part 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 7072:1989, *Code of practice for inspection and repair of offshore containers*.

Health and Safety at Work etc. Act 1974. London: The Stationery Office.

The Control of Substances Hazardous to Health Regulations 1988. Statutory Instrument 1657. London: The Stationery Office.

The Docks Regulations 1988. Statutory Instrument 1655. London: The Stationery Office.

The Shipbuilding and Ship Repairing Regulations 1960. Statutory Instrument 1932. London: The Stationery Office.

The Factories Act 1961. London: The Stationery Office.

The Construction (Lifting Operations) Regulations 1961. Statutory Instrument 1581. London: The Stationery Office.

The Merchant Shipping (Hatches and Lifting Plant) Regulations 1988. Statutory Instrument 1639. London: The Stationery Office.

## 3 Terminology and definitions

### 3.1 Terminology

#### 3.1.1 Comparison of terms

Certain terms used in the offshore crane industry have similarities with terms used in other lifting industries. For the purposes of this part of BS 7121, the distinctions given in Table 1 apply.

**Table 1 — Comparative terms used in offshore crane and other lifting industries**

Offshore crane industry term	Otherwise known as
Slew/slewing	Swing/swinging
Booming	Luffing/derricking/jibbing
Hoisting (load)	Winching, whip/main hoist
Slew bearing	Slewing/race, slew/swing circle
Boom	Jib, stick
Extension (tip)	Fly jib
A-frame	Gantry, apex, struts/backties/legs
Machinery bed/house	Carbody
Sheaves	Pulleys
Counterweight	Backweight, ballast
Crane operator	Crane driver

#### 3.1.2 Safe working load and safe load indicator (rated capacity and rated capacity indicator and limiter)

The terms “safe working load” and “safe load indicator” are long established in the British crane industry, and used in BS 7262:1990. During preparation of this part of BS 7121, however, several European Standards for cranes were being developed, and the CEN committees responsible adopted the alternative terms “rated capacity” and “rated capacity indicator”. These terms have gained wide acceptance in the European crane industry, and for this reason the drafting committee for this part of BS 7121 decided to align with the European Standards, and use “rated capacity” and “rated capacity indicator”.

#### 3.1.3 Appointed person and responsible person

During preparation of this part of BS 7121 it was recognized that the terms “appointed person” and “responsible person” are equivalent in the offshore crane industry. The term “appointed person” is used in this part of BS 7121, in common with BS 7121-1.

### 3.2 Definitions

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

#### 3.2.1

##### appointed person

competent person authorized by the duty holder to ensure that the crane and associated equipment are safe for use

### 3.2.2 cabin

permanent control position on or off a crane, with protective enclosure

### 3.2.3 check

visual and functional assessment (not a test) of the condition of a crane, without dismantling, prior to use (e.g. detection of defects or fluid levels)

### 3.2.4 competent person

person with practical and theoretical knowledge of a crane and its equipment, experience of operation in an offshore environment, ability to detect deficiencies and to assess their criticality in relation to strength and performance, and to recommend remedial action to ensure that conditions are appropriate for safe use

### 3.2.5 dynamic rated load

maximum permissible load that can be lifted in the prevailing sea state, if there is relative motion between the crane and load

### 3.2.6 gross overload/overmoment protection (GOP)

device or system safeguarding a crane and its primary load-carrying elements against failure, in conditions where uncontrolled loading of the hoist line may occur (e.g. if the load becomes snagged on the supply vessel)

### 3.2.7 inspection

visual check of a crane for defects, and operation of the controls and limiting and indicating devices without loading

NOTE An inspection does not normally require dismantling of any part of the crane.

### 3.2.8 installation

- a) fixed or mobile unit, primarily operating in an open sea environment, used to develop, explore and recover natural hydrocarbons in subsea formations

NOTE Typically, installations include platforms fixed to the sea bed, semi-submersible vessels, mono-hull vessels, tension-leg platforms, guyed towers and jackup platforms.

- b) specialized crane vessel that can be used to deploy equipment for constructing or modifying units in a) offshore

### 3.2.9 installation manager

competent person appointed by the operator or owner to manage the installation and personnel

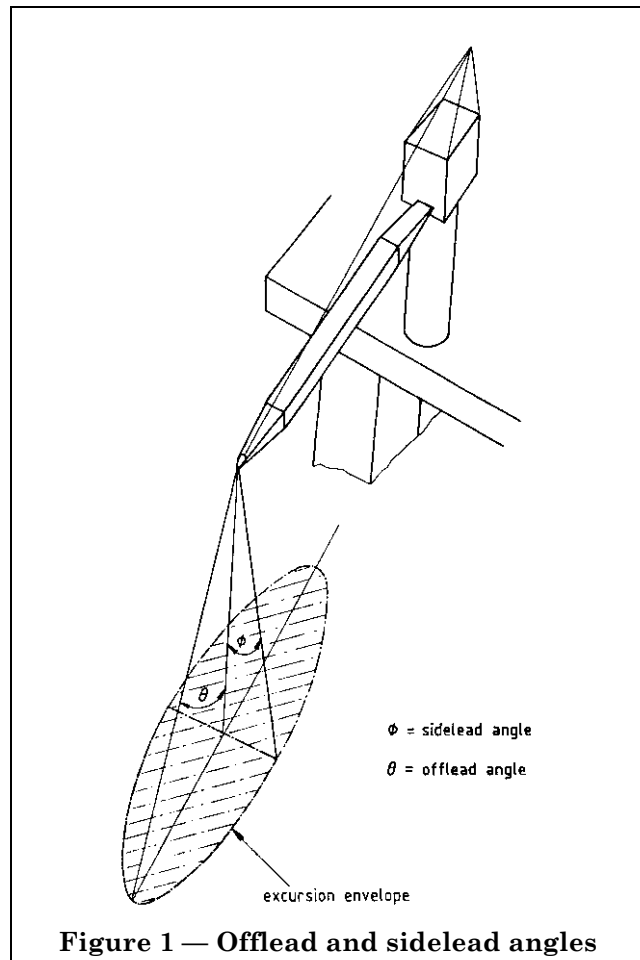
### 3.2.10 offlead

condition where the load line, under tension, deviates outwardly from the crane (see Figure 1)

### 3.2.11 offshore crane

machine with slewing facility, used to lift, lower or move loads in an offshore environment, operating from a fixed location on an offshore installation

NOTE Examples of offshore cranes are shown in Figure 2.

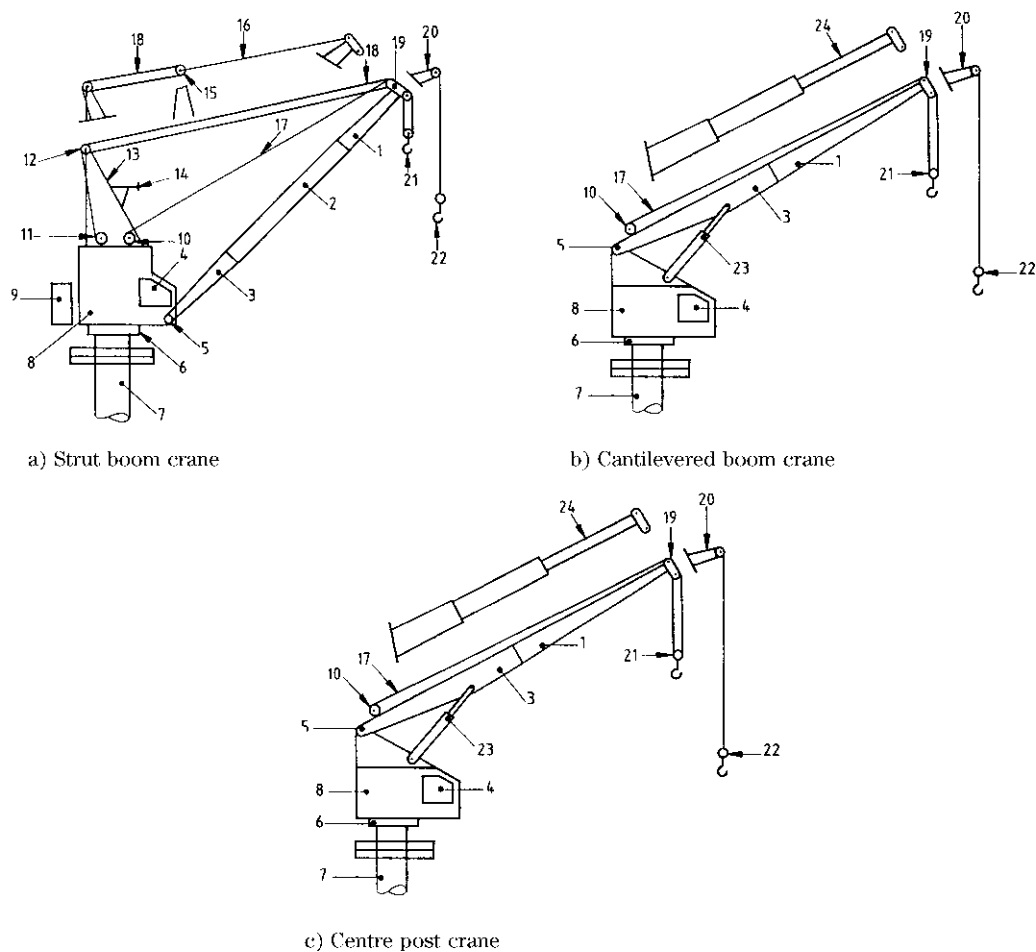


### 3.2.12 pennant

single part-line of wire rope or chain suspended from the crane hook, permitting safe connection of the hook to the load

### 3.2.13 rated capacity

load(s) a crane is designed to lift for a given operating condition (configuration, sea state, wind speed, radius)

**Key**

1	Boom head section	14	Boom back stops
2	Boom mid-section	15	Suspension bridle/live mast
3	Boom foot section	16	Boom pendant rope
4	Cabin	17	Load hoist rope
5	Boom foot pin	18	Boom hoist rope(s)
6	Slew bearing/hook roller assembly	19	Boom head sheaves
7	Pedestal mounting	20	Boom head extension
8	Machinery house	21	Multi-fall hook block
9	Counterweight (if fitted)	22	Hook and overhauling weight
10	Load hoist winch <sup>1)</sup>	23	Boom hoist ram
11	Boom hoist winch	24	Telescoping boom
12	A-frame or mast sheaves	25	Centre post/mast
13	A-frame or mast		

<sup>1)</sup> Same cranes are fitted with two load hoist winches.

**Figure 2 — Examples of offshore cranes**

### 3.2.14 rated capacity indicator

device that continuously indicates, within specified tolerance limits, as the rated capacity is approached, and continuously indicates, in another manner, if the rated capacity is exceeded

NOTE The specified tolerance limits for rated capacity include a higher wind speed than permitted for the in-service conditions.

### 3.2.15 sidelead

condition where the load line, under tension, deviates sideways from the crane (see Figure 1)

### 3.2.16 static rated load

maximum permissible load that can be lifted from, or lowered onto, the installation supporting a crane

### 3.2.17 structure

steelwork to which a crane is affixed

### 3.2.18 test

specific operation of a crane, with or without a defined load, to establish whether it may be used

### 3.2.19 thorough examination

verification that a crane can safely continue in service, including a functional test of all safety devices (e.g. limiting and indicating equipment, brakes, clutches)

NOTE A thorough examination is not an inspection (see 3.2.7), and can involve non-destructive examination or testing techniques, and including dismantling.

## 4 Crane management

### 4.1 Safe system of work

A safe system of work should be established for each lifting operation, whether an individual special lift or a group of repetitive or routine operations. The sensitivities and limitations of the crane, its permissible duties and operational performance should be understood.

The safe system of work should include at least the following:

- a) planning of the operation;
- b) crane selection;
- c) maintenance, examination and, if necessary, testing of the crane and equipment;
- d) provision of suitably trained and competent personnel who are aware of their relevant responsibilities regarding the Health and Safety at Work etc. Act 1974 and any other current statutory offshore regulations;

- e) adequate supervision by suitably trained and competent personnel;
  - f) assurance that all necessary test certificates and other documents are available;
  - g) assurance that all other statutory requirements are in place;
  - h) identification of all hazardous and restricted areas;
  - i) emergency procedures in case of damage or impairment to the crane during operation, and for safe recovery of the crane to a holding location on the installation;
  - j) means of preventing unauthorized movement or use at all times;
  - k) completion of any preparatory work at the location of the lifting operation;
  - l) an English language communication system;
  - m) assurance of safety of personnel not involved in the lifting operation;
  - n) assurance that an adverse weather policy is in place;
- NOTE The Beaufort scale of wind forces and related sea states is given in Annex A.
- o) provision of an effective system for storage and use of spare parts.

### 4.2 Control of the lifting operation

To ensure effective implementation of the safe system of work, an appointed person should take control of the lifting operation and ensure compliance with 4.1

The appointed person should also be responsible for:

- a) assessment of the lifting operation and provision of lifting gear, equipment, instruction and supervision for the task to be undertaken safely;
- NOTE This should include consultation with other responsible bodies as necessary, and ensuring that if different organizations are involved, they collaborate effectively.
- b) provision of an effective procedure for reporting defects and incidents, and for taking remedial action as appropriate;
  - c) authorization of any work permits that may be necessary;
  - d) provision and availabilities of personal protective equipment appropriate for the operational location, such as helmets, safety spectacles, safety boots and clothing, ear defenders, life jackets and emergency escape equipment;
  - e) ensuring that personnel are instructed in the correct use of the appropriate personal protective equipment;



- f) checking the crane and any associated equipment before and after use, and maintaining good working order and replacing if appropriate;
- g) maintaining records of checks through examinations and repairs as appropriate;
- h) ensuring that the person directing crane movements (the signaller) is readily identifiable to the crane operator (e.g. by wearing high visibility clothing or distinguishing markings);
- i) ensuring that a clear and effective radio communications system is available to all parties involved with the lifting operation, including the crane operator, signaller, and if applicable, the master and deck crew of the attendant vessel;
- j) ensuring that the crane operator has a copy of the shipping manifest accurately showing the weight and description of each individual piece of cargo, and if appropriate, clearly drawing attention to any cargo deemed heavy or hazardous;
- k) ensuring that the workplace is provided with adequate lighting.

If lifting operations have been identified as routine, the appointed person may delegate duties, but not responsibilities, to a fully trained and competent person (usually the signaller) to take control of the lifting operation.

The appointed person should make known to all key personnel the details of any duties delegated and the person charged with their undertaking.

### 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 have been taken into account. Planning should be carried out by personnel with appropriate expertise.

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

Planning should include, if appropriate, consideration of the following:

- a) verification of the weight of the load, its centre of gravity and the method of lifting;
- b) maintenance of adequate clearance between the load and the crane structure and any other obstruction in the vicinity of the lifting operation;
- c) inclusion of the weight of any ancillary lifting equipment in assessing the total load;

- d) clear identification of proximity hazards and restricted areas;
- e) procedures for effective release of sea fastenings;
- f) requirement of any work permits for special lifting operations;
- g) space availability and deck loading ability on the installation or attendant vessel;
- h) configuration of the crane;
- i) environmental conditions that may occur at the site of operation necessitating interrupting the operation, and procedures for safe abandonment;
- j) distribution and any variance of the forces within the lifting attachment arising from the lifting operation;
- k) use of tested and certified lifting attachments;
- l) provision of competent and trained personnel to coordinate use of tugger/tag lines;
- m) provision of suitable facilities for multiple lifting (if applicable);
- n) provision of additional planning factors if lifts are to be undertaken by specialized crane vessels (e.g. environmental conductors, water ballasting, dynamic positioning, deployment of anchors, abandonment procedures and tie back operations).

## 4.4 Selection of personnel and allocation of duties

### 4.4.1 General

Selection of personnel and allocation of duties should be determined by the installation manager or appointed person.

### 4.4.2 Suitability of personnel

The installation manager or appointed person should ensure that all personnel involved with lifting operations or maintenance of lifting equipment are medically fit and trained to approved levels appropriate to their tasks and responsibilities. Records of training and experience specifically identifying the tasks and type of crane or lifting equipment in use should be provided and used as an aid for personnel selection. Personnel under training should only undertake duties in keeping with their current level of assessment by the appointed person and then only under the supervision of a suitably qualified person.

### 4.4.3 Duties and responsibilities

#### 4.4.3.1 Crane operator

The crane operator should be responsible for correct operation of the crane in accordance with the manufacturer's instructions and the safe system of work (see 4.1), and should at any time respond to the signaller's signals. The crane operator should also undertake other duties (including routine crane lubrication, daily and periodic maintenance checks of the crane) and should assist with the change out of ropes and hook blocks and procedures recommended by the crane manufacturer and operating company, and authorized by the appointed person.

All crane operators (including fully qualified) should be assessed every 2 years through practical and theoretical examinations by suitably trained and qualified assessors.

#### 4.4.3.2 Signaller

The signaller should be responsible for relaying signals from the slinger to the crane operator and for initiation and direction of safe movement of the crane and hook load.

NOTE 1 The signaller may also be the slinger (see 4.5.1.3).

The signaller should remain in contact with the crane operator at all times, and with the slinger during the initial and final phases of the lift as appropriate. The signaller should only use hand signals when in full view of the crane operator or slinger.

NOTE 2 Recommended signaller's hand signals are given in Annex B.

If, during the lifting operation, responsibility for directing the crane and load is transferred, the signaller should clearly indicate to the slinger(s) and crane operator, the identity of the new person responsible. The new person should indicate acceptance of the transfer of responsibility, which should be acknowledged by the slinger(s) and crane operator.

The signaller should be trained in inspection, safe use and storage of lifting equipment and signalling systems (visual and radio communications) and should be assessed through practical and theoretical examination by suitably trained and qualified assessors.

#### 4.4.3.3 Slinger

The slinger should be responsible for attaching and detaching slings to and from the load and informing the signaller (if appropriate) when ready.

NOTE The slinger may also be the signaller.

Slingers can operate from the deck of the attendant vessel or from the installation. Slingers should be trained in inspection, safe use and storage of lifting equipment and signalling systems (visual and radio communications), and should be assessed through practical and theoretical examination by suitably trained and qualified assessors.

In the event of loss of visual or radio communication between the crane operator, signaller or slinger, crane lifting operations should be halted until communications are restored.

#### 4.4.3.4 Maintenance personnel

Maintenance personnel should be responsible for maintaining the crane and ensuring conditions for safe and satisfactory operation. Maintenance should be carried out in accordance with the crane manufacturer's recommendations and the operating company's planned maintenance procedures within the safe system of work (see 4.1).

Maintenance personnel should be trained in operating the crane to a level enabling service tasks to be performed safely.

If maintenance personnel are required to undertake the duties of a crane operator, they should be trained to a level qualifying them to operate the crane either with or without supervision, as appropriate (see 4.5.1.1).

### 4.4.4 Formal requirements of personnel

#### 4.4.4.1 Crane operator

A crane operator should be:

- a) medically fit to the UKOOA standard;
- b) trained for the type of crane operated, with full knowledge of the crane and its safety systems.

#### 4.4.4.2 Signaller

A signaller should be:

- a) capable of giving precise and clear instructions by radio and hand signalling techniques, to initiate and safely direct movement of the crane and its hook load;
- b) capable of judging distances, heights and clearances;
- c) fully conversant with the duties of the crane operator and slinger(s);
- d) trained in inspection, safe use and storage of lifting equipment, including containers, and reporting any defects that could render such equipment unfit for safe use;
- e) familiar with procedures for handling dangerous loads such as acids and caustic substances, explosives, pressurized substances, etc.;

- f) trained to use personnel carriers and conversant with the relevant procedures established in the installation;
- g) conversant with marine terminology.

#### 4.4.4.3 *Slinger*

A slinger should be:

- a) physically capable of handling lifting gear and equipment;
- b) trained in slinging techniques;
- c) capable of selecting lifting gear and equipment, including containers, and ensuring they are in a suitable condition for safe lifting of the load
- d) capable of ascertaining weights and balancing loads, and judging distances, heights and clearances;
- e) capable of giving precise and clear instructions by radio and hand signalling techniques, confirming that a load is ready to lift and the slings are free, and notifying the signaller of any manipulative movements required;
- f) familiar with procedures for handling dangerous loads;
- g) fully conversant with the duties of the crane operator and signaller;
- h) trained to use personnel carriers and conversant with the relevant procedures established in the installation;
- i) conversant with marine terminology.

#### 4.4.4.4 *Maintenance personnel*

Maintenance personnel should be:

- a) competent to maintain the crane in a safe condition for satisfactory operation;
- b) fully knowledgeable of the crane's operating functions and safety systems, and, if appropriate, specially trained to service the crane to safe operating standards;
- c) familiar with the operational sensitivities and limitations of the crane;
- d) trained in emergency recovery procedures arising from power failure or severe overloading of the crane;
- e) conversant with procedures and precautions to render the crane safe before and during routine or major maintenance work;
- f) fully conversant with the duties of the crane operator, and, if necessary, trained to operate the crane in order to fulfil servicing activities;
- g) conversant with procedures and precautions for testing individual drives, braking systems and safety systems, and controlled overload testing of the crane.

### 4.5 **Qualified training instructors**

The installation manager should ensure that all key personnel involved with crane operations receive training to a level of competence appropriate to perform tasks safely.

A programme of training appropriate to each individual crane discipline should be provided by experienced instructors qualified to provide tuition in the rudiments of design, performance, maintenance and safe operation of offshore cranes and associated equipment. The system of tuition should enable continued and effective measurement of the theoretical and practical performance of crane personnel, leading to accreditation in the form of a final certificate awarded by the assessor, valid for 2 years.

Certification should be revalidated through assessment of personnel on the theoretical and practical issues of safe use of offshore cranes, specifically to the particular disciplines of personnel and crane type(s).

### 4.6 **Documentation**

#### 4.6.1 *General*

The appointed person should ensure that all documentation relevant to the condition of a crane and its equipment (e.g. test certificates) is kept up to date and readily available.

All documentation should be written in English.

#### 4.6.2 *Regulatory documents*

All codes applicable to crane operation should be available to key personnel.

#### 4.6.3 *Crane duty charts*

Crane duty charts specifying the duties of the crane for the permitted operating conditions should be maintained and located conspicuously in the cabin.

#### 4.6.4 *Manuals*

The crane manufacturer's operation instruction manual should be readily available and kept up to date.

#### 4.6.5 *Instructions and procedures*

To ensure that the safe system of work (see 4.1) is effectively communicated, written procedures should be provided for all crane operations.

#### 4.6.6 *Records*

Records should be specifically identified with each crane. Records should be kept up to date to enable the condition of the crane to be determined and its fitness for operation to be assessed. Records should bear the signature of the appointed person.

Records should include:

- a) technical information including maintenance and performance data provided by the crane manufacturer arising from alterations to the crane;
- b) details of significant repairs and modifications to the crane, including renewal of major parts;
- c) details of inspections and examinations carried out on the crane and wire ropes;
- d) shift change-over log pre- and post checks, conveying to the incoming crane operator information necessary for safe continuity of lifting operations;
- e) an events log for detailing occurrences that may influence safe lifting operations;
- f) details of non-destructive examinations and repair reports.

#### 4.6.7 *Certificates*

Certificates should be current, valid and specifically identifiable with the crane and its associated lifting equipment.

#### 4.7 **Maintenance programme**

An effective planned maintenance programme should be established by the installation manager, allowing routine and major servicing to be undertaken safely and to a standard ensuring the crane is safe for use.

### 5 **Procedures and precautions**

#### 5.1 **Rated capacity**

The rated capacity of the crane or any item of equipment in the lifting operation should not be exceeded, other than for testing purposes.

#### 5.2 **Rated capacity indicator and limiter**

The rated capacity indicator and limiter should be maintained in working order. The crane operator should:

- a) ensure correct selection of duties for inboard lifting operations on the installation, and, if applicable, the correct duties for lifting over the sea from supply vessels allied to the prevailing sea state;

- b) ensure correct selection and setting of the sea state and maintaining the correct sea status throughout the lifting operation, from continuous updates provided by the appointed person;
- c) ensure correct setting for the number of parts of rope reeved at the hook block;
- d) acknowledge overloads and overmoments and report any serious overloads and overmovements immediately;
- e) report all errors or any malfunction of the rated capacity indicator.

#### 5.3 **Operational principles and practices**

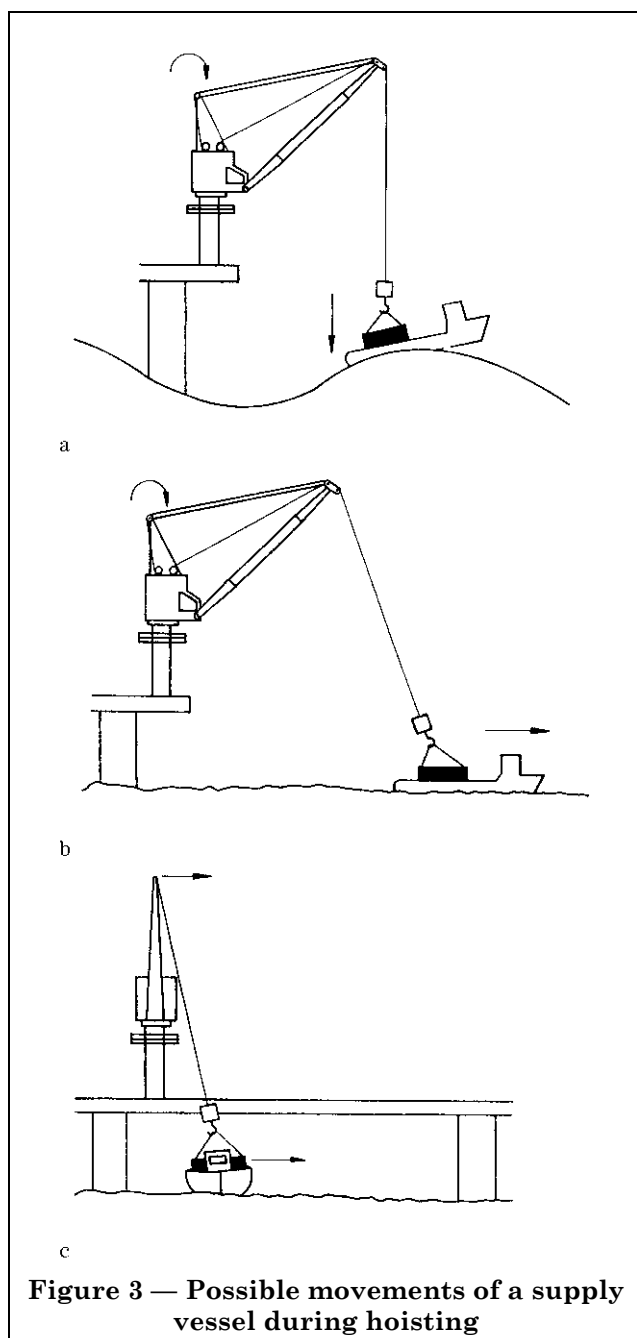
##### 5.3.1 *General*

To maintain effective and safe operations, certain operational principles and practices should be adhered to, including:

- a) operational checks (see 6.2);
- b) not using the crane's safety devices as a routine means of stopping its motions;
- c) all personnel standing clear of any load being lifted (particularly from stacked materials, e.g. drilling tubulars);
- d) being aware of helicopter movements, having procedures in place to ensure that the crane does not inhibit helicopter movements;
- e) exercising care when lifting hoses for bulk materials handling, and directing this activity by a clear radio communications system;
- f) the crane operator and signaller remaining on station if the crane is used in support of critical activities required for certain diving or drilling operations, and responding to instructions from the appointed person directing the activities;
- g) the crane operator remaining at the controls when a load is suspended from a crane;

**NOTE** In no case should a crane be left unattended even for short periods, unless all loads have been removed and the crane is in a safe position, the prime mover stopped and all motion braked effectively.

- h) exercising care when hoisting from supply vessels, taking into account the possible movements of the supply vessel in all directions (see Figure 3).



### 5.3.2 Supply vessel cargo

The installation manager or appointed person should prepare a set of procedures (see 4.7.5) ensuring that cargo shipped from shore bases arrives in a condition that enables safe access for the vessel and installation crews and safe lifting by crane. The set of procedures should include instructions for:

- a) a pennant to be used for lifting loads between the supply vessel and installation, if practicable;

- b) cargo to be containerized, if practicable, in containers conforming to BS 7072:1989;
- c) securing cargo within the container, at a centralized point of balance;
- d) accurately defining and labelling the contents and total weight of containers, and recording on the shipping manifest;
- e) loading dangerous or hazardous materials securely, in containers designed for safe handling and shipment, in accordance with The Control of Substances Hazardous to Health Regulations 1988;
- f) all cargo to be pre-slung and the slings to be identified with a current certificate of fitness for purpose;
- g) bundling drilling tubulars separately according to size or length;
- h) conspicuously marking heavy containers carrying dangerous or hazardous materials or loads, to enable visual identification by the crane operator prior to lifting from the supply vessel;
- i) positioning cargo on the supply vessel so as to permit lifting onto the installation in a sequential and disciplined manner;
- j) providing the crane operator with a copy of the shipping manifest, detailing the cargo, its weight and any distinctive markings, before the arrival of the supply vessel at the installation;
- k) designating cargo laydown areas on the installation, in advance of the lifting operation, and taking care that the areas are adequate to carry the weight of the cargo, and that personnel access ways or emergency escape routes are not inhibited.

### 5.3.3 Raising and lowering of personnel

Raising or lowering of personnel by offshore cranes with carriers such as personnel baskets, inspection carriers and small sea-going craft should be performed in accordance with procedures approved by the duty holder.

The procedures should ensure, as appropriate, that:

- a) the crane operator, signaller and crew of the attendant vessel are trained in the procedures for safe personnel transfer;
- b) the crane is approved for such use;
- c) the environmental conditions are within the defined limits for safe operation;
- d) the dedicated personnel carrier is inspected, tested and certified fit for use as lifting equipment;
- e) a safety line is fitted from the crane hook to the carrier, in addition to the main lifting equipment;

- f) the attendant vessel can maintain station alongside the installation and that heave, pitch and excursion of the vessel are commensurate with the ability of the crane to maintain a plumb load line;
- g) visual and radio communications are maintained throughout operations.

NOTE These provisions are for safe use of the crane only. Other provisions, such as personal protective equipment, conditions for the attendant vessel, briefing requirements, etc., should be contained in the operational safety policy for the installation.

#### 5.3.4 Pennant selection

The appointed person should select the pennant taking the following into account:

- a) the single part rope or chain should be of sufficient length and rated capacity margin of slack for safe connection to the heaviest load identified on the manifest;
- b) the working load limit should not be less than the heaviest load identified on the manifest;
- c) the load connector and all terminations should be snag-free in operation at all times;
- d) the pennant should be suitable for use in a corrosive saline marine environment;
- e) the pennant should be load tested and certified appropriate for the operation;
- f) the pennant should be highly visible.

#### 5.3.5 Access and egress

The crane operator should ensure that walkways are kept free of standing water, ice, oil based fluids, trip hazards and obstructive items, and that cleaning materials and equipment are available.

Walkways should not be used as storage areas (e.g. for drummed substances).

Access and egress systems should be illuminated at all times and supplemented with emergency lighting maintained to operating standard.

#### 5.3.6 Constraints on the installation

To minimize the risk of dangerous occurrences, the areas of the installation over which the crane may move should be specified.

Procedures for crane movements should be provided by the appointed person, and should include the following:

- a) identification of prohibited, hazardous and restricted areas;
- b) sensitivities and tolerances of plant and equipment to swinging loads and/or dropped loads, and any consequential effects;

- c) an assessment of the risks of the type of load;
- d) the proximity of personnel in the work place, personnel access ways and emergency escape routes;
- e) identification of primary and secondary load set-down areas;
- f) helicopter movements;
- g) movements of other cranes on the installation;
- h) well-slot movement of the drilling derrick;
- i) environmental conditions;
- j) other interfacing activities, including lifeboat drills, maintenance work and stowing the crane's boom in its rest (see 5.3.7).

#### 5.3.7 Emergency procedures

Emergency procedures should be provided by the appointed person for the following situations:

- a) diving operations;
- b) well service operations;
- c) installation shutdown and planning;
- d) emergency helicopter operations;
- e) extreme environments (wind, snow, ice, fog, etc.).

All key personnel should be conversant with these procedures.

#### 5.3.8 Crane out of service

Cranes taken out of operational service should be stowed in accordance with the manufacturer's or company recommendations.

## 6 Inspections, examinations, tests and checks

### 6.1 Regular inspections, examinations, tests and checks

#### 6.1.1 Test programme

Operational safety of the crane and its equipment should be maintained by implementing a planned programme of inspections, examinations and tests and checks, and an organized approach to corrective action.

Statutory requirements for use of offshore cranes should be adhered to (see Annex C).

Lifting gear should be tested prior to first use and thoroughly inspected and examined at intervals.

Inspections, examinations and tests of specialized crane vessels should be carried out in accordance with the certifying authority's specifications and the statutory requirements in Annex C.

The following inspections, examinations, tests and checks should be carried out:

a) *Initial inspections and tests*

Prior to first time use on the installation, the crane should be inspected and load tested by a competent person, in accordance with the relevant statutory requirements, following procedures specified by the crane manufacturer.

NOTE These inspections and tests are additional to any inspections and tests performed at the crane manufacturer's test site.

b) *Regular inspections*

If cranes are in regular service, the frequency of inspection depends on the type of crane, components and systems, exposure to environmental effects, wear during operation and the consequences of failure (for example, cranes with open friction drives are likely to be less tolerant to environmental factors than cranes with fully enclosed drive systems, and therefore inspections should take account of this). Regular checks include:

- 1) operational checks (visual checks carried out by the crane operator prior to starting the crane and during operation);
- 2) frequent checks (checks at daily to monthly intervals, including operational checks);
- 3) periodic checks (monthly to six-monthly checks, including frequent inspection schedules and any statutory requirements).

c) *Six-monthly thorough examination*

Six-monthly should thorough examinations should involve routine assessments, by a competent person, of critical crane elements, scheduled adjustments and possible overhaul of equipment, regular inspection schedules and statutory requirements. Whenever considered necessary by the competent person, thorough examinations should be supplemented by the following:

- 1) non-destructive testing on the condition of any part of the crane;
- 2) opening of concealed or encased parts by a skilled person.

Six-monthly thorough examinations should confirm that all mechanisms function correctly and that the crane is safe for further use. All safety limit switches should be checked for correct operation.

d) *Four-yearly tests and thorough examinations*

A test programme should be established by a competent person to ensure that each element in the crane's structural and mechanical primary load carrying system is load tested (all new cranes should be load tested prior to first use). The competent person should ensure the test programme includes tests given on the original test certificate, supplemented if necessary by any testing due to major structural or mechanical repairs or modification to the crane.

### 6.1.2 Test conditions

The competent person should ensure that all test programmes are carried out in accordance with approved company procedures. Test programmes should include the following:

- a) a permit to work system, with the test area clearly enclosed with warning notices preventing access by unauthorised personnel;
- b) a test area with capacity to support setting down of test weights;
- c) a test area that allows all the crane's mechanical drive and structural elements to be subjected to the test loads for all motions of the crane (if there are obstructions, the competent person should consider alternative tests in the obstructed area, and, if these are not possible, then use of the crane should be restricted to the tested areas, and this should be endorsed accordingly on the test certificate, with details of the crane's restricted use posted in the operator's compartment);
- d) environmental conditions appropriate for testing the crane throughout the test programme;
- e) the crane and any associated lifting attachment correctly configured, inclusive of the correct counterweight and number of falls of rope as specified by the crane manufacturer, with all safety devices and systems of the crane in correct working order;
- f) a test load conforming to statutory requirements, with test weights of a certified accuracy of  $\pm 1\%$ ;

NOTE If water weights are used, the potential loss of high water volumes and consequential hazards to personnel and flooding of the installation should be considered prior to use.

- g) load testing carried out with extreme care, with all crane motions tested in isolation at the lowest speed;
- h) test loads kept as close as possible to the deck (100 mm to 200 mm), without passing over or interfering with any obstruction on the installation;

i) measurement of the crane's test radius and test weights by independent means, i.e., without using the crane's instrumentation (the crane's instrumentation should be validated at the same time, by the independent means);

j) during major repairs or change-out of brakes and clutches, individual function testing to the full load torque capacity without slip for a duration specified by the crane manufacturer.

After load testing, the crane should be thoroughly examined by the competent person to assess that the test loads have not caused any structural or mechanical damage, and that the crane is safe for use.

### 6.1.3 Test procedures

Specialized crane vessels may be tested by lifting a prepared barge of known weight. Care should be exercised to ensure that the crane vessel is correctly trimmed by coordinated control of water ballast during the lifting operation. For cranes mounted on barges or pontoons, testing should be carried out in accordance with Annex D.

All load bearing components of the crane should be tested at all crane motions.

Overloads should be kept as low to the deck as possible (100 mm to 200 mm) and should not be raised to pass over obstructions. If obstructions exist, alternative tests should be carried out on the crane's performance in that position, or restrictions should be applied to use of the crane [see 6.1.2 c)].

The test programme should be arranged so that each load bearing component is tested once, to save repetition (e.g. to test the hoist mechanism and brakes, a single overload should be applied on maximum line pull).

Linear dimensions should be measured to ensure that loads are applied at the correct position (the crane instrumentation should not be used for this).

With the jib set at maximum working radius (i.e. minimum working load), the rated capacity load for the radius should be applied and the crane operated through all motions at the slowest speed. The load should be raised sufficiently to ensure that each tooth in the train of gears is subjected to the load, and the load then held in the brake. The load should be increased by 25 % and the procedures repeated.

The jib should be set at minimum working radius and the procedures repeated, at the maximum rated capacity and with the overload.

### 6.1.4 Thorough examination

On completion of the test in 6.1.3, a thorough examination conforming to 6.1.1 c) should be carried out, including:

a) a detailed examination by a competent person to ensure that the crane is safe for use;

b) if necessary, dismantling of parts of the crane by a skilled person.

The examination should be carried out with the crane both operating and at rest.

### 6.1.5 Certification

If the crane passes the tests in 6.1.2 to 6.1.4, the competent person should issue a certificate confirming this.

### 6.1.6 Inspection of cranes not in regular use

Company and manufacturer's inspection procedures and all statutory requirements should be carried out on cranes not in regular use.

### 6.1.7 Deficiencies arising from inspections

Deficiencies arising from inspections should be reported to the appointed person. The appointed person should assess whether safe crane performance is affected. If safe crane performance is affected, the crane should be removed from operational service and caution notices posted in the cabin and at key points of access until the deficiency is rectified.

If major repairs or modifications are undertaken to structural or mechanical components, thorough examinations, followed by function and load testing and a further examination, should be conducted by the competent person.

### 6.1.8 Records

Records of inspections, repairs, modifications, NDE reports, and regular, annual and four-yearly inspections should be signed and dated by a competent person. Details of tests arising from repairs, modifications or change-out of primary load path components, or because of requirements from certifying bodies should be recorded.

Records, together with inspection reports and certificates provided by independent inspectors, should be kept available on the installation and at any other agreed location.

### 6.2 Operational checks

Operational checks should be made visually by the crane operator. Check lists specific to the crane type and its operational activities should be drawn up by the appointed person in accordance with any schedules and procedures prescribed by the company or crane manufacturer.



### 6.3 Post primemover start checks

The following post primemover start checks should be carried out:

- a) crane control functions, communication systems, annunciator and all safety devices (particularly rated capacity indicator) and GOP systems for correct setting for the crane configuration;
- b) oil/fuel pressure and oil/water temperature instrumentation for diesel engines, torque converters, compressors and gearboxes, if applicable;
- c) hydraulic pipework for leaks, filter indicators for condition of their elements, and the temperature of the hydraulic tank;
- d) boost and main hydraulic circuit pressure for each drive system of the crane;
- e) pumps and motors for undue noise or high temperatures;
- f) hydraulic rams for leaks and the general condition of rod and anchor bearings;
- g) air pressure and condition of air driers and filters;
- h) condition of diesel engine air filters, if applicable;
- i) condition and effectiveness of brakes and clutches;
- j) hook and blocks condition and function of safety latch/locking devices;
- k) winch drums for rope abrasion and mechanical damage;
- l) open gear and chain drive systems for wear and tear and lubrication;
- m) cabinets closed and/or locked.

## Annex A (informative)

### Beaufort scale of wind forces and related sea states

The Beaufort scale of wind forces and related sea states are given in Table A.1.

**Table A.1 — Beaufort scale of wind forces and related sea states**

Wind force	Sea state	Wind speed at about 10 m height <sup>a</sup>		Wave height m	Description
		m/s	knots		
0	—	0.4	1	—	Calm. Sea surface glassy or mirror-like; wind not related to any swell.
1	—	0.5 to 1.4	1 to 3	—	Light air. Sea surface rippled in patches.
2	—	1.5 to 3.2	3 to 6	0.3	Light breeze. Sea surface completely rippled, miniature waves
3	1 to 2	3.3 to 5.3	6 to 11	0.6 to 1	Gentle breeze. Small waves with beginnings of scattered whitecaps.
4	2 to 3	5.4 to 8.0	11 to 16	1.5	Moderate breeze. Waves with numerous whitecaps spotting the surface.
5	4 to 5	8.1 to 10.7	16 to 21	2.5	Fresh breeze. Waves with prominent white crests; spray beginning to blow from crests.
6	5 to 6	10.8 to 13.8	21 to 27	3 to 3.5	Strong breeze. Waves with numerous streaks of spray blowing from foamy crests.
7	6 to 7	13.9 to 16.9	27 to 33	5	Moderate gale. Waves with white foam whipped in the direction of wind gusts.
8	7 to 8	17.0 to 20.6	33 to 40	6 to 8	Fresh gale. Extremely rough, violent sea; dense foamy waves with streaks showing wind direction.

<sup>a</sup> For cranes 50 m to 100 m above LAT, the wind speed is approximately 15 % higher than shown.

## Annex B (informative)

### Recommended signaller's hand signals

The signaller should stand in a position clearly visible to the crane operator, and from which the load can be seen at all times.

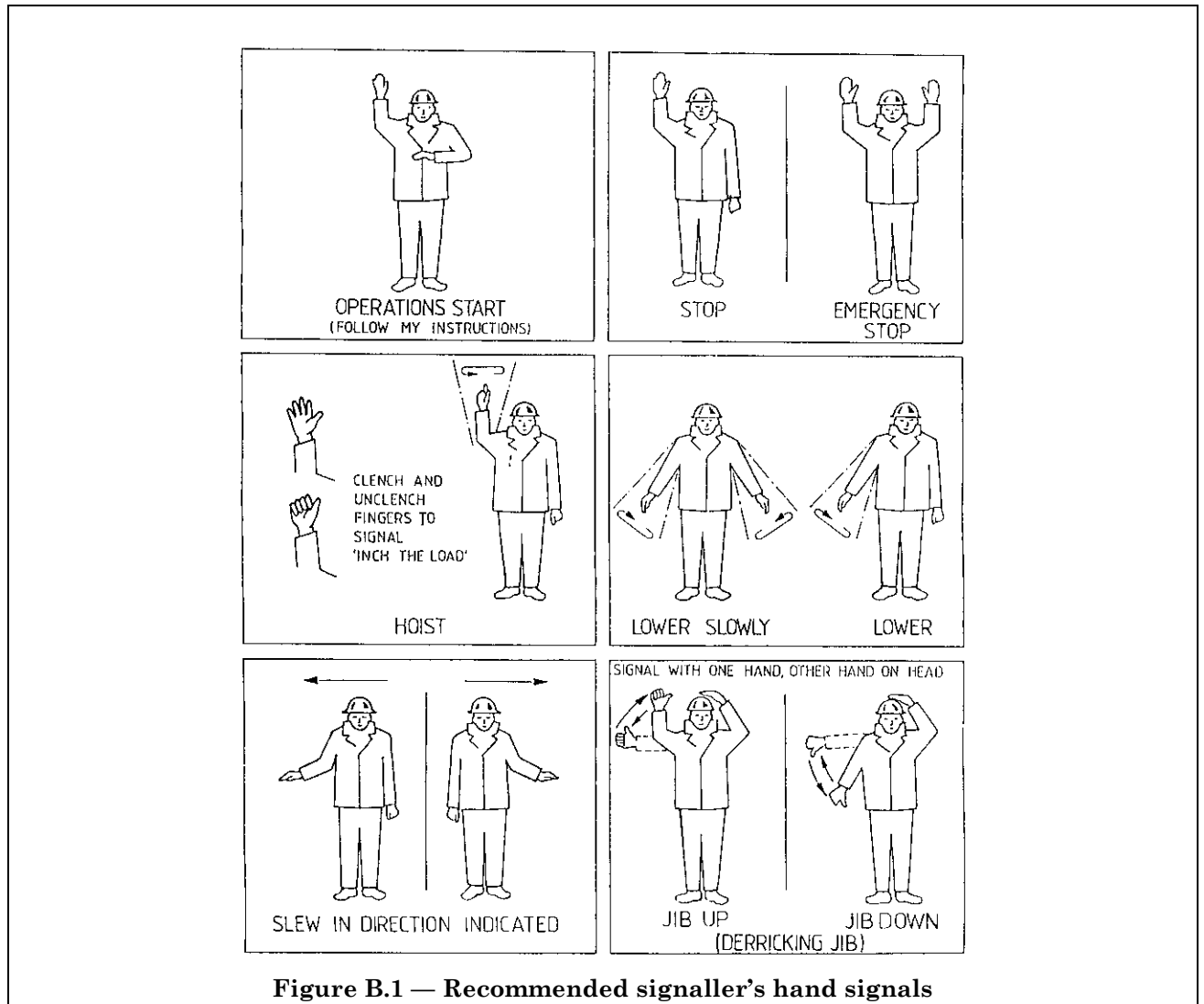


Figure B.1 — Recommended signaller's hand signals

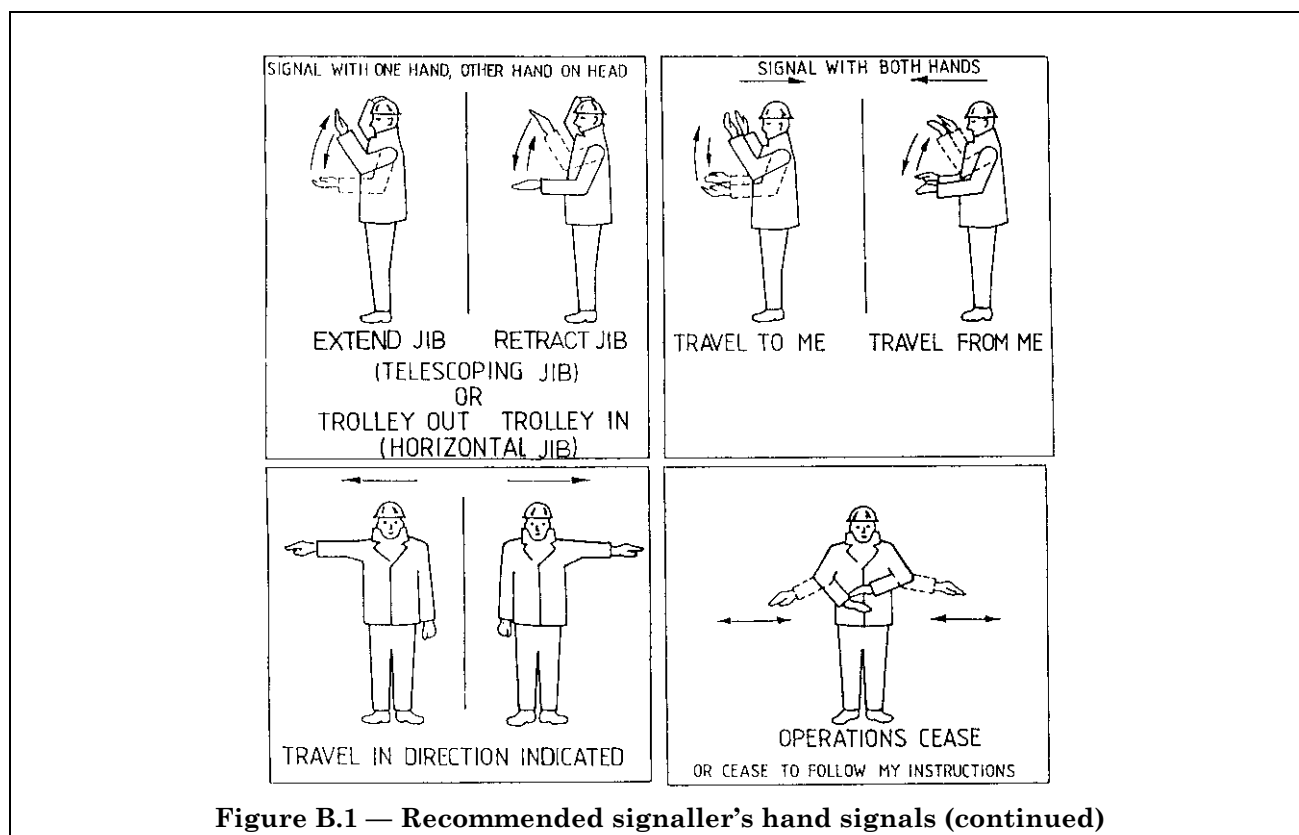


Figure B.1 — Recommended signaller's hand signals (continued)

**Annex C (normative)****Statutes for inspections, tests and thorough examinations of offshore cranes**

Inspections, tests and thorough examinations should be carried out in accordance with the statutes and at the intervals given in Table C.1.

**Table C.1 — Statutes for inspections, tests and thorough examinations of offshore cranes**

Statute	Interval <sup>a</sup>						
	Before erection, after adjustments or conditions affecting anchorage or ballasting	Before first use	Weekly	Twelve-monthly	Fourteen monthly	Four-yearly	After substantial alterations or repairs likely to affect strength or stability
The Docks Regulations 1988 SI 1655	Test and thorough examination; Regulations 14(1)(a) and 15(1)(b)	Test and thorough examination; Regulations 14(1)(a) and 15(1)(b)		Regulation 15(1)(a)			Test and thorough examination; Regulations 14(1)(b) and 15(1)(b)
The Shipbuilding and Ship Repairing Regulations 1960 SI 1932		Test and thorough examination; Regulation 34(1)		Thorough examination; Regulation 34(2)			Test and thorough examination; Regulation 34(1)
The Factories Act 1961		Test and thorough examination; Section 27(6)			Thorough examination; Section 27(2)		

Table C.1 — Statutes for inspections, tests and thorough examinations of offshore cranes

Statute	Interval <sup>a</sup>						
	Before erection, after adjustments or conditions affecting anchorage or ballasting	Before first use	Weekly	Twelve-monthly	Fourteen monthly	Four-yearly	After substantial alterations or repairs likely to affect strength or stability
The Construction (Lifting Operations) Regulations 1961 SI 1581	Examination of anchorages and/or ballasting; Regulations 19(3) and (7) <sup>b</sup>	Test and thorough examination; Regulation 28(1)	Inspection; Regulation 10(1)(c)		Thorough examination; Regulation 28(3)	Test and thorough examination; Regulations (28)(1)	Test and thorough examination; Regulations 28(2) and (3)
	Test of anchorages and ballasting; Regulation 19(4) <sup>b</sup>	Test of automatic safe load indicators; Regulations 30(1) and 30(2) <sup>b</sup>	Inspection of automatic safe load indicators; Regulation (30)(1) and (2) <sup>b</sup>				
	Test automatic safe working load indicators; Regulations 30(1) and (2)						
The Merchant Shipping (Hatches and Lifting Plant) Regulation 1988 SI 1639		Thorough examination and test; Regulation 7(1)(a)		Thorough examination and test 8(a)			Thorough examination and test; Regulation 6(1)(b)
NOTE Reference should be made to the full text of the act or regulation indicated.							
<sup>a</sup> A thorough examination should be carried out after a period of disuse of more than 2 months.							
<sup>b</sup> For cranes affixed temporarily.							

## Annex D (normative)

### Inspections, tests and examinations of cranes mounted on barges or pontoons

#### D.1 General

**D.1.1** Cranes mounted on pontoons or barges should be considered as a floating crane. The position of the crane on the pontoon or barge affects the stability of the combination, and this should be taken into account.

**D.1.2** Information regarding the amount of list and free board allowed under rated capacity and overload conditions should be provided by a competent person or authority experienced in crane design and stability of craft. The manufacturer should be consulted on the effect on the crane's land based ratings whilst on the barge or pontoon, so that excessive loads are not applied on the structure when any part of the barge or pontoon is at maximum list.

**D.1.3** The following should be ascertained before testing:

- a) the allowable freeboard of the vessel;
- b) the crane manufacturer's allowable rated capacity whilst working on the pontoon or barge (taking account information obtained in accordance with **D.1.2**);
- c) the amount and position of any ballast required;
- d) the depth of water below the keel of the vessel (so that the vessel does not ground during the tests);
- e) the limiting weather and sea state specified by the crane manufacturer, certifying authority or other competent person.

**D.1.4** If it is not possible to anchor the vessel to the shore, the vessel should be anchored to a craft alongside. Anchorage should be sufficiently free to allow the vessel to take up a natural list in the water.

**D.1.5** The rated capacity indicator of the crane should be checked to ensure that any reductions and increase in radius due to listing of the vessel are taken into account.

**D.1.6** For steam cranes, stability tests should be performed with the fuel bunker and water tank empty, and boiler water mid-way. The water tank should be refilled after the stability tests prior to overload testing.

**D.1.7** A thorough examination of the crane should be made before applying any loads. The examination should include verification that ties, supports, anchorages, ballast counterweight and load radius configuration conform to the crane manufacturer's specifications. A functional test should be carried out, without load, to ensure correct operation of controls, switches, contactors and other devices. Correct adjustment of brakes and limit switches should be checked, and tests carried out to ensure they operate correctly.

#### D.2 Stability margin

The stability margin for a crane mounted on a pontoon should be 50 %. Stability testing of the combination should be carried out if the crane is derated from its land based duties to achieve a stability margin of 50 %. Test loads should not exceed 125 % of land based duties.

### Bibliography

BS 7121-1:1989, *Code of practice for safe use of cranes — General*.

BS 7262:1990, *Automatic safe load indicators*.

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