

Code of practice for

Safe use of cranes

Part 4. Lorry loaders

ICS 53.020.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to 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 Association
Electricity Association
Engineering Equipment and Materials Users' Association
Federation of Manufacturers of Construction Equipment and Cranes
Federation of Wire Rope Manufacturers of Great Britain
Health and Safety Executive
Institute of Logistics
Institution of Mechanical Engineers
Institution of Occupational Safety and Health
Institution of Plant Engineers
Institution of Structural Engineers
Lifting Equipment Engineers' Association
Lloyd's Register of Shipping
Safety Assessment Federation Ltd.

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

Amalgamated Engineering Union
Construction Health and Safety Group
Federation of Civil Engineering Contractors
Institution of Civil Engineers
Oil and Chemical Plant Constructors' Association
United Kingdom Module Constructors' Association Ltd.

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on
15 May 1997

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Amendments issued since publication

Amd. No.	Date	Text affected

The following BSI references relate to the work on this standard:
Committee reference MHE/3
Draft for comment 93/710825 DC

ISBN 0 580 27121 8

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Foreword

This Part of BS 7121 has been prepared by Technical Committee MHE/3. It provides recommendations for the safe use of lorry loaders and their associated equipment. It should be used in conjunction with BS 7121 : Parts 1 and 2, to which specific references are made.

It is in the interest of all parties involved in lifting operations to ensure that these operations are carried out efficiently and safely. This Part of BS 7121 is commended to owners and users of lorry loaders, who are encouraged to observe all the recommendations, and where possible, upgrade existing equipment and operating procedures accordingly.

Whilst it is recognized that the recommendations given do not relate to the design and manufacture of lorry loaders, designers are strongly advised to take them into consideration.

This Part of BS 7121 is one of a suite of standards. The complete series will be as follows:

BS 7121 *Code of practice for safe use of cranes*

- 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 people.

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.

This British Standard is based on a text provided by the Association of Lorry Loader Manufacturers and Importers, and due acknowledgment is made to this organization.

Attention is drawn to relevant legislation and, in particular, to statutory requirements for the testing and examination of cranes.

This standard does not at present cover the use of lorry loaders for the lifting of personnel, as new legislation relating to such use is in preparation.

The Health and Safety Executive (HSE) commends the use of this British Standard to those who have duties under the Health and Safety at Work etc. Act 1974. The standard was drawn up with the active participation of HSE representatives and will be referred to in relevant HSE publications.

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 20, an inside back cover and a back cover.

Code of practice

1 Scope

This Part of BS 7121 gives recommendations for the safe use of lorry loaders. It should be read in conjunction with BS 7121 : Part 1 : 1989 and BS 7121 : Part 2 : 1991.

Subjects covered include management, procedures and precautions, testing, inspection, maintenance and examination.

2 References

2.1 Normative references

This Part of BS 7121 incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies: any subsequent amendments to or revisions of the cited publication apply to this Part of BS 7121 only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This Part of BS 7121 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on page 53, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Part of BS 7121, the definitions given in BS 7121 : Part 1 apply, together with the following.

3.1 lorry loader

A combination of a loader crane fitted to a commercial vehicle or trailer which normally has a load carrying capability.

3.2 operator

The person preparing the lorry loader for operation, or operating the crane for the purpose of positioning loads.

NOTE. The operator may also perform the task of driving the vehicle.

4 Management of the lifting operation

4.1 Safe system of work

A safe system of work should be established and this should be followed for every lifting operation whether it be an individual operation or a group of repetitive operations.

The safe system of work should include the following:

- a) planning of the operation;
- b) selection, provision and use of a suitable lorry loader and equipment;
- c) maintenance, examination and, where necessary, testing of the lorry loader and equipment;
- d) the provision of properly trained and competent personnel who have been made aware of their relevant responsibilities under the Health and Safety at Work etc. Act 1974 [1];
- e) adequate supervision by properly trained and competent personnel having the necessary authority;
- f) ensuring that all necessary test certificates and other documents are available;
- g) preventing unauthorized movement or use at all times;
- h) the safety of persons not involved in the lifting operation;
- i) the need for the operator, unless in imminent danger, to remain at the operating controls throughout the lifting operation.

The lifting operation should be taken to include any necessary preparation of a site and erection and dismantling of the lorry loader.

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

4.2 Control of the lifting operation

To ensure the implementation of the safe system of work, one person should be appointed to have overall control of the lifting operation to act on behalf of the management of the organization requiring the load to be moved (the 'employing organization'). The appointment of the person does not remove any legal responsibility from the management but enables them to use his expertise to fulfil their responsibilities. The person appointed may have other duties and need not be an employee of the employing organization. The person appointed should have adequate training and experience to enable the duties stated in 4.3 to be carried out competently.

4.3 Duties of the person appointed to control the lifting operation

The appointed person's duties should include the following:

- a) the assessment and planning of the lifting operation, the selection of the lorry loader, lifting gear and equipment, and such instruction and supervision as is necessary for the task to be undertaken safely;

- b) consultation with other responsible bodies, if necessary, and ensuring that where different organizations are involved they collaborate appropriately;
- c) ensuring that adequate inspection and maintenance of the equipment has been carried out;
- d) ensuring that there is an effective procedure for reporting defects and incidents, and taking any necessary corrective action;
- e) responsibility for the organization and control of the lifting operation.

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

It may be appropriate for the operator to be in control of the lifting operations.

4.4 Contractual considerations

The employing organization (see 4.2) may enter into a contract with another party (the 'contractor') who will undertake the work on their behalf.

The contract should state the following:

- a) that all work should be carried out in accordance with this Part of BS 7121;
- b) that the contractor should appoint a person, in accordance with 4.2, to the satisfaction of the employing organization;
- c) that all information or services provided by the employing organization to facilitate compliance with this Part of BS 7121 should be notified to the contractor in writing.

The contractor should be given full authority to ensure that the recommendations of this Part of BS 7121 are followed, including, where appropriate, the authority to control and instruct the employing organization's personnel.

Before entering into a contract, the employing organization should satisfy itself that the contractor has the necessary competence to carry out the work in accordance with this Part of BS 7121.

5 Planning the lifting operation

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

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

Planning should include consideration of the following:

- a) the load, its characteristics, the method of lifting, and any likely adhesion between the load and its support;
- b) the selection of a suitable lorry loader, and the need for adequate clearances between the load(s) and the lorry loader during lifting (see clause 8);
- c) the selection of lifting gear, and the contribution of its weight to the load on the lorry loader;
- d) the position of the lorry loader and of the load before, during and after the operation;
- e) the site of the operation, taking into account proximity hazards, space availability and suitability of the ground or foundations;
- f) any necessary erection and dismantling of the lorry loader;
- g) the environmental conditions that exist or may occur at the site of the operation, and whether the operation will need to be stopped if conditions become unfavourable.

6 Selection and duties of personnel

6.1 Selection

It is essential to select suitable personnel who are competent to carry out the required duties, and reference should be made to records of their training and experience. Those responsible for the selection should ensure that the personnel involved in the operation are efficiently organized in order to ensure good teamwork. No person should be a member of the team if his efficiency is impaired by alcohol, drugs or other influences. All personnel in the team should be aware of their duties (see 6.2). Personnel who are under training should be adequately supervised. It is essential to ensure that all personnel can communicate clearly in the same language.

NOTE. In some circumstances it may be appropriate for one person to undertake the duties of more than one of the roles described in 6.2.

6.2 Duties

6.2.1 Operator

The operator should be responsible for the correct operation of the lorry loader in accordance with the manufacturer's instructions and within the safe system of work (see 4.1). The operator should at any one time respond only to the signals from one slinger/signaller, who should be clearly identified (see 9.2).

6.2.2 Slinger

The slinger should be responsible for attaching and detaching the load to and from the lorry loader's lifting attachment and for the use of the correct lifting gear and equipment in accordance with the planning of the operation.

The slinger should be responsible for initiating and directing the safe movement of the lorry loader. If there is more than one slinger, only one of them should have this responsibility at any one time, depending on their positions relative to the lorry loader.

Continuity of signalling is of paramount importance. If the slinger is not visible to the lorry loader operator, signals should be relayed to the operator by a signaller (see 6.2.3) or by other audio or visual methods. If audio or visual methods are used, the equipment or its means of use should be such that the operator will be immediately aware of failure of the equipment.

Typical examples are as follows.

- a) A blank screen on a television monitor should require an operator to stop immediately all lorry loader movements.
- b) A slinger using a radio should continuously instruct the operator to lower a load, e.g. by saying 'lower-lower-lower...', and failure of this instruction from the slinger should require the driver to halt all lorry loader movements.

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

6.2.3 Signaller

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

6.2.4 Lorry loader erector

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

6.2.5 Maintenance personnel

The maintenance personnel should be responsible for maintaining the lorry loader 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).

7 Attributes of personnel

7.1 Operator

The operator should be:

- a) competent;
- b) over 17 years of age, unless under the direct supervision of a person competent for the purpose of training;
- c) suitably fit, with particular regard to eyesight, hearing and reflexes;
- d) physically able to operate the lorry loader safely;
- e) able to judge distances, heights and clearances to a reasonable degree;
- f) trained for the type of lorry loader and its accessories, and familiar with the lorry loader's safety devices;
- g) fully conversant with the duties of the slinger and signaller, and with the signal code shown in clause 16, and with any alternative methods of signalling that are to be used;
- h) familiar with the fire appliances on the lorry loader and trained in their use;
- i) familiar with the means provided for escape in case of emergency;
- j) authorized to operate the lorry loader;
- k) aware of any duties allocated to the slinger and/or signaller by the person appointed (see 4.3).

NOTE. Evidence that the operator is medically fit to operate a lorry loader should be obtained at intervals of not more than 5 years.

7.2 Slinger

The slinger should be:

- a) competent;
- b) over 17 years of age, unless under the direct supervision of a person competent for the purpose of training;
- c) fit, with particular regard to eyesight, hearing, reflexes and agility;
- d) physically able to handle lifting gear and equipment;
- e) able to balance loads and judge weights, distances, heights and clearances;

- f) trained in the techniques of slinging;
- g) capable of selecting lifting gear and equipment that is suitable for the load to be lifted;
- h) trained in the techniques of signalling and familiar with the signal code shown in clause 16;
- i) capable of giving precise and clear verbal instructions where audio equipment (e.g. radio) is used, and capable of operating the equipment;
- j) capable of initiating and directing the safe movement of the lorry loader and load;
- k) authorized to carry out slinging duties;
- l) aware of any duties allocated to the lorry loader operator and/or signaller by the person appointed (see 4.3).

7.3 Signaller

The signaller should be:

- a) competent;
- b) over 17 years of age, unless under the direct supervision of a person competent for the purpose of training;
- c) fit, with particular regard to eyesight, hearing, reflexes and mobility;
- d) able to judge distances, heights and clearances;
- e) trained in the techniques of signalling and familiar with the signal code shown in clause 16;
- f) capable of giving precise and clear verbal instructions where audio equipment (e.g. radio) is used, and capable of operating the equipment;
- g) capable of directing the safe movement of the lorry loader and load;
- h) authorized to carry out signalling duties;
- i) aware of the responsibilities allocated to the lorry loader driver and slinger by the person appointed (see 4.3);
- j) aware of any duties allocated to the lorry loader operator and/or slinger by the person appointed (see 4.3).

7.4 Lorry loader erector

The erector should be:

- a) competent;
- b) over 17 years of age, unless under the direct supervision of a person competent for the purpose of training;
- c) fit, with particular regard to eyesight, hearing, reflexes and agility;
- d) physically able to handle safely the loads involved in crane erection;
- e) able to work confidently and safely at heights;

- f) able to establish weights, balance loads and judge distances, heights and clearances;
- g) trained in the techniques of slinging;
- h) capable of selecting lifting gear and equipment that is suitable for the load to be lifted;
- i) trained in the erection, dismantling and working of the relevant type of lorry loader, and in the safe use and setting up of any lifting appliance used in the course of these duties;
- j) trained in the checking of the safety devices fitted to the relevant lorry loader, and of those on any lifting appliance being used for the erection.

7.5 Maintenance personnel

The maintenance personnel should be:

- a) competent;
- b) fully conversant with the machinery they are required to maintain, and with its hazards;
- c) properly instructed and trained;
- d) familiar with the inspection and maintenance procedures recommended in clause 11.

Where special machinery is involved, personnel should attend appropriate training courses given by the supplier of the equipment.

8 Selection of lorry loaders

An effective and safe lorry loader is one in which the vehicle and crane are well matched to the type and size of load to be carried. Attention is drawn to the legal requirements relating to road vehicles.

Consideration should be given to:

- a) weight, dimensions and characteristics of the loader;
- b) operation, speed, radii, height of lift and areas of movement;
- c) the number, frequency and types of lifting operation;
- d) the space required for effective deployment of stabilizers;
- e) the control position which will be most suitable for the intended purpose¹⁾.

Before accepting a lorry loader, the user should ensure that:

- 1) an appropriate test certificate is supplied;
- 2) relief valves are properly sealed;
- 3) an operator's manual is supplied;
- 4) CE documentation is supplied, when appropriate.

¹⁾ A choice is normally available which includes dual position, high seat or remote controls.

9 Safety

9.1 General

Responsibility for safety lies with the person or organization having overall control of the place of work and with the employers of personnel involved in the lifting operation. In order that this responsibility may be effectively discharged, the appointed person (see 4.2) should be given the authority to ensure that adequate systems to achieve safety are in operation. Matters relating to the safety of lifting operations include the use, maintenance, repair and renewal of safety equipment and the instruction of, and allocation of responsibilities to, the various personnel handling the equipment.

9.2 Identification of person directing movements

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

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

9.3 Personal protective equipment

The person appointed in accordance with 4.2 should ensure that:

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

Some safety equipment (e.g. helmets and safety harnesses) may deteriorate with age and should therefore be considered for renewal periodically. Damaged safety equipment should be replaced immediately.

9.4 Use of personal protective equipment

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

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

9.5 Access and emergency escape

9.5.1 General

Safe access and means of emergency escape should be provided, and maintained in good condition, for the operating position(s) of the lorry loader and for inspection, maintenance, repair, erection and dismantling of the lorry loader.

9.5.2 Boarding and leaving the lorry loader

No person should be permitted to board or leave without first obtaining the operator's permission. The operator should be aware of the precautions that are necessary while the person is boarding or leaving and should take them. If the boarding or leaving point is out of sight of the operator, means should be provided to ensure that the operator is aware of the other person's whereabouts, and a notice stating the boarding procedure should be posted at the boarding point.

9.5.3 Instruction of personnel

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

9.6 Fire extinguishers

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

NOTE. Attention is drawn to BS 5306 : Part 3.

9.7 Lorry loader safety equipment

9.7.1 Motion limiting devices

Devices fitted to limit any motion of the lorry loader, should be regularly inspected and maintained in good working order.

9.7.2 Overload cutout devices

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

9.7.3 Level indicator

Level indicators should be used in accordance with the instruction manual and maintained in good working order.

9.7.4 Anemometer

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

9.7.5 Machinery guarding

All guarding should be properly fitted whenever the lorry loader is in use and should be maintained in good condition.

NOTE. Attention is drawn to BS 5304 : 1988.

9.8 Documentation

9.8.1 Rated capacity charts

Readily understandable rated capacity charts applicable to the various specified operating conditions of the lorry loader should be prominently displayed to the operator. They should indicate the appropriate derating for special applications such as magnet or grabbing duties. The lorry loader should not be operated outside these parameters, even in an unloaded situation.

9.8.2 Instruction manuals

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

9.8.3 Test and examination certificate

All current certificates of test and examination for the lorry loader and lifting gear should be kept readily available.

9.8.4 Records

A record of the lorry loader's condition should be maintained, to enable its fitness for further operation to be assessed.

The record should include the following:

- a) technical information, including maintenance instructions and performance data provided by the manufacturer;
- b) test certificates, and a record of inspections (whether statutory or not), including inspection of ropes;
- c) a record of significant repairs and modifications, including renewal of major parts, and confirmation of completion, with signatures of responsible person(s);
- d) details of occurrences that are of more than short-term relevance. (See 11.3 of BS 7121 : Part 1 : 1989.)

The form in which records are kept should allow a relevant and coherent history of the lorry loader to be readily retrieved. The records should clearly identify the lorry loader to which they refer.

10 Siting

10.1 General

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

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

10.2 Standing and support conditions

Under working conditions, the loads imposed on the tyres and stabilizers arise from the combined effects of:

- a) the dead weight of the vehicle plus loader;
- b) the lifted load plus any attachments;
- c) the load carried on the vehicle platform;
- d) dynamic effects caused by loader and lifted load movements.

The highest pressures upon the ground are likely to occur under the stabilizer feet. The use of special packing to spread the load under the feet should be considered when working on soft ground. Care should be taken to ensure that such packing is sufficiently strong to withstand the loadings imposed by a fully loaded vehicle and its loader when working.

Particular care should be taken to ensure that tyres and stabilizers are not positioned close to excavations, cellars, ground cavities or on weak decking of any sort. The placing of stabilizer feet on the verges of roads or pavements should be avoided. If roads or pavements cannot be avoided, stabilizers should be extended and special reinforcement should be considered. If doubt exists, competent advice should be sought.

The loads quoted by the manufacturer are usually given for the lorry loader standing on firm, level ground. Working on sloping ground should be avoided because this can have an adverse effect on the load radius and the stabilizers (see figure 1).

10.3 Proximity hazards

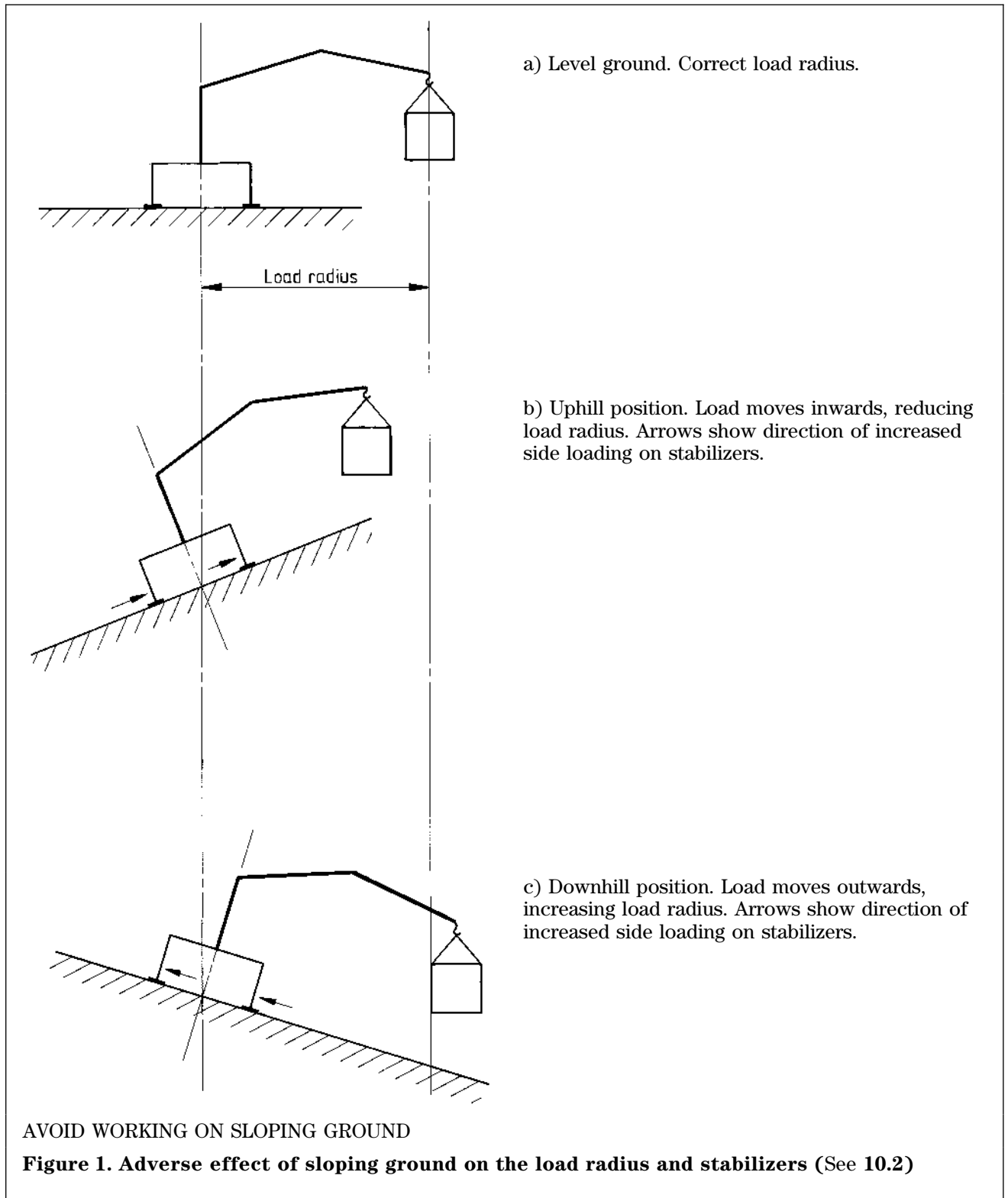
10.3.1 General

Consideration should be given to proximity hazards such as overhead electric lines or conductors, nearby structures or machinery, and public areas including highways, railways and rivers. The danger to or from underground services such as gas mains or electric cables should also be considered. Care should be taken to ensure that the lorry loader stands clear of any underground services or, where this is not possible, that the services are adequately protected against damage.

10.3.2 Electric cables

The operator and other persons nearby can be killed if the lorry loader, or its load, touches or comes too close to overhead electric cables. An operator controlling the crane from a position on the ground is particularly vulnerable.

The local electricity authority or, if appropriate, the generating authority, should be consulted if the lorry loader is to be used within a distance of 15 m plus the maximum jib length from overhead lines which are supported on steel towers, or within a distance of 9 m plus the maximum jib length from overhead lines which are supported on wood, concrete or steel poles.



It is recommended that a warning plate (see figure 2) be permanently mounted where it can always be seen from the control positions.



The symbol and wording should be black on a yellow background. The yellow background should constitute at least half the total area of the sign.

Figure 2. Example of a warning plate to advise of the proximity of overhead electric cables (see 10.3.2)

Detailed guidance is available in HSE Guidance Note GS 6 [2], which should be referred to whenever this type of hazard is likely to be encountered.

Under no circumstances should a lorry loader travel under live overhead cables with its jib raised or extended. Regular travel under cables should only be by a route marked with goalposts (see figure 3).

Where these clearances cannot be achieved, the approval of the local electricity authority, or, if appropriate, the generating authority should be sought before operations start.

Should contact with an overhead line occur accidentally, the following action should be taken.

- a) *If driving or operating the lorry loader from a position in or on the vehicle*, stay on board and warn everyone else to keep away; or jump off. Do not climb down.
- b) *If operating the crane from a position on the ground*, stand well clear and ensure that everyone else is kept clear.
- c) Inform the responsible engineer of the works, or the local electricity authority or generating authority immediately.

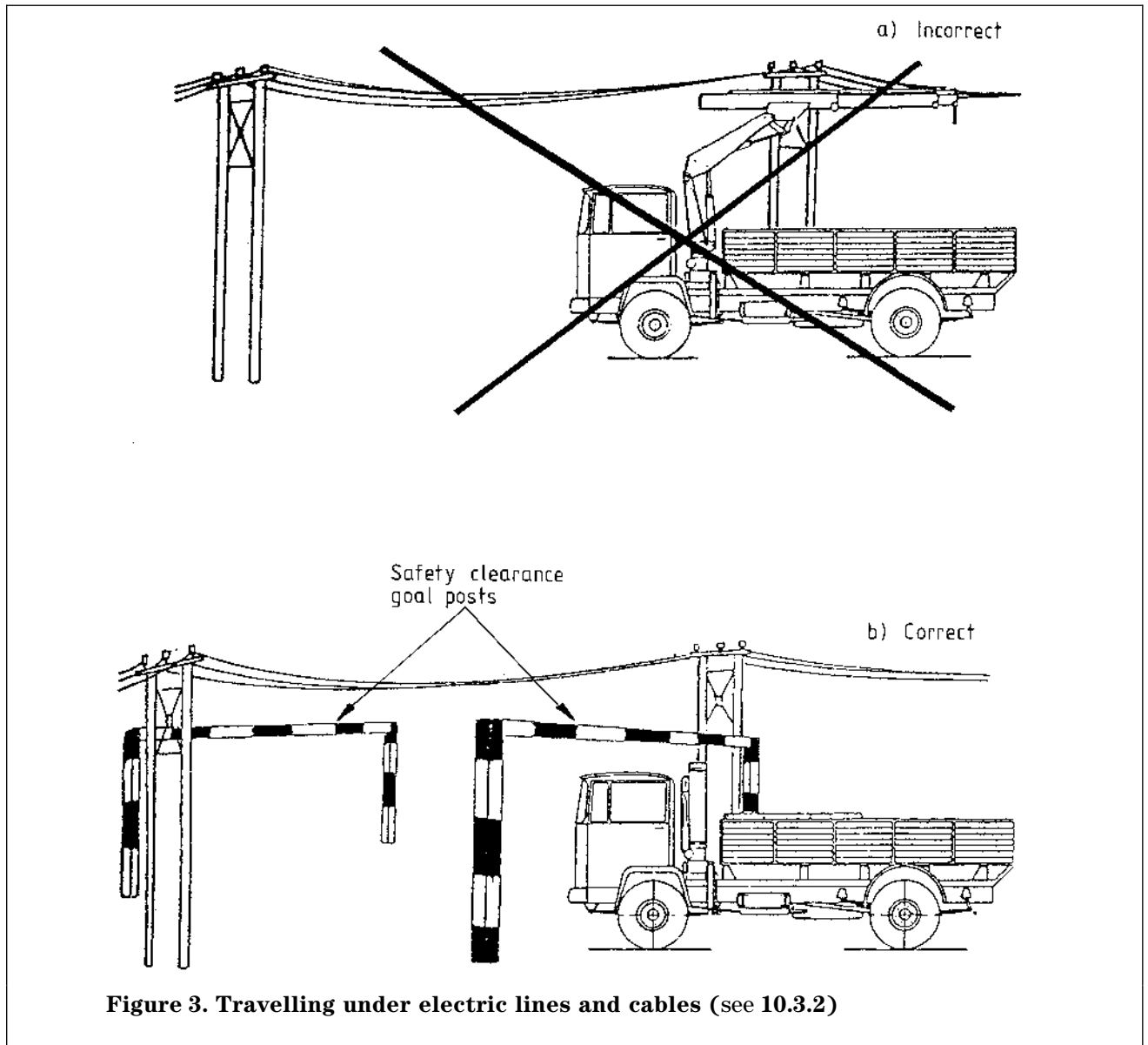
Until assistance is received, a responsible person should remain near the loader to warn of the danger.

10.4 External electrical supply to the lorry loader

If a lorry loader is to be powered by an external electrical supply, the following recommendations apply.

- a) There should be an effective earth connection.
- b) The lorry loader structure, motor frames and conductive cases of all electrical equipment (including metal conduit and cable guards) should have an effective and direct connection to earth.
- c) The power supply and the lorry loader equipment should be known to be compatible before connection.
- d) Cables providing power to the lorry loader should have protection from mechanical damage, for example by:
 - 1) running in conduit or trunking, or on trays; or
 - 2) being clipped to a structure in a position where they are protected from mechanical damage; or
 - 3) being of armoured construction.

- Where conducting material is used for protection, it should be bonded to earth at each end. In no case should the protection be used as an earth conductor.
- e) Where practicable, the power supply to a travelling lorry loader should be through a cable-winding drum or a properly installed, insulated and protected collector system.
- f) Any trailing cable should not be vulnerable to damage during operational movement or when the lorry loader is travelling. The travel distance should be within the length of the trailing cable.
- g) In addition to any isolator within the lorry loader that is capable of cutting off the electrical supply to the lorry loader motions, there should be an identified isolator remote from the lorry loader, that can be used to cut off the electrical supply to the lorry loader itself.
- h) All isolators should be capable of being locked to prevent unauthorized operation and should identify the lorry loader power supplies that they control.



11 Inspection and maintenance

11.1 General

When personnel are required to work on lorry loaders for inspection, maintenance or other reasons, a system should be in operation to ensure that they are not endangered by movement of the lorry loader and that a secure working place is provided.

If the operator has a clear view of all the moving parts, the system may be by means of verbal communication, provided that it is clearly defined and readily understood by all personnel.

Provision should be made to ensure that throughout its use the lorry loader and other equipment used in the lifting operation are maintained in a satisfactory condition.

The person appointed in accordance with 4.2 should be satisfied that adequate information is available, e.g. manufacturer's instructions, and that the maintenance is carried out by trained personnel who have adequate knowledge of the correct procedures. The frequency and extent of such maintenance should take account of all factors that affect the lorry loader in carrying out its work.

11.2 Inspection

11.2.1 Periodic checks

11.2.1.1 General

The person appointed in accordance with 4.2 should ensure that the checks given in 11.2.1.2 to 11.2.1.4 have been carried out.

11.2.1.2 Daily

At the beginning of each shift or working day that the lorry loader is in use, the following routine checks should be made.

- a) Carry out the checks required by the manufacturer's handbook.
- b) Check that all ropes are correctly positioned on their sheaves and that drums have not been displaced.
- c) Visually check that no electrical equipment is exposed to contamination by oil, grease, water or dirt.
- d) Visually check, by inspecting relevant levels and/or components, that no loss of fluids such as lubricating oil and coolant is apparent.
- e) Check the operation of all limit switches or cut outs and the dead man's handle or lever. Check with caution, in case of malfunction.
- f) Check that the automatic safe-load indicator is set for its correct duty and that the manufacturer's daily test is carried out.
- g) Check that the load plate is appropriate and legible.
- h) By varying the radius of the load lifting attachment without load, check that the movement of the equipment in items f) and g) is correct.
- i) Check that the correct air pressure is maintained in any pneumatic control system.
- j) Check that any lights, windscreen wiper(s) and washers fitted to the control station operate efficiently.
- k) Without load, check that all lorry loader controls function correctly.
- l) Check that all audible warning devices operate satisfactorily.
- m) Check that the lorry loader is in a tidy condition and free from tins of oil, rags, tools and materials other than those for which storage provision is made, that access and egress are adequate and that the appropriate fire-fighting equipment is available.

11.2.1.3 Weekly

Once a week, when the lorry loader is in use, in addition to the checks recommended in 11.2.1.2, the following checks should be made.

- a) Carry out the checks required by the manufacturer's handbook.
- b) Check the automatic safe-load indicator in accordance with the operating instructions.
- c) Check all ropes for broken wires, flattening, basket distortion and other signs of damage, excessive wear and surface corrosion. (See clause 15 of BS 7121 : Part 1 : 1989.)

d) Check that all rope terminations, swivels, pins and retaining devices are in good working order, and check all sheaves for damage, worn bushes and seizure (see clause 15 of BS 7121 : Part 1 : 1989).

e) Check the structure for damage, e.g. bulges, indentations and unusual rubbing marks on telescopic jibs, cracked welds and loose fasteners.

f) Check hooks and other load-lifting attachments, safety catches and swivels for damage or wear. Check the hook shank thread and securing nut for undue movement, which may indicate wear or corrosion.

g) Check the operation and adjustment of controls.

h) On hydraulic machines, check for creep of hydraulic rams.

i) Check the slew lock, if fitted.

Enter the results of the checks in the record of inspections (see 9.8.4b). Where applicable, statutory forms should be used.

11.2.1.4 Lorry loader not in regular use

If the lorry loader is not in regular use, it may be necessary to carry out a special programme of checks before it is used. The extent and thoroughness of this programme should depend not only on the length of the period for which the lorry loader was out of use, but also on the location of the lorry loader during that period. A lorry loader standing under cover or inside a workshop may require very little in addition to the checks recommended in 11.2.1.2 and 11.2.1.3, but a lorry loader that has been out of use in the open, and therefore exposed to the weather and atmospheric pollution etc., may require an extensive appraisal to determine its fitness for work.

The appraisal should include at least the following procedure.

a) Carry out any checks recommended by the manufacturer.

b) Examine all ropes for signs of corrosion and damage, and ensure that there is thorough lubrication.

c) Examine all control linkages for evidence of seizure or partial seizure, and ensure that there is correct lubrication.

d) Test every crane motion for several minutes without load, each motion individually at first then with two or more motions simultaneously as appropriate. Repeat the test with a load on the crane.

e) Check that all the lorry loader safety devices function correctly.

f) Check hoses, seals or other components for evidence of deterioration.

Before the lorry loader is returned to service, the results of all the tests in the programme should be documented in the records (see 9.8.4), along with details of any corrective action taken.

11.3 Reporting of defects and incidents

The person appointed in accordance with 4.2 should ensure that there is an effective procedure for reporting defects and incidents. This procedure should include notification to the person appointed, recording of action taken to rectify any defects and clearance of the lorry loader for further service.

This procedure should include the immediate notification of the following:

- a) defects found during daily or weekly checks;
- b) defects found at any other time;
- c) incidents or accidents, however slight;
- d) shock loads, however they occur;
- e) dangerous occurrences or reportable accidents.

The procedure should include provision for an examination by a competent person after any incident, whether or not a repair is necessary, to ensure that the lorry loader is fit for further service.

11.4 Planned maintenance

To ensure safe and satisfactory operation of the lorry loader, a planned maintenance system should be established and used.

Manufacturers' instruction books recommend that specific tasks be carried out at stated intervals, and these periods should not be exceeded. The manufacturer's instruction book should be referred to on such matters as lubrication points, frequency of greasing and oil changes, grades and quality of lubricant to be used, and for other essential maintenance such as replacement of filters, draining intervals of air receivers, recommended tyre pressures, frequency for checking the security of fixing bolts, and recommended torque settings and other adjustments, e.g. clutches and brakes.

The statutory examination of the lorry loader requires a competent person to assess whether or not the lorry loader is fit for service at the time of the examination. The examination does not cover the absolute legal requirements to ensure that the equipment is properly maintained. To satisfy this requirement, a more frequent inspection should be carried out, that takes account of the frequency of use of the lorry loader and the environmental conditions.

An effective planned maintenance system should recognize the possible need to prohibit the use of the lorry loader until essential maintenance work has been carried out.

In addition to any statutory requirements, a record (see 9.8.4) of the lorry loader should be kept, giving information on the major components used in manufacture, e.g. rope diameters, lengths, construction and breaking loads, tyre sizes and ply ratings, make and model of motors, pumps, gear boxes, winches, drives, electrical and hydraulic

equipment and switchgear. The availability and source of replacement items should be checked and noted in the record. Consideration should be given to stocking certain expendable items and other parts, to minimize down time in the event of crane breakdown.

11.5 Replacement components

Replacement components should conform to the manufacturer's specification.

11.6 Special materials

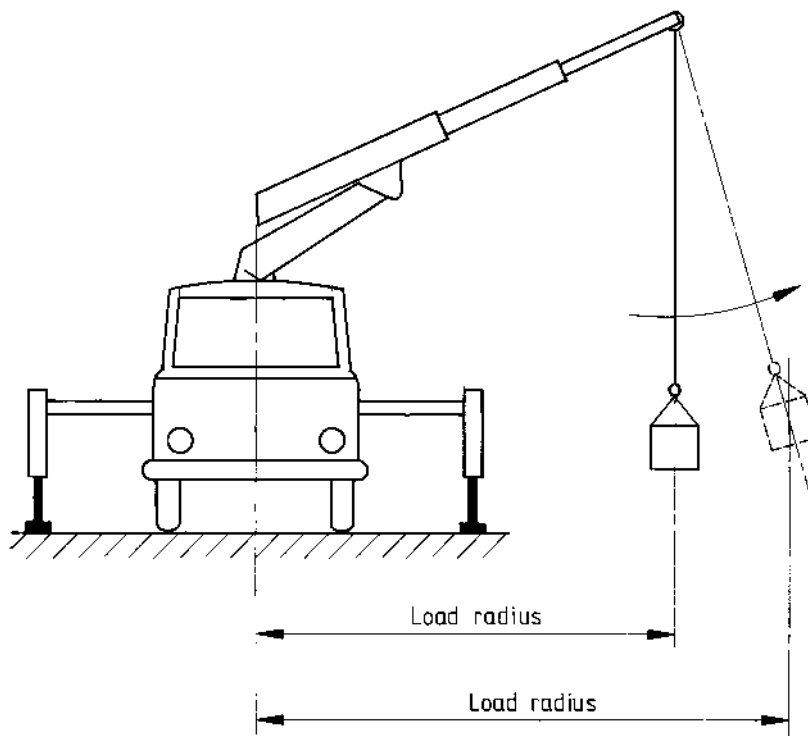
Modern lorry loaders make extensive use of high-tensile steels. If it is necessary to carry out repairs to any parts of the lorry loader structure, it is essential that the correct procedure laid down by the manufacturer be strictly followed. In particular, excessive heat that can change the properties of the steel should be avoided.

12 Operating conditions

12.1 Rated capacity

The rated capacity of the lorry loader should not be exceeded other than for the express purpose of testing the lorry loader, under the supervision of the competent person. The rated capacity of any item used to attach the load to the lorry loader should not be exceeded other than for the express purpose of testing the item under the supervision of a competent person.

Care should be taken to prevent pendulum swinging of the load, by careful control of the operating motions to match the swing of the load and to keep it under control at all times. A swinging load will increase the load radius and the overturning moment of the lorry loader (see figure 4). Loads should always be lifted gently and crane motions should be operated smoothly to prevent loads from swinging. Steady lines should be used where necessary, particularly where the load presents a wind-catching area. Travel should always take place with the load near to ground level so that swinging of the load can be controlled. Rated capacities usually apply only to freely suspended loads. The hoisting, slewing, traversing, luffing or travelling motions of a lorry loader should not be used to drag any load along the ground with the hoist rope out of the vertical position, unless the lorry loader is specifically designed for such operations (see 12.6.4). Before lifting a load, the hoist line should be plumb (see figure 5). Failure to observe these points can adversely affect the stability of the lorry loader or introduce loadings (stresses) for which it has not been designed and, even if an automatic rated capacity indicator is fitted, a structural failure can result without warning.



KEEP THE LOAD UNDER CONTROL

Figure 4. Adverse effect of a swinging load on the load radius (see 12.1)

12.2 Mode of operation and control

12.2.1 General

On no account should the operator tamper with any controls, mechanisms or equipment, including the automatic rated capacity indicator, either to enable the lorry loader to function outside the operational range of loads specified by the lorry loader manufacturer or other competent person, or to attempt to correct any suspected defect (see 11.3).

Before starting any lifting operation with a lorry loader, the following should be observed.

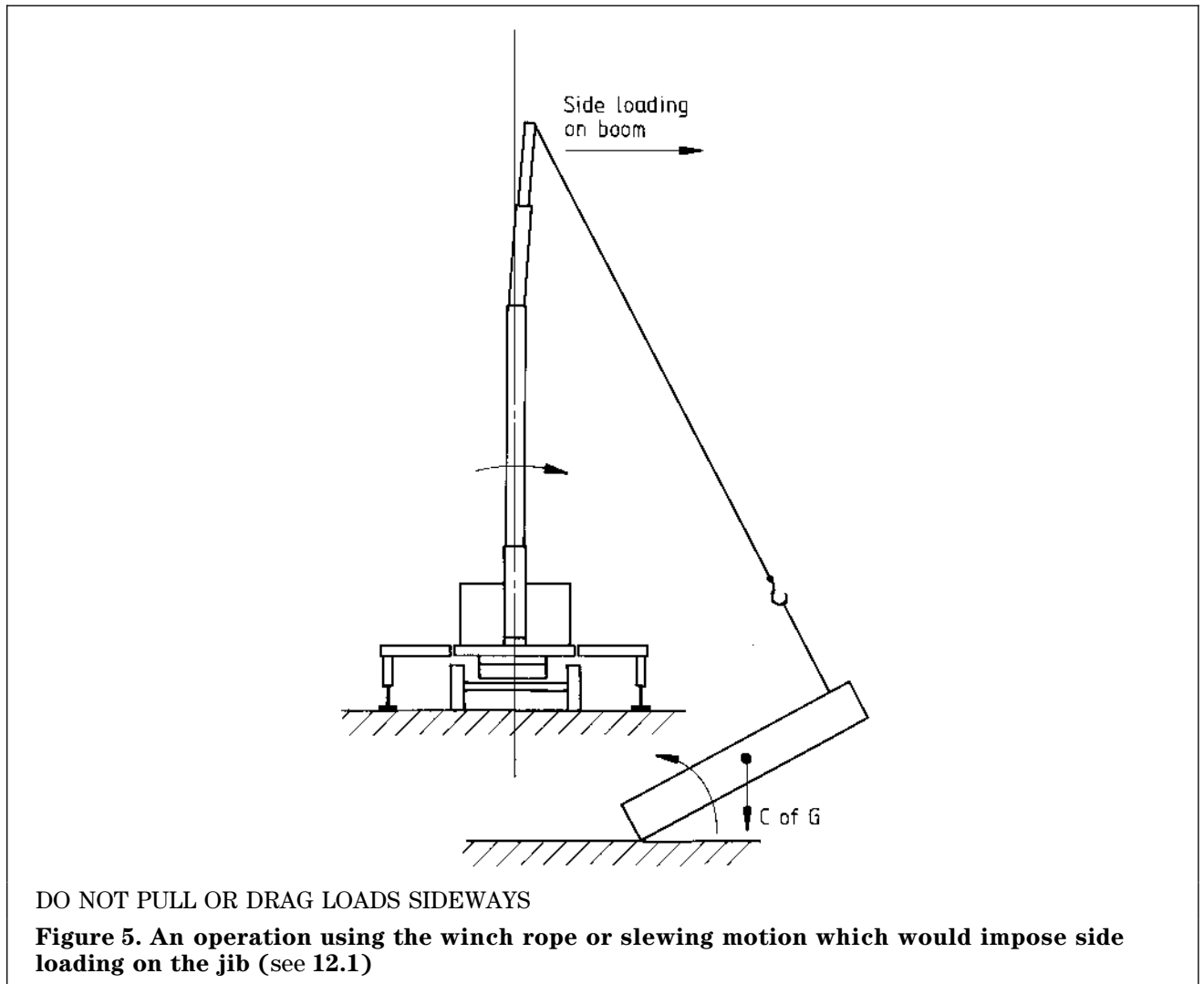
- a) The operator should be familiar with the controls and their layout.
- b) The operator should have a clear and unrestricted view of the load and operational area or should act under the directions of the slinger or an authorized signaller who is positioned to have a clear and uninterrupted view; in some circumstances this may be a legal requirement. It is particularly important that the operator ensure that lifts can be carried out without causing damage. The operator should therefore ensure that loads and lorry loader hoist ropes are well clear of obstructions.

c) Where telephone, radio or closed-circuit television communications are being used, the operator should ensure that the calling signal is functioning satisfactorily and that verbal messages can be clearly heard.

d) Where air or hydraulic systems are used, the operator should ensure that the gauges are functioning and that the systems are at the correct operating pressures.

The hoist rope or, if applicable, the hoist chain should be vertical at the start of and throughout the hoisting operation. The load should initially be lifted just clear of the supporting surface and be brought to rest while the slings, balance of the load etc. are checked, before proceeding. Care should be exercised by the operator at all times to avoid shock or side loadings on the jib or structure. Care should also be taken to prevent the load lifting attachment from coming into contact with the structure. Motion motors should not be reversed before the motor has come to rest, unless the control gear is specifically designed to allow this.

The lorry loader safety devices should not be regarded as routine means of stopping the motions.



12.2.2 Remote-controlled cranes

To prevent unauthorized use, the operator of a lorry loader that is controlled by transmitted signals, e.g. radio, should retain the transmitter in his physical possession or remove the key from its keylock switch and, for short periods, retain the key in his possession. For longer periods or when the lorry loader is not in use, he should deposit the transmitter in safe storage. Provision should be made for the security of the transmitter when the lorry loader is not in use.

If the transmitter is fitted with a belt or harness, the operator should be wearing the harness before switching on the transmitter, so that accidental operation of the lorry loader is prevented. The transmitter should only be switched on when operating the lorry loader and should be switched off before the harness is removed.

The controlled-range feature, if provided, should be tested at regular intervals. The controlled-range feature should also be checked at the beginning of each shift, or whenever there is a change of operator, to ensure that it operates within the limits specified.

12.3 Handling of loads near persons

When loads have to be handled in the vicinity of persons, extreme care should be exercised and adequate clearances allowed. Operators and signallers should be particularly aware of the possible danger of persons working out of sight.

All persons should stand clear of the load being lifted. When loads are being lifted from a stack, all persons should stand well away from the stack in case adjacent materials or objects are displaced.

Lifting of loads over highways, railways, rivers or other places to which the public have access should be avoided. If this is not possible, permission should be obtained from the appropriate authority and the area should be kept clear of traffic and persons.

12.4 Multiple lifting

Multiple lifting should not be carried out with lorry loaders.

12.5 Demolition operations

Lorry loaders should not be used for impact demolition.

12.6 Special duties

12.6.1 General

In all cases involving special duties, the guidance of the manufacturer or of another competent engineer should be obtained. The weight of any special lifting attachments should always be included as part of the load to be lifted. The attachment should be tested, certified and plainly marked with the rated capacity and weight of the attachment. Attachments should only be used for the purpose for which they were designed.

12.6.2 Grabbing and magnet crane service

12.6.2.1 General

When using lorry loaders for special duties such as grabbing or magnet crane service, allowance should be made not only for the weight of the grab, magnet or other attachments, together with load, but also for additional loadings imposed on the lorry loader by fast slewing, grab suction effects, impacts etc. Consequently, the weight of the grab and contents, or the weight of the magnet and load, will be less than the corresponding rated capacity for normal duty. Reference should be made to the lorry loader manufacturer or other competent engineer for details of special duty ratings.

12.6.2.2 Grabbing

When lorry loaders are used as grabbing cranes, the load lifted is the weight of the grab and its contents. The weight of the contents depends on the density of the material handled. It is essential that any grab used be of appropriate capacity for the material, allowing for the rated capacity of the crane. The weight should be checked in cases of doubt.

12.6.2.3 Magnet service

A load supported by a magnet is not as secure as a load supported by a hook. Precautions are therefore necessary to ensure that there is no hazard to personnel caused by unexpected release of the load. The magnet should be marked with the rated capacity, which should be determined by tests using weights of the same characteristics as the load for which the device is intended to be used.

The power to the magnet should not be switched on until the magnet has been lowered on to the load to be lifted. The magnet should be carefully lowered on to the load and should not be allowed to strike a solid obstacle. It should not be used on hot metal unless specifically designed for this duty.

When the magnet is not in use, the power should be switched off so that the magnet does not become too hot. The magnet should not be deposited on the ground, but should be rested on a wooden platform.

12.6.3 Vacuum lifting devices

12.6.3.1 Vacuum lifting devices should be regularly inspected to ensure that adequate suction is maintained over the required period.

A vacuum lifting device should be fitted with a device that gives a visual indication to the operator of the state of the vacuum at any time, and which gives an audible warning, to the driver and any person working in the vicinity at ground level, when the vacuum is 80 % or less of the designed working vacuum and/or if the vacuum-inducing pump fails.

12.6.3.2 If the vacuum-inducing pump fails, a vacuum lifting device should be able to maintain sufficient vacuum to continue to support the load suspended for a sufficient time (including a safety margin) to allow that load to be safely deposited from the maximum height of lift to ground level.

A vacuum lifting device should be fitted with a suitable vacuum gauge that is of sufficient size and is situated so that it can be easily read from the position where the load is attached and released. The gauge should be distinctively marked in red to indicate the vacuum below which the device should not be used.

A vacuum lifting device should only be used to lift loads that have a surface suitable for vacuum lifting pads.

12.6.3.3 The vacuum device should be used as follows.

- a) Each pad should support an equal part of the load, as far as is practicable.
- b) The contact surface of the load should be suspended horizontally as far as is practicable.
- c) The surface of the load should be free from loose material that would prevent any vacuum pad from making an effective contact with the surface.

12.6.3.4 Before being taken into use for the first time, or after any substantial repair, the vacuum device should be tested by a competent person by application of a test load. The surface of the test load should, as far as is practicable, be similar to the worst type of surface on which the device is intended to be used.

The vacuum device, particularly the hoses and vacuum pads, should be inspected before use at the beginning of each shift or day. The warning device (see **12.6.3.1**) should be tested at the beginning of each week.

12.6.4 Winch operation

Most lorry loaders fitted with extending jibs are capable of providing a purely vertical motion at the load hook, but the radii and the heights at which this can be achieved may be strictly limited by the jib configuration. The addition of a winch to a loader removes this limitation.

The winches used with lorry loaders are normally hydraulically powered. This permits the winch to be driven and controlled by the loader hydraulic power system. It also enables certain hydraulic safety features to be applied to the winch motor. While a hydraulically locked winch motor will support a load, it is always supplemented by a positive brake of the fail-safe type, i.e. the positive brake is applied unless a torque capable of supporting the load is provided by the hydraulic motor. The matching of the winch to the loader is extremely important; a bad match could cause the winch to overload the boom system. As a general rule, the winch rope pull should not be greater than the rated capacity of the boom.

Care should be taken to avoid having the hoist rope paid out until the rope is applying a load directly to the winch drum anchorage. At least two turns should remain on the drum as a minimum. It is recommended that the hoist rope be marked with tell-tale marking which can be seen by the loader operator well before the last two turns are run off the winch drum. Alternatively, an automatic trip device which stops the winch should be fitted.

Some crane and winch manufacturers offer their equipment for certain non-vertical lifting applications, e.g. vehicle recovery and winching boats on to slipways. It should be appreciated that the only safety device monitoring such loads may be the torque-limiting device and that this may only be operative when winching in. Care should be taken not to overload the winch or winch rope when paying out a load, as this can hazard the stability of the lorry loader. It should be appreciated that non-vertical loads applied to the loader can generate lateral loads on stabilizer feet, which may not have been designed to withstand such loads.

Pull-multiplying devices, such as additional sheave blocks, should not be interposed between the winch and the winch hook, as this will negate the effect of the winch torque-limiting device.

The manufacturer's instructions concerning the use of multi-fall blocks should always be followed.

A true appreciation of the hazards which can arise from winch operation is essential. The crane manufacturer should always be consulted if special applications are planned, and the completed installation should always be subjected to tests which reproduce the worst conditions likely to be encountered in service.

NOTE. Some applications of winches on lorry loaders can fall within the scope of statutory regulations, e.g. The Construction (Lifting Operations) Regulations 1961 [3].

12.7 Leaving the lorry loader unattended

An operator should always be present when a load is suspended from a lorry loader.

In no circumstances should a lorry loader be left unattended, even for short periods, unless:

- a) all loads have been removed from the lifting attachment, and the lifting attachment has been left in a safe position;
- b) the power supplies to all motions have been switched off, or the engine has been stopped; and
- c) appropriate motion brakes and locks have been applied to put the machine in a safe condition.

The ignition key and any other keys should be removed from the crane whenever the driver is absent from the machine.

For longer periods and for out-of-service conditions, switches should be locked off, fuel supplies cut off and any doors giving access to machinery or control cabs locked to prevent unauthorized access. Machinery should be left in the out-of-service condition as described in the operating instructions.

12.8 Weather conditions

12.8.1 General

The operation of lorry loaders in situations where they are likely to be affected by the weather should be given careful consideration. Certain weather conditions such as strong wind, heavy rain, ice or snow can impose loads on a crane and adversely affect the safety of lorry loader operations.

12.8.2 Wind

Gusting wind conditions can adversely affect the handling of the load and the safety of the lorry loader. Even in relatively light wind conditions, extra care should be taken when handling loads which have large wind-catching areas.

12.8.3 Visibility

In poor visibility, suitable means of communication should be provided to ensure the safe operation of the lorry loader. In extreme conditions, operations should be stopped until there is sufficient improvement in visibility to enable operations to be resumed safely.

12.8.4 Rain, snow or ice

The appointed person should ensure that adequate precautions are taken to avoid danger when the lorry loader or the load is affected by rain, snow or ice.

13 Testing and examination

13.1 General

13.1.1 Testing and examination

Table 1 gives a summary of recommendations for the periodic testing and examination of lorry loaders. It does not apply to lifting tackle.

Attention is drawn to statutory requirements for the inspection, testing and examination of cranes. (See table 1 of BS 7121 : Part 2 : 1991.)

Further details on initial and in-service testing are given in BS 1757 and BS 7121 : Part 2.

Table 1. Recommendations for periodic testing and examination of lorry loaders	
Occasion	Minimum test and examination
Before first being taken into use	Full test as detailed in 13.2.2
Annually after first being put into service	Proof load test of rated capacity +10 % at full radius and through the full slewing arc, and a thorough examination as detailed in 13.1.3
4 years after first being put into service	Full test as detailed in 13.2.2
8 years after first being put into service	a) Non-destructive test of structure b) Full test as detailed in 13.2.2
After each major repair or component change	Full test as detailed in 13.2.2
When chassis is changed	Full test as detailed in 13.2.2
NOTE. These recommendations are in addition to legal requirements for inspection, testing and examination. (See table 1 of BS 7121 : Part 2 : 1991.)	

13.1.2 Test certificates and documentation

Lorry loaders are used under a wide variety of conditions, but the following general recommendations apply.

- A lorry loader should not be used unless it has the appropriate current test certificates. Tests should be carried out following substantial repairs or alteration, in addition to tests prescribed by legislation.
- Inspections, systematic maintenance, repairs, renewals and any necessary heat treatment should be carried out and recorded.
- The rated capacity should be clearly marked on the lorry loader or the charts affixed to it.

- Any lifting attachments should be clearly marked with their rated capacities.
- A copy of the operating instructions should be kept with the lorry loader.
- All test certificates and records related to items a) to e) should be available for inspection (see **9.8.4**).

13.1.3 Thorough examination

A thorough examination should be understood to mean the following:

- a detailed examination, by a competent person, that is sufficient to ensure that the lorry loader is safe for use;

NOTE. When considered necessary by the competent person, visual examination may be supplemented by methods of non-destructive testing that determine the condition of any part of the lorry loader without causing any detrimental change to the materials.

- when considered necessary, dismantling of parts of the lorry loader by a skilled person to the extent requested by the competent person.

The examination should be carried out with the lorry loader in operation and at rest.

13.1.4 Test site

Careful consideration should be given to the conditions of the test site. It should be remembered that the recommendations given in the operating instructions for the lorry loader relate to operations within the rated capacity.

The following general recommendations apply.

- The ground should be well consolidated and capable of withstanding the loads that will be applied to it. Care should be taken to ensure that there are no hidden dangers such as cable ducts, drains, pipes, back-filled areas, cellars or other subterranean weaknesses.
- The ground should be level within the limits appropriate for testing the particular lorry loader.
- The site should have unrestricted overhead clearance and be large enough to allow unobstructed movement of the lorry loader and load through all its test movements, e.g. slewing, derricking and telescoping.
- A test is designed to prove a lorry loader and so it is essential to bear in mind that the lorry loader might not withstand the loading. It is therefore necessary to ensure that all personnel not essential to the test are kept away from the area. Test personnel should be so positioned that they are unlikely to be injured should there be any mishap. The test area should be roped off and notices posted prohibiting unauthorized entry. The test site should be well clear of public areas such as roads and railways. The site should also be clear of plant and property, which, as well as inhibiting the test, could be damaged.

13.1.5 Weather conditions

Apart from the obvious danger to personnel, weather conditions such as wind, ice and snow can impose loads on the lorry loader. For this reason, test sites should preferably not be in areas where there is a higher than average likelihood of adverse weather conditions. The limitation on wind speed for testing of the lorry loader may be lower than the limitation for normal operation. In cases of doubt, the advice of the manufacturer or of another competent engineer should be obtained.

The competent person in charge of the tests should ensure that adequate precautions are taken when the wind speed exceeds the limit or when the lorry loader or load is heavily coated with ice or snow.

Tests should never be undertaken when the lorry loader or load cannot be clearly seen owing to rain, snow, mist or fog etc.

13.2 Conduct of tests

13.2.1 General

The tests should be carried out under the control of the competent person appointed for this purpose, who should clearly indicate when the tests start and when they have been completed. During the tests, the operator, signaller and/or slinger should accept instructions only from the competent person.

Immediately prior to the tests, the competent person should ensure by thorough examination (see **13.1.3**) that the lorry loader is as follows:

- a) free from any defect that would preclude it from safely handling the test load;
- b) in the correct configuration and condition according to the manufacturer's instructions;
- c) equipped with sufficient falls of rope for the load to be used.

The competent person should also ensure that the site and weather conditions are suitable (see **13.1.4** and **13.1.5**).

During the tests, the load should be kept close to the ground. Shock loading, which may be caused by rapid acceleration of crane motions, sudden braking, erratic or sudden movements of the steering or of the lorry loader controls, should be avoided.

At all times, care should be exercised to avoid danger to personnel and damage to plant and surrounding property.

At the completion of the test and thorough examination, it is essential that all safety devices be restored and checked to ensure that they function correctly.

13.2.2 Overload testing

13.2.2.1 General

Testing should be carried out in two stages, in the following order:

- 1) overload test;
- 2) dynamic/functional tests.

13.2.2.2 Static overload test

This test is designed to ensure that a margin exists against structural failure and systems failure of the lorry loader, including anchorages to the vehicle, all vehicle structural parts, stabilizers and hydraulic equipment.

To enable the test to be carried out, it is necessary to override or disconnect the relief valve system and the rated capacity indicator or motion-limiting device.

A test load of $1.25 \times$ rated capacity, appropriate to the radius under test, should be applied in accordance with table 2.

At each radius, the load should be slewed, slowly, through the full slewing arc possible in service.

Safety devices should be reconnected, and where appropriate, reset and retested before the lorry loader is released from testing.

The tilt which occurs during the test should be assessed as part of the process of assuring stability and suitable matching of loader to chassis.

The test should be considered unsuccessful if it results in:

- a) a visible crack;
- b) permanent deformation;
- c) paint flaking;
- d) visible damage or loose connections which affect the functional safety of the crane;
- e) twists or deflections in the chassis which are considered to affect the calculated stability margin of the lorry loader, or to endanger its safe operation.

Arrangement		Radius
1	Articulating jib	a) Maximum obtainable b) For the maximum rated capacity
2	Articulating jib plus telescopic sections (powered or manual, but not both)	a) Maximum obtainable b) Maximum obtainable with sections retracted c) For the maximum rated capacity
3	Articulating jib plus powered and manual telescoping sections	a) Maximum obtainable b) Maximum obtainable with manual sections retracted c) Maximum obtainable with manual and powered sections retracted d) For the maximum rated capacity

13.2.2.3 *Dynamic/functional tests*

These tests subject the hydraulic system and structural members to dynamic conditions and fluctuating loads, in order to check each powered function through its full range of travel and to check the operation of load-decelerating relief valves and the rated capacity indicator (if fitted).

For these tests, all relief valves, and the rated capacity indicator, if fitted, should be brought into operation at the correct settings. Any motion limiting devices should be disconnected until later in the tests.

Hydraulic oil should be brought up to operating temperature before the tests are started.

The test load should be $1.10 \times P$, where P is the rated capacity at the maximum radius attainable with hydraulic outreach.

All loader positions, attainable in service, should be reached in the course of the tests.

The dynamic testing should continue, without interruption, until the full range of movements, throughout the speed range, has been carried out.

The correct functioning of load-decelerating relief systems should be checked by sudden arrests of the moving suspended load, but such tests should be conducted well clear of persons, the ground and any obstructions.

The set points for the rated capacity indicator should be noted in terms of radius and load at which the visible and audible warnings occur.

At the end of this continuous period of testing, the temperature of the hydraulic oil should be noted.

The test should be considered successful if it results in no visible crack or damage, if anchorages remain tight and secure, and if the hydraulic oil is at a satisfactory temperature at the end of the continuous test period.

The motion-limiting device should be reconnected and the set point for operation, in terms of radius and load, should be noted after any necessary adjustments have been made.

At the end of the test, all adjustable relief valves should be sealed with tamper-proof seals.

14 Ropes

Reference should be made to clause 15 of BS 7121 : Part 1 : 1989.

15 Slinging and handling of loads

Reference should be made to clause 16 of BS 7121 : Part 1 : 1989.

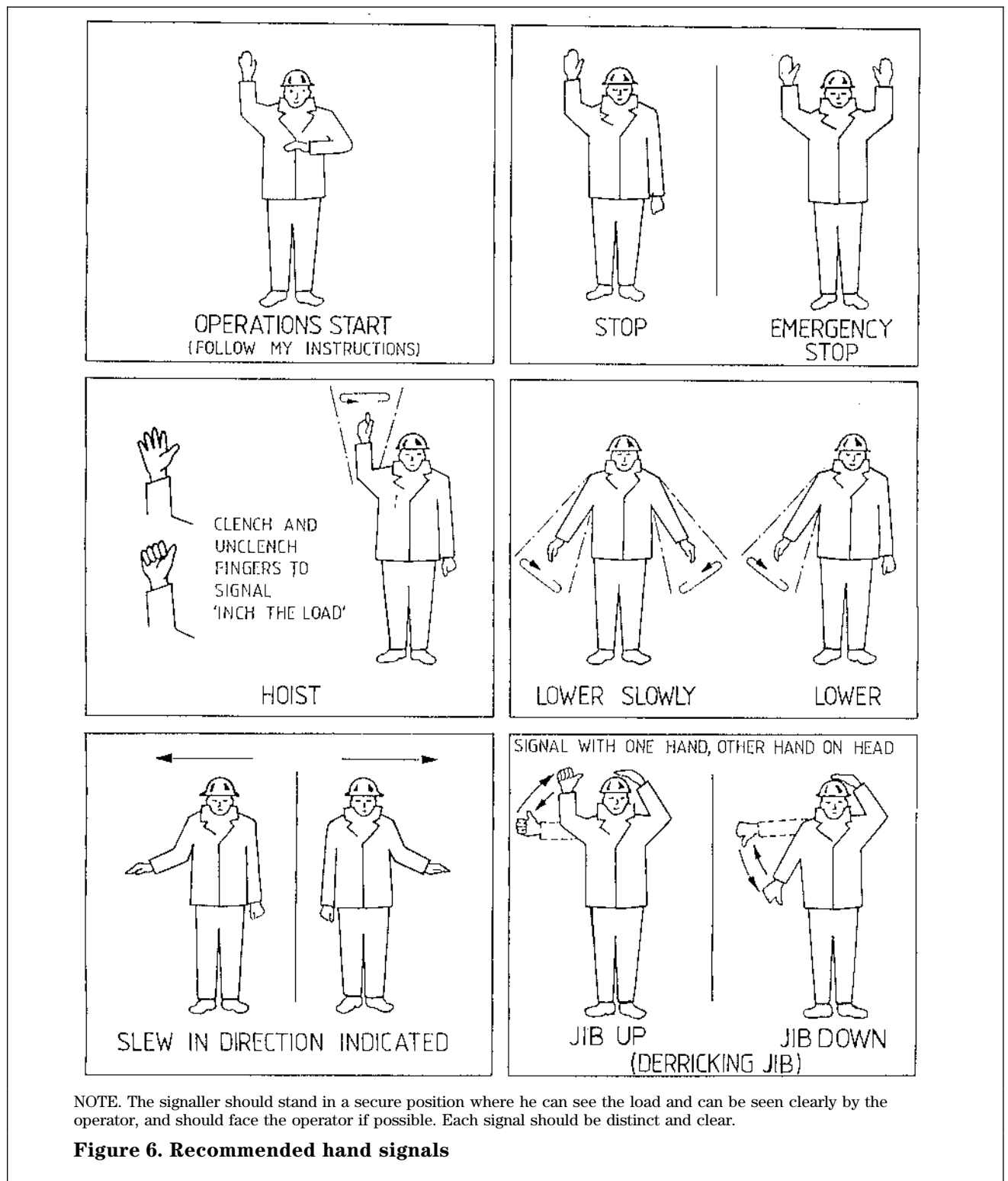
16 Signalling systems

To ensure that a universal signalling code is used, copies of the code of hand signals shown in figure 6 should be issued to all operators, slingers and other personnel involved in a lifting operation.

In situations where special lifts are involved or where hand signals alone are inadequate, other forms of communication should be used, by means of either radio or telephone, to supplement the hand signal code.

When radio is used as a means of signalling, the channel selected should be kept clear of all other communications. All personnel involved in the signalling should be given a clear and unique call sign and all communications should be preceded by this call sign. The operator should not respond to any command that is not preceded by the given call sign.

During the carrying out of the lifting operation, hand signals and any voice instruction to the operator(s) should only be given by one person at a time.



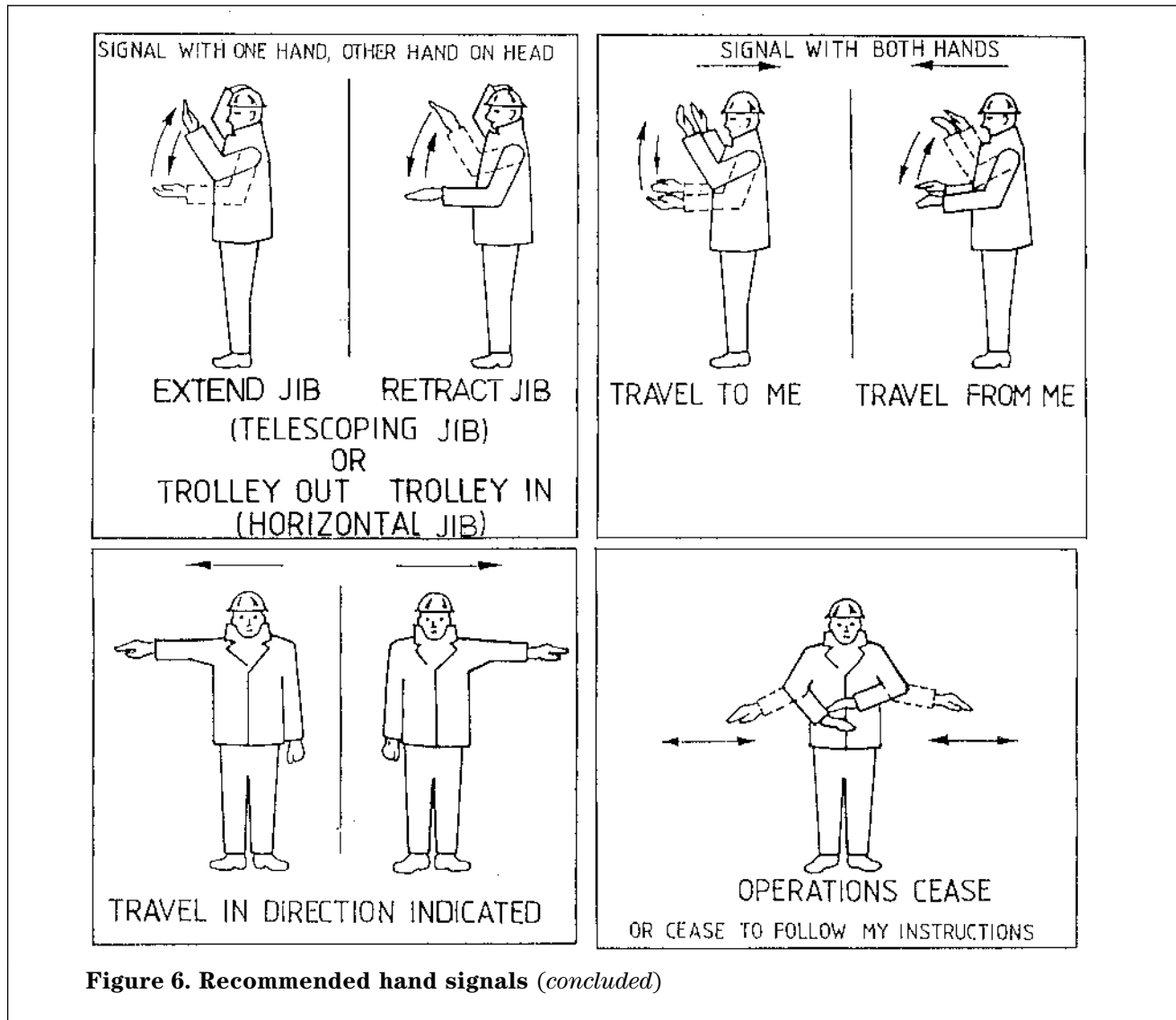


Figure 6. Recommended hand signals (concluded)

List of references (see clause 2)

Normative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 7121 :	<i>Code of practice for safe use of cranes</i>
BS 7121 : Part 1 : 1989	<i>General</i>
BS 7121 : Part 2 : 1991	<i>Inspection, testing and examination</i>

Other publications

- [1] GREAT BRITAIN. Health and Safety at Work etc. Act 1974. London: HMSO
[2] HEALTH AND SAFETY EXECUTIVE. Guidance Note GS 6. *Avoidance of danger from overhead electric lines*. 1991. London: HMSO

Informative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 1757 : 1986	<i>Specification for power-driven mobile cranes</i>
BS 5304 : 1988	<i>Code of practice for safety of machinery</i>
BS 5306 : Part 3 : 1985	<i>Code of practice for selection, installation and maintenance of portable fire extinguishers</i>

Other publication

- [3] GREAT BRITAIN. The Construction (Lifting Operations) Regulations 1961. London: HMSO

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