



BSI Standards Publication

Code of practice for safe use of cranes – Part 4: Lorry loaders

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ISBN 978 0 580 53622 9

ICS 53.020.20

The following BSI references relate to the work on this standard:

Committee reference MHE/3/11

Draft for comment 09/30082939 DC

Publication history

First published May 1997

Second edition, February 2010

Amendments issued since publication

Date	Text affected

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 94, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 7121 is published by BSI and came into effect on 28 February 2010. It was prepared by Subcommittee MHE/3/11, *Crane safety and testing*, under the authority of Technical Committee MHE/3, *Cranes and derricks*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 7121 supersedes BS 7121-4:1997, which is withdrawn.

Relationship with other publications

The Lifting Operations and Lifting Equipment Regulations (LOLER) [1] and the Provision and Use of Work Equipment Regulations (PUWER) [2] came into force in December 1998. Details of the Regulations, an Approved Code of Practice plus Health and Safety Executive (HSE) guidance can be found in the HSE books *Safe use of lifting equipment* [3] and *Safe use of work equipment* [4].

BS 7121-1 provides general recommendations for crane types not covered in an additional part of BS 7121. BS 7121-2 covers in-service inspection, thorough examination and, where appropriate, testing for the safe use of all types of crane. Subsequent parts of BS 7121 deal with the specific crane types as follows:

- a) Part 3: Mobile cranes;
- b) Part 4: Lorry loaders;
- c) Part 5: Tower cranes;
- d) Part 6: Derrick cranes;
- e) Part 7: Overhead/under-hung travelling and goliath cranes;
- f) Part 8: High pedestal and portal jib dockside cranes;
- g) Part 9: Container handling cranes;
- h) Part 10: Rail mounted cranes;
- i) Part 11: Offshore cranes;
- j) Part 12: Recovery vehicles and equipment;
- k) Part 13: Hydraulic gantry lifting systems;
- l) Part 14: Side boom pipelayers.

When all parts of BS 7121 have been published, CP 3010 will be withdrawn and BS 5744 will be revised to cover manually operated and light cranes only.

Information on the background to the development and use of BS 7121 since the initial publication of BS 7121-1 in 1989 is given in Annex C.

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

Information about this document

This is a full revision of the standard. It is intended to be used in conjunction with other parts of BS 7121 to ensure, so far as is reasonably practicable, that lifting operations are carried out safely.

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 [5]. This standard was drawn up with the participation of HSE representatives and will be referred to in relevant HSE publications.

Use of this document

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

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

Presentational conventions

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

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

Contractual and legal considerations

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

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

1 Scope

This part of BS 7121 gives recommendations for the safe use of lorry loaders. Subjects covered include management, selection of equipment, selection and training of personnel, procedures and precautions, testing, inspection, maintenance and examination.

This part of BS 7121 is intended to be used in conjunction with BS 7121-2, which provides general guidance on the inspection, testing and examination of all types of cranes.

NOTE Annex A and Annex B give detailed recommendations on the training of personnel for lorry loader operations. Annex C provides background information on the BS 7121 series.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

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

Other publications

HSE Guidance Note HS G 118, *Electrical safety in arc welding*. Sudbury: HSE Books, 1994

HSE Guidance Note GS 6, *Avoidance of danger from overhead power lines*. Sudbury: HSE Books, 1997

3 Terms and definitions

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

3.1 additional sheave blocks

sheave blocks which can be used to increase the number of falls of rope and hence the lifting capacity of a hoist

3.2 appointed person

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

3.3 bob weight

weight permanently fixed to the hook block of a hoist rope to ensure that the rope remains tensioned even under no load conditions

3.4 carrier

device that supports persons during lifting and lowering

NOTE This is also known as a "manrider".

3.5 competent engineer

person who has such theoretical knowledge and experience of the design of the lifting equipment as enables them to assess the design of loader crane bases and supporting structure connections, together with the adequacy of supporting structures to take the loads imposed by the loader crane

3.6 competent person

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

3.7 crane coordinator

person who plans and directs the sequence of operations of cranes (including lorry loaders) to ensure that they do not collide with other cranes, loads and other plant (e.g. concrete-placing booms, telehandlers, piling rigs)

3.8 lorry loader/crane supervisor

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

3.9 employing organization

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

NOTE In the case of a hired lorry loader, the degree of the employing organization's responsibility for the safe use of the lorry loader depends on whether the lorry loader is being supplied under a lorry loader hire contract or a part of a contract lift. See Clause 5.

3.10 indicator

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

3.11 intermediate inspection

inspection carried out at appropriate intervals between thorough examinations to identify potential faults and deterioration (so that appropriate action can be taken to ensure that the lorry loader remains safe to use)

3.12 lifting

any movement of loads or persons that includes a change of height

3.13 lifting equipment

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

3.14 lifting accessory

equipment from which the load can be suspended

NOTE These are also known as "accessories for lifting".

3.15 lifting eye

designated point for the attachment of lifting accessories to a load

3.16 lifts**3.16.1 basic lift**

lifting operation where the weight of the load(s) can be simply established, and there are no significant hazards within the working area or on the access route to the working area

3.16.2 intermediate lift

lifting operation where there are significant hazards, either within the working area of the lorry loader or on the access route to the working area

NOTE Formerly known as a "standard lift".

3.16.3 complex lift

lifting operation where the lorry loader is used to lift complex loads or persons, where two or more lorry loaders are used to lift the load or where the lifting operation is carried out at a location with exceptional hazards

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

3.17 load

weight which is lifted by the lorry loader

NOTE If lorry loaders are used to lift loads from water, the load could also include forces due to water flow or suction.

3.18 loader crane

powered crane comprising a column which slews about a base, and a boom system which is attached onto the top of the column

3.19 lorry loaders**3.19.1 lorry loader**

commercial vehicle or trailer, fitted with a loader crane, which normally has a load-carrying capability

3.19.2 single boom lorry loader

commercial vehicle or trailer, fitted with a loader crane, which has a single boom only

NOTE These are also known as "stiff booms" or "T-booms".

3.20 lorry loader operator

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

3.21 method statement

document produced by the appointed person to describe how the lorry loader set up or lifting operation is to be carried out

3.22 plant

equipment which might enter the path of the loader crane boom(s) or collide with the vehicle on which the loader crane is mounted

3.23 pre-use checks

visual checks carried out by the lorry loader operator at the start of each shift to ensure that the lorry loader has not suffered any damage or failure, and is safe to go to work

3.24 radius

horizontal distance between the point at which the axis of rotation meets the ground and the vertical centreline passing through the hook or attachment

3.25 radius indicator

device that shows the radius at which the lorry loader is operating

3.26 rated capacity

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

NOTE The rated capacity was formerly known as the "safe working load".

3.27 rated capacity indicator/limiter (RCI/L)

device that warns of the approach to overload and prevents the lorry loader from being overloaded

3.28 service conditions**3.28.1 in-service**

condition where the lorry loader is handling loads not exceeding the rated capacities within permissible wind speeds and other conditions as specified by the manufacturer

3.28.2 out-of-service

condition where the lorry loader is either not required for use or out of use, without a load on the hook and in conditions as specified by the manufacturer

3.29 signaller

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

3.30 slinger

person responsible for attaching and detaching the load to and from the lorry loader, for correct selection and use of lifting accessories in accordance with the specifications of the appointed person and for initiating the movement of the load

3.31 slinger/signaller

person combining the duties of both slinger and signaller

3.32 tag line

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

3.33 testing**3.33.1 functional testing**

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

3.33.2 performance testing

operation of each motion of the lorry loader with the rated load applied in order to determine whether the equipment performs to the manufacturer's specification, including checking of the rated capacity indicator/limiter

3.33.3 overload testing

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

3.33.4 overload testing

<static> operation of the lorry loader with a load exceeding the rated load applied but without operating the full range of motions of the lorry loader in order to determine whether the equipment is structurally sound and fit for the use for which it was designed

3.33.5 non-destructive testing (NDT)

testing carried out on the structure of the lorry loader to establish the presence, location and extent of any defects that could affect the integrity of that structure

NOTE The techniques employed for non-destructive testing are such that they do not damage or alter the material under test. NDT is also known as "non-destructive examination (NDE)".

3.33.6 stability testing

testing to verify the stability of the loader crane mounted on the unloaded vehicle

3.34 thorough examination

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

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

3.35 timber handling crane

loader crane specifically designed, manufactured and equipped with a grapple for the loading/unloading of unprepared timber (e.g. tree trunks, branches)

NOTE The operator controls the crane from a high seat or from a cabin.

3.36 use

<of work equipment> activity of any kind involving work equipment

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

3.37 user

person or organization that has control of the lifting operation and the lorry loader operator, and is responsible for ensuring that the lorry loader is properly maintained and thoroughly examined by a competent person

3.38 weight

vertical force exerted by a mass as a result of gravity

4 Management of the lifting operation

4.1 Safe system of work

A safe system of work should be established and followed for every lorry loader operation or lifting operation, whether it be an individual lift or a group of repetitive operations. The safe system of work should include:

- a) planning of the operation;
- b) selection, provision and use of a suitable lorry loader(s) and work equipment;

NOTE Lorry loader specifiers have a duty to ensure that lorry loaders are selected with sufficient capacity for the intended use. Lorry loader users have a duty to ensure that the lorry loader is only used for its intended purpose.

- c) any necessary preparation of the site;
- d) any setting up of the lorry loader(s), e.g. manual boom extensions or stabilizers;
- e) maintenance (including inspection), thorough examination and, where necessary, testing of the lorry loader(s) and equipment;

- f) 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 [5];
- g) adequate supervision by properly trained and competent personnel having the necessary authority;
- h) ensuring that all necessary reports of thorough examination and other documents are available;
- i) preventing unauthorized movement or use at all times;
- j) the safety of persons not involved in the lorry loader setting up or lifting operation;
- k) the need for the operator, unless in imminent danger, to remain in control of the lorry loader throughout the lifting operation.

The safe system of work should be communicated to all parties concerned with the lifting operation.

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

Lorry loaders are work equipment and it is essential that they are not used for the lifting of persons for entertainment purposes, including joyriding, bungee jumping and stunts.

4.2 Control of the lifting operation

4.2.1 General

In order to implement the safe system of work effectively, one person should be appointed to have overall control of the lifting operation to act on behalf of the management of the employing organization. The appointment of the person does not remove any legal responsibility from the management but enables them to use the appointed person's expertise, the better to fulfil their responsibilities. The person appointed may have other duties and need not be an employee of the employing organization. The appointed person should have adequate training and experience to enable these duties to be carried out competently.

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

NOTE In the case of a lorry loader delivering to a construction or industrial site, two appointed persons may be involved – the person appointed by the employer of the lorry loader operator and the person appointed by the person in control of the site where the lifting operation is being carried out.

4.2.2 Selection of appointed person

When selecting an appointed person, the employing organization should take into account the variety and complexity of the operation, as well as all the problems that could arise from proximity hazards

and environmental courses. The appointed person should be notified formally in writing of their appointment. The appointed person should be given authority to carry out the duties involved, including consulting others with specialist knowledge and experience, and should be able to delegate duties and tasks for any part of the safe system of work to suitably qualified individuals.

NOTE To assist in the selection of an appointed person, some examples of lifting operations that require different levels of expertise, training and experience, and that impose different duties on the appointed person, are given in 4.3.2.

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

4.2.3 Avoidance of collisions

On sites where there is a possibility of collision between the lorry loader and other plant (e.g. tower cranes, mobile cranes, mobile elevating work platforms (MEWPs) or concrete booms), the crane coordinator (see 7.2.5) should plan the sequence of lorry loader and plant movements to prevent collisions. Any corresponding instructions from the crane coordinator to the lorry loader operator and other plant operators should be given in an agreed format. In such circumstances the operators should obtain the agreement of the crane coordinator before carrying out any operation.

During pauses in the lifting operation or on completion of the lifting operation, the lorry loader and its components should be positioned to ensure that collisions cannot take place.

4.3 Duties of the person appointed to control the lifting operation

4.3.1 General

The appointed person's duties should include the following:

- assessing the lifting operation to provide such planning (including approval of all risk assessments, lift categorization and method statements), selection of lorry loader(s) and lifting accessories, instruction and supervision as is necessary for the task to be undertaken safely. This might include consultation with other responsible bodies to ensure effective collaboration;
- ensuring that adequate pre-operational checks, intermediate inspections, maintenance and thorough examination of the equipment have been carried out;

NOTE For further information, see BS 7121-2.

- ensuring that there is an effective procedure for reporting defects and incidents and taking any necessary corrective action;
- taking responsibility for the organization and control of the lifting operation;

- e) ensuring that the crane supervisor and other members of the lifting team are fully briefed on the contents, scope and limits of the method statement (see 6.3);
- f) being familiar with the relevant parts of the project Health and Safety Plan where the lifting operation is being carried out on a site where the Construction (Design and Management) Regulations [6] apply.

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

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

The duties of appointed persons for lorry loader operations can vary according to the complexity of the operation. The duties for a basic lift are considerably fewer and less demanding than for a complex lift. An appointed person employed for a basic lift might not be suitably trained or experienced for a more complicated operation, and another appointment could be required for this. The information given in 4.3.2 can be used so that an appropriate appointment is made and a suitable method statement produced for each lifting operation.

4.3.2 Lift categories

4.3.2.1 General

To enable lifts to be planned, supervised and carried out effectively, three categories of lift are detailed in 4.3.2.2, 4.3.2.3 and 4.3.2.4. The category into which a particular lift falls depends on the assessment of the hazards associated with both the environment in which the lift is to be carried out and the load and lifting equipment. As demonstrated in Figure 1, increases in either or both environmental complexity or load complexity (the Complexity Index) lead to the lift being allocated a higher category. Having identified the hazards associated with a particular lift, a hierarchy of control measures should be applied to eliminate or control those hazards and reduce the complexity.

Figure 1 Relationship between Complexity Index and lift category

Environmental complexity (E)	3	Complex	Complex	Complex
	2	Intermediate	Intermediate	Complex
	1	Basic	Intermediate	Complex
		1	2	3
	Load complexity (L)			

NOTE 1 Table 1 shows examples of where the same basic lifting task falls into different lift categories depending on differing environmental or load complexities.

NOTE 2 "Intermediate" was formally known as "standard".

4.3.2.2 Basic lift

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

- a) establishing the complexity of the lifting operation, including environmental and load complexity;

NOTE 1 Consideration of environmental hazards at the location of the operation includes the access and egress required for the lorry loader and the suitability of the ground to take the loads imposed by the lorry loader during preparation for the lift and during the lift itself.

NOTE 2 Load complexity includes characteristics such as weight, centre of gravity and presence of suitable lifting points. This can be established by a reliable source of information, measuring and weighing the load, or calculation (with allowance for possible inaccuracies).

- b) selecting the lorry loader, based on: the load characteristics, including weight of the load and any lifting accessories; the maximum height of lift and the maximum radius required. The rated capacity of the lorry loader is generally specified by the manufacturer/installer in the information for use supplied with the lorry loader. In cases where the lorry loader has been de-rated at time of thorough examination, the rated capacity stated on the current report of thorough examination, issued by the competent person, should be used. The manufacturer's sales leaflets should not be relied on for the rated capacity for a specific lorry loader;
- c) ensuring that the lorry loader is not operated in wind speeds in excess of those given in the instruction manual for the lorry loader. The wind area of the load should also be taken into account to ensure that its movement in the wind does not present a hazard (see Annex D for information on the Beaufort Scale);
- d) ensuring that the lorry loader has been thoroughly examined at least within the previous six months (for lifting of persons) or 12 months, inspected and checked before use. It is essential that the report of thorough examination, which confirms that the equipment is safe to use, is available;

NOTE 3 The report of thorough examination for the lorry loader should be carried with the vehicle.

- e) selecting appropriate lifting accessories, including their method of attachment to the load, configuration and any protection used to prevent damage;
- f) ensuring that lifting accessories are thoroughly examined, at least within the previous six months, inspected and checked before use. It is essential that the report of thorough examination is available to confirm that the lifting accessories are safe to use;
- g) ensuring that a system for reporting and rectifying defects is in place;
- h) designating a suitable person to check that the lifting accessories and any lifting points that are provided on the load are free from any obvious defects before attaching the load to the lorry loader;

- i) ensuring that the outcomes of the planning process are recorded in a risk assessment and method statement which should be signed by the appointed person;
- NOTE 4 In many instances, a basic lift may be covered by a generic risk assessment and a generic method statement provided that no additional hazards are identified on site.*
- j) briefing all persons involved in the lifting operation to ensure that the safe system of work described in the method statement is understood. All persons involved in the lifting operation should be instructed to seek advice from the appointed person if any change is required to the lifting operation, or if any doubts about safety arise. If one or more hand lines/tag lines are required to give more control of the load, the appointed person should designate persons to handle the lines;
- k) checking that no changes are required in the safe system of work if numerous loads are to be lifted over a long period;
- l) ensuring that there is a crane supervisor designated to direct personnel and that the operation is carried out in accordance with the method statement.

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

NOTE 5 For guidance on the combination of roles during a basic lift, see 7.3.

4.3.2.3 Intermediate lift

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

- a) identifying all significant hazards in the operating area, including any areas required for access or setting up of the lorry loader;
NOTE This might involve the appointed person visiting the site if he/she has any doubts about the quality of the information which has been provided.
- b) ensuring that a site-specific risk assessment and method statement, detailing control measures for the identified risks, are prepared;
- c) liaising with any other person or authority, as required to overcome any hazard, by including any necessary corrective action or special measures in the safe system of work;
- d) determining any requirement for personnel in addition to the lorry loader operator, such as a slinger, signaller or dedicated crane supervisor;
- e) considering the effect of the lifting operation on surrounding property or persons, including the general public. This should lead to arranging for appropriate action to minimize any adverse effects, and to giving appropriate notice to all persons concerned.

4.3.2.4 Complex lift

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

- a) identifying all exceptional hazards in the operating area, including any areas required for access or setting up of the lorry loader. This require the appointed person to visit the location of the planned lifting operation as part of the planning process;
- b) ensuring that the method statement includes access, ground conditions, setting up, etc., as well as the exact sequence of operations when lifting the load;
- c) preparing a detailed and dimensioned drawing of the site, the lorry loader and the load, identifying the load path, pick-up and set-down areas, together with the position of any exceptional hazards in the area. The information provided should be sufficient to enable the operator to position the lorry loader accurately;
- d) ensuring that, where persons are being lifted, the requirements of 18.1 are met;
- e) ensuring that, where the lifting operation requires more than one lorry loader or other crane to lift the load, the requirements of 18.2 are met.

NOTE 1 This does not apply to purpose-designed, vehicle-mounted container handling cranes with twin lifting units.

NOTE 2 It is good practice for the appointed person to be present on the site during a complex lift.

Table 1 Examples of the categorization of lifts based on environmental and load complexities

Task	Lift category		
	Basic	Intermediate	Complex
Unloading a pallet of goods using forks	The lorry loader operator has clear sight of the load path and the load is to be placed on the ground.	The load is to be placed over an obstruction such that the lorry loader operator might not have clear sight of the landing area from the control position.	The load is to be placed on a partially completed building at height, without line of sight, and with proximity hazards, such as scaffolding or overhead power lines.
	Complexity Index E1:L1	Complexity Index E2:L1	Complexity Index E2:L2
Delivering standard house roof trusses	The lorry loader operator has clear sight of the load path and the load is to be placed on the ground.	The roof trusses are to be placed on a partially completed building at height, without line of sight.	The roof trusses are to be placed on a partially completed building at height, without line of sight, and with proximity hazards, such as scaffolding or overhead power lines.
	Complexity Index E1:L1	Complexity Index E2:L1	Complexity Index E3:L1

Table 1 Examples of the categorization of lifts based on environmental and load complexities (continued)

Task	Lift category		
	Basic	Intermediate	Complex
Delivering temporary buildings and placing in position	The lorry loader operator has clear sight of the load path (buildings and stairs) and the load is to be placed on the ground or double stacked with a lorry loader with sufficient reach and height.	The lorry loader operator does not have a clear sight of the load path (buildings and stairs) and the load is to be placed on the ground or double stacked with a lorry loader with sufficient reach and height.	Rows of linked temporary buildings are to be triple stacked, and additional hazards are present, such as persons working at height, no line of sight between the lorry loader operator and the load or other personnel, and limitations of outreach and height of the lorry loader.
	Complexity Index E1:L1	Complexity Index E2:L1	Complexity Index E3:L2
		Rows of linked temporary buildings are to be double stacked, and additional hazards are present, such as persons working at height or no line of sight between the lorry loader operator and the load or other personnel. Complexity Index E2:L1	
		Stair/landing assemblies are to be lifted/installed into multi-cabin complexes. The load is unstable. Complexity Index E2:L2	
Delivering a loading platform to a construction site and unloading	The lorry loader operator has clear sight of the load path and the load is to be placed on the ground.	The loading platform is to be unloaded and assembled on a construction site, and additional hazards owing to the assembly are present. These might include instability of the load during assembly and the proximity of people involved in the assembly.	The loading platform is to be unloaded, assembled and lifted into position on a construction site, and additional hazards are present owing to both the assembly and the installation of the structure at height. These might include instability of the load during assembly, the proximity of people involved in the assembly, people working at height close to an unprotected edge and proximity hazards, such as scaffolding.
	Complexity Index E1:L1	Complexity Index E2:L2	Complexity Index E3:L2

Table 1 Examples of the categorization of lifts based on environmental and load complexities (continued)

Task	Lift category		
	Basic	Intermediate	Complex
Lifting persons	The persons are to be lifted using a loader crane with an integrated work platform conforming to BS EN 280 and operating in an environment with no significant hazards.		The persons are to be lifted in a man-riding basket suspended from a loader crane not specially designed for the purpose.
	Complexity Index E1:L1		Complexity Index E1:L3
			The persons are to be lifted in a non-integrated basket attached to the boom of a loader crane.
			Complexity Index E2:L3
			The persons are to be lifted in a man-riding basket suspended from a loader crane not specially designed for the purpose with additional hazards, such as the lowering of a person into a deep shaft in a man-riding basket attached to hoisting winch hook.
			Complexity Index E3:L3
Grabs	Spoil from an excavation is to be handled with a clear view of the load path.	An object in an excavation is to be handled with people in proximity and clear view of load path.	An object in an excavation is to be handled with people in proximity without a clear view of load path.
	Complexity Index E1:L1	Complexity Index E2:L1	Complexity Index E3:L1
Delivering and placing a grand piano		The piano is to be delivered and unloaded to the side of the vehicle at street level. The load is without lifting points and hazards include the proximity of the public.	The piano is to be delivered, unloaded and placed into a third-storey apartment building through a window opening. Additional hazards might include the presence of the public, trees or traffic, the load itself, the location of cellars and basements, access into the building (window), or overhead power and telephone lines.
		Complexity Index E2:L2	Complexity Index E3:L2

Table 1 Examples of the categorization of lifts based on environmental and load complexities (continued)

Task	Lift category		
	Basic	Intermediate	Complex
Delivering and collecting a large rectangular tank	The lorry loader operator has clear sight of the load path, the tank is to be placed on the ground, the tank is empty and it has integral lifting points.	An empty tank is to be placed over an obstruction such that the lorry loader operator might not have clear site of the landing area.	A partially full tank is to be lifted from a position above ground level, the weight of the load is not accurately known and the centre of gravity is likely to shift during lifting. There are no integral lifting points.
Lifting a boat	Complexity Index E1:L1 The lorry loader operator has clear sight of the load path and the load is to be placed on the ground.	Complexity Index E2:L1 The boat is to be lifted into water and additional hazards are present owing to the presence of water and the need to release slings adjacent to water.	Complexity Index E2:L3 The boat is to be lifted from water, the weight of the load is not accurately known and the centre of gravity is likely to shift during lifting.
Handling forestry timber	Complexity Index E1:L1 A vehicle is to be loaded with felled timber in a forestry environment using a timber handling crane.	Complexity Index E2:L1 Felled timber is to be unloaded from a vehicle in a saw mill using a timber handling crane.	Complexity Index E2:L3 Felled timber is to be loaded onto a rail wagon using a timber handling crane.
Lifting lamp standards	Complexity Index E1:L1 A vehicle is to be loaded with new lamp standards in a depot.	Complexity Index E2:L1 Old lamp standards are to be unloaded in a depot with a risk that the standard will collapse owing to age and corrosion.	Complexity Index E3:L1 Old lamp standards are to be extracted adjacent to a live carriageway.
Delivering and collecting refuse and recycling containers	Complexity Index E1:L1 A vehicle is to be loaded with a container in a depot.	Complexity Index E1:L2 A container is to be loaded or unloaded in a supermarket car park.	Complexity Index E3:L2 A container is to be loaded or unloaded adjacent to a children's playground.
	Complexity Index E1:L1	Complexity Index E2:L1	Complexity Index E3:L1

NOTE This list is not exhaustive and the examples are given as illustrations of the lift categorization. It is the responsibility of the appointed person to ensure that all risks have been identified, assessed and eliminated or controlled.

4.4 Duties of the persons involved in construction projects

The Construction (Design and Management) (CDM) Regulations [6] require that designers, CDM coordinators, principal contractors, sub-contractors and clients consider health and safety matters throughout all stages of a construction project from conception, design and planning through to carrying out the work, including maintenance, repair and/or demolition.

Lifting operations are commonly carried out using cranes (including lorry loaders) and they should be included in the Health and Safety

Plan required by the Regulations [6] so that factors influencing crane and lorry loader safety can be assessed at a sufficiently early stage.

When constructing the Plan, the ways in which the cranes (including lorry loaders) are intended to be used, i.e. by the manufacturer and hirer, and any limitations in the conditions expected on site that would affect safety should be taken into account.

The Plan should include information to allow all parties involved in the specification, installation or use of cranes (including lorry loaders) to be made aware of the fundamental criteria and planning issues needed to ensure that lifting operations are initiated and proceed in a logical and safe manner.

Designers should obtain and make available to the CDM coordinator, information relating to the site and type(s) of lorry loader to be used.

When designing a structure to be assembled by cranes (including lorry loaders), designers should consult an appropriate appointed person at the design stage to ensure compatibility between structure components and the cranes (including lorry loaders) that are likely to be lifting them into position. Further advice is given in the Construction Industry Council General Information Note I 002 [7].

NOTE Contractors have a duty to operate cranes (including lorry loaders) safely, and this can be made extremely difficult by thoughtless design which puts pressure on them to use lorry loaders at their operating limits and sometimes encourages improper use.

5 Contract lift or lorry loader hire

5.1 General

Given the wide variety of contractual arrangements, it is important to that the planning, organization control and management of lifting operations are not compromised. In general, any organization requiring a load to be moved by lorry loader, which does not have its own lifting equipment, has two basic options: hiring a lorry loader (hired lorry loader) or employing a contractor to carry out the lifting operation (contract lift). The difference between the two options is summarized in Figure 2.

In the case of lorry loaders, the contract lift includes three possibilities:

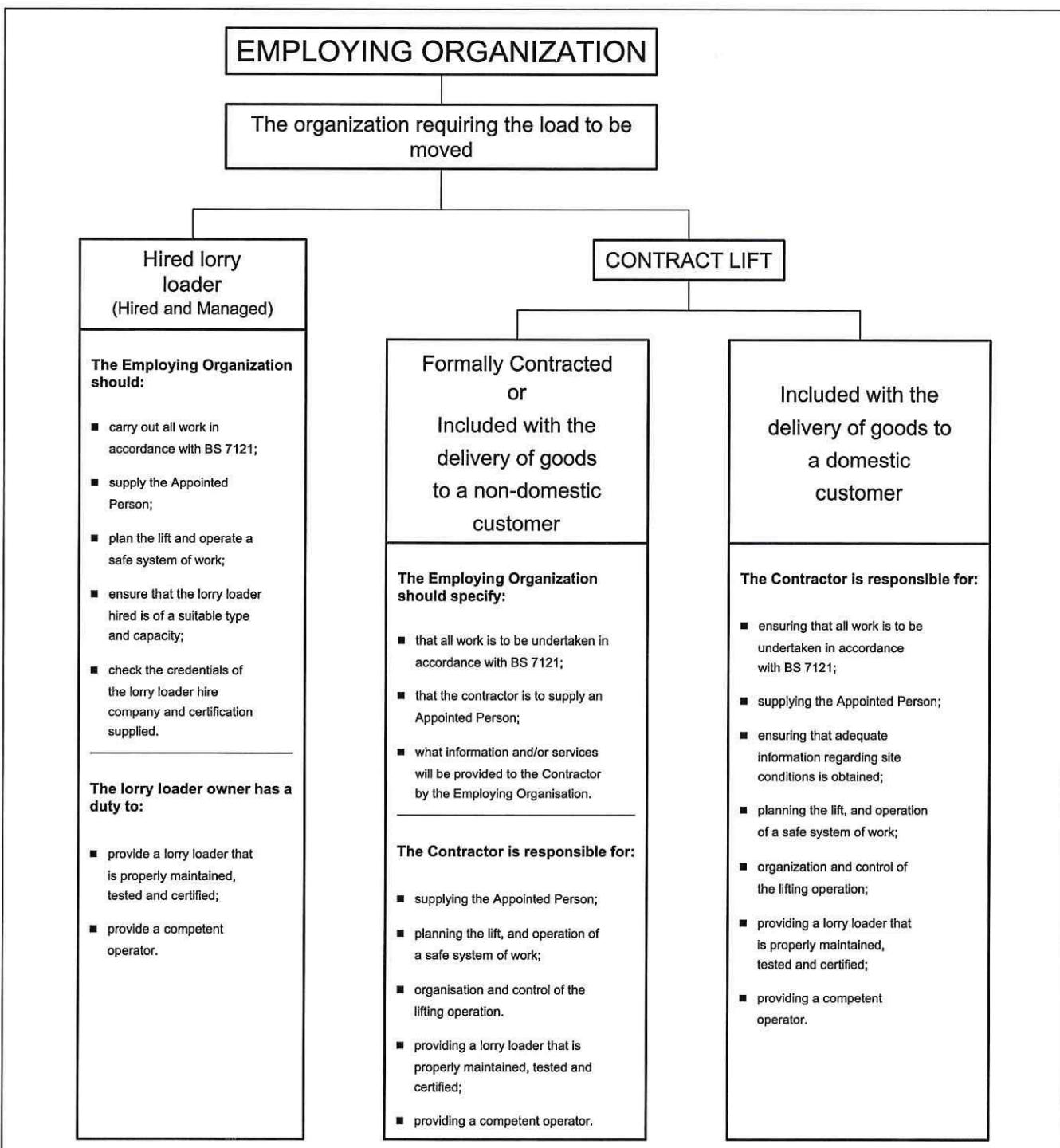
- a) a formal contract lift, as with a mobile crane, where a lorry loader owner is contracted by an employing organization to move a load on their behalf using a lorry loader;
- b) lifting operations as part of the supply and delivery of goods to a non-domestic customer, e.g. where a builder's merchant is delivering packs of blocks to a construction site on a vehicle and unloads the blocks using a loader crane mounted on the delivery vehicle;
- c) lifting operations as part of the supply and delivery of goods to a domestic customer, e.g. where a builder's merchant is delivering packs of blocks to a householder on a vehicle and unloads the blocks using a lorry loader.

NOTE 1 In option c), the lorry loader supplier assumes full responsibility for all aspects of the lifting operation as the householder would not be expected to have sufficient knowledge to advise the supplier of any significant hazards or be aware of the requirements of LOLER [1] and BS 7121.

If an individual or organization does not have expertise in lifting operations, they should not hire lorry loaders but should opt for a contract lift. Before entering into a contract, employing organizations should satisfy themselves that the contractor has the necessary competence to carry out the work.

NOTE 2 Responsibilities for insurance in terms of the lorry loader, personnel, the load and third parties might also need to be clarified.

Figure 2 Contract options



5.2 Contract lifting operations

5.2.1 Formally contracted lifting

The employing organization may enter into a contract with a contractor who undertakes the work on their behalf.

The parties to the contract should ensure that:

- a) all work is carried out in accordance with the BS 7121 series;
- b) the contractor appoints a person, in accordance with 4.3, to the satisfaction of the employing organization;
- c) all information or services provided by the employing organization to facilitate compliance with the BS 7121 series are notified to the contractor in writing.

The contractor should carry out lifting operations in accordance with the BS 7121 series. The contractor should be given full authority by the employing organization to work in accordance with the BS 7121 series including, where appropriate, authority to control and instruct the employing organization's personnel.

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

Before entering into a contract, employing organizations should confirm that the contractor has the necessary competence to carry out the work in accordance with the BS 7121 series.

5.2.2 Contract lifting as part of the supply and delivery of goods to a non-domestic customer

An organization requesting the supply and delivery of goods (the employing organization) which involves a lifting operation with a lorry loader to unload the goods from the delivery vehicle, is entering into a de facto contract lift agreement with the person delivering the goods (the contractor).

The parties to the contract for supply should ensure that:

- a) all work is carried out in accordance with the BS 7121 series;
- b) the contractor appoints a person, in accordance with 4.3, to the satisfaction of the employing organization;
- c) all information or services provided by the employing organization to facilitate compliance with the BS 7121 series are notified to the contractor in writing.

The contractor should carry out lifting operations in accordance with the BS 7121 series. The contractor should be given full authority by the employing organization to work in accordance with the BS 7121 series including, where appropriate, authority to control and instruct the employing organization's personnel.

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

Before entering into a contract, employing organizations should confirm that the contractor has the necessary competence to carry out the work in accordance with the BS 7121 series.

5.2.3 Contract lifting as part of the supply and delivery of goods to a domestic customer

The domestic customer requesting the supply and delivery of goods which involves a lifting operation with a lorry loader to unload the goods from the delivery vehicle is entering into a de facto contract lift agreement with the person delivering the goods (the contractor).

The contractor should ensure that:

- a) a person is appointed, in accordance with 4.3;
- b) adequate information regarding site conditions is obtained;
- c) the lift is planned and a safe system of work is followed;
- d) the lifting operation is appropriately supervised and carried out in a safe manner;
- e) the lorry loader provided is properly maintained, inspected and thoroughly examined;
- f) a competent operator is provided.

The contractor should carry out lifting operations in accordance with the BS 7121 series.

NOTE 1 Although the BS 7121 series is intended to assist organizations to comply with their statutory and common law obligations, it does not relieve them from these obligations.

NOTE 2 The lorry loader supplier will assume full responsibility for all aspects of the lifting operation as the householder would not be expected to have sufficient knowledge to advise the supplier of any significant hazards or be aware of the requirements of LOLER [1] and BS 7121.

5.3 User's duties when using hired lorry loaders

When a lorry loader is hired out together with an operator to the user organization, the lorry loader owner should provide a competent operator and a lorry loader that is properly maintained, inspected and tested in accordance with BS 7121-2, and has a current report of thorough examination.

The user organization retains the responsibility for nominating the appointed person in accordance with 4.3 and for following the recommendations given in the BS 7121 series. Notwithstanding any advice the lorry loader owner might have offered concerning the selection of a particular lorry loader or any other relevant matter (e.g. clearances or ground conditions), the responsibility for ensuring that the lorry loader is of a suitable type, size and capacity for the task being undertaken and for planning the operation remains with the user organization.

Therefore, if an individual or organization does not have expertise in lifting operations, they should not hire lorry loaders but should opt for a contract lift.

NOTE In the event that a lorry loader is hired without an operator, all of the these points apply.

6 Planning of the lifting operation

6.1 General

All lifting operations should be planned so that they can be carried out safely and all foreseeable risks are taken into account. Planning should be carried out by an appointed person who has the appropriate knowledge for the lift being undertaken (see 4.3.2).

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

NOTE 1 For lifting operations carried out on construction projects, further information on the duties of personnel is given in 4.4.

Planning of the lifting operation should take into account:

- a) the load, its characteristics and the method of lifting paying particular attention when loads are lifted out of water, e.g. flow, suction and loss of buoyancy;

NOTE 2 It might also be necessary to make allowance for any adhesion between the load and its support.

- b) the stability of the load when being lifted and set down;
- c) the selection of a suitable lorry loader(s) appropriate to the operation so that adequate clearances are maintained between the load(s) and the lorry loader structure (see Clause 9);
- d) the selection of lifting accessories/attachments, the weight to be taken into account when assessing the load on the lorry loader(s);
- e) the position of the lorry loader(s) and of the load before, during and after the operation;
- f) the site of the operation including proximity hazards, space availability, suitability of the ground or foundations and other environmental conditions;
- g) any necessary set up of the lorry loader(s);
- h) the identification and selection of personnel for the lifting operation.

NOTE 3 Lone working is to be avoided wherever possible. Where this is not possible, it is essential that suitable measures are put in place to minimize risk to the lone worker.

6.2 Risk assessment

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

NOTE 1 Attention is drawn to the Management of Health and Safety at Work Regulations [8] which require a risk assessment to be carried out.

Generic risk assessments are unlikely to be sufficient, other than for basic lifts (see 4.3.2.2), since most sites have unique hazards which should be taken into account in the separate site-specific assessment.

The results of the risk assessment should be recorded in writing and used in the preparation of the method statement (see 6.3).

NOTE 2 The employing organization needs to inform the appointed person of hazards identified by the overall site risk assessments.

6.3 Method statements

6.3.1 General

Once the risk assessment has been carried out, the appointed person should ensure that a method statement is prepared, detailing the safe system of work (see 4.1) for the lifting operation and including the risk assessment.

The appointed person should, when necessary, consult with others with specialized knowledge and experience to assist in the planning process for which the appointed person retains responsibility.

The method statement should include:

- a) the tasks to be achieved;
- b) details of the steps to be taken to eliminate danger to personnel not involved in the lifting operation, and, where necessary, prevent their entry into danger zones, e.g. by organizing for road closures;
- c) the requirement for pre-use checks to be completed;
- d) a clear statement of the allocation of tasks to all parties involved in the lifting operation.

The crane supervisor should ensure that the lifting team are inducted in the general site precautions and the specific features of the method statement at the start of the job.

A copy of the method statement and associated operating instructions should be made available to all those involved in the lifting operation.

6.3.2 Team briefing/induction

It is essential that the method statement is sufficient to provide the basis of a briefing or induction for each member of the team. This should include:

- a) a description of the item to be lifted;
- b) its weight;
- c) its dimensions;
- d) lifting points/method;
- e) type of lifting accessories to be used and configuration;
- f) pick up and landing points referenced to the site plan;
- g) the height of the lift and the maximum radius;

- h) the model and configuration of lorry loader to be used;
- i) stabilizer support arrangements;
- j) overhead hazards;
- k) underground hazards;
- l) personnel involved.

The crane supervisor, site owner or principal contractor's representative should normally take the opportunity during the site induction to seek the views of the team about any arrangements for health and safety that might be relevant to them.

To be effective, the method statement needs to specify clear roles for each member of the team. Arrangements for effective communication among the team (and if necessary with adjacent lorry loader operators in case of danger) should be available.

7 Selection and duties of personnel

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

7.1 Selection of personnel

Safe lifting operations depend upon the selection of suitable personnel who are competent to carry out the required duties. Records of training and experience of persons, such as the lorry loader operator, assist in the selection of suitable personnel. The appointed person should be trained in accordance with Annex A. The lorry loader operator and slinger(s) should be trained in accordance with Annex B.

Those responsible for the selection of personnel should ensure that the personnel involved in the operation are efficiently organized so that there is good teamwork in the working situation.

Work associated with lifting operations should not be carried out by personnel whose efficiency is impaired by alcohol, drugs or other influences. It is essential that all personnel in the team are made aware of both this fact and their other duties (see 7.2).

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

7.2 Duties of personnel

7.2.1 Lorry loader operator

The lorry loader 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), as detailed in the method statement.

The lorry loader operator should at any one time respond only to the signals from one slinger/signaller (in the case where separate slingers/signallers are provided), who should be clearly identified (see 10.3).

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

7.2.2 Slinger

The slinger should be responsible for:

- a) attaching and detaching the load to and from the lorry loader load lifting attachment;
- b) using the correct lifting accessories and other equipment in accordance with the planning of the operation.

The slinger should also be responsible for initiating and directing the safe movement of the lorry loader [see 8.3h)]. 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. Where continuity of signalling is required and this slinger is not visible to the lorry loader operator, another slinger or signaller might be necessary to relay signals to the lorry loader operator. Alternatively, other audio or visual methods may be used.

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

Typical examples of audio or visual methods used are as follows.

- 1) A blank screen on a monitor immediately indicates that the operator needs to stop all lorry loader movements.
- 2) A slinger using a radio continuously instructs the operator to lower a load, e.g. by saying "Lower-lower-lower...", and failure of this continuous instruction from the slinger indicates that the operator needs to stop 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 lorry loader 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. Furthermore, the lorry loader operator and the new nominated person should clearly indicate that they accept the transfer of responsibility.

7.2.3 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.

7.2.4 Crane supervisor

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

NOTE *The appointed person may decide to undertake the duties of the crane supervisor or to delegate these to another person with appropriate expertise for the lifting operation, such as the lorry loader operator, where appropriate for basic and intermediate lifts.*

7.2.5 Crane coordinator

The crane coordinator should plan and direct the sequence of operations of cranes, including lorry loaders, so that they do not collide with other cranes, loads and other equipment (e.g. concrete placing booms, telehandlers, piling rigs).

7.2.6 Maintenance personnel

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

7.3 Combination of roles

In certain circumstances, it might be possible to combine some of the roles of members of the lifting team (see Table 2). However, the combination of roles should only take place following a review of the lifting operation by the appointed person.

It should be noted that an appointed person is required to plan all lifting operations. It is also good practice for the appointed person to be present on site during a complex lift.

It might be appropriate for the appointed person to assume other roles such as crane supervisor, lorry loader operator or slinger/signaller.

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

Table 2 Combination of lifting team roles^{A)}

Activity	Role	Lift category		
		Basic	Intermediate	Complex
Planning	Appointed person	Required	Required	Required
Site visit	Appointed person	Not essential	Might be required	Required
Lifting operation	Appointed person	Not essential	Might be required	Required
	Crane supervisor			Required
	Lorry loader operator	Roles may be combined	Roles may be combined	Required
	Slinger/signaller			Required

^{A)} This table is for guidance and should not be taken as definitive for every circumstance. It is the responsibility of the appointed person to determine the combination of roles for each lifting operation.

8 Minimum attributes of personnel

8.1 General

All personnel should be:

- a) competent to perform the tasks required of them;
- b) adequately trained and/or successfully assessed;
- c) able to present a record of training and assessment;
- d) physically able to carry out the work.

NOTE Competency requirements for lorry loader operators, slingers, signallers and assessors are given in BS ISO 15513.

8.2 Lorry loader operator

The lorry loader operator should be:

- a) fit, with particular regard to eyesight, hearing, reflexes and mobility;
- b) physically able to operate the lorry loader safely;
- c) able to judge distances, heights and clearances;
- d) adequately trained and assessed for the specific model of lorry loader and its accessories, and have sufficient knowledge of the lorry loader, its operating instructions and its safety devices;
- e) adequately trained and assessed by their employer in job-specific duties, including any generic risk assessments and method statements;
- f) fully conversant with the duties of the slinger and signaller, and with the signal code shown in 16.4, and any alternative methods of relaying the signals that are to be used, in order to implement safely the instruction of the slinger or signaller;
- g) authorized to operate the lorry loader.

Evidence that the operator is medically fit to operate a lorry loader should be obtained on employment and, subsequently, at yearly intervals. The type of evidence obtained is dependent on the type of lorry loader being operated and the risks to the operator and others involved in the operation. Based on this evidence, a supplementary medical examination might be required.

8.3 Slinger

The slinger should have been assessed as competent unless they are undergoing training and are under the direct supervision of a person competent for the purpose of training.

The slinger should also be:

- a) fit, with particular regard to eyesight, hearing, reflexes and mobility;
- b) physically able to handle lifting accessories and equipment;

- c) able to establish weights, balance loads and judge distances, heights and clearances;
- d) trained in the techniques of slinging;
- e) capable of selecting lifting accessories and equipment in suitable condition for the load to be lifted;
- f) trained in the techniques of signalling and the signal code shown in 16.4;
- g) capable of giving precise and clear verbal instructions where audio equipment (e.g. radio) is used and capable of operating the equipment in accordance with 16.4;
- h) capable of initiating and directing the safe movement of the lorry loader and the load;
- i) authorized to carry out slinging duties.

8.4 Signaller

The signaller should have been assessed as competent unless they are undergoing training and are under the direct supervision of a person competent for the purpose of training.

The signaller should also be:

- a) fit, with particular regard to eyesight, hearing, reflexes and mobility;
- b) able to judge distances, heights and clearances;
- c) trained in the techniques of signalling and the signal code shown in 16.4;
- d) capable of giving precise and clear verbal instructions where audio equipment (e.g. radio) is employed and capable of operating the equipment in accordance with 16.4;
- e) capable of directing the safe movement of the lorry loader and the load;
- f) authorized to carry out signalling duties;
- g) aware of the responsibilities allocated by the appointed person to the lorry loader operator and slinger.

8.5 Crane supervisor

The crane supervisor should be:

- a) authorized to carry out the duties listed in 7.2.4;
- b) fully conversant with the duties of all persons involved in the lifting operation;
- c) able to give clear, unambiguous instructions to all other members of the team;
- d) able to assess danger to the lifting operation from changed circumstances on site, and to call a halt to the operation if the risk becomes unacceptable, so that the appointed person can be referred to for further instructions if necessary.

8.6 Crane coordinator

The crane coordinator should be:

- a) fit, with particular regard to eyesight, hearing, reflexes and mobility;
- b) capable of giving precise and clear verbal instructions where audio equipment (e.g. radio) is employed, and capable of operating such equipment in accordance with 16.4.

8.7 Maintenance personnel

Maintenance personnel should be:

- a) fully conversant with the machinery they are required to maintain and its hazards;
- b) properly instructed and trained. Where special machinery is involved, this should include attending appropriate courses given by the supplier of the equipment;
- c) familiar with the procedures and precautions recommended in Clause 13;
- d) fully conversant with the appropriate sections of the manufacturer's instruction manual;
- e) familiar with the use of "permit to work" systems, where required by the safe system of work, and able to operate them correctly;
- f) familiar with all aspects of their personal protective equipment and capable of using it correctly.

9 Selection of lorry loaders

An effective and safe lorry loader is one in which the vehicle and loader crane are well matched to the type and size of load to be carried and lifted.

NOTE 1 Attention is drawn to the legal requirements relating to road vehicles, such as the Road Traffic Act 1988 [9] and the Road Vehicles (Construction and Use) Regulations 1986 [10].

Consideration should be given to:

- a) the weight, dimensions and characteristics of the lorry loader and the load(s) to be lifted;
- b) the operation, speed, radii, height of lift and areas of movement;
- c) the number, frequency and types of lifting operation;
- d) the space available for lorry loader access, deployment, operation and stowage, including the space required for correct deployment of stabilizers;
- e) the control position which is most suitable for the lifting operation. The control position should be selected so that the lorry loader operator has an adequate view of the load path and that he/she is adequately protected from crushing hazards;

NOTE 2 A choice of control position is normally available which includes dual position, high seat or remote controls.

- f) the need for motion limiting devices, such as slewing arc or height limiters;
- g) the effect of the operating environment on the lorry loader.

NOTE 3 Timber handling cranes are specialist forestry equipment and are not suitable for general lifting operations.

10 Safety

10.1 General

The person or organization having overall control of the place of work, and the employers of personnel involved in the lifting operation, have responsibility for safety. In order that this responsibility can be effectively discharged, the appointed person (see 4.3) should be given the necessary authority to ensure that adequate systems to achieve safety are in operation. Safety matters relating to lifting operations include the use, maintenance, repair and renewal of safety equipment and the instruction, and allocation of responsibilities to the various personnel in relation to the equipment.

10.2 Modifications and materials

Modifications to the structure, controls systems or any other part of the lorry loader may only be carried out with the written approval of the lorry loader manufacturer, or, where the lorry loader manufacturer is no longer in existence, a competent engineer familiar with the design of the particular lorry loader.

Many lorry loader parts are constructed from special materials and may only be repaired or replaced in accordance with the manufacturer's specification. Records should be kept of all major component repairs or replacements.

Welding or other heat treatments should be carried out in accordance with the manufacturer's specification.

Nuts and bolts manufactured from high tensile steel or other special steels carry markings so that they can be distinguished from other nuts and bolts. It is important that high tensile bolts are tightened to a specified preload so that torsional loads are transferred across the joint by friction, rather than by shear across the bolt shank, and that there is sufficient preload on the joint to reduce the effects of cyclic loading (fatigue). It is essential that the re-use of high tensile bolts is in accordance with the manufacturer's conditions.

Bolts used to secure slew rings should be renewed whenever they are removed. They should only be tightened in accordance with the manufacturer's instructions.

10.3 Identification of person directing movements

Where a person is required to direct lorry loader movements (slinger or signaller), they should be easily identifiable to the lorry loader operator, e.g. by wearing high visibility clothing if appropriate.

NOTE When choosing high visibility clothing, backgrounds, type of illumination and other relevant factors ought to be taken into account.

10.4 Provision and use of personal protective equipment

The appointed person should ensure that:

- a) personal safety equipment is available that is appropriate for the conditions of the location, such as helmets, safety spectacles, fall protection equipment, safety boots, ear defenders, high-visibility clothing and life jackets or other buoyancy aids;
- b) equipment is inspected before and after use and maintained in good working order or replaced, where appropriate;
- c) a record of inspection and repairs is maintained where appropriate.

NOTE 1 Further information on the selection, use and maintenance of personal fall protection systems and equipment is given in BS 8437.

Certain safety equipment (e.g. helmets, safety spectacles and fall protection equipment) can deteriorate with age and should therefore be considered for renewal periodically. Damaged safety equipment should be replaced immediately.

NOTE 2 The Health and Safety at Work etc. Act [5] and the Personal Protective Equipment at Work Regulations [11] require that employees cooperate with their employer by using and reporting defects in appropriate personal protective equipment provided for their safety.

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.

It is essential that personnel are instructed in the correct use of the personal protective equipment provided.

10.5 Access and egress (including emergency escape)

10.5.1 General

Requirements for safe access and means of emergency escape are specified in BS EN 12999. All access should be maintained in a good condition, including that for the operating position(s) and the load bed of the lorry loader, and any additional access provided for inspection, maintenance and repair of the lorry loader.

NOTE Attention is drawn to the Work at Height Regulations 2005 [12] regarding the provisions for safe access and rescue.

10.5.2 Boarding and leaving the vehicle load area

No person should be permitted to board or leave without first obtaining the lorry loader operator's permission. The lorry loader operator should be aware of the precautions that are necessary while the person is boarding or leaving and should take them. Personnel should be instructed to use (and should use) only the proper access points.

10.6 Limiting and indicating devices

10.6.1 General

The correct operation of all limiting and indicating devices should be verified regularly and they should be maintained in good working order in accordance with the manufacturer's instructions.

10.6.2 Motion limiting devices

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

10.6.3 Rated capacity indicator and limiter

The function of the RCI/L should be confirmed during the pre-use inspections.

10.6.4 Level indicators and inclinometers

Where fitted, lorry loader level indicators and inclinometers should be used in accordance with the instruction manual and maintained in good working order.

10.6.5 Wind-speed indicating and monitoring devices

Where fitted, anemometers or other wind-speed measuring devices should have their indicators located in clear view of the lorry loader operator and, if appropriate, the person controlling the lift. The correct operation of these devices should be determined regularly and they should be maintained in good working order.

NOTE Frequent calibration of wind-speed indicators is not generally required as they are an indicator to the lorry loader operator to assist in a judgement about when to take a lorry loader out of service because of increasing wind speed.

10.7 Machinery guarding

All machinery guarding should be maintained in good condition.

10.8 Boom "over height" indicator

The function of the boom "over height" indicator should be confirmed during the pre-use inspections.

10.9 Stabilizer "not locked in transport position" indicator

On lorry loaders with manual stabilizer beam extensions, the function of the stabilizer "not locked in transport position" indicator should be confirmed during the pre-use inspections, where fitted.

11 Lorry loader documentation

11.1 Rated capacity charts

Readily understandable rated capacity charts should be prominently displayed to the lorry loader operator. Rated capacity charts for special applications should be available in the lorry loader operator's handbook. The lorry loader should not be operated outside these parameters.

11.2 Instruction manuals

Instruction manuals in the appropriate language(s) should be kept with the lorry loader.

11.3 Reports of thorough examination/test certificates

Copies of current reports of thorough examination and any current test certificates for lorry loaders and lifting accessories should be kept with the lorry loader.

11.4 Records

In order to enable the condition of the lorry loader to be determined and its fitness for further operation to be properly assessed, records should be maintained, which include the following:

- a) technical information, including maintenance instructions and performance data provided by the manufacturer;
- b) test certificates, reports of thorough examinations and records of inspections carried out on the lorry loader (whether statutory or not);
- c) records of significant repairs and modifications to the lorry loader including renewal of major parts and confirmation of completion including signatures of responsible person(s);
- d) records of planned preventive maintenance and inspection.

12 Siting of the lorry loader

12.1 General

The siting of the lorry loader should take account of all the factors that might affect its safe operation, particularly the following:

- a) the standing and support conditions;
- b) the presence and proximity of other hazards;
- c) the impact of environmental conditions, e.g. the effect of wind;
- d) the adequacy of access to allow the positioning and set up of the lorry loader for the lifting operation, and for its stowage and egress after completion of lifting operations;
- e) hazards associated with working on or adjacent to a highway.

NOTE 1 Attention is drawn to the New Roads and Street Works Act 1991 [13].

NOTE 2 Further details regarding the siting of lorry loaders are given in the Association of Lorry Loader Manufacturers and Importers (ALLMI) publication Code of practice for the installation, application and operation of lorry loaders [14].

12.2 Standing and support conditions

The appointed person should ensure that the loads imposed by lorry loaders can be sustained by the ground. This might require the appointed person to seek specialist guidance and information.

NOTE Guidance on the assessment of ground conditions is given in CIRIA publication C703 [15] and ALLMI Guidance Note 016 [16].

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

When arriving on site, particular attention should be given to the ground the vehicle will be standing on and any potential hazards in the surrounding area. The person assessing the ground should ensure that the supporting ground is firm and can take the weight of the vehicle. The highest pressures upon the ground are likely to occur under the stabilizer feet and it is here that the use of special packing is required, in order to spread the load and protect the surface. Such packing materials should be sufficiently strong to withstand the loadings imposed by a fully loaded vehicle and its loader crane when working. It is beneficial to carry out a "dry run" without the load, before the lifting operation is carried out.

Particular care should be taken to ensure that tyres and stabilizers are not positioned close to excavations, cellars, ground cavities, drains, trenches, soakaways, underground services etc., or on weak decking of any sort. Special reinforcement could be required if these cannot be avoided. When lifting operations are being undertaken on paved areas, such as car parks, pavements and driveways, additional care should be taken to ensure that they are able to sustain the loads imposed by the vehicle and the stabilizers.

Lorry loaders should not be operated on slopes in excess of those stated in the operator's handbook (see Figure 3).

12.3 Proximity hazards

12.3.1 General

Consideration should be given to the presence of proximity hazards, such as:

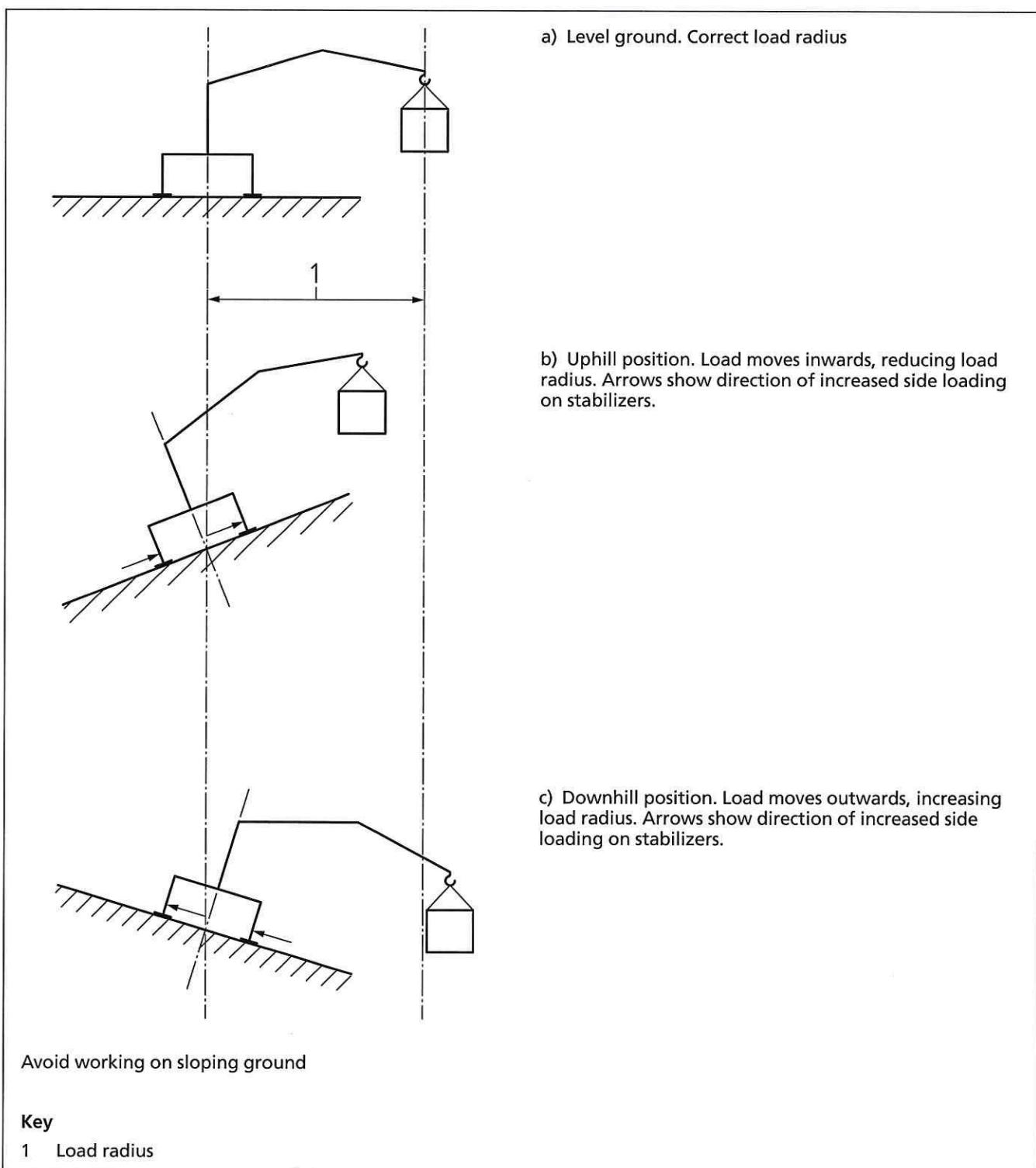
- a) overhead electric lines or cables (see also 12.3.2);
- b) nearby structures;
- c) other lorry loaders, vehicles or ships being loaded or unloaded;
- d) stacked goods; and
- e) public access areas including highways, railways and rivers.

Where any part of the lorry loader or its load cannot be kept clear of such hazards, the appropriate authority should be consulted.

The danger to or from underground services, such as gas mains or electric cables, should not be overlooked. Precautions should be taken so that the lorry loader is clear of any underground services or, where this is not possible, that the services are adequately protected against damage.

At any place where a lorry loader or its load passes an obstacle, effective precautions should be taken to prevent access to any trapping hazards.

Figure 3 Adverse effect of sloping ground on the load radius and stabilizers



12.3.2 Electric cables

The lorry loader operator and other persons nearby can be killed if the lorry loader, or its load, touches or comes too close to overhead electric cables. A lorry loader operator controlling the lorry loader 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 boom length from overhead lines which are supported on steel towers, or within a distance of 9 m plus the maximum boom length from overhead lines which are supported on wood, concrete or steel poles. The authority will either arrange to isolate the supply or provide a specific minimum safe approach distance.

It is recommended that a warning plate (see Figure 4) be permanently mounted where it can always be seen from the control positions.

Detailed guidance is available in HSE Guidance Note GS 6 and this 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 boom raised or extended. Regular travel under cables should only be by a route marked with goalposts (see Figure 5).

If contact with an overhead line occurs 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. If it is necessary to leave the vehicle, e.g. because of a fire, jump off. Do not climb down.
- b) If operating the lorry loader 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.

While the hazard persists, a responsible person should remain near the loader to warn of the danger.

Where lorry loaders are frequently used in the vicinity of overhead power lines, consideration should be given to the fitment of height limiters which require an intervention by the lorry loader operator to exceed a pre-determined height.

Figure 4 Example of a warning plate for overhead electric cables

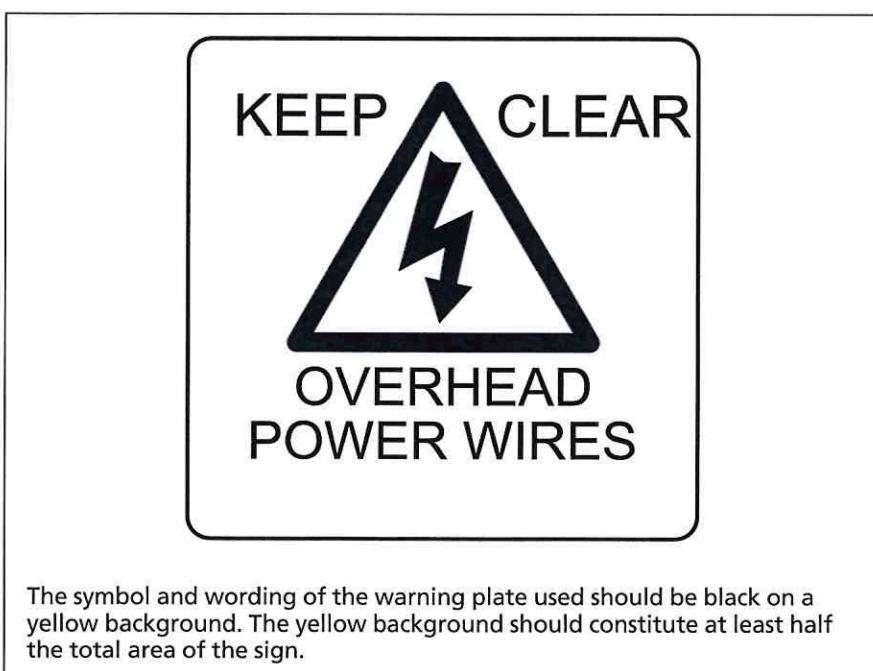
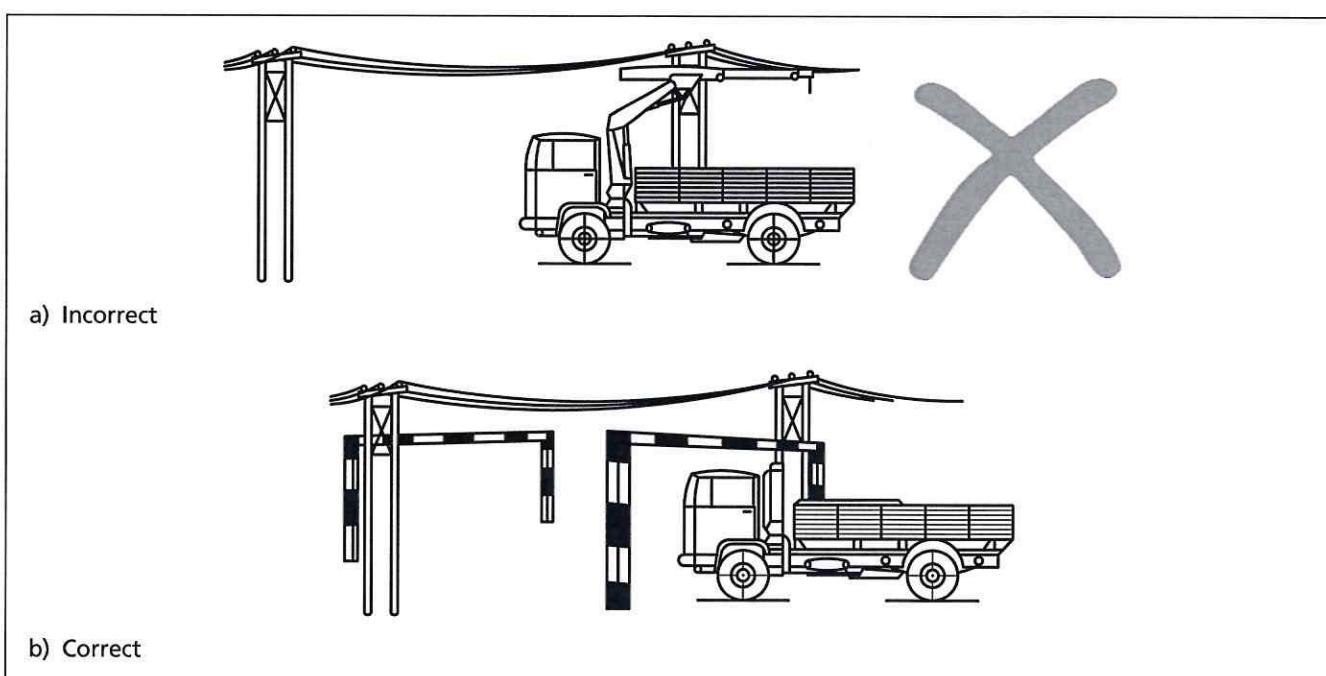


Figure 5 Travelling under electric lines and cables



12.4 Lorry loader control in the vicinity of aerodromes/airfields

If a lorry loader is to be used within 6 km of an aerodrome/airfield and its height exceeds 10 m or that of surrounding structures or trees, if these are higher than 10 m, the appointed person should consult the aerodrome/airfield manager for prior permission to work. Restrictions could be placed on the overall height of the lorry loader and there could be a requirement to fit warning (obstacle) lights to the top of the lorry loader.

NOTE 1 Further details are contained in Cranes and planes – A guide to procedures for operation of cranes in vicinity of aerodromes [17]. Guidance on this topic can also be found in A voluntary code of practice for the safe use of cranes in and around airports [18].

NOTE 2 The Air Navigation Order 2000 [19] makes it an offence to act recklessly or negligently in a manner likely to endanger aircraft.

13 Maintenance and inspection

13.1 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 appointed person should be satisfied that the lorry loader is adequately maintained. The frequency and extent of such maintenance should take account of all factors that affect the operation of the lorry loader.

13.2 Periodic inspections

13.2.1 General

The appointed person should confirm that the checks and inspections recommended in 13.2.2, 13.2.3 and 13.2.4 have been carried out.

13.2.2 Pre-use checks

At the beginning of each shift 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 appropriate documentation, such as operator manuals and reports of thorough examination, are available.
- c) Check PTO (power take off) operation.
- d) Check that height warning signs are present.
- e) Check, by visually inspecting relevant levels and/or components, that no loss of fluids, such as hydraulic fluid, lubricating oil and coolant, is apparent.
- f) Check all lifting attachments.
- g) Check stabilizer beam locks.
- h) Check stabilizer hoses and pipework.
- i) Check loader crane structure.
- j) Check loader crane hoses and pipework.
- k) Check that any ropes are correctly routed and positioned on their sheaves or pulleys, and are correctly wound on drums.
- l) Check the function of all limiting and indicating devices.
- m) Check that the load plate is appropriate and legible.
- n) Check that any lights for illuminating the work area operate efficiently.
- o) Check that all lorry loader controls function correctly without load.
- p) Check that all audible warning devices operate satisfactorily.
- q) Check the function of any remote controls.
- r) 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, and that access and egress are adequate.
- s) Check tyre pressure and condition.

NOTE A sample pre-use check sheet is given in Annex E.

13.2.3 Intermediate inspection

Intermediate inspections should be carried out in accordance with the manufacturer's instructions. These may be supplemented by additional inspections specified by a competent person.

The results of the checks should be entered in the record of inspections [see 11.4b)].

13.2.4 Checks when the lorry loader is not in regular use

If the lorry loader is not in regular use, it might be necessary to carry out a special programme of checks before it is used. The extent and thoroughness of this programme should be based not only on the length of the period for which the lorry loader has been out of use, but also on the location of the lorry loader during this period. A lorry loader standing under cover or inside a workshop could require very little in addition to the checks recommended in 13.2.2 and 13.2.3, but a lorry loader that has been out of use in the open, and therefore exposed to the weather and atmospheric pollution etc., is likely to 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) Where fitted, examine all ropes for signs of corrosion and damage, and check that there is thorough lubrication.
- c) Examine all control linkages for evidence of seizure or partial seizure, and check that there is correct lubrication.
- d) Test every lorry loader 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 lorry loader.
- e) Carry out a full functional check.
- 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 11.4), along with details of any corrective action taken.

13.3 Reporting of defects and incidents

The appointed person should ensure that there is an effective procedure for reporting defects and incidents. This procedure should include notification to the appointed person or his nominee, 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 pre-use checks or intermediate inspections;
- b) defects found at any other time;
- c) incidents or accidents, however slight;
- d) shock loads, such as those caused by lift accessory failure or falling 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.

13.4 Planned maintenance

A planned maintenance system should be established and used.

Manufacturer's instruction manuals recommend that specific tasks be carried out at stated intervals, and these periods should not be exceeded. They also specify the lubrication points that require attention, the interval or frequency of greasing and oil changes and the grades and quality of lubricant to be used. Instruction manuals also cover other essential maintenance, such as tightness of electrical connections, frequency for checking the security of fixing bolts, recommended torque settings, and functional testing.

LOLER [1] requires a competent person to assess whether or not the lorry loader is fit for service at the time of the thorough examination. The thorough examination does not cover the absolute legal requirements to ensure that the equipment is properly maintained. Therefore, 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.

It is essential that the calibration of a lorry loader's RCI/L is checked as part of the planned maintenance.

NOTE See BS 7121-2:2003, 9.8, for further information.

13.5 Replacement components

Replacement components should conform to the manufacturer's specification.

13.6 Special materials

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 is strictly followed. In particular, excessive heat that can change the properties of the steel should be avoided.

14 Operating conditions

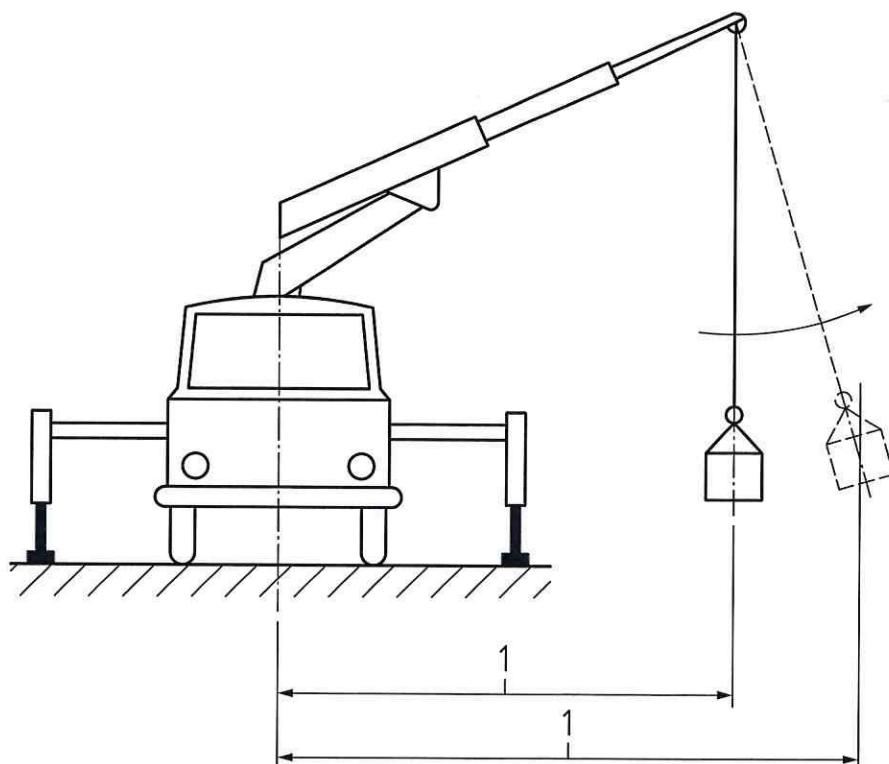
14.1 Rated capacity

The rated capacity of the lorry loader may only be exceeded when testing the lorry loader, under the supervision of a competent person.

A swinging load increases the load radius and the overturning moment of the lorry loader (see Figure 6). Loads should always be lifted gently and lorry loader motions should be operated smoothly to prevent loads from swinging. Tag lines should be used where necessary, particularly where the load presents a wind-catching area. Movement should always take place with the load near to ground level.

Rated capacities 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. Before lifting a load, the hoist line or lifting hook should be "plumb" (see Figure 7). 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. Even if a rated capacity indicator is fitted, a structural failure can result without warning.

Figure 6 Adverse effect of a swinging load on the load radius



Keep the load under control

Key

1 Load radius

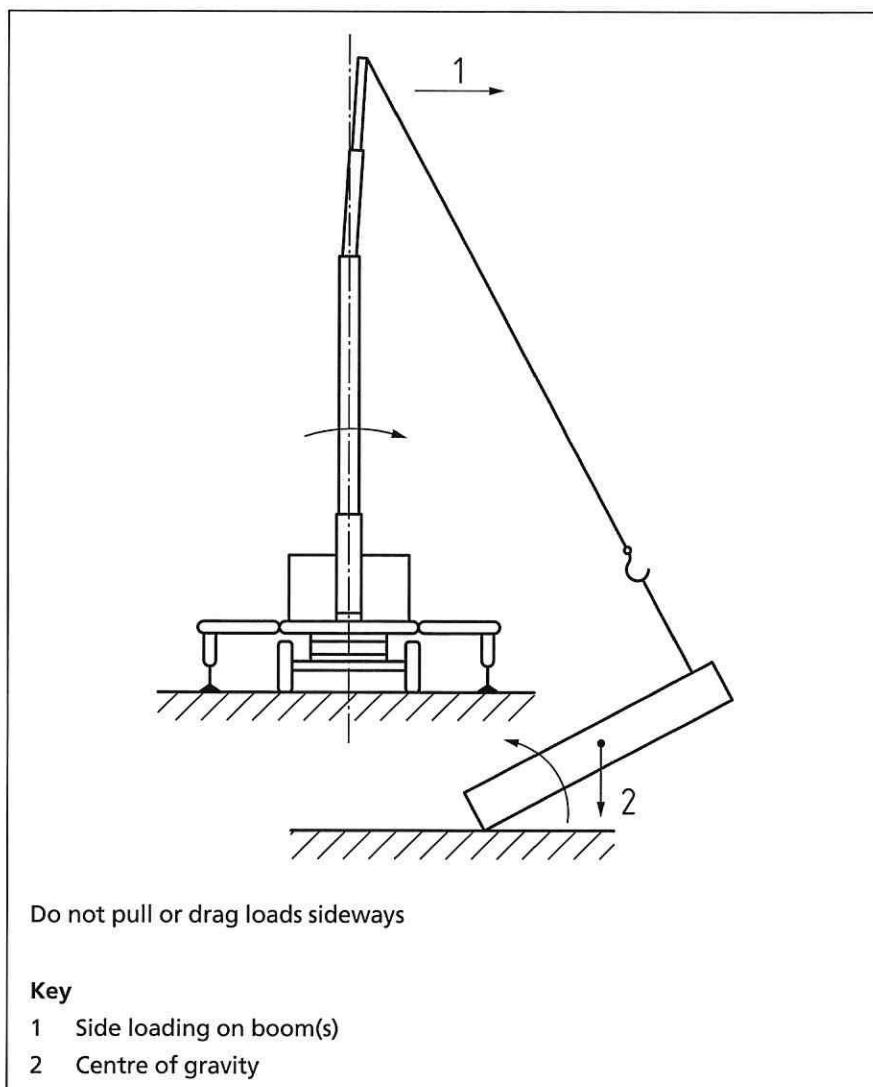
14.2 Mode of operation and control

14.2.1 General

Each control should be marked to identify the motion controlled and the direction of movement. Markings should either be in the appropriate language(s) or consist of internationally agreed symbols (see BS EN 12999), and these should be adequately maintained.

It is essential that neither the lorry loader operator nor any other person tampers with any controls, mechanisms or equipment, including limiting and indicating devices, either to enable the lorry loader to function outside the operational range or loads specified by the lorry loader manufacturer or other competent person, or to attempt to correct any suspected defect.

Figure 7 Operation using the hoist rope or slewing motion which would impose side loading on the boom



Before starting any lifting operation with a lorry loader, the lorry loader operator should:

- a) be trained and deemed competent on the particular lorry loader;
- b) have a clear and unrestricted view of the load and operational area or act under the directions of a slinger or an authorized signaller who is positioned to have a clear and uninterrupted view. The operator should also be in a position to receive warnings from any indicating devices;
- c) confirm that lifts can be carried out without causing damage and that the loads and the lorry loader hoist ropes are suitably clear of obstructions;
- d) confirm that the calling signal is functioning satisfactorily and that verbal messages can be clearly heard, especially where telephone, radio or closed-circuit television (CCTV) communications are being used;
- e) confirm that the load is not attached to the structure on which it is resting.

The hoist rope should be vertical at the start of, and throughout, any 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, stability of the lorry loader, etc. are checked, before proceeding. Care should be exercised by the operator at all times to avoid shock or side loadings on the boom or structure. Care should also be taken to prevent the load lifting attachment from coming into contact with the structure.

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

14.2.2 Remote-controlled lorry loaders

To prevent unauthorized use of a lorry loader that is controlled by transmitted signals, e.g. radio, the transmitter should be retained in the physical possession of the lorry loader operator or the key should be removed from its keylock switch and, for short periods, retained in the operator's possession. For longer periods or when the lorry loader is not in use, the transmitter should be deposited in safe storage.

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.

NOTE 1 Interference with radio remote controls can occur in areas where strong electromagnetic signals are present, such as in the vicinity of radio and micro wave transmitters. Some sites might also place restrictions on the strength of signals transmitted by remote controls.

NOTE 2 Specifications for cableless controls and control systems are given in BS EN 13557:2003, Annex C.

14.3 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. Lorry loader 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. This is of particular importance when lifting to or from the deck of a vehicle, where movement of the load could cause persons to fall.

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.

14.4 Demolition operations

Lorry loaders should not be used for impact demolition.

14.5 Leaving the lorry loader unattended

A lorry loader 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.

The ignition key and any other keys should be removed from the lorry loader whenever the operator is absent from the machine.

15 Weather conditions

15.1 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 lorry loader and adversely affect the safety of lorry loader operations.

15.2 Wind

15.2.1 General

The lorry loader should not be operated in wind speeds that are in excess of those specified in the operating instructions for the lorry loader. Gusting wind conditions can have an additional adverse effect on the safe handling of the load and the safety of a lorry loader. Even in relatively light wind conditions, extra care should be taken when handling loads presenting large wind-catching areas as these can act as sails and affect their ability to be handled safely or the stability of the lorry loader.

15.2.2 Wind speed assessment

As lorry loaders are not normally fitted with anemometers, the need for wind speed assessment should be determined by risk assessment and an appropriate means of wind speed measurement adopted. This might be the use of a handheld anemometer, use of the Beaufort scale (see Annex D) or site-based information, such as a tower crane anemometer.

The wind speed should be monitored throughout the lorry loader operation.

15.3 Visibility

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

15.4 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.

16 Slinging and handling of loads

16.1 Slinging operations

16.1.1 General

Slingers should be properly trained in all aspects of slinging loads. Slingers should be authorized by the appointed person.

If lifting eyes are provided as an integral part of the load, they should be used. If lifting eyes are provided on containers (tanks, silos, etc.), the appointed person should ascertain whether the containers can be lifted full or whether they need to be empty. Slings should be attached to the eyes by shackles of at least the same capacity as the slings. If lifting eyes are not provided, slings should be attached to points on the load with sufficient strength to take any additional loads that could be induced by the slinging method. Slings should be protected by suitable packing material to prevent contact with any sharp edges that could cause damage. If the packing could be dislodged during, or at the end of, the lifting operation, it should be lashed securely in place.

Once the slings are attached, they should be monitored as the tension increases, so that they do not slip or become fouled during the initial raising of the load.

If a hoist rope is fitted, just before the load is lifted clear of the support, checks should be conducted for any imbalance of the load or inclination in the hoist line, and corrections should be made as necessary. The lorry loader operator should make progressive corrections to the boom angle as the hoist rope tension is increased, so that the load is lifted with no horizontal movement.

NOTE Any inclination of the lorry loader, or poor adjustment of the side wear pads of a telescopic boom system, can lead to side deflections that could cause structural damage to the crane or make the load swing sideways as it is lifted clear.

16.1.2 Use of tag lines

Tag lines should be used if there is a possibility that the load could come into contact with any other object during the lifting operation. The safe system of work should identify how many tag lines are to be used and how they are to be attached to the load.

Care should be taken that tag lines cannot become fouled during use.

NOTE Tag lines are especially useful for controlling the load during placing, and essential if any degree of precision is required.

WARNING. Persons holding tag lines should not wrap the line around any part of their body or attach the tag line to any structure.

16.2 Weight and centre of gravity of the load

16.2.1 Weight of the load

It is essential that the weight of the load to be lifted is established to a reasonable degree of accuracy. The weight may be determined by any of the following procedures.

- Look to see if the weight is marked on the load. If it is, check that it is the weight of all parts of the load (a machine tool, for example, might not include the drive motor).
- Check the weight stated on any documentation.
- Look at a drawing of the load. If the weight is marked, check that it includes all parts of the load in the same way as in item a).
- If the load is still on a trailer or truck, use a weighbridge.
- Estimate the weight of the load by using tables of weights. BS 4-1 gives the weight of rolled steel sections and Table 3 gives weights for other materials.

Table 3 Weight of materials

Material	Weight	Weight
	kg/m ³	lb/ft ³
Aluminium	2 700	170
Brass	8 500	530
Brick	2 100	130
Broken Glass	1 290–1 940	80–121
Coal	1 450	90
Concrete	2 400	150
Copper	8 800	550
Earth	1 600	100
Gravel (loose, dry)	1 522	95
Iron and Steel	7 700	480
Lead	11 200	700
Oil	800	50
Paper	1 120	70
Sand (dry)	1 602	100
Soft (wet)	1 922	120
Water	1 000	62
Wood (hard)	450	28
Wood (soft)	800	50

NOTE 1 In some cases the values given are an average and the actual weight could vary according to the particular composition/water content, etc.

NOTE 2 All values have been rounded for convenience of use.

NOTE 3 When dealing with a hollow body, check whether or not it contains anything and whether or not any such contents are liable to move.

NOTE 4 When assessing the load, check that the weight of the attachment and/or container used for handling the material is included.

16.2.2 Centre of gravity

16.2.2.1 General

Where the centre of gravity of the load is not known, the appointed person should ensure that an assessment is made.

16.2.2.2 Regularly shaped load(s)

With a regularly shaped load (for example, a rolled steel joist), the centre of gravity is normally at the midpoint.

16.2.2.3 More complex-shaped loads or irregularly shaped loads

For more complex-shaped loads where the centre of gravity is unknown, it is necessary to estimate various parts of the load and then combine them to get a centre of gravity for the whole. This should then be followed by a test lift and any necessary adjustments made.

16.3 Use of lifting accessories/attachments

16.3.1 General

Only slings and other lifting accessories/attachments for which a current report of thorough examination has been issued within the previous six months or in accordance with a scheme of thorough examination should be used.

Lifting accessories/attachments should be clearly identified and marked with the rated capacity.

Lifting accessories/attachments should be visually inspected on each occasion before use.

Lifting accessories should be stored appropriately to prevent damage or deterioration.

Under no circumstances should slings be knotted.

Under no circumstances should chains be joined by means of bolts or wire, and, when shackles are used, it is essential that the correct pins are fitted.

When used in connection with the handling of molten metal or slag, the rated capacity of all lifting accessories/attachments should be de-rated to half the normal rated capacity.

Consideration should be given the effect of the operating environment on lifting accessories/attachments.

Lifting accessories/attachments should not be dragged along the ground or floor.

NOTE The Code of practice for the safe use of lifting equipment [20] provides further information regarding the selection and use of equipment. See also BS 6166-3.

16.3.2 Flat webbing slings

Webbing slings should only be used if authorized by the appointed person as part of the safe system of work. The safe system of work should include any special instructions to protect the slings from

damage. Slingers should be instructed to take care to prevent webbing slings from slipping during the initial tensioning stage of the lifting operation, as this is when the material of the sling is most susceptible to wear or damage.

Webbing slings should be checked carefully each time before attachment to, and after removal from, the load. Webbing slings should be withdrawn from use immediately if there are any signs of cuts or fraying in the fabric.

16.3.3 Hooks and hook blocks

Hooks and hook blocks should be of sufficient capacity for the load. It is essential that hooks and hook blocks are not loaded beyond their working load limit.

NOTE Hooks can be over stressed by application of a load to the point.

Hooks should either:

- a) have a safety catch or other efficient device to prevent displacement of the sling or load; or
- b) be of a shape that minimizes the risk of the sling or load becoming detached.

Only one sling should be placed on any hook. The sling should be attached to a ring, link or shackle and then placed on the hook. Rings, links and shackles should ride freely on the hook.

WARNING. If multiple slings are not attached via a ring, link or shackle before placing on the hook, the hook could be strained due to spreading of the slings, the hook safety catch could be damaged or the slings could slip over the nose of the hook.

If setting a load down using a single fall of hoist rope, and consequently relieving the tension of the rope, the hook can spin. The slinger should take care when approaching a hook to disconnect the slings.

16.4 Signalling systems

Where the risk assessment shows that a signalling system is required, all personnel involved in the lift should be conversant with the chosen signalling method. Recommended hand signals are shown in Figure 8.

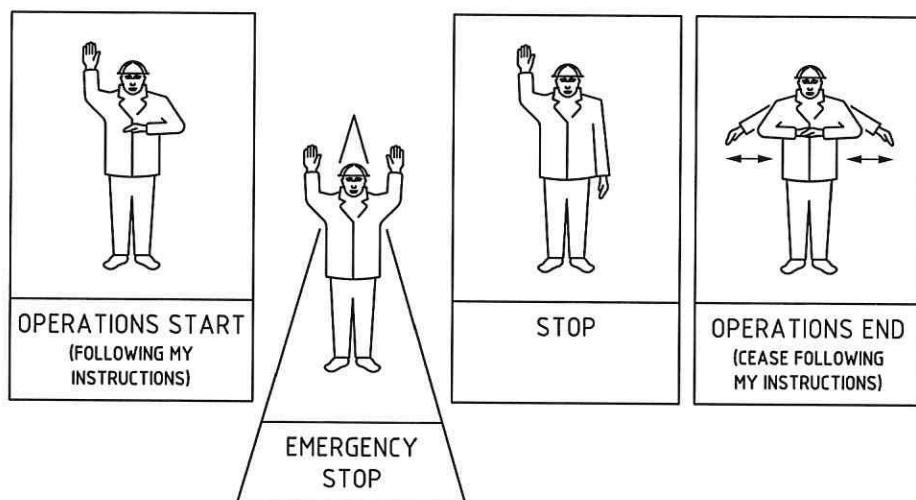
In situations where hand signals alone are inadequate, other forms of communication, such as radio, should be used to supplement the hand signal code.

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 lorry loader operator should not respond to any command that is not preceded by the given call sign.

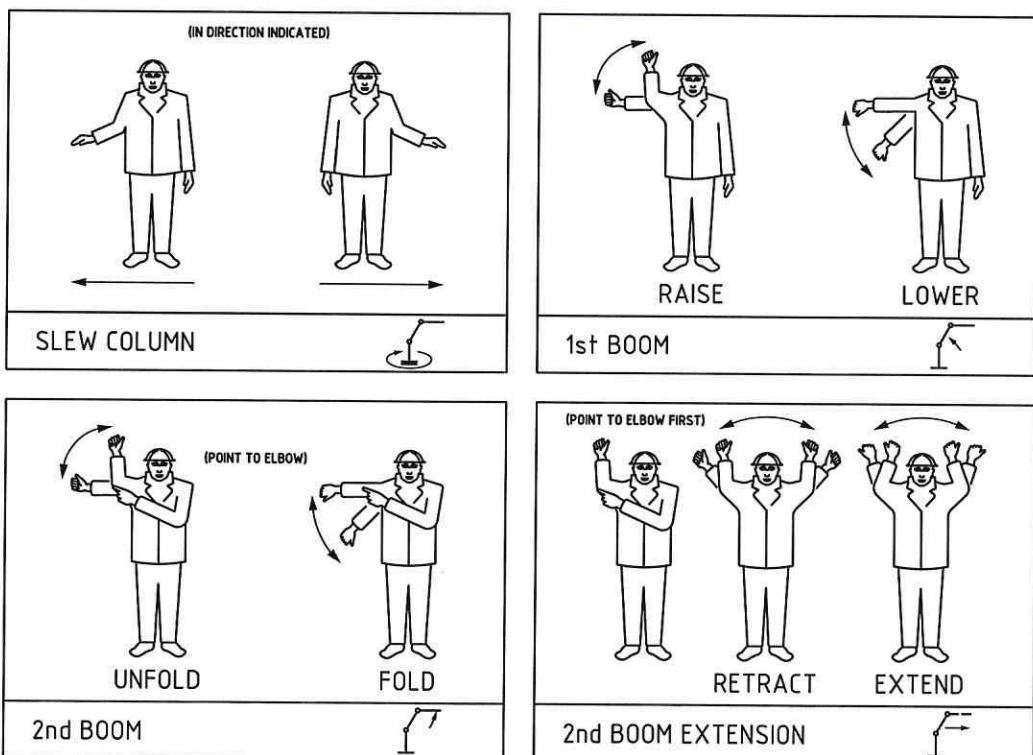
During the carrying out of the lifting operation, hand signals and any voice instruction to the lorry loader operator(s) should only be given by one person at a time.

Additional information on radio communication for lifting operations is given in Annex F.

Figure 8 Recommended hand signals

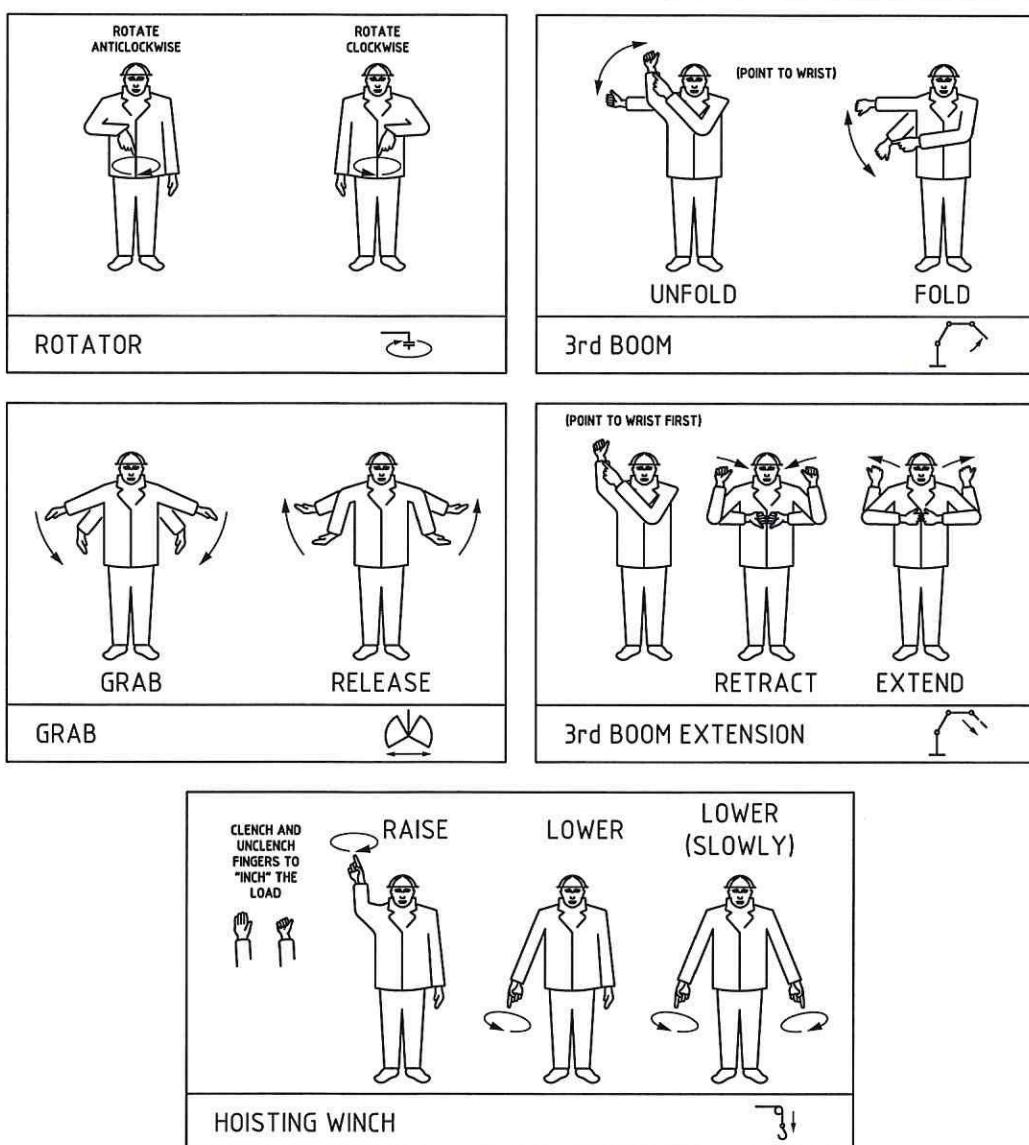


a) Starting and ending crane operations



b) Standard crane movements

Figure 8 Recommended hand signals (continued)



c) Cranes with special equipment

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

17 Thorough examination including testing

17.1 General

BS 7121-2 gives comprehensive guidance on the thorough examination of cranes. In particular, BS 7121-2:2003, Clause 16, provides specific guidance on the thorough examination and testing of lorry loaders.

Attachments such as brick grabs and clamshell buckets should be thoroughly examined at intervals not exceeding six months. Overload testing should be undertaken as required by the competent person carrying out the thorough examination.

Recommendations for periodic testing of lorry loaders, as a supplement to thorough examination, are given in Table 4.

Table 4 Recommendations for periodic testing of lorry loaders as a supplement to thorough examination ^{A)}

Age		Stability installed test	Static overload test	Dynamic test	Thorough examination plus 110% static overload	Performance test	Function test
Years	Months						
1	12				✓	✓	✓
2	24				✓	✓	✓
3	36				✓	✓	✓
4	48	✓	✓	✓	✓	✓	✓
5	60				✓	✓	✓
6	72				✓	✓	✓
7	84				✓	✓	✓
8	96	✓	✓	✓	✓	✓	✓
8.5	102				✓	✓	✓
9	108				✓	✓	✓
9.5	114				✓	✓	✓
10	120	✓	✓	✓	✓	✓	✓
10.5	126				✓	✓	✓
11	132				✓	✓	✓
11.5	138				✓	✓	✓
12	144	✓	✓	✓	✓	✓	✓
12.5	150				✓	✓	✓
13	156	✓	✓	✓	✓	✓	✓
13.5	162				✓	✓	✓
14	168	✓	✓	✓	✓	✓	✓
14.5	174				✓	✓	✓
15	180	✓	✓	✓	✓	✓	✓
15.5	186				✓	✓	✓
16	192	✓	✓	✓	✓	✓	✓
Interval							
After re-installation		✓	✓	✓	✓	✓	✓
After structural component repair/replacement		✓	✓				
After hydraulic valve repair/replacement				✓			✓
After RCI/L repair/replacement						✓	✓
After significant vehicle modification		✓					

^{A)} Prior to the lorry loader being thoroughly examined, previous reports of thorough examination and test certificates should be made available to the examiner. These will form the basis for any testing to be conducted. The previous test certificate should be checked for any limitations placed on the crane at the initial installation. If a test certificate cannot be found then the crane should be treated as a new installation.

17.2 Preparations for thorough examination

17.2.1 General

The lorry loader user should ensure that the lorry loader is taken out of use for the period of time required by the competent person to carry out the thorough examination. A safe system of work should be in place to prevent all persons involved in thorough examination from being exposed to danger.

Where the lorry loader is hired from a third-party, the user should ensure that the thorough examinations are undertaken at the required intervals.

17.2.2 Provision of facilities and services

The lorry loader user should ensure that facilities or services which are required by the competent person to carry out the thorough examination are provided. These could include the following:

- a) an appropriate area, cordoned off to prevent access by persons not directly involved in the examination where the risk assessment identifies a risk of dropping objects and materials onto persons below which could cause injury;

NOTE 1 The responsibility for ensuring that persons not directly involved in the examination are excluded from the cordoned-off area rests with the user, not the competent person.

- b) an operator for the lorry loader;
- c) person(s) to remove covers or open up parts of the lorry loader;
- d) preparation of parts or areas of the lorry loader for any NDT that might be required;
- e) suitable test weights.

NOTE 2 The following test weights are to be used:

- a) *weights of proven accuracy to within $\pm 1.0\%$;*
- b) *weights proven on a weighbridge, the weighbridge having been calibrated within the last 12 months;*
- c) *weights suspended from a calibrated weighing device, the weighing device having been calibrated within the last 12 months.*

It is important that the weighing device is capable of weighing the test load to within $\pm 1.0\%$.

17.2.3 Test site

Careful consideration should be given to the conditions of the test site. The following general recommendations apply.

- a) 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.
- b) The ground should be level to within ± 0.5 degrees for testing the lorry loader.

- c) 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.
- d) Test personnel should be positioned so that they are unlikely to be injured if there are any mishaps. The test area should be cordoned off and notices posted prohibiting unauthorised 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.

NOTE The responsibility for ensuring that persons not directly involved in the examination are excluded from the cordoned-off area rests with the user, not the competent person.

Test sites should preferably not be in areas where there is a higher than average likelihood of adverse weather conditions. In cases of doubt, the advice of the manufacturer or of another competent engineer should be sought.

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

17.2.4 Provision of information

Prior to the lorry loader being thoroughly examined, all relevant information, e.g. regarding rated capacities, alterations, maintenance repairs, renewals, operator instructions, should be made available to the competent person as necessary to carry out the thorough examination. The machine-specific rated capacity information should be checked for any limitations placed on the lorry loader at the initial installation. If this is not available, the machine should be treated as a new installation.

A "report of thorough examination after installation" should be supplied, where appropriate, and retained. It is essential that the EC Declaration of Conformity for the lorry loader is always available.

17.3 Thorough examination of hoists and wire ropes

The hoist and wire rope (where fitted) are an integral part of the lorry loader and their examination should be in accordance with the lorry loader's regime.

The continued safe use of wire ropes depends on regular assessment of the condition of the ropes and the equipment with which they are used.

Some lorry loaders operate in conditions where the wire ropes and equipment are particularly liable to damage, e.g. corrosive atmosphere, abrasive particles. In such circumstances, assessment of the condition of the rope and the equipment should be carefully carried out and the rope removed from service when the damage affects its safe operation.

Records should be kept of the examination and replacement of wire ropes. These should consist of the reports of thorough examination for the lorry loader and certificates of test for the wire ropes at time of supply.

When carrying out inspections and examinations to assess the fitness of the wire rope for further service, both general deterioration and localized deterioration or damage should be considered. Therefore, the whole length of the rope should be examined, paying particular

attention to the rope adjacent to the terminations, lengths that have been running or are stationary over drums, sheaves and deflection pulleys and any other areas likely to sustain damage.

NOTE Information on the installation, maintenance and thorough examination of wire ropes is given in BS 7121-1.

17.4 Supplementary testing

17.4.1 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 lorry loader operator, signaller and/or slinger should accept instructions only from the competent person.

Immediately prior to the tests, the competent person should confirm by thorough examination that the lorry loader is:

- 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) where fitted with a hoist, equipped with sufficient falls of rope for the load to be lifted.

The competent person should also confirm that the site and weather conditions are suitable (see Clause 15).

During the tests, the load should be kept close to the ground. Shock loading, which can be caused by rapid acceleration of lorry loader motions, sudden braking, erratic or sudden movements 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 are restored and checked to confirm that they function correctly.

17.4.2 Functional testing

17.4.2.1 General

The operational functions of the lorry loader should be tested with no load to demonstrate:

- a) the satisfactory operation of each control device. This should include checking:
 - 1) the smoothness of operation;
 - 2) that all controls return to neutral when released; and
 - 3) that the motion is in the direction as indicated by the decal;
- b) the satisfactory operation of each lorry loader motion;
- c) the satisfactory operation of all lorry loader functions throughout the full range of permitted movements up to the maximum speed.

17.4.2.2 Control system

To ensure that the control system is functioning correctly, the following should be checked:

- a) "legs not stowed" warning (if fitted) – this generally takes the form of a visible warning but can also be audible;
- b) "over height" warning – this generally takes the form of a visible warning but can also be audible:
 - a check should be made to confirm there is a notice, which is visible from the driver's seat, displaying the travelling height of the lorry loader;
- c) with the boom set above its normal travelling height, check that the warning light illuminates when the lorry loader safety system is switched off. If fitted with an audible warning, check that the alarm is operational (in the case of systems fitted with hand brake defeat, confirm that both audible and visible alarm devices operate when the hand brake is released);

NOTE 1 The Road Vehicles (Construction and Use) Regulations 1986 [10] require all vehicles to be fitted with a device that warns the operator when the equipment installed on the chassis exceeds the normal travelling height. All lorry loaders are to be fitted with height warning devices when the crane is installed onto a road-going vehicle that are to be set before the crane is released. In the case of cranes fitted with an attachment, the Regulations require that consideration is given to allow for the body (floor and body runners). Some customers also require an audible warning in addition to the visible. This audible warning may have a hand brake defeat in order to prevent the warning from sounding during crane use. The work instructions need to be checked to see if these options have been requested.

- d) operator safety envelope (if fitted):
 - both mechanical and electronic safety envelope systems should be checked for correct operation during the thorough examination and final inspection;
 - for mechanical slew stops (spacers), the lorry loader should be slewed to the stop and its position checked against the platform;
 - for mechanical inner boom cylinder stops, the boom system should be lowered over the platform and its position checked against the platform;
 - for raised control stations fitted with a platform sensor, the system should be tested with the switch in both conditions (operator on platform/operator not on platform);
 - it should not be possible to slew or lower the boom system into the safety envelope when an operator is standing on the platform. It should be checked that it is possible to reverse direction once the boom system has been stopped as a result of trying to enter the safety envelope.

NOTE 2 Extreme caution needs to be exercised when performing these checks.

NOTE 3 The area above the platform floor is described as an "envelope". The envelope equipment ought to be configured to prevent the boom system entering this envelope, either mechanically or electronically, or by a combination of both. To determine which system is fitted, reference can be made to the work instructions

issued with the lorry loader, or, in the case of a supply-only loader crane, the specification of loader crane controls ordered. Mechanical solutions typically employ spacers that are fitted into both the slew tubes (to prevent the lorry loader slewing over the platform) and the inner boom cylinder (to prevent the boom being lowered over the platform). Electronic solutions typically employ a platform sensor (to detect if an operator is present at the platform), an inner boom angle sensor, an outer boom angle sensor (optional) and slew sensors.

- e) mechanical slew restriction (if fitted):
 - if mechanical stops are in place, checks should be made that the lorry loader stops slewing at the correct angle according to the work instructions or the stability calculation results;
- f) electronic slew restriction (if fitted):
 - electronic overload protection systems should be checked to ensure that, when the crane is slewed into the reduced sector with too much load, the overload protection cuts in and the slewing stops;
 - the system should then be checked to ensure it is possible to slew the crane back or to operate within the envelope of the rated capacity indicator;
 - the system should also be checked to ensure that, if a load is lifted in the reduced sector and the overload protection system cuts in, it is possible to use normal overload protection system logic, and possible to slew out of the sector only on the side where the crane entered the sector.
- g) manual boom down rate switch (if fitted);
- h) leg deployment systems (if fitted);
- i) any other special features that might be fitted.

17.4.2.3 Lorry loader

The following checks should be undertaken on the lorry loader.

- a) Check the operation of stabilizer "cam locks" and automatic latches. Check that they are free from wear, distortion and corrosion.
- b) Check that the stabilizer beams slide in and out correctly. Also check for wear and security.
- c) Check the operation and locking of swing-up stabilizers, if fitted.
- d) Check that stabilizer legs make firm contact with the ground and do not creep during operation.
- e) Check the stabilizer foot pads fitted to the stabilizers.
- f) Check the condition of any supplementary load spreader mats.
- g) Operate the telescopic extensions on the lorry loader and inspect them for wear, lubrication and security.

17.4.2.4 Chassis

The following checks should be undertaken on the chassis.

- a) Check the parking brake interlock, or other control that prevents operation of the lorry loader unless the parking brake is set.
- b) Check the operation of the PTO switch.

- c) Check the operation of "Power on demand".
- d) If connected, check any air suspension control.

17.4.2.5 Hoist

The following checks should be undertaken on the hoist, if fitted.

- a) Check that three turns remain on the hoist drum when the rope is fully paid out.
- b) Check the over hoist limit function.
- c) Check the torque limit.

17.4.2.6 Removable boom or third boom (if fitted)

If a removable boom or third boom is fitted, it should be checked to ensure that it functions correctly in relation to the loader crane controls.

17.4.2.7 Commissioning

All functions should be operated, without load, throughout their permitted range in order to purge the hydraulic system of any air pockets.

Each hydraulic cylinder should be end-stroked in both directions and checked for any hydraulic fluid leak.

NOTE End-stroking the inner and/or outer boom cylinders could induce an overload condition

If a hoist is fitted, the hoist drum should be rotated four times in each direction.

The loader crane should be slewed fully, clockwise and anticlockwise, to purge the slew system.

17.4.3 Load testing

17.4.3.1 Calibration of limiting and indicating devices

The calibration of limiting and indicating devices should be carried out using the appropriate loads, lorry loader configurations and methods specified by the manufacturer of lorry loader or limiting/indicating device. Further details can be found in BS EN 12999.

17.4.3.2 Static overload test

17.4.3.2.1 General

NOTE 1 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.

NOTE 2 To enable the test to be carried out, it might be necessary to override or disconnect the relief valve system and the rated capacity indicator or motion-limiting device.

The test should be carried out with the stabilizers fully deployed and a test load of 1.25 times the rated capacity at or close to the following radii:

- a) maximum radius with any manual extensions;
- b) maximum radius attainable with hydraulic outreach;
- c) shortest practical radius shown on the rated capacity chart.

NOTE 3 Any manual boom sections need to be removed or taken into account when calculating the test load.

At each radius the load should be positioned as close to the ground as possible, allowing for vehicle stability and boom deflection, and slewed slowly through the full in-service slewing arc of the crane.

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

Where fitted, hoists may also be subjected to overload testing.

17.4.3.2.2 Approval criteria

The static overload 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 lorry loader;
- e) twists or deflections in the chassis which are considered to affect the stability of the lorry loader or to endanger its safe operation.

17.4.3.3 Dynamic test

17.4.3.3.1 General

NOTE The purpose of this test is to 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 operating speeds, and to confirm the operation of load decelerating valves.

Dynamic tests should be performed separately for each loader crane motion and all crane positions attainable in service should be reached during the course of the tests.

Testing should be carried out at speeds to those appropriate for normal crane operation and should include repeated starting and stopping of each motion throughout the range of the motion.

The test load should be 110% of the rated capacity for the maximum hydraulic extension.

If the crane is fitted with a removable boom or manual section, this should be removed and the crane tested without it. The boom or manual section should then be remounted and the crane tested again.

The hydraulic oil should be at working temperature and the RCI and RCL should be disabled.

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

17.4.3.3.2 Approval criteria

The dynamic test(s) should be considered successful if:

- a) all the components have been found to perform their functions correctly in accordance with the design specification;
- b) an examination after the test reveals no damage to the mechanisms or structural components;
- c) the hydraulic oil is at a satisfactory temperature at the end of the continuous test period.

17.4.3.4 Stability test

17.4.3.4.1 General

NOTE The purpose of the test is to verify the stability of the loader crane mounted on the unloaded vehicle.

The stability for a vehicle carrying a loader crane deduced by calculation is to be used for guidance only. Stability should be verified by test loading.

The test load should be applied to the unloaded vehicle without the lorry loader operator.

17.4.3.4.2 Test load

Stability test loads should be determined in accordance with the following equation:

$$T = [(K_s \times P) + 0.2G] \geq (1.25 \times P)$$

where:

T is the test load;

K_s is the stability factor;

P is the rated capacity;

G is the point mass at boom tip.

NOTE 1 The point mass at boom tip gives the same dead load moment around the slewing centre as the real boom does.

For cranes other than timber handling cranes, the stability factor should be 1.2 and the test load should be not less than $1.25 \times P$.

For timber handling cranes, the stability factor K_s may be assigned the value of the actual tolerance of the RCL:

$$K_s = \frac{1 + \Delta\%}{100}$$

The tolerance of the RCL should be such that it is activated between 100% and $(100 + \Delta)\%$ of the rated capacity. The value of Δ depends on hydraulic outreach, in accordance with the following equation:

$$\Delta \leq (8 + 0.5R) \leq 20$$

where:

R is the hydraulic outreach in metres (m).

However, K_s should be not less than 1.1.

NOTE 2 The application of the test load constitutes load combination C3; see BS EN 12999:2002+A2, 5.2.4.2.

Alternatively, the test load may be divided into two parts, one at the boom tip and one closer to the column. The two parts of the test load

should produce the same tipping moment with respect to the tipping line under consideration as the test load. The part of the test load at the boom tip should be at least $1.25 \times P$. The maximum test load at the boom tip should be as recommended by the manufacturer.

17.4.3.4.3 Test conditions

Stability should be tested with:

- a) the least favourable boom configuration including maximum manual boom extension within the whole slewing range;
- b) the lorry loader placed on a firm surface under the least favourable conditions in relation to the tipping line, in accordance with the manufacturer's specification.

If the rated capacity is lower in part of the slewing range, the test load in those parts should be determined accordingly. Limiting and indicating devices may be temporarily disconnected during the test. The crane inclination should be within the maximum inclination in accordance with the manufacturer's specification.

The appropriate test method depends on whether the crane has a fixed load moment or not, as follows.

- 1) The stability calculations of a vehicle/loader crane combination with a fixed load moment should be verified by deploying the stabilizers correctly, attaching the test load and slewing the crane throughout its full slewing arc.
- 2) Some vehicle/loader crane combinations incorporate a load moment setting that varies with the slew angle (e.g. loader crane over the rear of the vehicle, or over the cab), or varies with the amount of stabilizer extension (e.g. stabilizers fully extended or fully retracted), or both. The stability calculations for these types of installation should be verified by the requisite overloads being applied at the positions with maximum and minimum load moment settings, as identified by the calculations. It is not necessary to verify (by overload testing), the stability calculations for all the intermediate positions between a maximum and minimum load moment setting. It will suffice to attach a load equal to the maximum working load at maximum radius, and slew this load through the full slewing arc, reducing the radius of the load as demanded by the loader crane, to confirm that the available load moment at every position conforms to the predictions of the stability calculations.

For stability verification, the required overturning moment with respect to the actual tipping line may be obtained at a reduced outreach.

NOTE Stability calculations might be necessary to establish the least favourable position.

17.4.3.4.4 Approval criteria

The stability test should be considered to be successful if the test load is held static. During the test loading, one or more stabilizer legs or a wheel may lift from the ground. However, at least one wheel, braked by the parking brake should remain in contact with the ground sufficiently so that there is adequate braking on the maximum permitted slope.

There should not be any twists or deflections in the chassis which are considered to affect the stability of the lorry loader or to endanger its safe operation.

17.4.3.5 Test documentation

A test report, detailing static, dynamic and stability tests carried out during installation should be provided. If the stability at intermediate positions is demonstrated solely by calculations, these calculations should also be provided. The test report should accompany the lorry loader.

18 Special applications of lorry loaders

18.1 Raising and lowering of personnel

18.1.1 General

Raising and lowering of personnel by equipment that is not specifically designed for this purpose should only be carried out in exceptional circumstances, when it is not practicable to do so by other less hazardous means. It is essential that timber handling cranes are not used for this purpose.

Careful planning of the event should be carried out prior to each raising and lowering operation.

NOTE 1 Attention is drawn to LOLER [1] regarding the planning of lifting operations.

NOTE 2 Further details on raising and lowering personnel are given in ISO 12480-1 and BS EN 14502-1.

18.1.2 Carrier

The type of carrier selected when raising and lowering personnel should depend on a risk assessment and varies according to the application, e.g. construction, forestry, rescue.

18.1.3 Compatibility of carrier and lorry loader

18.1.3.1 Capacity

The lorry loader selected to lift the carrier should have a rated capacity on the fixed load lifting attachment of not less than twice the minimum rated capacity of the lorry loader configuration in use.

18.1.3.2 Motion control system

The lorry loader should be equipped with a motion control system that brings motion to rest automatically when the controls are released.

The lorry loader should be equipped with power lowering. Lorry loaders with free-fall capability should not be used to raise and lower persons. Load bearing hydraulic cylinders should be fitted with a device to stop movement in case of hose rupture or pipe fracture.

The lorry loader control system should be able to provide a smooth transition of the carrier. The working speed of the carrier should be limited to a maximum of 0.5 m/s on all motions.

Means should be provided so that if the power supply or control system fails, the carrier can be positioned to enable access/egress without risk.

18.1.3.3 Ropes

Ropes used for hoisting and lowering the carrier should have a minimum diameter of 8 mm.

18.1.3.4 Hook

The lorry loader hook should be provided with a safety catch.

18.1.4 Thorough examination and pre-use checks

Additional recommendations for the thorough examination and pre-use checks of cranes and carriers for lifting persons are given in BS 7121-2:2003, Clause 11.

18.1.5 Other devices/facilities**18.1.5.1 Anemometer**

The lorry loader should be fitted with an appropriate means of assessing wind speed.

18.1.5.2 Storage

Storage accommodation for equipment, including any emergency egress equipment, should be provided in the carrier.

18.1.5.3 Indicating and limiting devices

The RCI/L on the lorry loader should be maintained in good working order.

Limit switches should be provided to prevent over-hoisting, or over-lowering.

The operator should check limit switches for correct operation each day before personnel-carrying operations are carried out. Limit switches are not necessarily fail safe and therefore care should be taken if motion limits are approached.

A fail-safe procedure should be provided so that sufficient hoist rope remains on the winch drum at all times to prevent the end of the rope running off the drum while lowering the carrier.

To ensure that sufficient rope remains on the drum at all times, the carrier should be lowered to the bottom of the shaft, cofferdam or caisson as follows:

- a) the first time it is lowered;
- b) after each time the shaft, cofferdam or caisson depth increases;
- c) if the lorry loader hoist rope is replaced.

Care should be taken when the lorry loader is moved to different locations to ensure that sufficient rope is fitted for each operation.

Operation of limit switches, check valves and similar devices could prevent some motions of the lorry loader with the carrier still suspended. Precautions should be taken so that persons in the carrier are not left suspended for an excessive period, and/or a procedure for raising or lowering the carrier to a safe position should be provided.

18.1.6 Operation

18.1.6.1 Organizational requirements

Lifting, lowering and supporting the carrier should be carried out by the lorry loader operator in controlled conditions directed by an appointed signaller.

It is essential that the lorry loader operator is present at the normal lorry loader control station when the carrier is occupied. Visible and audible communication should be possible between the persons in the carrier and the lorry loader operator at all times during the lifting operation.

During the operation:

- a) an adequately trained and briefed person should be present to perform any emergency recovery procedure;
- b) the lorry loader operator and signaller should not perform any other work at the same time. The lorry loader operator and signaller should only be responsible for operating one lorry loader or directing one carrier;
- c) machines should not operate simultaneously in the same place if there could be a risk of collision;
- d) all movements should proceed gently and not exceed 0.5 m/s.

Load-lifting attachments for carriers should not be used for any other purpose.

Carriers should not be used in the following conditions:

- 1) winds exceeding 7 m/s (25 km/h). Wind speed measurements should be taken using a calibrated handheld anemometer at a similar level to that to which the carrier will be lifted;
- 2) electrical storms;
- 3) snow or ice;
- 4) fog;
- 5) sleet;
- 6) other weather conditions that could affect the safety of personnel.

Unintentional rotation of the carrier should be prevented, e.g. by using guide ropes or anchoring. The means of preventing unintentional rotation should not inhibit any emergency procedures or otherwise interfere with the safe operation of the carrier.

Lifts should not be made on any other hoist lines of the lorry loader while any person occupies a carrier attached to the lorry loader.

The lorry loader, lifting accessories and carrier should be inspected every working day during use.

NOTE For further information on inspections, see BS 7121-2. An example of a personnel carrier pre-use check form is given in BS 7121-2:2003, Annex E.

18.1.6.2 Precautions for persons in the carrier

The payload of the carrier should not be exceeded.

The stability of the carrier should not be affected by the operation.

Additional care should be taken if the carrier is of a length that could lead to excessive tilting through movement of persons or tools within the carrier.

It is strongly recommended that all users of carriers wear full body harnesses with work restraint systems attached to a suitable anchorage point in the carrier. The most appropriate type of work restraint system is an adjustable lanyard, adjusted to be as short as possible so that a person is restrained within the carrier. Further information on the use of personal fall protection equipment is given in BS 8437.

Consideration should be given to the rescue of persons from carriers if the carrier is unable to be lowered for any reason, such as machine malfunction or carrier entanglement. Any rescue procedure should be properly planned, taking into account the reasons why the carrier is stranded at height and any need for urgent action. In many circumstances, the rescue plan simply involves the lowering of the carrier by the supporting lorry loader.

In the event that fall arrest equipment is selected, a rescue plan should be prepared to avoid the consequences of suspension trauma when a person is suspended from a fall arrest harness.

Any tools or materials in the carrier should be secured to prevent displacement, tipping or falling out.

Personnel should remain entirely inside the carrier during raising, lowering and positioning to avoid pinch points. Personnel should only stand on, or work from, the floor of the carrier.

Carriers should be secured so that access and egress can be accomplished without danger.

18.1.7 Work from a carrier

NOTE 1 Exposed electrical conductors in the vicinity of the lifting operation can present electrical hazards. Exposed high voltage conductors can cause electric shocks or burns even if not touched by personnel. If there are electrical conductors adjacent to the work area, advice needs to be sought from the owner of the conductor. Overhead lines usually belong to the local electricity supplier or National Grid. These suppliers can provide advice on safe working distances from electrical conductors.

If electric arc welding is carried out from a carrier, precautions should be taken to prevent stray welding return currents from flowing through the lifting accessories, lorry loader hoist rope, or other part of the lorry loader. Electric arc welding should be carried out in accordance with HS G 118. The return welding current lead should be secured to the welded part, as close as practicable to the point of the weld.

NOTE 2 Complete insulation of the lorry loader hoist rope or use of clean dry webbing lifting accessories can also prevent stray currents.

Electric-powered hand tools, if used, should be battery powered.

Power cables provided to the carrier should not interfere with safe operation of the carrier and should not be used as steady lines.

18.2 Multiple lifting

18.2.1 General

Lifting a load with two or more lorry loaders or other cranes requires greater attention to planning and supervision than lifting with one lorry loader because the effects of the relative motion between the lorry loaders/cranes can induce additional loads on the lorry loaders/cranes, the load and the lifting accessories/attachments. As a

result of this and the difficulty in monitoring these additional loads, multiple lifting should only be used when the physical dimensions, characteristics, weight or required movement of the load prevent the operation being carried out by a single lorry loader.

Multiple lifting should be planned with extreme care and include an accurate assessment of the proportion of the load to be carried by each lorry loader/crane. It is essential that the planning ensures that any hoist ropes remain vertical and that lorry loader booms are not subjected to side loads. The lorry loaders/cranes should not be subjected to forces in excess of those that would occur if they were handling their rated capacities as single lifts.

18.2.2 Main factors to be considered when planning multiple lifting

18.2.2.1 Weight of the load

The total weight of the load and its distribution should be either known or calculated. Where the information is taken from a drawing, due allowance should be made for manufacturing tolerances.

18.2.2.2 Centre of gravity

Owing to the variable effect of manufacturing tolerances, variable density etc., the centre of gravity of the load might not be known accurately and the proportion of the load being carried by each lorry loader/crane could therefore be uncertain.

18.2.2.3 Weight of the lifting accessories/attachments

The weight of the lifting accessories/attachments should be part of the calculated load on the lorry loader/crane. When handling heavy or awkwardly shaped loads, the deduction from the rated capacity of the lorry loader/crane to allow for the weight of the lifting accessories/attachments might be significant. The weight of the lifting accessories/attachments, and hook blocks, where appropriate, and its distribution should therefore be accurately known.

In cases where the hoist ropes are reeved around pulleys that are part of a specially designed lifting accessory/attachment, e.g. a lifting beam, the weight of the removed hook block and hook may be taken into consideration when determining the net weight of the lifting accessories/attachments.

18.2.2.4 Capacities of the lifting accessories/attachments

The distribution within the lifting accessories/attachments of the forces that arise during the lifting operation should be established. The lifting accessories/attachments used should have a capacity margin well in excess of that needed for its proportioned load, unless specially designed for the particular lifting operation.

NOTE Special lifting accessories/attachments might be necessary to suit the maximum variation in distribution and direction of application of loads or forces that can occur during multiple lifting.

18.2.2.5 Synchronization of lorry loader/crane motions

If the variations in the direction and magnitude of the forces acting on the lorry loaders/cranes during the multiple lift are to be kept to a minimum, it is essential that the lorry loader/crane motions are synchronous in their effect.

Lorry loaders/cranes of equal capacity and similar characteristics should therefore be used, whenever possible. In practice, there is always some variation owing to differences in response to the activation of the motion controller and the setting and efficiency of the braking system.

The rated capacity of a lorry loader/crane is calculated on the assumption that the load is raised and lowered in a vertical plane. The lorry loader/crane structure is designed to withstand any lateral loads imposed by accelerations in the various crane motions, but it is unsafe to rely on this lateral strength to withstand horizontal components of "out-of-plumb" lifts.

If the lorry loaders/cranes have dissimilar characteristics, it is unlikely that the motions will be accurately synchronized. Therefore, an assessment should be made of the effect of variation in plumb of the hoist ropes, which could arise from inequalities of speed, together with a determination of the means for keeping such inequalities to a minimum.

18.2.2.6 Instrumentation

Instruments are available to monitor the angle of the load and verticality and the force in any hoist rope constantly throughout the lifting operation. The use of such instruments and the restriction of the motion speeds, together with the strict use of one motion at any one time, can assist in the control of the loads on the lorry loaders/cranes within the planned values.

18.2.2.7 Supervision

One competent person should be in attendance and in overall control of a multiple lorry loader/crane operation. Only this person should give instructions to personnel operating or driving machines, except in an emergency when a commonly recognized stop signal may be given by any person observing a situation leading to danger.

If all the necessary points cannot be observed from one position, other personnel should be positioned at various points to observe and report to the person in charge of the operation.

NOTE It is essential that adequate means of signalling between the person in charge of the operation, the operators of the lorry loaders and cranes, and the slingers and signallers are provided (see 16.4).

18.2.2.8 Recommended rated capacity during multiple lifting

As all the factors cannot be accurately evaluated, an appropriate down-rating should be applied to all the lorry loaders/cranes involved. The down-rating might need to be 20% or more.

18.3 Hoist operation

When the load attachment point, hook or lifting accessory is directly coupled to the boom system of a lorry loader, any lifting operation is limited to the possible articulations of the boom system. The addition of a hoist to a lorry loader removes this limitation.

The matching of the hoist to a lorry loader, where the lorry loader was manufactured before 1995, is extremely important. A bad match could cause the hoist to overload the boom system or the boom system to overload the hoist. As a general rule, the hoist 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 hoist drum anchorage. A bob-weight should be attached to the hoist rope at all times that the hoist is deployed.

At least two turns should remain on the drum. It is recommended that the hoist rope be identified with marking which can be seen by the lorry loader operator well before the last two turns are run off the hoist drum. Alternatively, an automatic trip device which stops the hoist should be fitted.

For loader cranes fixed with a CE mark, the hoist will be incorporated into the RCL, including two turns protection, anti-two-blocking and overload protection for the rope. The hoist is prevented from overloading the loader crane and the loader crane from overloading the hoist.

Lorry loader mounted hoists should not be used for non-vertical lifting operations to avoid side loadings on the boom system, unless purposely designed.

Most lorry loader hoists employ torque-limiting devices to protect the hoist and hoist rope from overload. Line pull increases as rope layers on the hoist drum reduce. For lorry loaders without an RCI which incorporates the hoist, care should be taken when using pull-multiplying devices, such as additional sheave blocks interposed between the host and the return block. The resultant lifting capacity at the hoist block could exceed the capacity of the loader crane.

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

An understanding of the hazards which can arise from hoist operation is essential. The lorry loader manufacturer should always be consulted if special applications are planned, and the completed installation should always be subjected to tests which reproduce the worst configuration likely to be encountered in service (see Figure 7 and Figure 8).

18.4 Car-lifting frames

18.4.1 General

Car-lifting frames are designed to enable cars to be lifted damage-free for parking enforcement and road traffic accidents where preservation of evidence is required. There are three basic types (see 18.4.2, 18.4.3 and 18.4.4) but all types consist of a main frame, lifting strops and wheel frames. All components selected for use should carry the CE mark and also clearly marked with their rated capacity.

All lifting frames should be carefully matched to the lorry loader's performance and the weight of the frame system should be considered as part of the load. Frames with hydraulic rotation require the rotation function to be restricted either by adjustment or by the use of restrictors in the rotator to reduce their speed.

18.4.2 Mechanical manual type

This type consists of a main "H" frame which can be made up of assembled beams to aid storage. This is then fitted with strops and wheel frames. The frame is suspended from the loader hook and the balance of the load (cog) is adjusted by shortening the length of the strops.

18.4.3 Manual levelling with hydraulic rotation

This type consists of a main "H" frame attached to the lorry loader via a hydraulic rotator and link. This enables the frame to be rotated but levelling is carried out by:

- a) using a slider with clamp;
- b) pinning the rotator mounting in different positions within a slider; or
- c) using a spring compensated levelling system.

This type requires one extra hydraulic function to the boom tip.

18.4.4 Hydraulic levelling with hydraulic rotation

This type consists of a main "H" frame attached to the lorry loader via a hydraulic rotator and link., which enables the frame to be rotated and levelled using the loader hydraulics.

This type requires two extra hydraulic functions to the boom tip.

The levelling ram should be fitted with an overcentre valve to protect against hose failure.

18.5 Timber handling cranes

Timber handling cranes are used for loading and unloading vehicles with round timber in forests and are exempted from some of the requirements of BS EN 12999 for all other types of loader crane. A timber grapple is generally attached to the boom end of the loader crane and they are mostly operated via a high seat control or from a cabin installed to the side of the column of the loader crane.

NOTE 1 Particular attention needs to be paid to the access and egress to the high seat and cabin.

Timber handling cranes are built to the BS EN 12999:2002+A2, B4, specification because of the arduous work they have to perform in forests. Timber handling cranes with the standard forestry specification should only be used in a forestry environment. If the timber handling crane is to be used in areas other than the forest, an exclusion zone should be in place to protect persons from falling loads. Timber handling cranes used for any other purpose should meet all the requirements of BS EN 12999 for other types of loader cranes.

NOTE 2 Operators of timber handling cranes require specific training (see Annex A).

18.6 Other special applications

18.6.1 General

Special applications generally make use of special lifting accessories which aim to reduce the load complexity of the lifting operation.

In all cases involving special applications, the guidance of the manufacturer or a 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 lifting attachments 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.

All lifting attachments should have a current report of thorough examination, issued not more than six months before the date of intended use.

When not in use, all lifting attachments should be secured such that they cannot swing outside the confines of the vehicle during transit.

18.6.2 Grab/tipper applications with a clamshell grab

18.6.2.1 General

Whether the application is a re-handling application or an excavating operation depends upon the design of the grab. Grabs designed for digging are equipped with teeth and have kinematic characteristics which cause the grab to pull itself into the ground when closing. Re-handling grabs are usually not equipped with teeth and have kinematic characteristics which assist the jaws to scrape across a surface when closing, rather than digging into it.

As the load is always consistent and contained within the grab, and its weight easily established, the load complexity could be classed as L1 (see Figure 1). When working in confined spaces, the characteristics of the crane control system should be taken account of when deciding the environmental complexity.

18.6.2.2 Loading and unloading loose spoil, sand or gravel using a re-handling grab

Most general-purpose loader cranes are suitable for this purpose, but the appointed person should decide whether it is more appropriate to either use a loader crane designed into a higher fatigue group or reduce the rated capacity.

When making this decision, the appointed person should:

- bear in mind the intensity and frequency of the loading and unloading operations;
- seek the advice of either the manufacturer or a competent engineer.

18.6.2.3 Excavating with a clamshell grab

Loader cranes intended for excavating operations should generally be designed into a higher fatigue group (i.e. BS EN 12999:2002+A2, B4) than loader cranes designed for general use (which are usually designed into fatigue group B3).

Using general-purpose loader cranes for frequent excavating work is not recommended. Reference should be made to the lorry loader manufacturer or other competent engineer for advice on special duty

ratings to protect the structure against premature fatigue. This usually involves a reduction of the rated capacity, possibly by as much as 25%, which needs to be taken into account by the appointed person during lorry loader selection.

Lifting accessories should only be attached to clamshell grabs if they are provided with a designated lifting point.

18.6.2.4 Removing and erecting telegraph poles and lamp standards

18.6.2.4.1 General

New telegraph poles/lamp standards are likely to present an L1 load complexity (see Figure 1). Although the position of the centre of gravity is not marked, it can be easily predicted and established with a test lift.

Old poles/standards which are removed from the ground are likely to present L2 or L3 load complexity because their weight is not easily established owing to the amount of additional material which adheres to them and the position of the centre of gravity is more difficult to predict.

18.6.2.4.2 Slinging

Poles/standards are usually lifted using a fabric or wire sling. When the pole/standard is loaded or unloaded from the vehicle, it should be slung slightly below its centre of gravity, so that it is lifted slightly "top heavy". The angle of inclination and the lateral movement of the pole/standard can then be easily controlled using a tag line attached at the butt.

When erecting the pole/standard, it is recommended that it is slung near the top, so that it hangs almost vertical and can be lowered into position.

18.6.2.4.3 Extraction

Over the course of time the soil into which a pole/standard is inserted can become very compacted and might be covered with a layer of tarmac or concrete. Such poles/standards can exhibit a high resistance to extraction.

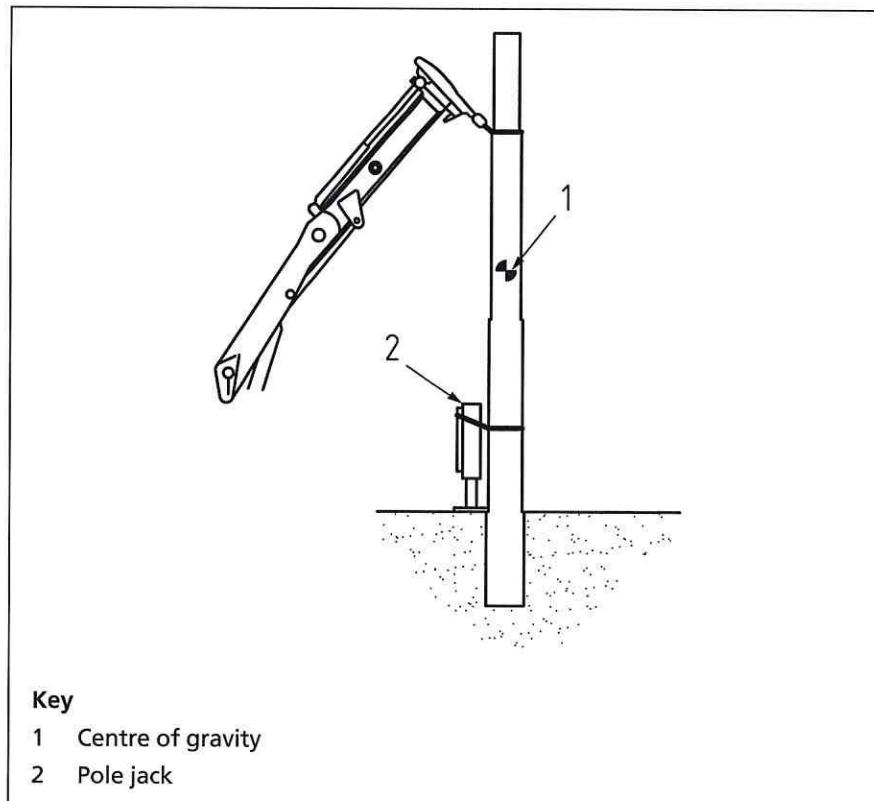
Loader cranes should not be used to directly extract poles or standards unless specifically designed for this application.

A pole extraction jack should be employed to pull the pole/standard from the ground and the loader crane used to support the weight of the pole/standard during the extraction process (see Figure 9). The pole/standard should be slung at a point well above its centre of gravity. Once clear of the ground, the pole/standard can be lowered to the ground, where it can be re-slung at its centre of gravity for loading onto a vehicle.

The planning of this type of operation should take into account the benefit of using remote controls.

NOTE Poles/standards need to be transported on vehicles designed for their transportation, i.e. vehicles with pole bolsters.

Figure 9 Use of a pole extraction jack to extract poles/lamp standards



18.6.2.5 Lifting refuse collection containers

Refuse collection containers ("collection banks"), normally used for the collection of glass bottles, paper or plastic, come in many shapes and sizes, with differing methods for lifting, opening and closing. Consequently only lifting accessories designed for the relevant model of collection container should be used.

Refuse collection containers are normally located in areas with public access, e.g. civic facilities or supermarket car parks. Additional measures should be taken to prevent the public from entering the area during the lifting operation.

Where a hydraulic rotator is used to allow the forks to be aligned with product, the connection to the loader crane should be made with a universal joint that allows the forks to hang in the perpendicular.

The lifting capacity of both the rotator and the discharge unit should not be exceeded.

When not in use, the lifting accessory should be secured such that it cannot swing out during transit.

18.6.3 Recycling operations with a scrap handling grab or magnet

18.6.3.1 General

When using lorry loaders with scrap grabs or magnets, allowance should be made not only for the weight of the grab or magnet, as well as the load, but also for the additional dynamic loads imposed on the lorry loader by high slewing speeds and the sudden

release of the load. Loader cranes intended for use in recycling operations are generally designed into a higher fatigue group (i.e. BS EN 12999:2002+A2, B4) than loader cranes designed for general use (which are usually designed into fatigue group B3).

When using a general-purpose lorry loader for recycling duties, reference should be made to the lorry loader manufacturer or a competent engineer for advice on special duty ratings to protect the structure against premature fatigue. This usually involves a reduction of the rated capacity by at least 25%, which needs to be taken into account by the appointed person during lorry loader selection.

18.6.3.2 Scrap handling grabs

When a lorry loader is used with a scrap handling grab, the load lifted is the weight of the grab and its contents. The weight of the contents depends on the density of the material and there will be additional, sudden loads on the loader crane and the grab suspension, e.g. when the grab or its contents pull free from other material amongst which it is tangled. It is essential that any grab and grab suspension is an appropriate size, type, and load capacity for the material, its environment, and the rated capacity of the lorry loader, which might have been modified by the manufacturer or a competent engineer.

18.6.3.3 Magnets

A load supported by a magnet is not as secure as a load supported by a hook. Additional precautions might be necessary to ensure that there is no risk to personnel caused by an unexpected release of the load. Where the use of electromagnets with a loader crane is contemplated, the loader crane manufacturer should be consulted.

The magnet should be marked with the rated capacity, which needs to be determined by the manufacturer. It is important that the capacity of the electrical supply matches the requirement of the magnet.

To minimize the dynamic effects of sudden attachment and release of the load from the magnet, power to the magnet should not be switched on until it has been lowered into contact with the load to be lifted. The magnet should not be allowed to strike a solid object.

A magnet should not be used on hot metal unless specifically designed for this purpose.

19 Special attachments

19.1 General

Special lifting attachments for lorry loaders are designed to reduce the load complexity of the lifting operation. These attachments should only be used for the purpose for which they have been designed and in accordance with the manufacturer's instructions.

Lifting attachments should have a current report of thorough examination, issued not more than six months before the date of intended use.

When not in use, all lifting attachments should be secured such that they cannot swing outside the confines of the vehicle during transit.

19.2 Hydraulic attachments

19.2.1 General

Before connecting any hydraulic attachment to a loader crane, it should be checked that:

- a) the correct pressures are set for the attachment;
- b) the maximum flow for the attachment will not be exceeded;
- c) the correct spools are used to control the attachment, open or closed centre;
- d) all connections are kept clean and free from any material that would contaminate and affect the hydraulic system;
- e) quick release couplings are capped when not in use;
- f) quick release couplings are identified for correct connection;
- g) connection hoses between loader crane and attachment are sized for the correct flow and working pressure of the attachments;
- h) each function is protected by one of the following (see BS EN 12999):
 - 1) pilot operated check valves,
 - 2) overcentre valves; or
 - 3) motion control valves;
- i) hoses are, where possible, be secured to prevent accidental damage;
- j) the attachment is clearly identified with the model, serial number, rated capacity and CE mark.

19.2.2 Manipulator

19.2.2.1 General

A manipulator is a hydraulically operated attachment, rigidly mounted at the boom tip, which allows tilting and rotation.

NOTE 1 An example of a typical manipulator is given in Figure 10.

NOTE 2 It is also referred to as a "wrist".

When fitted with a gripping function, a manipulator can be used for the handling of telegraph/electricity poles and lamp standards (pole grapple) or wheels and tyres (tyre handler) provided that the following recommendations are met.

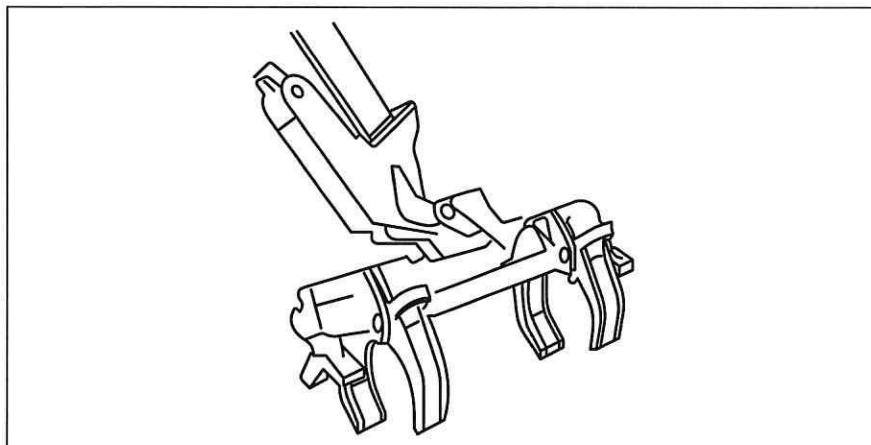
- a) The tilt function should be equipped with a double-acting load-holding valve to prevent uncontrolled movement in the case of a hydraulic line rupture.
- b) The rotate function should be equipped with a hydraulic off, spring-applied brake.
- c) The gripping function should be fitted with a hydraulic accumulator to maintain gripping pressure in the event of power failure.

Poles and lamp standards should always be grabbed at the centre of gravity.

NOTE 3 The centre of gravity of the pole or standard might not be in the middle.

Care should be exercised not to crush hollow lamp standards or tyres.

Figure 10 Typical manipulator



19.2.2.2 Tyre handlers

Tyre handlers are designed to manipulate complete wheel/tyre assemblies used on larger earth-moving equipment. They can be adapted to be used on lorry loaders provided that the following recommendations are met, thus allowing the wheel to be clamped, tilted and rotated.

- a) Selection of the lorry loader/tyre handler combination should be made once the wheel assembly size and weight is known. The lorry loader capacity [tonne metres (tm)] can only be selected once the weight and radius of the load to be handled is known, bearing in mind that the wheel, handler, and manual boom weights will also form part of the load.
- b) A stub boom section should be acquired from the lorry loader manufacturer so that the tyre handler headstock can be welded to it, thus enabling mounting to the lorry loader.
- c) Two to three extra hydraulic functions should be supplied to the boom tip (depending on handler specification).
- d) Lorry loaders with only two hydraulic functions available should have an electrical supply to the handler to allow an electrically operated diverter valve to change between the second and third function.

19.3 Crane/pallet forks

Crane/pallet forks are lifting attachments used for the loading and unloading of wall boards or palletized products, such as brick, blocks, stone or paving slabs. They consist of a vertical "A" frame with two horizontal forks that can enter a standard pallet, thereby allowing lifting. When used to lift bricks, blocks and other potentially fragmenting loads, a net should be used to contain any debris which could fall (see Figure 11).

During use, the centre of gravity is likely to shift depending on the load being lifted. This shift in the centre of gravity can be compensated:

- a) manually with a bow and eye arrangement, where the lifting eye is moved along the bow until the forks are balanced; or
- b) automatically with a spring load compensator; or
- c) hydraulically from one of the loader crane controls.

The forks should be:

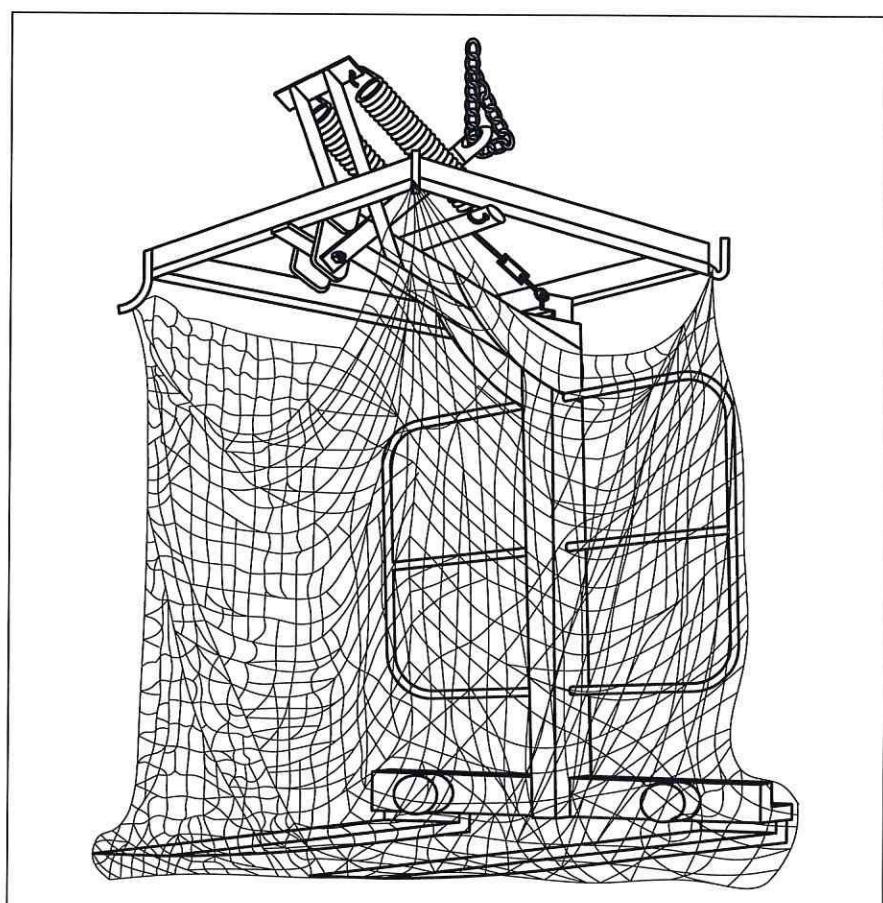
- 1) adjusted to take equal weight on each fork;
- 2) fully inserted under the load;
- 3) the correct length, i.e. at least two-thirds of the length of the load being lifted.

Wall board forks may have an additional fork tilt function to tilt the boards from the horizontal to the vertical, to allow the boards to be passed through narrow openings.

Where a hydraulic rotator is used to allow the forks to be aligned with product, the connection to the lorry loader should be made with a universal joint that will allow the forks to hang in the perpendicular. The lifting capacity of both the rotator and forks should be observed.

When not in use, the forks should be set down onto the bed of the vehicle and secured so that they cannot swing out during transit.

Figure 11 Typical pallet forks with debris net



Annex A (normative)

Training of appointed persons for lorry loader operations

A.1 General

The employment of a competent person to manage lifting operations is one of the most important factors in the safe use of lorry loaders. Poor management including planning and supervision is a contributory cause of lorry loader accidents, which result not only in significant damage to plant, but also in severe injury to those doing the work or those nearby. Training enables suitable employees to learn the basic elements of managing lorry loader lifting operations. Following training, candidates should work under the supervision of an experienced appointed person until such time their employer has assessed them as competent to perform their duties.

NOTE Detailed information about the content of training courses varies depending on the individual circumstances. The information provided in this annex is intended to assist organizations running training courses, either internally or as a service to other organizations, to determine whether their courses are adequate.

A.2 Employer's duties

Training of personnel should be treated as an important element in the overall planning and supervision of safe lifting operations. Therefore, the employer should:

- a) use appropriate procedures to ensure that suitable potential trainees are selected (see A.3);
- b) provide adequate basic training in the role of the appointed person, including the principles of lorry loader and lifting accessory selection, planning, supervision, operation, slinging, signalling, inspection, maintenance and thorough examination (see A.4);
- c) train employees in the identification of hazards on sites where lifting operations are to take place and the identification of control measures to reduce the level of residual risk;
- d) ensure that only employees who have been assessed as reaching an adequate level of competence are authorised to act as appointed persons (see A.6);
- e) provide adequate supervision so that the competence of appointed persons can be monitored and the need for any refresher training assessed.

A.3 Selection of appointed persons

A.3.1 General

Potential appointed persons should be carefully selected by the employer on the basis of their:

- a) prior relevant experience;
- b) academic and vocational qualifications;
- c) numerical and literary ability;
- d) supervisory and management skills, and experience.

Selection tests may be used as part of the process.

A.3.2 Assessment of training needs

An assessment should be made of the extent of training which is needed for an individual, bearing in mind that this could be influenced by any previous training and experience. When potential appointed persons are recruited it is essential that employers check that their qualifications and experience relate to the job they are to do. Where the type of lorry loader(s) to be operated or the slinging procedures to be used are outside the employee's previous experience, additional training should be provided. In any event, some further training is likely to be necessary to familiarize the employee with specific requirements of the new job.

A.4 Basic training of appointed persons

A.4.1 General

Basic training covers the principles, both theoretical and practical, governing the management of lifting operations with lorry loaders.

A basic training course is usually designed with the requirements of novice potential appointed persons in mind but it would be unwise to assume that more experienced employees do not need basic training. Many training organizations acknowledge this and run short courses for those with experience, recognizing that less time is necessary for training in the fundamental aspects.

A.4.2 Training venue

Training should be given at a suitable facility. Where it is given at the employer's premises, it should be carried out independently of the trainee's normal work. This means that the instructor and trainees together with the lorry loader and loads should, during the basic training, be wholly devoted to that training. A suitable facility would include:

- a) a segregated area set aside for the purpose of training. The area should be the equivalent to the loader crane's maximum radius throughout its full slewing range, plus two metres;
- b) firm, level ground, which can take the weight of the vehicle and the forces imposed by the stabilizer legs;
- c) a range of different types of load, lifting accessories and simulated hazards;
- d) a suitable classroom environment.

A.4.3 Lorry loader available for training

A lorry loader together with a competent lorry loader operator should be available at the training venue for the exclusive use of the instructor and trainee for the purposes of training. The loader crane should have similar characteristics to the type the trainee will be managing after training. It should be in good condition, safe to use and accompanied by a current report of thorough examination and all appropriate instruction manuals.

A.4.4 Appropriateness of training

As far as possible, the instructor should ensure that the training provided covers the types of loader crane, the range of loads, lifting accessories/attachments and conditions likely to be met by the trainees, including any particular hazards met in normal operations. The employer should ensure that if another organization carries out the training it is made aware of the sort of work the trainee is likely to be doing.

A.4.5 Course structure

The course should be both theoretical and practical in nature and sufficient to enable the trainee to master the necessary skills.

The course should follow a carefully devised programme which ensures that each knowledge requirement is introduced at an appropriate point in the course, building from the simpler tasks and allowing adequate time for learning and practice before moving on.

A.4.6 Trainee/instructor ratio

It is important that the ratio of instructors and trainees suits the particular aspect of training being covered. There should be sufficient time for the instructor to demonstrate each part of the practical training and then for each trainee to practice the skills while also being able to learn from observing other trainees. A ratio of one instructor to eight trainees should not be exceeded.

A.5 Training programme

A.5.1 General

As a minimum the instructor should follow a carefully devised, documented training programme covering the subjects given in A.5.2 and A.5.3 which are relevant to the category of lorry loader for which training is being given.

A.5.2 Theoretical topics

Theoretical topics should include:

- a) an introduction to the course syllabus, with reasons for the importance of training;
- b) the relevant legal requirements, including those to do with lorry loader construction, maintenance, thorough examination, documentation, record keeping and use;
- c) the different responsibilities of all the individuals involved with a lifting operation;

NOTE Reference could be made to relevant published material including British Standards and HSE and industry guidance (ALLMI);

- d) an introduction to different types of lifting equipment such as loader cranes, mobile cranes, crawler cranes, lifting gantries, overhead travelling cranes and forklift trucks;

- e) a more detailed introduction to lorry loaders, explaining the purpose of all main components, including the location and function of controls, instruments, indicators and safety devices;
- f) the principles of mechanical, hydraulic, pneumatic and electrical systems as they are relevant to the safe operation of lorry loaders;
- g) pre-operational checks, reporting and operator level maintenance in accordance with manufacturer's instructions;
- h) site surveys, identification of hazards and the completion of risk assessments and method statements;
- i) the siting of the lorry loader, including the assessment of strength and stability, and ground conditions, and the calculation of the distribution of the total load;
- j) the preparation of a drawing showing the area of the lifting operation, including the position of the lorry loader and immediate hazards;
- k) the assessment of loads, including estimation of weights and centres of gravity, and their stability;
- l) lift categories, load complexities and environmental complexities (see 4.3.2);
- m) load charts and the selection of lorry loaders for different duties;
- n) good operating practices, including operation near other plant equipment, precautions near overhead lines, structures etc.;
- o) communication with site managers, principal contractors and others in the area of the planned lifting operation;
- p) an introduction to the different types of lifting accessories, and their functions, limitations and reasons for possible failure;
- q) the routine care, inspection and maintenance of lifting accessories and reporting of defects. Information should be given on the criteria for rejection and actions to be taken;
- r) the selection and correct use of appropriate lifting accessories, including methods of slinging, the methods of rating for multi-legged slings, the concepts of working load limit and rated capacity, interpretation of markings and de-rating of lifting accessories for any particular adverse conditions of use;
- s) signalling methods, including the recognized code of hand signals;
- t) the briefing of lifting team members in the details of the lift plan.

A.5.3 Practical topics

Practical topics should include:

- a) carrying out a site survey and preparing a drawing showing the intended position of the crane;
- b) selecting suitable loader cranes for different lifting operations;
- c) undertaking the elementary operation of all controls under "no-load" conditions, including folding and unfolding;
- d) assessing loads, lorry loader lifting duties and correct lifting accessories;

- e) preparing the risk assessment and method statement;
- f) briefing the lifting team (slinger/signaller and operator) on the details of the lift plan;
- g) supervising the siting and setting up of the lorry loader in preparation for the lifting operation;
- h) supervising the lifting operation;
- i) practising the roles of signaller and slinger;
- j) checking that the loader crane is stowed correctly and prepared for travel.

A.5.4 Training in slinging

Most appointed persons should also be given training in slinging (see B.7) either because they need an appreciation of those skills or because they could be acting as the slinger during lifting operations.

A.5.5 Instructors

The success of any training depends largely on the effectiveness of the instructors. Training should be carried out by people who have been selected and trained for the purpose. Some information on their selection and training is given in A.7.

A.6 Appraisal and authorization

A.6.1 General

Continuous assessment of a trainee's progress should be made by the instructor during training to ensure the required standards are reached at each stage, monitored and maintained.

A.6.2 Appointed person tests

Potential appointed persons should also be assessed by means of theoretical and practical tests, which confirm their ability to perform their duties satisfactorily. The tests should include:

- a) a written test, including questions relating to:
 - health and safety legislation;
 - British Standards for safe use of cranes including lorry loaders;
 - identification of site hazards;
 - assessment of loads;
 - lorry loader selection;
 - assessment of ground conditions, and the calculation of the distribution of the total load;
 - selection of lifting accessories and attachments;
 - lorry loader signals;
 - operational issues and the attachment(s) used during training;

- b) preparation of a lift plan for a theoretical lifting operation, including:
- a drawing of the site showing all significant hazards and the intended position of the loader crane;
 - assessment of the load to be lifted;
 - details of the loader crane selected for the lifting operation;
 - details of the lifting accessories or attachments selected for the lifting operation;
 - a risk assessment and method statement.

A.6.3 Training records and certification

Trainees who have satisfactorily completed a training course should be awarded a certificate to that effect. The employee, or the employer on their behalf, and the accrediting body should keep records of training carried out and the results of tests undertaken.

A.6.4 Authorization of employees

Employers should give specific authorization to employees to act as appointed persons. Employers should be satisfied that the employee has had appropriate training and is competent to do the job.

A.6.5 Continuing assessment

Even after training has been completed and authorization given, a periodic assessment of personnel should be carried out to determine continued competence. Refresher training should be carried out routinely every five years. It might be required earlier, for example, in the event of long periods of inactivity.

A.7 Selection and training of instructors

A.7.1 General

Training should be carried out by instructors who are competent, carefully selected and trained for the purpose.

A.7.2 Previous experience

As training contains a lot of practical and theoretical work, instructors should have a minimum of two years of experience working as an appointed person with lorry loaders. In addition, instructors should hold a qualification in instructional techniques, and current certificates for "lorry loader appointed person", operation, slinging and signalling.

A.7.3 Instructor training course content

Instructor training should cover the following topics.

- a) principles of instruction, including classroom techniques and practice demonstration techniques;
- b) the systems and processes used by the accrediting body;
- c) instruction on delivering the topics covered in A.5.

A.7.4 Assessment

Assessments should include:

- a) theoretical assessments of the instructor's knowledge relating to standards and legislation affecting lorry loaders, technical aspects of lorry loaders, operational requirements, training standards and instructional techniques;
- b) practical assessments covering the operation of a lorry loader, preparing and presenting practical and classroom lessons, the administration of practical operator assessments and producing assessment reports.

An instructor's competency should be reviewed annually and refresher training given, if needed.

Annex B (normative)

Training of lorry loader operators and slingers

B.1 General

The employment of competent, trained operators and slingers is one of the important factors in the safe use of lorry loaders. Inadequate employee training is a contributory cause of lorry loader accidents, which result not only in significant damage to plant, but also in severe injury to those doing the work or those nearby. Training enables suitable employees to learn the basic elements of lorry loader operation and slinging.

NOTE Detailed information about the content of training courses varies depending on the individual circumstances. The information provided in this annex is intended to assist organizations running training courses, either internally or as a service to other organizations, to determine whether their courses are adequate.

B.2 Employer's duties

Training of personnel should be treated as an important element in the overall safe planning and supervision of lifting operations. Therefore, the employer should:

- a) use appropriate procedures to ensure that suitable potential trainees are selected (see B.3);
- b) provide adequate basic training in the principles of lorry loader operation and slinging (see B.4 and B.7);
- c) train employees in the use of the particular equipment (lorry loaders or lifting attachments) which they are expected to use, and instruct them in the jobs they are required to do and any particular hazards of the sites where they could work;
- d) ensure that only employees who have been assessed as reaching an adequate level of competence are authorised to operate the lorry loader (see B.7);
- e) provide adequate supervision so that the competence of operators and slingers can be monitored and the need for any refresher training assessed.

B.3 Selection of operators and slingers

B.3.1 General

Potential lorry loader operators and slingers should be carefully selected by the employer on the basis of appropriate criteria (see Clause 8). Selection tests may be used as part of the process.

B.3.2 Assessment of training needs

An assessment should be made of the extent of training which is needed for an individual, bearing in mind that this could be influenced by any previous training and experience. When lorry loader operators or slingers are recruited, it is essential that employers check that their qualifications and experience relate to the job they are to do. Where the type of lorry loader to be operated or the slinging procedures to be used are outside the employee's previous experience, additional training should be provided. In any event, some further training is likely to be necessary to familiarize the employee with specific requirements of the new job.

B.4 Basic training of operators

B.4.1 General

Basic training covers the principles, both theoretical and practical, governing the safe operation of a given category of lorry loader (see Table B.1).

A basic training course is usually designed with the requirements of novice operators in mind but it would be unwise to assume that more experienced employees do not need basic training. Many training organizations acknowledge this and run short courses for those with experience, recognizing that less time is necessary for training in the fundamental aspects.

B.4.2 Training venue

Training should be given at a suitable facility. Where it is given at the employer's premises, it should be carried out independently of the trainee's normal work. This means that the instructor and trainee together with the lorry loader and loads should, during the basic training, be wholly devoted to that training. A suitable facility would include:

- a) a segregated area set aside for the purpose of training. The area should be the equivalent to the loader crane's maximum radius throughout its full slewing range, plus two metres;
- b) firm, level ground, which can take the weight of the vehicle and the forces imposed by the stabilizer legs;
- c) a suitable classroom environment.

B.4.3 Lorry loaders used for training

A lorry loader used for training should have similar characteristics to the type the trainee would normally use after training. It should be in good condition, safe to use and accompanied by a current report of thorough examination and all appropriate instruction manuals.

B.4.4 Appropriateness of training

As far as possible, the training should include practice in the range of loads and conditions likely to be met by the trainee, including any particular hazards met in normal operations. The employer should ensure that, if another organization carries out the training, it is made aware of the sort of work which the trainee is likely to be doing.

B.4.5 Course structure

The course should be largely practical in nature and sufficient to enable the trainee to master the necessary skills.

The course should follow a carefully devised programme which ensures that each operation is introduced at an appropriate point in the course, building from the simpler, less hazardous tasks to the more complex operations, allowing adequate time for learning and practice before moving on. At each stage the instructor should explain and demonstrate the operation and the trainee should then practice it under close supervision.

B.4.6 Multiple lorry loader types

If there is a requirement to operate more than one category of lorry loader (see Table B.1), training should be given for each type and, although this would not normally require a re-run of the complete basic training course, it should cater for the differences between categories and be sufficient for the lorry loader operator to demonstrate competence (see 8.2).

B.4.7 Trainee/instructor ratio

It is important that the ratio of instructors, machines and trainees suits the particular aspect of training being covered. There should be sufficient time for the instructor to demonstrate each part of the practical training and then for each trainee to practice the skills while also being able to learn from observing other trainees. A ratio of one instructor to four trainees and one lorry loader should not be exceeded.

B.5 Training programme

B.5.1 General

As a minimum, the instructor should follow a carefully devised, documented training programme covering the subjects given in B.5.2 and B.5.3, as relevant to the category of lorry loader for which training is being given.

B.5.2 Theoretical topics

Theoretical topics should include:

- a) an introduction to the course syllabus, with reasons for the importance of training;
- b) the relevant legal requirements, including those to do with lorry loader construction, maintenance, thorough examination, documentation, record keeping and use;

- c) the different responsibilities of all the individuals involved with a lifting operation;
NOTE Reference could be made to relevant published material including British Standards and HSE and industry guidance (ALLMI);
- d) an introduction to lorry loaders, explaining the purpose of all main components, including the location and function of controls, instruments, indicators and safety devices;
- e) the principles of mechanical, hydraulic, pneumatic and electrical systems as they are relevant to the safe operation of lorry loaders;
- f) pre-operational checks, reporting and operator level maintenance in accordance with manufacturer's instructions, which are within the trainee's responsibilities;
- g) risk assessments and method statements, which will usually be generic;
- h) siting the lorry loader including an understanding of strength and stability, ground conditions, and the distribution of the total load;
- i) the assessment of loads, including estimation of weights and centres of gravity, and their stability;
- j) the use and effect of lifting attachments;
- k) lift categories, load complexities and environmental complexities (see 4.3.2);
- l) good operating practices including operation near other plant equipment, precautions near overhead lines, structures etc.;
- m) signalling methods including the recognized code of hand signals (see Figure 9);
- n) correct stowing procedures and preparation for travel.

B.5.3 Practical topics

Practical topics should include:

- a) undertaking pre-operation checks and maintenance, reporting defects and completing relevant records;
- b) carrying out a risk assessment and method statement, which will usually be generic;
- c) siting and setting up the lorry loader in preparation for the lifting operation;
- d) undertaking the elementary operation of all controls under "no-load" conditions, including folding and unfolding;
- e) assessing loads, lorry loader lifting duties and correct lifting accessories;
- f) using the lorry loader to lift and position loads in progressively more demanding situations, both for the lorry loader and the lorry loader operator, using as many configurations of the lorry loader as is practicable;
- g) practising working with a signaller;
- h) practising correct stowing procedures and preparing for travel.

B.5.4 Training in slinging

Most operators should also be given training in slinging (see B.7) either because they need an appreciation of those skills or because they are likely to be acting as the slinger as well as operating the lorry loader.

B.5.5 Machine-specific training

B.5.5.1 General

As lorry loaders vary widely in the way they are operated and the circumstances in which they are used, the knowledge and expertise required by the lorry loader operator varies accordingly. It should be recognized that a lorry loader operator who is competent to operate one make and model of lorry loader might not have the necessary knowledge and experience needed to operate other makes and models.

B.5.5.2 Appropriate training

It is essential that training is related to the knowledge and experience of the lorry loader operator, to likely job hazards, and to the size and complexity of the lorry loader itself. For example, operating a small single boom lorry loader used for a limited range of simple lifting operations is likely to require different training from operating a large lorry loader capable of being used in different ways for various complex lifting operations and in different work locations.

B.5.6 Instructors

The success of any training depends largely on the effectiveness of the instructors. Training should be carried out by people who have been selected and trained for the purpose. Some information on their selection and training is given in B.9.

B.6 Job-specific training for lorry loader operators

B.6.1 General

Job-specific training of operators can follow the completion of basic training. It should be tailored to the employer's needs and include the following elements:

- a) instruction in the operating principles and controls of the specific lorry loader(s) to be used, especially where these relate to special attachments and loads;
- b) training on the use of equipment in the conditions the lorry loader operator is likely to meet on the job, and on the particular work to be undertaken;
- c) training on the application, under normal working conditions, of the skills learned during the basic training. This should be carried out under supervision.

Table B.1 Lorry loader categories for training purposes^{A)}

Categories						
1	2	3	4	5	6	7
a) Electric or hand powered up to 1 tonne metre using hook attachment	Electric or hand powered up to 1 tonne metre using winch attachment	Electric or hand powered up to 1 tonne metre using special attachment	N/A	N/A	Electric or hand powered up to 1 tonne metre using pallet attachment	Electric or hand powered up to 1 tonne metre using auger attachment
b) Up to 4 tonne metres using hook attachment ^{B)}	Up to 4 tonne metres using winch attachment ^{B)}	Up to 4 tonne metres using special attachment ^{B)}	Up to 4 tonne metres using clamshell attachment ^{B)}	Up to 4 tonne metres using brick grab attachment ^{B)}	Up to 4 tonne metres using pallet attachment ^{B)}	Up to 4 tonne metres using auger attachment ^{B)}
c) Up to 20 tonne metres using hook attachment	Up to 20 tonne metres using winch attachment	Up to 20 tonne metres using special attachment	Up to 20 tonne metres using clamshell attachment	Up to 20 tonne metres using brick grab attachment	Up to 20 tonne metres using pallet attachment	Up to 20 tonne metres using auger attachment
d) Above 20 tonne metres using hook attachment	Above 20 tonne metres using winch attachment	Above 20 tonne metres using special attachment	Above 20 tonne metres using clamshell attachment	Above 20 tonne metres using brick grab attachment	Above 20 tonne metres using pallet attachment	Above 20 tonne metres using auger attachment
e) +e = with remote control	+e = with remote control	+e = with remote control	+e = with remote control	+e = with remote control	+e = with remote control	+e = with remote control
f)	Specialist					

^{A)} It is important to remember that training is ongoing throughout the lorry loader operator's working life. Therefore, operators should always be familiarized when moving from one type of lorry loader to another.

^{B)} Typically defined as a loader crane with a rated capacity of less than 1 000 kg or a maximum net lifting moment of less than 40 000 N·m.

B.7 Training of lorry loader slingers

B.7.1 General

The training of lorry loader slingers (who may also be lorry loader operators) should provide information and practical experience on principles relating to the inspection, care, maintenance, selection and use of lifting accessories.

B.7.2 Training equipment

There should be a good range of lifting accessories available including, where possible, any special purpose accessories which the employee is likely to use. The lifting accessories in use should be in good condition with a current report of thorough examination. Examples of faulty lifting accessories should be made available to the trainee for inspection purposes.

B.7.3 Training facilities

Suitable facilities and training aids should be made available so that the instructor can cover the theoretical and practical elements of the training.

B.7.4 Course duration

Sufficient time should be available to cover the subject adequately and to allow time for practical work.

B.7.5 Training programme

B.7.5.1 Theoretical topics

Theoretical topics should include:

- a) an introduction to the course syllabus, with reasons for training;
- b) the relevant legal requirements and published guidance material;
- c) an introduction to the different types of lifting accessories, their functions, limitations and reasons for possible failure;
- d) the routine care, inspection and maintenance of lifting accessories and reporting of defects. Information should be given on the criteria for rejection and actions to be taken;
- e) the assessment of loads, including estimation of weights and centres of gravity;
- f) the selection and correct use of appropriate lifting accessories including methods of slinging, the methods of rating for multi-legged slings, the concepts of working load limit and rated capacity, interpretation of markings and de-rating of lifting accessories for any particular adverse conditions of use;
- g) signalling methods, including the recognized code of hand signals;
- h) record keeping to the extent that it is the lorry loader slingers' responsibility.

B.7.5.2 Practical topics

Practical topics should include:

- a) assessing loads, including estimating weights, centres of gravity and lifting points;
- b) selecting lifting accessories for particular loads;
- c) using appropriate lifting accessories, including methods of slinging, methods of rating for multi-legged slings, the practical application of the concepts of working load limit and rated capacity, interpretation of markings and de-rating of lifting accessories for any particular adverse conditions of use;
- d) storing lifting accessories correctly after use;
- e) giving appropriate signals to a lorry loader operator.

B.8 Appraisal and authorization

B.8.1 General

Continuous assessment of trainee's progress should be made by the instructor during training to ensure the required standards are reached at each stage, monitored and maintained.

B.8.2 Lorry loader operator's tests

At the end of the training programme, lorry loader operators should take a series of tests to confirm that the skills listed in B.5 have been gained. The tests should include:

- a) pre-operational checks;
- b) theoretical assessments, including questions relating to health and safety, operational issues and the attachment(s) used during training;
- c) a practical assessment to demonstrate safe operation of the lorry loader and to ensure the correct procedures can be carried out.

B.8.3 Lorry loader slinger's tests

Lorry loader slingers should also be assessed by means of theoretical and practical tests, which confirm their ability to perform their duties satisfactorily.

B.8.4 Training records and certification

Trainees who have satisfactorily completed a training course should be awarded a certificate to that effect. The employee, or the employer on their behalf, and the accrediting body should keep records of training carried out and the results of tests undertaken.

B.8.5 Authorization of employees

Employers should give specific authorization to employees to operate lorry loaders and/or to act as slingers and signallers. Employers should be satisfied that the employee has had appropriate training and is competent to do the job.

B.8.6 Continuing assessment

Even after training has been completed and authorization given, a periodic assessment of personnel should be carried out to determine continued competence. Refresher training should be carried out routinely every five years. It might be required earlier, for example, in the event of long periods of inactivity.

B.9 Selection and training of instructors

B.9.1 General

Training should be carried out by instructors who are competent, carefully selected and trained for the purpose.

B.9.2 Previous experience

As training contains a lot of practical work, instructors should have a minimum of two years of experience with lorry loaders. In addition, instructors should hold a qualification in instructional techniques, and current certificates for lorry loader operation, slinging and signalling.

B.9.3 Instructor training course content

Instructor training should cover the following topics:

- a) principles of instruction, including classroom techniques and practice demonstration techniques;
- b) the systems and processes used by the accrediting body;
- c) instruction on delivering the topics covered in section B.5 and B.7.5.

B.9.4 Assessment

Assessments should include:

- a) theoretical assessments of the instructor's knowledge relating to standards and legislation affecting lorry loaders, technical aspects of lorry loaders, operational requirements, training standards and instructional techniques.
- b) practical assessments covering the operation of a lorry loader, preparing and presenting practical and classroom lessons, the administration of practical operator assessments, and producing assessment reports.

An instructor's competency should be reviewed annually and refresher training given, if needed.

Annex C (informative)

Background to the BS 7121 series

The misuse of cranes through lack of knowledge and understanding of hazards and/or safe working procedures is a major cause of accidents. The BS 7121 series therefore aims to:

- a) describe the principal characteristics of the various forms of cranes of the types most commonly used;
- b) draw attention to some of the more common hazards and potential dangers which might be encountered in their use;
- c) recommend general precautions to be taken and procedures to be followed to avoid accidents;
- d) implement legislation by providing guidance drawn together by expert parties on good practice in the use of various types of cranes.

These codes of practice have been prepared by committees of representatives from different branches of the crane industry and the HSE. Their combined experience and specialist knowledge in the fields of crane design, manufacture, application and safety ensure that the recommendations are well founded and practical.

For over 28 years, UK experts have worked together codifying recommendations to address these issues that have been adopted and used by the crane industry.

It has long been recognized by the committees that the safe use of a crane ultimately rests with the operational personnel taking account of manufacturer's/supplier's information.

Committee members are unanimous in their view that there is a need for the introduction of national systems, e.g. for licensing crane operators to operate only those types of cranes for which they have received training and have demonstrated their competence.

Management have the overall responsibility for safety and supervision and it is to management that these codes of practice are primarily directed.

The intention is that these codes are used by management both as a working guide and in the training of personnel in safe working practices, and that appropriate information and recommendations are incorporated in their company standing instructions for the safe use of cranes.

It is worth noting that the guidance published by the HSE in support of LOLER makes eight references to the BS 7121 series.

The Health and Safety at Work etc. Act 1974 [5] requires duty holders to have in place safe systems for all work activities. The systems require adequate:

- 1) planning;
- 2) management and supervision;
- 3) training of personnel;
- 4) clear instructions.

The BS 7121 series has been accepted as representing the consensus of practical experience for safety on cranes. Therefore, as far as safe crane operations are concerned, the benchmark for safe working practices is the BS 7121 series.

Annex D (informative) **Beaufort scale**

Table D.1 provides information on the Beaufort scale for measuring wind speed.

Table D.1 Beaufort scale wind conditions

Beaufort number	Description of wind	Specifications for use on land	Wind speed	
			mph	m/s
0	Calm	Calm; smoke rises vertically	0 to 1	0 to 0.2
1	Light air	Direction of wind shown by smoke	1 to 3	0.3 to 1.5
2	Light breeze	Wind felt on face; leaves rustle; ordinary vanes moved by wind	4 to 7	1.6 to 3.3
3	Gentle breeze	Leaves and small twigs in constant motion; wind extends light flag	8 to 12	3.4 to 5.4
4	Moderate breeze	Raises dust and loose paper; small branches are moved	13 to 18	5.5 to 7.9
5	Fresh breeze	Small trees in leaf begin to sway; crested wavelets form on inland waterways	19 to 24	8.0 to 10.7
6	Strong breeze	Large branches in motion; whistling heard in telephone wires; umbrellas used with difficulty	25 to 31	10.8 to 13.8
7	Near gale	Whole trees in motion; inconvenience felt when walking against wind	32 to 38	13.9 to 17.1
8	Gale	Breaks twigs off trees; generally impedes progress	39 to 46	17.2 to 20.7
9	Strong gale	Slight structural damage occurs (chimney pots and slates removed)	47 to 54	20.8 to 24.4

Annex E (informative) Lorry loader pre-use check sheet

An example of a pre-use check sheet for lorry loaders is given in Figure E.1.

Figure E.1 Lorry loader pre-use check sheet

Lorry Loader Pre-use Check Sheet			
OPERATOR'S NAME:		VEHICLE REG:	
LOADER TYPE:		DATE:	
Items to be checked by Operator before and during Operation – MARK ✓ or X			
In Cab		Stabilizers	
PTO Cab Switch Operation		Stabilizer Beam Cam-Locks	
Handbrake Interlock (if fitted)		Stabilizer Beam Secondary Locks	
Height Warning Signs		Swing Up Stabilizer Locks	
Lorry Loader Test Certificate		Stabilizer Hoses and Pipework	
Report of Thorough Examination			
Training Certificate/Card			
Operator's Manual			
Hydraulic Fluid		Loader Crane	
Hydraulic Oil Level		Loader Operation	
Condition of Oil (visual/colour)		Operation of Control Levers/Remotes	
Hydraulic Oil Leaks		Operation of Rated Capacity Indicator	
		Operation of Emergency Stop Switches	
		Operation of Height Warning Device	
		Additional Safety Systems	
		Condition of Hoses and Pipework	
Attachments			
Operation of Attachment (if fitted)		Condition of Hook and Safety Catch	
Condition of Attachment (e.g. Brick Grab Rubbers)		Loader Stowing Device (Transport Position)	
Stowing of Attachment to Vehicle		Attachment of Loader to Vehicle	
Hydraulic Oil Leaks			
Lifting Gear			
Correct Lifting Accessories			
Condition of Lifting Accessories			
Lifting Accessories Report of Thorough Examination			
Lifting Accessories Test Certificate			
Is the loader crane safe to use? Y/N			
Remarks:			
Operator's Signature		Manager's Signature	

Annex F (normative) Radio communication for lifting operations

F.1 Introduction

Lorry loaders often work on congested construction sites where the signaller is out of sight of the tower crane operator and the standard hand signals specified in BS 7121 cannot be used. As an alternative, handheld VHF/UHF (very high/ultra high frequency) radios are often used. However, the use of these radios can lead to a number of problems which could interfere with the clear communication vital for safe lifting operations, such as:

- a) loss of signal and thus communication, resulting in the loss of control of the lifting operation;
- b) interference from radios on adjacent sites, which can result in the loss of communication or directions being given to the wrong lorry loader/crane operator;
- c) misunderstanding between the lorry loader operator and the signaller, leading to problems, such as a load being lifted before the slinger has his hands clear, loads colliding with the building structure and the load being lowered before people are clear of the landing area.

F.2 Radio specification

Issues a) and b) in F.1 should be addressed by specification of the correct radio equipment for the application taking into account:

- signal strength – if it is too low, there is a risk of signal loss, but, if it is too high, it is likely to cause interference with adjacent sites. When working blind, the structure might well cause signal loss and a booster aerial could be required. Signal strength should be checked at the beginning of each shift before lifting operations are started;
- frequency – a different frequency from other radios on the site or in the area should be selected to avoid interference from or to other radios;
- durability – radio hand sets should be sufficiently durable to withstand use on site;
- charging – adequate charging arrangements should be made so that batteries are charged at the end of a shift and that spare charged batteries are available at all times;
- battery capacity – the radio battery should have sufficient capacity to last for a full shift.

F.3 Calls signs and standard commands

Issue c) in F.1 (misunderstandings between the lorry loader operator and signaller) should be addressed as follows:

- both parties should have a sufficient command of a common language (normally English) so that clear, unambiguous communication can take place;
- a clear, unique call sign should be allocated to each signaller and crane operator;

- each message should be preceded by the call sign;
- the crane operator should not respond to any command (other than "Stop") that is not preceded by the call sign;
- voice commands should only be given by one person, normally the signaller, at any one time;
- voice commands should be given using the signals in Table F.1.

Table F.1 Voice commands for lifting operations

	Command	Type of lorry loader
1	"Stop Now" (<i>Emergency Stop</i>)	Standard
2	"Slew Column Left" ^{A)} "Slew Column Right" ^{A)}	
3	"First Boom Raise" "First Boom Lower"	
4	"Second Boom Unfold" "Second Boom Fold"	
5	"Second Boom Extend" "Second Boom Retract"	
6	"Rotator Rotate Left" "Rotator Rotate Right"	
7	"Third Boom Unfold" "Third Boom Fold"	
8	"Third Boom Extend" "Third Boom Retract"	
9	"Grab" "Release"	Fitted with grab
10	"Take the Weight" "Raise" ^{B)} "Lower" ^{B)} "Lower Slowly"	Fitted with hoist

A) "Left" and "Right" are defined from the viewpoint of a lorry loader operator sitting at a control station looking down at the load. This also applies when a lorry loader is being operated using remote controls.

B) When fine positioning control is required, the person giving the signal should repeat the command continuously for as long as motion is required "Lower slowly, Lower, Lower, Lower, Lower, Lower, Lower, Stop". As long as the lorry loader operator can hear the command, it will be clear that the radio is working. If the commands cease before the final Stop, the operator will know that communication has broken down and stop the operation.

F.4 Radio system familiarization

It is essential that all radio users are familiar with the controls and operation of the model of radio that they are required to use.

F.5 Radio licensing

Radios used for two-way communication on construction sites, and for industrial use, are referred to as private mobile radios (PMR). Some low-powered PMRs use a European system called PMR446 and do not require a licence. However, this system is limited to 8 UHF frequencies, each with 38 channels, which could lead to interference from other users. PMR446 radios are also limited to a maximum of 500 mW effective radiated power, which gives a range of 0.8 km (0.5 miles) to 1.6 km (1 mile) in built up areas and 3.2 km (2 miles) in open country.

More powerful radios work on VHF and UHF radio frequencies, which are assigned to a user by Ofcom who also regulate the frequency bands. To obtain a licence on one of these frequencies an application needs to be made to Ofcom. The benefits of a licensed frequency are generally greater range, less interference from other users and more features available on the radio sets.

These frequencies are allocated to businesses only, on a case-by-case basis. Once the licence has been issued, radios can be purchased. The supplier will need to see a copy of the licence to program the radios to the correct frequency before shipping.

Additional guidance is given in Ofcom's *Information Sheet RA 195: Business radiocommunications for tower cranes* [21].

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 4-1, *Structural steel sections – Part 1: Specification for hot-rolled sections*

BS 5744, *Code of practice for safe use of cranes (overhead/under hung travelling and goliath cranes, high pedestal and portal jib dockside cranes, manually operated and light cranes, container handling cranes and rail-mounted low carriage cranes)*

BS 6166-3, *Lifting slings – Part 3: Guide to the selection and safe use of lifting slings for multi-purposes*

BS 8437, *Code of practice for selection, use and maintenance of personal fall protection systems and equipment for use in the workplace*

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¹⁾ Reissued in 2006.

²⁾ In preparation.

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