Guidance Notes on Safe Use of Lorry-mounted Crane
This Guidance Notes is prepared by the

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1. Introduction

1.1 Lorry-mounted cranes are commonly used for transportation and lifting operations in construction sites and other industrial undertakings. In recent years, there have been many serious accidents involving the use of lorry-mounted cranes during the lifting operations. The common causes of these accidents are often due to the absence of a safe system of work for the lifting operation, poor maintenance, improper operation and instability of the crane, etc.

1.2 This Guidance Notes provides practical guidance to the industry on how to use lorry-mounted cranes safely and properly with a view to assisting the duty holders in preventing accidents and complying with the Factories and Industrial Undertakings Ordinance (Cap. 59) (hereinafter referred to as FIUO) as well as the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations (hereinafter referred to as LALGR) when using lorry-mounted cranes in industrial undertakings.

1.3 The purpose of this Guidance Notes aims at strengthening the safety awareness of the owners, appointed persons, lifting supervisors, crane operators, slingers and signallers who involve in the lifting operations by using lorry-mounted cranes.

1.4 The first part of this Guidance Notes is focused on the safe system of work for lifting operation by lorry-mounted crane while the second part starting from Section 6 provides clear and practical guidelines.

1.5 This Guidance Notes should be read in conjunction with the ‘Code of Practice for Safe Use of Mobile Cranes’ (hereinafter referred to as the CoP) as well as other guidance notes, such as ‘Guidance Notes on
Inspection, Thorough Examination and Testing of Lifting Appliances and Lifting Gear’ published by the Labour Department. Apart from these publications, reference should also be made to the relevant international standards and the instructions contained in the manufacturer’s manuals of specific cranes.

1.6 The provisions in this Guidance Notes should not be regarded as exhausting those matters which need to be covered by the relevant safety legislations, nor are they intended to relieve persons undertaking the work of their statutory responsibilities. It is important to note that compliance with this Guidance Notes does not of itself confer immunity from the legal obligations.
2. Definition
For the purpose of this Guidance Notes, the definitions given in LALGR as well as the following shall apply:

2.1 Lorry-mounted crane means a crane which is mounted on a lorry chassis.

2.2 "automatic safe load indicator" (ASLI) means a device intended to be fitted to a crane that automatically gives an audible and visible warning to the operator thereof that the crane is approaching its safe working load and that automatically gives a further audible and visible warning when the crane has exceeded its safe working load.

2.3 "owner" in relation to any lifting appliance or lifting gear, includes the lessee or hirer thereof, and any overseer, foreman, agent or person in charge or having the control or management of the lifting appliance or lifting gear, and the contractor who has control over the way any construction work which involves the use of the lifting appliance or lifting gear is carried out and, in the case of a lifting appliance or lifting gear situated on or used in connection with work on a construction site, also includes the contractor responsible for the construction site.

2.4 A contractor is responsible for a construction site if he is undertaking construction work there or, where there is more than one contractor undertaking construction work at the site, if he is the principal contractor undertaking construction work there.

2.5 "competent examiner" in relation to the carrying out of any test and examination, means a person who is-

(a) appointed by the owner;

(b) a registered professional engineer registered under the Engineers
Registration Ordinance (Cap. 409) within a relevant discipline specified by the Commissioner for Labour; and

(c) by reason of his qualifications, training and experience, competent to carry out the test and examination.

2.6 "competent person" means a person who is-

(a) appointed by the owner; and

(b) by reason of training and practical experience, competent to perform the duty.

2.7 "lifting sub-contractor" means a sub-contractor who has control over the way any construction work which involves the use of the crane or lifting gear is carried out.

2.8 "safe working load" (SWL) in relation to a lorry-mounted crane, means the appropriate safe working load for operating the crane as specified in the current certificate of test and thorough examination delivered in the approved form by a competent examiner in respect of that crane for the purposes of LALGR.
3. Management of Lifting Operation

3.1 Safe system of work

3.1.1 A safe system of work should be established and documented. This safe system of work should be prepared and endorsed by the owner, with the advice of the appointed person (see Section 5.2), safety officer and other relevant personnel. The safe system of work should be strictly followed, fully implemented, and closely monitored for every lifting operation, whether it is an individual lift or a series of repetitive operations. The system should be effectively communicated to all parties concerned.

3.1.2 The safe system of work should include, but not limited to, the following:

(a) task-specific risk assessment for the lifting operation (see Section 3.2);
(b) planning of the lifting operation (see Section 3.3);
(c) adoption of a permit-to-lift system for the lifting operation (see Section 3.4);
(d) selection, provision and use of a suitable lorry-mounted crane, lifting gear and associated equipment (see Section 4);
(e) maintenance, inspection, examination and testing of the lorry-mounted crane and the lifting gear;
(f) provision and maintenance of manufacturer's manuals and maintenance log books;
(g) devising a proper rigging method for the load;
(h) ensuring that all necessary test and examination certificates and other documents are available;
(i) access control of the lorry-mounted crane (see Section 6.1.1);
(j) provision and appointment of properly trained and competent personnel;
(k) adequate supervision by properly trained and competent personnel;
(l) observing for any unsafe conditions;
(m) preventing unauthorized movement or use of the crane at all times;
(n) safety of other persons who may be affected by the lifting operation; and
(o) contingency plan.

3.2 Risk assessment

3.2.1 When the lifting work is to be undertaken by a lorry-mounted crane in a workplace, the owner should appoint a competent person to carry out a risk assessment for the lifting operation and make recommendations on safety measures to be taken in relation to safety and health of workers involved.

3.2.2 The assessment and recommendations should be in writing, and identify all potential hazards associated with the proposed lifting operation and evaluate the extent of the risks arising from such hazards. The risk assessment should be task-specific, having due regard to the specific nature such as man, machine, material, method and environment of the lifting operation.

3.2.3 In general, the assessment should consist of the following:

(a) identifying all potential hazards;
(b) deciding who might be harmed, and how;
(c) evaluating the risks arising from the hazards, and decide whether existing safety precautions are adequate or more should be done;

(d) recording the findings; and

(e) reviewing the assessment from time to time and revise it if necessary.

3.2.4 The assessment together with the instructions/warnings specified in the manufacturer’s manual, such as limitations on operating the lorry-mounted crane, should be taken into consideration for developing a lifting plan for the proposed lifting operation.

3.3 Lifting plan

3.3.1 All lifting operations should be planned to ensure that they are carried out safely and that all foreseeable risks have been taken into account. The lifting plan should be formulated in writing by the appointed person. In case of repetitive or routine operations, a lifting plan is required in the first instance, with periodic reviews to ensure that it copes with any factors that have changed.

3.3.2 The lifting plan should be task-specific with due consideration to the actual site conditions, including but not limited to:

(a) the characteristic of the load (its size, bulkiness, weight and the location of the centre of gravity etc.);

(b) the lifting/rigging method to ensure its stability (use of lifting frame, lifting configuration of two-leg or multi-leg sling etc.);

(c) the selection of suitable lorry-mounted crane (see Section 4) and the selection of suitable lifting gear (e.g. of suitable capacity);

(d) the position and siting of the lorry-mounted crane (e.g. on firm
(e) the space around the lorry-mounted crane to ensure that all outriggers of the lorry-mounted crane can be fully extended;

(f) the clearance between the lorry-mounted crane and its nearby objects to be at least 600mm;

(g) the appointment of lifting personnel involved in the lifting operation such as the appointed person, lifting supervisor, crane operator, slinger and signaller;

(h) pre-lifting inspection of the lorry-mounted crane before the lifting operation to ensure all safety devices such as ASLI, limit switches and cut-outs, etc. are in good working order;

(i) the effectiveness of communication among relevant parties, including the crane operator, the slinger and the signaller; and

(j) any necessary set up of the lorry-mounted crane, e.g. hook, safety catch and other attachment.

3.3.3 After the lifting plan has been devised and documented, the lifting plan should be properly and fully communicated to the lifting team. A copy of this lifting plan should be made available to the lifting team as well as the management of the workplace with lifting operations before the start of lifting operation.

3.4 Permit-to-lift system

3.4.1 A permit-to-lift system should be devised and put in place prior to the lifting operation to ensure that necessary safety precautions have been taken and continue to be effective to ensure that the lifting operation is carried out safely.

3.4.2 A permit-to-lift should be issued by a lifting supervisor (see Section 5.3)
and endorsed by an appointed person. This permit should only be issued after all the safety precautions have been taken according to the lifting plan formulated by the appointed person to ensure lifting safety and it should only be valid for a specified period of time.

3.4.3 The permit-to-lift should be made available on the lorry-mounted crane for inspection.

3.5 Control of lifting operation

3.5.1 To ensure the implementation of the safe system of work, a person should be appointed to have overall control of the lifting operation and to act on behalf of the owner. The appointment of the person would not avoid any legal liability from the owner but enables them to make use of the appointed person’s expertise to better fulfil their responsibilities.

3.5.2 A competent person should be appointed as the lifting supervisor to directly and immediately supervise the lifting operation.
3.5.3 Suitable coordination and arrangement should be made to avoid any possible collision between the lorry-mounted crane and other plants in the workplace. The lorry-mounted crane should be so positioned that collision will not take place. The sequential movement of the lorry-mounted crane and other plants should be properly coordinated and arranged to prevent collision.
4. Selection of Lorry-mounted Crane

4.1 A safe lorry-mounted crane is the one in which the vehicle and the crane are well matched to the type, weight and size of the load to be carried and lifted.

4.2 The crane should be mounted onto the lorry chassis in accordance with the requirements of the manufacturers’ instructions. Advice of the manufacturer should be sought in case of doubts. Reference should also be made to the Safety Alert No. 002/15 on “Considerations when Purchasing and Assembling Lorry-mounted Cranes (including brand-new and second hand)” and its updated version, if any, issued by the Construction Industry Council.

4.3 The owner of the lorry-mounted crane should consider the following factors on the selection of a suitable lorry-mounted crane, but not limited to:

(a) the weight, dimensions, characteristics of the lorry-mounted crane and the load to be lifted (Particular attention should be paid to the availability of the space required for fully extension of all outriggers of the lorry-mounted crane at the workplace. When considering the adequacy of lifting capacity of the lorry-mounted crane, reference should always be made to the safe working loads specified in the approved form, not the lifting capacity chart affixed on the lorry-mounted crane or provided in the user manual of the manufacturer);

(b) the operation, operating speed and radii, height of lift and area of movement;

(c) the number, frequency and type of the lifting operation;

(d) the space available for the access, deployment, operation and
stowage of the lorry-mounted crane;

(e) the control position which is most suitable for the lifting operation. The control position should be so selected such that the lorry-mounted crane operator has a clear and unrestricted view of path of the load during the lifting operation and that the operator is adequately protected from crushing hazards, in particular under the circumstance when the lorry-mounted crane overturns (A choice of control positions including controls at the sides of the crane, high seat controls and remote controls);

(f) the effect of the operating environment for the lorry-mounted crane; and

(g) the restriction and limitation concerning the use of the lorry-mounted crane.
5. Responsibilities and Requirements of Relevant Personnel

5.1 Owner

5.1.1 For lifting operation being carried out by a lorry-mounted crane, the owner should comply with the LALGR, the general duties provisions of the FIUO and the CoP.

5.1.2 The owner should ensure that all lifting team members understand the safe system of work as designed for the lifting operation using the lorry-mounted crane in the workplace. The lifting team members should be provided with necessary information, instruction and training about the safe system of work. Adequate supervision should be provided to the lifting team members.

5.1.3 For clear delineation of safety responsibilities among duty holders, Appendices I and II set out examples of the roles and responsibilities of the principal contractor, lifting sub-contractor and physical owner of the crane respectively on construction sites. The principal contractor should adopt, among others, the safety measures listed in Appendix I. The lifting sub-contractor and the physical owner of the crane should adopt, among others, the safety measures listed in Appendix II.

5.2 Appointed person

5.2.1 The owner should appoint a person in writing to have overall control of the lifting operation.

5.2.2 The appointed person should have adequate training and experience on the management of the lifting operation to enable the duties to be carried out competently. His main responsibility is to ensure the proper implementation of the safe system of work, formulate the lifting plan and endorse the lifting permit.
5.2.3 The appointed person should:

(a) be fully conversant with crane operation and crane maintenance;
(b) have adequate practical experience in mechanical engineering;
(c) be familiar with hazards, limitations and precautions associated with the crane operation;
(d) have properly trained in the safe use of lorry-mounted cranes including the theory of crane operation;
(e) be familiar with the provisions of the LALGR and the contents of the CoP;
(f) ensure the safe system of work is fully understood by the personnel associated with the lifting operation; and
(g) be capable of performing inspections and tests on lorry-mounted cranes in accordance with the manufacturer’s instructions.

5.3 Lifting supervisor

5.3.1 The owner should appoint a competent person as the lifting supervisor in writing to directly supervise the whole lifting operation.

5.3.2 The lifting supervisor should have adequate training and experience on monitoring of lifting operation to enable the duties to be carried out competently. His responsibility is to ensure the full execution of the lifting plan. He is also responsible for issuing lifting permit.

5.3.3 The lifting supervisor should provide adequate information, instruction, training and supervision to the lifting team members. Before the lifting operation, the lifting supervisor should brief the lifting team members of the lifting plan and operation.

5.3.4 The lifting supervisor should have sufficient authority to stop the lifting
operation if he observes any unsafe condition or unsafe act during the lifting operation. When he notices any abnormality, any unexpected unsafe condition in the lifting zone and/or any deviation from the lifting plan, he should stop the lifting operation and report to the appointed person for verification and review of the lifting plan, if needed be.

5.4 Crane operator

5.4.1 The crane operator should ensure at all times the safe operation of the crane under his control. He should follow the correct operation of the crane in accordance with the manufacturer’s instructions and the safe system of work. He should at any one time only respond to the signals from one appointed person/lifting supervisor/slinger/signaller who should be clearly identified. In particular, the crane operator should:

(a) have attained the age of 18 years and hold a valid certificate issued by either the Construction Industry Training Authority before 1 January 2008 or the Construction Industry Council or by any other person specified by the Commissioner for Labour as required by Regulation 15A(1) of LALGR;

(b) be fit, with particular regard to eyesight, hearing and reflexes;

(c) have been trained in the general principles of slinging and be able to establish weights and judge distances, heights and clearances;

(d) have been adequately trained in the operation of the type of crane he is operating and have sufficient knowledge of the crane and its safety devices;

(e) understand fully the duties of the slinger and be familiar with the signal code shown in Table 1 of the CoP in order to implement safely the instructions of the appointed person/lifting supervisor/slinger/signaller; and
(f) understand fully the radio/tele-communication signals between the parties concerned.

5.4.2 The owner should ensure that the manufacturer’s manual of the lorry-mounted crane in a language which could be comprehended by the crane operator is available for the crane operator to make reference at all times before and during the lifting operation.

5.5 Slinger

5.5.1 The slinger should be responsible for attaching and detaching the load to and from the crane, and for the use of correct lifting gear in accordance with the lifting plan. In particular, the slinger should:

(a) have attained the age of 18 years;
(b) be fit with particular regard to eyesight, hearing and reflexes;
(c) be agile and have the physique for handling lifting tackle;
(d) have been trained in the general principles of slinging and be able to establish weights and judge distances, heights and clearances;
(e) be capable of selecting tackle and lifting gear as well as rigging method suitable for the loads to be lifted;
(f) understand fully the signal code shown in Table 1 of the CoP and be able to give clear and precise signals;
(g) be capable of directing the movement of the crane and load in such a manner as to ensure the safety of personnel and plant; and
(h) understand fully the radio/tele-communication signals between the parties concerned.
5.6 Signaller

5.6.1 Where the crane operator does not have a clear and unrestricted view of the load carried by the crane, its vicinity or the point of attachment for a load where no load is being carried and such view is necessary for the safe working of the crane, a signaller should be employed to relay the slinger’s instructions to the crane operator.

5.6.2 The signaller should be responsible for relaying the signal from the slinger to the crane operator. He is also responsible for directing the safe movement of the crane. He should not be engaged in other activities while giving signal to the crane operator. In particular, he should:

(a) have attained the age of 18 years;
(b) be fit with particular regard to eyesight, hearing and reflexes;
(c) understand fully the signal code shown in Table 1 of the CoP and be able to transmit the instructions of the slinger in a clear and precise manner;
(d) be easily identifiable to the crane operator (e.g. by wearing ‘high-visibility’ clothing, or other means); and
(e) understand fully the radio/tele-communication signals between the parties concerned.
6. Safe Lifting Operation
6.1 Access control / pre-lifting control and arrangement

The following safety precautions summarize essential requirements to use and operate a lorry-mounted crane especially in access control and its pre-lifting safety control and arrangement. In any case, the appointed person should make reference to the safety notes of the manufacturer’s manual to get the full sight of the lorry-mounted crane before it is put into use.

6.1.1 Access control

6.1.1.1 Before the lorry-mounted crane enters the workplace area, the owner should ensure the availability of the approved certificates of the crane, its associated lifting gear and crane operator. The manufacturer's manual and maintenance record should also be available with the lorry-mounted crane.

6.1.1.2 After the lorry-mounted crane is permitted to enter the workplace area, it should be parked in a designated area to wait for further instruction by the owner and necessary arrangement for the lifting operation should be made before any lifting operation commences.
6.1.2 Site preparations before lifting operation

6.1.2.1 Before any lifting operation commences, the owner should carry out site preparations for the safe operation of the lorry-mounted crane. The following safety measures should be observed:

(a) the ground of the selected lifting zone should be firm and level;

(b) the lifting zone should be suitable for the lifting operation;

(c) the lifting gear, equipment and tackle should be suitable for the lifting operation;

(d) adequate safety measures should be adopted to safeguard against the proximity hazards;

(e) all the lifting zones should be fenced/barricaded off properly with suitable warning notices displayed;
(f) suitable goal posts and warning signs should be provided if the lifting zone is in the vicinity of overhead electricity lines;

(g) site traffic controls should be properly arranged;

(h) adequate site access roads to the lifting zone should be provided;

(i) personal protective equipment, such as safety helmets fitted with chin straps, safety shoes, reflective vests, and means of communication should be provided to operators, signallers, riggers and any other persons assisting in the lifting operation; and

(j) a valid permit-to-lift should be obtained prior to the lifting operation.

Photo 3 - Properly fencing off the lifting zone
6.1.3 Pre-lifting inspection of the crane

6.1.3.1 The crane operator should read and understand the safety information relating to the crane concerned from the manufacturer’s manual before he operates the lorry-mounted crane. It is important that the operator, apart from possessing the necessary qualifications, has sufficient knowledge in safety procedures and safety precautions in operating the crane.

6.1.3.2 At the beginning of each shift or working day, the crane operator, if competent by reason of training and practical experience to perform the duty assigned for the purpose, or a competent person, should as appropriate:

(a) carry out checks as required by the manufacturer’s instructions;

(b) check that the ASLI is correctly set and that the manufacturer’s daily test is carried out;

(c) check the levelling of the crane to confirm that there has been no change in the original levelling, no sinking of outrigger feet or settling of the foundation;

(d) check the oil level(s), fuel level and lubrication;

(e) check hook for signs of obvious wear and damage;

(f) check the ropes, rope terminal fittings and anchorages for obvious damage and wear;

(g) check the condition and inflation pressure(s) of tyres;

(h) check that all water is drained from any air
receivers;

(i) check the jib structure for obvious damage;

(j) check the operating pressures in any air and/or hydraulic system(s);

(k) check leakage of brake fluid and hydraulic oil;

(l) check the operation of the crane through all motions with particular attention to brakes to ensure that these are operating efficiently; and

(m) check the operation of all limit switches and cut-outs (use caution in making the checks in case of non-operation).

6.1.3.3 A full inspection of the crane should be carried out by a competent person at least once a week. Apart from those items under Section 6.1.3.2 covered in the daily inspection, attentions should also be paid to all mounting, fixing and structural members.

6.1.3.4 The competent person responsible for the inspection of the crane should have the responsibility to ensure proper regular inspection to the crane under his responsibility according to the schedule set under the safe system of work has been carried out. He should record the state of the crane.

6.1.3.5 Use of “checklist” for carrying out the above mentioned routine visual inspection is recommended. Reference should also be made to the Safety Alert No. 001/16 on “Lorry-Mounted Crane Pre-Use Checklist” and its updated version, if any, issued by the Construction Industry Council. A certificate in an
approved form stating that the crane is in safe working order should be submitted to the owner by the competent person when no defect is found in the weekly inspection.

6.1.4 Reporting the abnormality

6.1.4.1 Should any defect or abnormality in the crane be found in an inspection or in the operation of the crane, or should the crane be accidentally damaged, this should be reported immediately to the appointed person and lifting supervisor. The crane should be taken out of service (with ignition key removed and a notice stating that the crane is out of order attached to the prominent position of the crane) until the faults have been rectified and clearance is given by the appointed person and lifting supervisor.

6.1.4.2 When the crane operator or any other person notices any unsafe condition in the lifting zone, they should stop the lifting operation, lower the load onto the ground or the deck of lorry as appropriate and report to the appointed person and also the lifting supervisor in order to revise the work method and procedures for the lifting operation.

6.1.5 Provision of safe access

6.1.5.1 Safe access and means of emergency escape should be provided and maintained in good condition in the lifting zone, including that for the operating positions and the deck of the lorry, and any additional access provided for inspection, maintenance and repair of the lorry-mounted crane.
6.1.5.2 An unobstructed passageway of 600mm wide or more should be maintained between the slewing or other moving parts of the lorry-mounted crane and the guard rails, fences or other fixtures. If such passageway cannot be maintained at any particular place, access to that place should be prevented when the lorry-mounted crane is in use.

6.1.5.3 When the crane is in operation, no person should be permitted to board or leave the lorry-mounted crane except with permission granted by the appointed person/lifting supervisor. Personnel should be instructed to use and should use only the proper access points for boarding or leaving the crane.

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

6.2 Lifting quadrants and working range of the crane

6.2.1 Lifting quadrants

6.2.1.1 The lifting capacity of a lorry-mounted crane for a particular combination of working radius and jib length is the structural capability of the crane or the capability of the crane based on its stability at such working radius and jib length, whichever is smaller. Given the asymmetric geometry of the crane, the lifting capacity may be different in the same working radius for different
lifting quadrants or different extended lengths of the lifting jib.

6.2.1.2 When a competent examiner conducts thorough examination and test on a lorry-mounted crane, the examiner is required to conduct proof load tests on the crane to verify the lifting capacities of the crane, and then specify the safe working loads in the approved forms which are actually the verified lifting capacities of the crane. While some competent examiners would specify different tables of safe working loads for different lifting quadrants, it is not uncommon that some competent examiners only specify one such table in the approved form without specifying the lifting quadrants. For a lorry-mounted crane of which only one table of safe working loads is specified in the approved form, the safe working loads may only be applicable to a lifting quadrant. Under such circumstance, the owner of the crane should clarify with the competent examiner to ascertain which lifting quadrant the table is applicable.

6.2.1.3 Unless the single table of safe working loads is applicable to all lifting quadrants, otherwise if the crane would be used for lifting at other lifting quadrants, the owner should arrange tests on the crane by a competent examiner to verify and document the lifting capacities (or safe working loads if they are specified in the approved form) of the crane for all other lifting quadrants before the crane is used to operate in such lifting quadrants. Notwithstanding the certification by the competent examiner, the crane with different lifting quadrants should be authorised by its manufacturer/body builder, equipped with ASLI for the reduced lifting
6.2.1.4 A lorry-mounted crane with variable operating radii should be clearly and legibly marked with safe working load at various radii of the jib. If the safe working loads are only applicable to one of the lifting quadrants, it should be clearly stated in the approved forms to alert the operator not to operate the crane at other lifting quadrants. If a load chart which is extracted from the manufacturer’s manual, with the lifting capacity stated at various load attachment positions along a horizontal line drawn from the inner-most fulcrum of the jib system is attached to the crane in such a way that it is clearly visible from all fixed control stations, the operator should be alerted that such lifting capacities may be different from the safe working loads as specified in the approved form and the operator should always observe the safe working loads as specified in the approved form instead of the lifting capacities extracted from the manufacturer’s manual.

6.2.1.5 The correct operation of all limiting and indicating devices such as ASLI, slew limiter and similar devices should be verified regularly and they should be maintained in good working order in accordance with the manufacturer’s instructions.

6.2.1.6 Under normal circumstance, the minimum safe working load for the lorry-mounted crane among all the lifting quadrants in a particular working radius (if available) should be adopted for planning the lifting operation. Otherwise, if there is only one table of safe working
loads specified in the approved form, it should make clear to the crane operator to which the lifting quadrants of these safe working loads are applicable, and under such circumstance adequate and effective measures should be in place for ensuring that the lifting operations would never go beyond the limit of the applicable lifting quadrant.

6.2.2 Mode of operation and control

6.2.2.1 Each crane control should be clearly identified to indicate its purpose and the mode of operation.
Markings should either be in the appropriate languages or consist of internationally agreed symbols. Where practicable, the crane control should also be provided with suitable spring or other locking arrangement to prevent accidental movement or displacement.

6.2.2.2 Before starting any lifting operation with a lorry-mounted crane, the operator should:

(a) be trained and competent on the particular lorry-mounted crane, in particular be informed of operating limitations of the crane;

(b) ensure that he has a clear and unrestricted view of the load and operational area; otherwise, he should act under the directions of an authorized signaller who is positioned to have such a clear and uninterrupted view. The operator should also
be in a position to receive warnings from any indicating devices;

(c) ensure, where communication equipment is being used, that the calling signal is functioning and that verbal messages can be clearly heard;

(d) ensure that all gauges are reading correctly and that pneumatic or hydraulic systems are up to the operating pressure;

(e) confirm that the load is not attached to the crane structure on which it is resting;

(f) confirm that lifts can be carried out without causing damage and that the loads and the lifting slings are suitably clear of obstructions; and

(g) check that the lifting zone is properly fenced off by suitable fencings and there is no unauthorized person in the lifting zone.

6.2.2.3 When the load is being handled, it should initially be lifted just clear of the supporting surface and brought to rest which the slings, balance of the load, stability of the lorry-mounted crane, etc. are checked before proceeding. Care should be exercised by the operator at all times to avoid shock or side loadings on the jib or other crane structures, and to avoid the load lifting attachment from coming into contact with the crane structures.

6.2.2.4 Handling of loads

(a) When loads have to be handled in the vicinity of persons, extreme care should be exercised and adequate clearances should be allowed. Lifting
supervisors, crane operators and signallers should particularly be aware of the possible danger of persons working out of sight;

(b) All persons should stay clear of the load being lifted. When loads are being lifted from a stack, all persons should stay 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;

(c) Lifting of loads over highways, railways, overhead electricity lines or other places to which the public have access should be avoided; and

(d) Suitable tag lines or control ropes with sufficient length should be used to assist in the controlling and positioning of the loads, in particular awkward or long loads, when they could possibility come into contact with any other objects/ persons during the lifting operation.
6.2.2.5 Remote-controlled lorry-mounted cranes

(a) To prevent unauthorized use of a lorry-mounted crane that is controlled by transmitted signals, e.g. radio signals, the transmitter should be retained in the physical possession of the lorry-mounted crane 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-mounted is not in use, the transmitter should be deposited in safe storage;

(b) If the transmitter is fitted with a belt or harness, the operator should wear the harness before switching on the transmitter, so that accidental operation of the lorry-mounted crane is prevented. The transmitter should only be switched on when

Photo 6 - All persons are standing clear of the lifted load
operating the lorry-mounted crane and should be switch off before the harness is removed.

Photo 7 - Typical remote control on lorry-mounted crane

6.2.2.6 Leaving the lorry-mounted crane unattended

A lorry-mounted crane should not be left unattended even for short periods unless the crane is powered off, the load is removed from the hook and the hook of the crane has been rested securely in a safe position on the vehicle chassis. The hand brake of the lorry should be applied properly to prevent accidental movement of the lorry. Besides, the driver cabin should be locked and the ignition key should be removed and kept by the designated driver or operator. For details of the methods to safeguard particular types of lorry-mounted cranes, reference should be made to the manufacturer’s instructions.
6.2.2.7 Weather conditions

Lorry-mounted cranes are generally designed to operate in conditions of normal steady wind speed and should not be operated in wind speeds that are in excess of those specified in the manufacturer’s manual / operating instructions for the crane. Gusty wind conditions may have an adverse effect on safe working loads and machine stability. Even in relatively light wind conditions, it is prudent to avoid handling loads presenting large wind-catching surfaces. The large surfaces may result in loss of control of the load or overturning of the crane despite the dead weight of the load being within the normal working capacity of the crane.

6.2.3 Safe working loads

6.2.3.1 The safe working load of a crane is defined in the LALGR as the appropriate safe working load for operating the lorry-mounted crane as specified in the current certificate of test and thorough examination delivered in the approved form by a competent examiner in respect of that crane. In other words, the safe working load is the maximum load under specified conditions for which a crane can lift safely.

6.2.3.2 The crane should have a substantial/durable table of safe working loads which:

(a) has clearly legible characters in English and Chinese and figures displayed inside the crane; and

(b) is easily visible to the crane operator.
6.2.3.3 A lorry-mounted crane and its lifting gear should be clearly and legibly marked with means of identification and their safe working loads, in English and Chinese.

![Photo 8 – Lifting gear properly marked with safe working load and identification](image)

6.2.3.4 Safe working loads apply only to freely-suspended loads. Before lifting a load, the hoist line should be plumb. Using the crane hook or slewing motion of a crane to drag any load along the ground, etc. should be forbidden.

6.2.3.5 Reference should always be made to the crane manufacturer’s manual of appropriate machine specification to establish the restriction, limitations or special conditions applicable to a particular lorry-mounted crane.
6.2.3.6 Due to the variations in the weight of the hook blocks and lifting gear which can be used on lorry-mounted crane for lifting operations, the weight of the hook block and lifting gear should be considered as part of the load.

6.2.3.7 Working at extremes or reach of safe working load should be avoided wherever possible.

6.2.3.8 The lorry-mounted crane should be positioned in the most favourable position so as to operate with as short a jib as possible and at a mid-radius position.

6.2.3.9 For lorry-mounted cranes fitted with long extended telescopic jibs at large radii, the influence on overturning moment due to the weight and dynamic effects of the jib itself would be very large by comparison with that due to the suspended load. Therefore, the operational controls such as the jib derricking control should be operated sensitively and smoothly.

6.2.3.10 The safe working load at any given radius generally varies with jib length. (For safe working load in different lifting quadrants, please refer to Section 6.2.1).

6.2.3.11 Fierce movements of any operational control even without a load on the hook should be avoided because these could be dangerous and damaging to the structure or machinery of the lorry-mounted crane.
6.3 Siting of the crane

6.3.1 General

6.3.1.1 The siting of the lorry-mounted crane should take account of all the factors that may affect its safe operation, particularly the following:

(a) the standing and support conditions;
(b) the presence and proximity of other hazards;
(c) the 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-mounted crane for the lifting operation, and for its stowage and egress after completion of lifting operations; and
(e) hazards associated with working on or adjacent to a highway.

6.3.2 Standing or support conditions

6.3.2.1 The appointed person should ensure that the loads imposed by lorry-mounted cranes can be sustained by the ground. This may require the appointed person to seek specialist advice, such as registered geotechnical engineer’s guidance and information.

6.3.2.2 When arriving on site, particular attention should be given to the ground that the vehicle will be standing on and any potential hazards in the surrounding area. The appointed person or others assessing the ground conditions should ensure that the supporting ground is
firm and can take the total weight of the vehicle and the load. It should be noted that wind loadings and dynamic effect should also be taken into account for the assessment.

Photo 9 - A firm and level ground condition

6.3.2.3 Before a lorry-mounted crane is put into operation in a land filling, reclamation or demolition site, a thorough investigation on the ground conditions should be conducted by an appointed person and where necessary other geotechnical specialist to ensure that the crane will not be positioned in areas which have insufficient load bearing capacity.
6.3.3  Proximity hazards

6.3.3.1 Consideration should be given to the proximity hazards such as overhead electricity lines and conductors, power cables, radio frequency wave transmitting tower, nearby structure and building, hoists, stacked materials, other construction works, the flight paths of airfields, the routes of aerial ropeway and other cranes, and public access areas including highways and railways.

6.3.3.2 As far as possible lorry-mounted cranes should be sited to avoid loads being handled over occupied premises, highways, the route of aerial ropeway, other construction works, or railways. The danger to or from underground services, such as gas mains or electric cables, should not be overlooked. Precautions should be taken to ensure that the lorry-mounted crane standing is clear of any underground services. Where this is not possible, the services should be adequately protected to safeguard against any damage.

6.3.3.3 Overhead electricity lines

(a) Where a lorry-mounted crane has a chance of coming within a horizontal distance of 9 meters from the outermost conductor of any live overhead electricity lines, the appointed person should before works are begun, liaise with the owner of the overhead lines, e.g. a power company, to work out the exact safety requirements and devise the safe lifting plan;

(b) Any person working in the vicinity of overhead electricity lines should observe the relevant
provisions on taking all reasonable steps and all reasonable measures as stipulated in Section 10 of the Electricity Supply Lines (Protection) Regulation (Cap. 406H). Reference should be made to the Code of Practice on Working near Electricity Supply Lines published by the Electrical and Mechanical Services Department;

(c) All overhead lines or other electric apparatus should be treated as live unless declared dead and safe by the relevant authority;

(d) Any person working in the vicinity of any electricity supply line should be properly trained to ensure that they are capable of taking necessary safety measures;

(e) When working parallel to overhead power cables, ground level barriers or a string of warning markers should be erected at a safe distance from the cables. The position of the barriers should be clearly marked. Warning notices of overhead lines nearby should be attached to or displayed on the barriers at intervals of not less than 2 metres;

(f) Where a lorry-mounted crane must travel underneath an overhead line, the crossing route should be plainly marked. Under no circumstances should a lorry-mounted crane travel under overhead line with its jib raised or extended; and

(g) Suitable goal posts and crossbars should be erected with warning notices on each side of the crossing approach to ensure that the jib or moving parts are lowered to a safe position.
6.3.3.4 Proximity of other cranes

When considering the positioning of a lorry-mounted crane for operation, care should be exercised regarding the proximity of other cranes. Where overlapping working areas cannot be avoided, all the crane operations should be coordinated and supervised by the appointed person and lifting supervisor. All the personnel involved including operators, slingers and signallers should be fully informed of the lifting arrangements.
6.3.3.5 Avoidance of collisions

The appointed person should take into account the possibility of collision between the lorry-mounted crane and other plant in the workplace. He should plan the sequence of work and plant movements to prevent collision. The lorry-mounted crane should be so positioned that any risk of collision should be eliminated.

6.4 Stability of the crane

6.4.1 To provide the maximum stability of the lorry-mounted crane for safe lifting operation, the beams of the outriggers should be fully extended unless the crane’s design allows the outrigger not in full extension. The jacks should be suitably extended, but not to the extent that they take the loads from the tyres/wheels and diminish the efficiency of the parking brake, and the crane is set in level condition.

6.4.2 Lorry-mounted cranes equipped with outriggers should be provided with a spirit level indicator in clear view of the operator at each control station. The outrigger beams should be marked or painted in a manner to indicate that they are correctly deployed.
6.4.3 Unless the crane’s design allows the outrigger not in full extension, use of lorry-mounted cranes with partially extended outriggers should be avoided because the stability of the crane may be greatly reduced. Where the use of partially extended outriggers cannot be avoided, the crane should be designed and manufactured in accordance with BS EN 12999:2011 and its updated version, or equivalent standard, and fitted with ASLI that varies the crane’s SWLs with the amount of outrigger extension and/or slewing angle and it should have appropriate certificates of test and thorough examination. It should also be supervised by a lifting supervisor.
6.4.4 The highest pressures upon the ground are likely to occur under the outrigger 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 such as mat or timber blocking should be sufficiently strong to withstand the loadings imposed by a fully loaded vehicle and its crane when working.

6.4.5 Under normal condition, the mat or timber blocking should be at least 3 times larger in area than the float (i.e. at least four times the area of the float) (for floats of small footprint, a greater ratio may be needed) unless the minimum requirement of such area is specified in the manufacturer’s manual or certified by a Registered Professional Engineer with a relevant discipline in writing after his/her assessments to ascertain the ability of the supporting ground at the workplace to support the loads imposed on outrigger feet prior to any lifting operations.
6.4.6 The mat and the timber blocking should completely support the float, be of sufficient strength, be tightly spaced and level to guarantee a right angle (90 degrees) between the cylinder and the float of the outrigger.

6.4.7 Particular care should be taken to ensure that tyres and outriggers 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 outriggers.

6.4.8 When operating close to the edge of a soil slope or an unsupported soil excavation, a lorry-mounted crane may collapse as the load bearing capacity there is much lower than those away from the edge. A safety distance at least 4 times the width of the foundation (the mat or timber blocking of the outrigger) should therefore be maintained between the foundation and the edge (Fig. 1). The distance between the foundation and the toe of the slope or excavation should also be at least 2 times the depth of the slope or excavation. In case of need, advice on closer distance from the edge of the slope or unsupported excavation with other materials should be sought from a Registered Geotechnical Engineer.

Fig. 1 - Position of lorry-mounted crane
6.4.9 Lorry-mounted crane should be avoided lifting on slopes wherever possible. If unavoidable, a Registered Professional Engineer within a relevant discipline should be consulted for the precautions prior to the negotiation and in attendance to advise on the feasibility of the operation. The following points should be particularly noted:

(a) As lifting on slope will generate additional side loading on the outriggers, lorry-mounted cranes should not be operated on slopes in excess of the limitations stated in the manufacturer’s manual;

(b) For safety sake, any lorry-mounted crane used in the negotiation of slopes should have a generous margin in capacity over the loads to be lifted;

(c) The load should always be placed on the uphill side of the crane and precautions should be taken to ensure that neither the jib nor the crane becomes unstable on release of the load; and

(d) The load should always be carried as near to the ground as possible;

Photo 14 - Crane siting on level ground
6.5 Automatic safe load indicator (ASLI)

6.5.1 General

All types of crane, except those with a maximum safe working load of 1 tonne or less or those operate with a grab or by electromagnetic means, should be fitted with an ASLI. The ASLI is usually used in association with overloading cut-out. The specification of ASLI should conform to British Standard BS 7262 or equivalent standards.

6.5.2 Environmental operating conditions

The correct operation of the ASLI should not be affected by the mechanical shocks and vibration transmitted by the crane structure during transportation and operation. It should be protected against rain, water spray, frost, dirt, condensation or other adverse conditions.

6.5.3 Warnings and indications

The ASLI should give warnings and indications for all permitted motions of the crane that induce an overload and for all configurations shown on the certificate of test and thorough examination of the crane to which it is fitted. The warnings for both of them approaching to safe working load and overload should be continuous and should be audible and visual. The audible warnings for approaching to safe working load and overload should be clearly distinguishable from each other and also from other relevant sounds such as telephones. The visual warnings should be clearly distinguishable under all conditions.
6.5.4 Limitation

For a lorry-mounted crane of which the lifting capacities or safe working loads are different for different lifting quadrants, the ASLI may only work correctly for one quadrant. The operator should be well informed of such limitation before using the crane and the crane should not be operated in the quadrants with ineffective ASLI.

6.6 Maintenance

6.6.1 In order that lorry-mounted cranes may operate safely and efficiently, they should be properly maintained. It is essential to carry out preventive maintenance work so that risk of accidents due to breakdowns is reduced to a minimum. Manufacturer’s instruction
manuals recommend that specific tasks be carried out at stated intervals and these should be followed. Any repairs or replacement of components should be in accordance with the manufacturer’s recommendation or specifications.

6.6.2 In addition to any statutory regulations, a record or log should be kept for all cranes, giving information such as diameter, length and construction details of ropes, hours worked, adjustments, insulation checks, renewal of parts, thorough examinations and repairs. The availability and source of replacement items should be checked and noted in the record.

6.6.3 All maintenance staff should be fully aware of the hazards involved in working on lorry-mounted cranes. Maintenance staff should have adequate working knowledge of the machinery they are required to maintain and have access to the manufacturer’s relevant literature.
References

1. A Guide to the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations, published by the Labour Department, HKSAR

2. BS 7121-1:2006: Code of Practice for Safe Use of Cranes – General

3. BS 7121-2-1:2012: Code of Practice for the Safe Use of Cranes – Inspection, Maintenance and Thorough Examination – General

4. BS 7121-2-4:2013: Code of Practice for the Safe Use of Cranes – Inspection, Maintenance and Thorough Examination – Loader Cranes

5. BS 7121-4:2010: Code of Practice for Safe Use of Cranes – Lorry Loaders

6. BS 7262:1990: Specification for Automatic Safe Load Indicators


10. Code of Practice for Safe Use of Mobile Cranes, published by the Labour Department, HKSAR

11. Guidance Notes on Inspection, Thorough Examination and Testing of Lifting Appliances and Lifting Gear, published by the Labour Department, HKSAR

12. Safety Alert No. 001/16 on “Lorry-Mounted Crane Pre-Use Checklist” issued by Construction Industry Council

13. Safety Alert No. 002/15 on “Considerations when Purchasing and Assembling Lorry-mounted Cranes (including brand-new and second hand)” issued by Construction Industry Council
Appendix I

Responsibilities of Principal Contractor

For the use of lorry-mounted crane for lifting operation, the principal contractor shall comply with the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations, the general duties provisions of the Factories and Industrial Undertakings Ordinance, the Code of Practice for Safe Use of Mobile Cranes and the Guidance Notes on Safe Use of Lorry-mounted Cranes published by the Labour Department. To fulfill the relevant requirements, the principal contractor should adopt, among others, the following safety measures:

1. Provide and maintain an effective monitoring system at the site entrance to ensure:
   (a) valid approved forms (Form 1, 3 and 5) are available to ensure the crane be inspected, tested and thoroughly examined before the lorry-mounted crane enters to the site;
   (b) crane operator of the lorry-mounted crane, slinger and signaller (if applicable) hold valid certificates and/or have received relevant training;
   (c) manufacturer’s manual is available on the crane (if the manual is to be read by the operator, supervisor or the appointed person, make sure the manual is written in a language that it could be comprehended, or otherwise a translation of the manual in an appropriate language should be made available);
   (d) maintenance record is available on the crane; and
   (e) lifting capacities of the lorry-mounted crane for the lifting quadrants that the crane is planned to be used (if such lifting capacities are smaller than the safe working loads specified in the approved form, and in case of the outriggers could not be fully extended, the reduced lifting capacities) are available to the operator to ensure these lifting capacities would not be exceeded throughout the lifting operation so as to avoid the crane from being overturned.
2. Provide and maintain an effective coordinating and monitoring system at
the lifting zone of the lorry-mounted crane to ensure the following:
(a) designate, fence off and post warning notices at the lifting zone;
(b) assess the bearing capacity, uniform and firmness of the ground to see
whether it can withstand the loading during the lifting operation;
(c) ensure no potential danger in the vicinity of the lifting zone (e.g.
overhead electricity cable or nearby lifting operation etc.);
(d) ensure the outrigger can be fully extended (unless the crane’s design
allows the outrigger not in full extension) during the lifting operation;
(e) ensure the crane is operated on levelling condition;
(f) visually inspect the condition of the lorry-mounted crane (including any
patent defect, wear and oil leakage of the crane etc.);
(g) conduct functional test to ensure the ASLI and the outrigger are in
working order (including the float is in good working condition);
(h) the mat or the timber blocking of floats are suitable and serviceable;
and
(i) ensure an appropriate signaller if the crane operator does not have a
clear and unrestricted view.
Appendix II

Responsibilities of Lifting Sub-contractor and Physical Owner of the Crane

For the use of the lorry-mounted crane for lifting operation, the lifting sub-contractor and the physical owner of the crane shall comply with the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations, the general duties provisions of the Factories and Industrial Undertakings Ordinance, the Code of Practice for Safe Use of Mobile Cranes and the Guidance Notes on Safe Use of Lorry-mounted Cranes published by the Labour Department. To fulfill the relevant requirements, the lifting sub-contractor and the physical owner of the crane should adopt, among others, the following safety measures:

1. Before entering the site for the lifting operation:
   (a) ensure the lorry-mounted crane has been inspected, tested and thoroughly examined by the competent person and the competent examiner respectively with valid certificates (Form 1, 3, and 5) available;
   (b) ensure the lorry-mounted crane has been tested for all lifting quadrants and identify and document the lifting capacities at these lifting quadrants if they are smaller than the safe working loads in approved form, and in case of the outriggers could not be fully extended, the reduced lifting capacities;
   (c) ensure that the crane operator of the lorry-mounted crane, slinger and signaller (if applicable) hold valid certificates and/or have received relevant training;
   (d) ensure the ASLI and the outrigger function properly (including the float is in good working conditions);
   (e) carry out repair and preventive maintenance programme to ensure major components/parts of the crane are in accordance with the
manufacturer’s specification and free from patent defect, damage or leakage of fluid etc.;

(f) the manufacturer’s manual is available on the crane (if the manual is to be read by the operator, supervisor or the appointed person, make sure the manual is written in a language that it could be comprehended by the said personnel, or otherwise a translation of the manual in an appropriate language should be made available);

(g) the maintenance record is available on the crane; and

(h) the minimum sizes of timber blockings or metallic mats to be placed between the ground and the floats of outriggers are large enough to spread the outrigger loading over a sufficiently large area so as to avoid sinking of outriggers by considering the magnitude of outrigger loading, the soil type and the hardness of the ground.

2. During the lifting operation on site:

(a) follow instructions of the principal contractor at the site entrance and gain access to designated lifting zone;

(b) strictly observe the site safety rule and the instruction of the principal contractor for the lifting operation at the designated lifting zone;

(c) before the lifting operation, assess the bearing capacity, flatness and firmness of the ground to see whether it can withstand the loading during the lifting operation;

(d) ensure the crane can only be operated on levelling condition;

(e) ensure the outrigger is fully extended (unless the crane’s design allows the outrigger not in full extension);

(f) ensure the mat or the timber blocking of floats is suitable and serviceable;

(g) during the lifting operation, ensure an appropriate signaller gives adequate signals to the crane operator for the safe lifting operation if the crane operator does not have a clear and unrestricted view;

(h) during the lifting operation, ensure the crane operator could estimate the working radius with reasonable accuracy, and provide the operator
with appropriate aids if necessary; and
(i) no person, except the lifting team member, is allowed to enter the lifting zone during the whole lifting operation.
Useful Information

Enquiries

If you wish to enquire about this Guidance Notes or require advice on occupational safety and health, please contact the Occupational Safety and Health Branch of the Labour Department through:

Telephone : 2559 2297 (auto-recording service available outside office hours)
Fax : 2915 1410
E-mail : enquiry@labour.gov.hk

Information on the services offered by the Labour Department and on major labour legislation is also available on our website at http://www.labour.gov.hk.

Information on the services offered by the Occupational Safety and Health Council can also be obtained through hotline 2739 9000.

Complaints

If you have any complaints about unsafe workplaces and work practices, please call the Labour Department’s occupational safety and health complaint hotline at 2542 2172. All complaints will be treated in the strictest confidence.