Guidance Notes on
Thorough Examination and Testing
of
Lorry-mounted Cranes
These Guidance Notes are prepared by the
Occupational Safety and Health Branch of the Labour Department

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1. Introduction

1.1 Lorry-mounted cranes (also known as a truck-mounted crane with alternative arrangement) are widely used for lifting operations in industrial undertakings including the construction industry. The use of lorry-mounted cranes could, however, pose serious hazard to persons working nearby if they are not properly thoroughly examined and tested as prescribed by the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations (LALGR) (Cap. 59J).

1.2 These Guidance Notes provide practical guidance on thorough examination and testing of lorry-mounted cranes so as to ensure the safety and reliability of the lorry-mounted cranes as well as the safety of persons involved in thorough examination and testing. The Labour Department would make reference to these Guidance Notes when enforcing the relevant ordinances and their subsidiary regulations.

1.3 These Guidance Notes should be read by all parties concerned, including competent examiners involved in carrying out thorough examination and testing of lorry-mounted cranes, owners of lorry-mounted cranes, etc. The advice contained in these Guidance Notes should not be regarded as exhaustive. It should be read in conjunction with relevant legislation, codes of practice, guidance notes, national / international standards, manufacturer’s instructions, etc. in order to ensure that proper procedures and precautions have been taken in carrying out thorough examination and testing. Particular attention should be drawn to the requirements set out in LALGR, Code of Practice for Safe Use of Mobile Cranes and Guidance Notes on Inspection, Thorough Examination and Testing of Lifting Appliances and Lifting Gear.

1.4 These Guidance Notes give a brief account on the legal requirements of thorough examination and testing of lorry-mounted cranes. They list out guiding principles and important notes of thorough
examination and testing, safe systems of work as well as the basic requirements and precautions for thorough examination and testing on the lorry-mounted cranes. They also spell out the items to be entered into the certificates in the approved forms by competent examiners including the limitations and special precautions to be taken for using the lorry-mounted cranes.

1.5 For the purpose of these Guidance Notes, the following interpretations apply:

“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;

“Competent examiner”, in relation to the carrying out of any test and examination required by LALGR, means a person who is -
(a) appointed by the owner required by LALGR to ensure that the test and examination is carried out;
(b) a registered professional engineer registered under the Engineers Registration Ordinance (Cap. 409) within a relevant discipline specified by the Commissioner; and
(c) by reason of his qualifications, training and experience, competent to carry out the test and examination;

A registered professional engineer means a person whose name is on the register of registered professional engineers established and maintained under section 7 of the Engineers Registration Ordinance (Cap 409). As at the date of issue of these Guidance Notes, Mechanical Engineering and Marine & Naval Architecture are the disciplines specified by the Commissioner for Labour.

“Crane” means any appliance equipped with mechanical means of raising and lowering a load and for transporting the load while suspended; and also all chains, ropes, swivels, or other tackle (down to and including the hook), used in the operation of a crane; but does not include –
(a) a hoist block running on a fixed rail or wire;
(b) a stacker or conveyer whereby a load is moved by means of a belt or platform; or
(c) an earth or mineral moving or excavating appliance not fitted with a grab;

“Lifting appliance” means a crab, winch, teagle, pulley block or gin wheel used for raising or lowering, and a crane, sheerlegs, excavator, pile driver, pile extractor, dragline, aerial ropeway, aerial cableway transporter or overhead runway, and also any part of any such appliance;

“Lorry-mounted crane” is a power-driven crane mounted on a lorry with a load carrying capability. The crane mainly consists of a column that slews about a base and a boom system that is fixed on top of the column as shown in figures 1-3;

![Figure 1](image1.png)  A lorry-mounted crane attached with a boom system behind a driving cabin

![Figure 2](image2.png)  A lorry-mounted crane attached with a boom system at the rear of a lorry
Terminologies adopted in these Guidance Notes for the main parts of a lorry-mounted crane

“Owner”, in relation to any lifting appliance, 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, and the contractor who has control over the way any construction work which involves the use of the lifting appliance is carried out and, in the case of a lifting appliance situated on or used in connection with work on a construction site, also includes the contractor responsible for the construction site;

“Safe working load” (SWL), in relation to a lifting appliance or to lifting gear, means the appropriate safe working load for operating
the lifting appliance or lifting gear as specified in the current certificate of test and thorough examination delivered in the approved form by a competent examiner in respect of that lifting appliance or lifting gear for the purposes of LALGR.
2. Legal Requirements

2.1 Specific regulations under LALGR setting out the requirements of ‘thorough examination’ and ‘test’ of lorry-mounted cranes are summarised in Table 1.

Table 1  Summary of legal requirements on ‘thorough examinations’ and ‘tests’ of typical lorry-mounted cranes

<table>
<thead>
<tr>
<th>Regulation Number</th>
<th>Thorough Examination</th>
<th>Test and Thorough Examination</th>
<th>Certificates in the Approved Forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>5(1)</td>
<td>at least once in the preceding 12 months before use</td>
<td></td>
<td>5 (Appendix II)</td>
</tr>
<tr>
<td>5(3) &amp; 7B</td>
<td></td>
<td>during the preceding 4 years before use</td>
<td>3 (Appendix I)</td>
</tr>
<tr>
<td>5(5) &amp; 7(B)</td>
<td></td>
<td>before use, after undergoing substantial repair, re-erection, failure, overturning or collapse</td>
<td>3</td>
</tr>
</tbody>
</table>

2.2 Under LALGR, the owner of a lorry-mounted crane shall appoint a competent examiner to test and thorough examine his lorry-mounted crane in the manner as prescribed in the First Schedule of LALGR which has been reproduced in Appendix III.

2.3 The said Schedule prescribes the following requirements:
   ● the amount of proof load to be adopted during the test;
   ● the greatest possible proof load for a hydraulic crane; and
   ● after being tested with proof loads, each part of the lorry-mounted crane should be examined so as to ensure that no part of the lorry-mounted crane has been damaged during the test.

2.4 Lorry-mounted cranes shall be thoroughly examined and tested during the preceding 1 year and 4 years before use by a competent examiner.
2.5 When a test or a thorough examination shows that the lorry-mounted crane is in safe working order, the competent examiner shall deliver the test or examination certificate to the owner of the crane within 28 days after the test or the thorough examination.

2.6 When a test or a thorough examination shows that a crane cannot be used safely unless certain repairs are carried out, the competent examiner shall immediately inform the owner of the lorry-mounted crane of the fact and shall, within 14 days after the test or the thorough examination, deliver a report to the owner of the crane and a copy of it to the Commissioner for Labour.

2.7 A competent examiner shall not deliver to an owner a certificate or make a report which is to his knowledge false as to a material particular.

2.8 The crane owner shall, among other things, follow the requirements of LALGR, to arrange a competent examiner to conduct thorough examination and testing of the lorry-mounted crane after change of the ownership of the crane and/or before its first use.
3. Guiding Principles and Important Notes of Thorough Examination and Testing

3.1 Guiding Principles of Thorough Examination and Testing

3.1.1 Set out below are the guiding principles governing thorough examination and testing of lorry-mounted cranes under LALGR.

3.1.2 A competent examiner should thoroughly examine and test a lorry-mounted crane in accordance with LALGR, relevant publications issued by the Labour Department, national/international standards and manufacturer’s instructions. Any lifting restrictions, limitations (such as lifting quadrants) or special conditions applicable to the crane should be specified in the certificates in the approved forms and addendum in Appendix IV.

3.1.3 Prior to the thorough examination and testing, the competent examiner should ensure that the crane is free from any patent defect as well as in the correct configuration and condition according to manufacturer’s instructions. All parts and components, particularly those load bearing parts, of the crane should be identical or in conformity with the specifications of the manufacturer.

3.1.4 The competent examiner should ensure that all outriggers of the crane are fully extended during thorough examination and testing unless otherwise specified by the manufacturer.

3.1.5 If different outrigger configurations are permitted by the manufacturer, the competent examiner should carry out thorough examination and testing under different permissible configurations with appropriate loads.

3.1.6 The competent examiner in thorough examination and testing should ensure that all safety devices of the crane are functioning
properly, and safe working loads of the crane are the same as the settings on the ASLI and the information provided in the certificates in the approved forms as well as their addendums for (i) thorough examination as well as (ii) test and thorough examination.

### 3.2 Important Notes on Thorough Examination and Testing

3.2.1 Thorough examination and testing should be conducted with the lorry unloaded and without the operator in the cab.

3.2.2 Before proof load test of a lorry-mounted crane, the crane should be loaded with a load equivalent to the safe working load at maximum hydraulic extension and the vehicle should be checked for stability.

3.2.3 Before testing, the lorry tyres should be inflated to the manufacturer’s recommended pressure. Also, if the crane is mounted on a lorry with active air suspension, the suspension locking status and tyres air pressure should follow the instructions of the manufacturer’s manual before the outriggers are deployed. The outrigger jacks should be extended sufficiently to be in firm contact with the ground, so that they provide adequate support for the lorry-mounted crane.

3.2.4 In thorough examination and testing, the loads imposed by all lifting gear / accessories (e.g. shackles, chains and rope slings etc.) should be counted as part of the test load.

3.2.5 Proper siting of the crane should be determined. All examination or tests should be carried out on uniform, level and firm ground, with a slope of no greater than +/- 0.5%. Also, the levelling of the crane should be regularly checked to ensure that its inclination is within the maximum permissible tolerance as specified in the manufacturer’s instruction.

3.2.6 After the thorough examination and testing is completed, the relief valve system and ASLI should be fully reinstated and tallied with SWLs specified in the certificates in the approved
forms and their addendums.

3.2.7 In case of a lorry-mounted crane which was manufactured to the standard conforming EN 12999:2011 (or latest equivalent standard) and deployment of every outrigger is automatically monitored by ASLI to determine SWLs in accordance with boom positions, the crane should be thoroughly examined and tested under different outrigger configurations covering fully extended and fully retracted outriggers with appropriate proof loads chosen to ensure that all extremities of the operating limits at different quadrants are systematically covered in the thorough examination and testing. Such device or indicator shall show the radius of the boom at any particular time and the safe working load applicable to that radius.

3.2.8 It is of utmost important that ASLI shall be properly configured. The competent examiner when carrying out the thorough examination and testing of the crane shall ensure that the ASLI is in good working order.
4. **Safe Systems of Work for Thorough Examination and Testing**

4.1 **Elements of the Safe System of Work**

4.1.1 Every employer shall ensure the occupational safety and health of all his employees. To fulfill his legal obligations, an effective safe system of work should be developed, documented, implemented and maintained to safeguard the safety and health at work of personnel involved, as well as to ensure accuracy and reliability of thorough examination and testing of lorry-mounted cranes. The safe system of work should be prepared with the advice of a registered safety officer, the competent examiner and other relevant personnel. The system should include (but not limited to) the following main elements:

- a) provision of information;
- b) site conditions;
- c) weather conditions;
- d) test weights;
- e) general safety precautions;
- f) competence of operators / personnel engaged in thorough examination and testing; and
- g) preparation work before conducting thorough examination and testing.

4.2 **Provision of Information**

4.2.1 The owner should provide all necessary information to the competent examiner so that he can perform the examination or testing safely. The competent examiner should be provided with the relevant documents including the manufacturer’s instruction manuals and maintenance records / logbook for reference.

4.2.2 The competent examiner should read the following documentation / information before conducting any examination or testing in respect of the lorry-mounted cranes:

- a) Relevant legal requirements and regulations such as LALGR;
b) Relevant publications issued by government departments, such as *Code of Practice for Safe Use of Mobile Cranes* and *Guidance Notes on Inspection, Thorough Examination and Testing of Lifting Appliances and Lifting Gear*;

c) National / international standards governing safe use, inspection, examination and testing of lorry-mounted cranes;

d) Documentation for the lorry-mounted crane to be examined or tested, including its load charts and instruction manuals;

e) Technical information, including maintenance instructions, performance data and reports provided by the manufacturer; and

f) Records showing the conditions of the crane, like its current / last statutory forms, maintenance records (including overhaul, significant repairs, modifications and renewal of major parts), records of planned preventive maintenance and pre-use checks, etc.

**4.2.3** The competent examiner carrying out the examination or testing should check the identification and safe working load chart on the crane against relevant records, such as the last statutory forms and manufacturer's instruction manuals. The competent examiner should determine if there is any history of defects or malfunctions, and whether any repairs, alterations or additions have been made in respect of the crane.

**4.2.4** Before the thorough examination or testing, the competent examiner has to devise a plan to determine all relevant areas to be covered in examination or testing and to set out a proper procedure for examination or testing. Coverage of the procedures should be referred to sections 5 and 6.

**4.3 Site Conditions**

**4.3.1** Before the commencement of thorough examination or test of the lorry-mounted crane, the owner / employer should give due consideration to the condition of the site or premises where examination or testing are to be conducted.

**4.3.2** The ground or structure for supporting the lorry-mounted crane
should be well consolidated, structurally stable and capable of withstandng the loads that would be applied to it. Care should be taken to ensure that there are no hidden hazards in the vicinity such as cable ducts, drains, pipes, back-fill areas, cellars or other underground weakness. Lorry-mounted cranes should not be examined or tested in the vicinity of overhead power lines. In general, brick or masonry work, metal or bamboo scaffolding, or temporary structure or working platforms should not be used as a test site during the proof load test.

4.3.3 The location where the test or examination is conducted should be of sufficient area, free from any obstruction and unrestricted overhead clearance to allow the unobstructed movement of the lorry-mounted crane and load throughout all its appropriate test movements.

4.3.4 Whenever possible, the lorry-mounted crane should be tested or examined in a fenced off test area. No other work activities should be allowed to carry out concurrently in the test area. Notices prohibiting unauthorized entry should be prominently posted. Personnel not involved in the examination or test should be kept away from the test area.

4.3.5 Thorough examination or test should not be carried out at high risk areas, such as a public area, road, highway, railway or occupied building. If it is unavoidable, prior arrangements and applications should be made with the appropriate departments / parties affected and relevant measures should be taken to ensure that the examination or testing can be carried out safely. Appropriate time and date should be arranged with all relevant parties to keep away traffic and pedestrians during the examination or test.

4.3.6 The ground should be uniform, firm and its level of no greater than +/- 0.5% or otherwise within the limits as specified by the crane manufacturer.

4.4 Weather Conditions
4.4.1 When the test site is in an open area, thorough examination or test should not be carried out in adverse weather conditions, such as rainstorm, thunderstorm, lightning or strong wind. The competent examiner has to consider the wind limits of the lorry-mounted crane in accordance with the manufacturer’s instructions before carrying out the examination or testing. Notwithstanding the above, examination or testing under rainy weather are not recommended.

4.5 Test Weights

4.5.1 The competent examiner should ensure that the test weights to be used are complied with the following requirements:
   ● weights of proven accuracy within +/- 1.0%;
   ● weights proven on a weighbridge, which has been calibrated within the last 12 months; and
   ● weights suspended from a calibrated weighing device, which has been calibrated within the last 12 months.

4.5.2 The suspended test weights should be kept as close to the ground as possible, ranging from 100 mm to 200 mm above the ground in general. Test weights should not be raised above 200 mm to pass over obstructions.

4.5.3 Test weights should be made up of concrete / metal blocks / plates or similar units purposely built / manufactured as standard test weights, preferably with markings to show their actual weights.

4.5.4 In the proof load test, a test load should not be applied to a lorry-mounted crane by pulling against an anchor point fixed on ground, structure, machine chassis or other similar device instead of using test weights.

4.6 General Safety Precautions

4.6.1 The competent examiner together with the owner of the lorry-mounted crane should work out proper procedures to clearly define the sequences and the responsibilities of each personnel
engaged in examination or testing of the lorry-mounted crane involved. It should set out which examination / testing to be carried out first and the procedure to be followed. It is important to note down all safety precautions from relevant codes of practice, guidance notes, publications, national / international standards and the manufacturer's instructions, and if appropriate, incorporate them into the safe system of work. The proper procedures and safety precautions for manually handling heavy test weights, equipment and lifting tackles should also be laid down.

4.6.2 The competent examiner should hold a briefing session to explain and highlight the procedures and precautions during the examination or test to ensure that all crew members are fully familiar with the relevant operation.

4.6.3 The competent examiner should ensure the lorry-mounted crane is free from any patent defect before carrying out the examination or test.

4.6.4 The competent examiner should check and verify the configurations of the lorry-mounted crane including its components and load bearing parts to be identical or in conformity with the specifications of the manufacturer before carrying out the examination or test.

4.6.5 The competent examiner and relevant personnel should well understand about the commencement and the progress of the examination and testing, so as to ensure no unauthorised entry to the dangerous zones during the process.

4.6.6 When a lorry-mounted crane operates with various Safe Working Loads (SWLs) at different working radii, adequate precautions should be exercised during the proof load test to prevent the load from swinging or wheeling outwards in order not to overload the lorry-mounted crane.

4.6.7 Appropriate safety precautions should be taken to ensure the work safety of the personnel involved in the thorough examination or
testing when the test weights are required to be raised / lowered, slewed or travelling along a path. In general, no persons are allowed to pass or stay under suspended test weights and the loaded boom. The crane operators should be instructed to stand in a safe position and constantly keep an eye on the stability of the cranes.

4.6.8 If the thorough examination or testing involves working at height, relevant safety measures to prevent fall of persons should be adopted, including the provision of safe access and egress, proper working platforms and personal protective equipment such as independent life lines and safety harnesses, etc.

4.6.9 All lifting gear used in the examination or testing shall be thoroughly examined and tested by a competent examiner in a manner according to LALGR with relevant certificates in the approved forms.

4.7 Competence of Operators Engaged in Thorough Examination or Testing

4.7.1 It is important to ensure the competence of the operator assisting the functional / operational, SWL performance and proof load tests. Crane operators shall:
(i) have attained the age of 18 years;
(ii) have possessed valid certificates issued by either the Construction Industry Council or the Construction Industry Training Authority before 1 January 2008 or by any other person specified by the Commissioner for Labour;
(iii) have been adequately trained in the operation of the type of crane in question; and
(iv) have been provided with the relevant manufacturer’s instructions.

4.7.2 The operator should be familiar with the characteristics of the lorry-mounted crane, the safety precautions in handling overloading and the limitation of the lorry-mounted crane in the brake test, functional test and proof load test. He should be able
to put the lorry-mounted crane under control at any time during the examination or testing. He should fully understand all signals given by the competent examiner to operate the lorry-mounted crane smoothly and accurately.

4.8 Preparation Works before Conducting Thorough Examination or Testing

4.8.1 Prior to thorough examination or testing, the lorry-mounted crane should be in a clean condition, i.e. the crane should be cleaned by appropriate means to remove all spoil / dirt that would otherwise conceal the structure or mechanisms and prevent an effective examination.
5. Thorough Examination of Lorry-mounted Cranes

5.1 Objective of Thorough Examination

5.1.1 The objective of ‘thorough examination’ is to ensure that the lorry-mounted crane so examined is of good mechanical construction, made of strong and sound materials, free from any defect and in the correct configuration and condition according to the manufacturer's instructions. The examination shall be carried out as carefully as the conditions permit so as to arrive at a reliable conclusion as to the safety of the parts and components examined.

5.2 Coverage of Thorough Examination

5.2.1 A thorough examination should cover those components of lorry-mounted crane which are subjected to wear, deterioration, malfunctioning or misalignment. Lorry-mounted cranes should be carefully examined to identify any deficiencies that may constitute a hazard. To ensure that the lorry-mounted crane is safe to be used, a thorough examination covering those items as specified below should be conducted:
   ● visual examination;
   ● dimensional examination;
   ● functional or operational test;
   ● open-up examination; and
   ● non-destructive test.

5.2.2 Visual Examination

5.2.2.1 Visual Examination includes the check and examination of the state of individual items of a lorry-mounted crane. The purpose of visual examination is to identify any problems that are likely to affect integrity. Visual examination is usually supplemented by hammer test so that concealed defects can be revealed. Visual examination should cover at least the following aspects:

   ● the parts and components of the raising and lowering mechanism, including the hydraulic cylinders, the
hydraulic hoses, all wire ropes, lifting attachment, controlling devices and buttons;

- the items of any braking systems including the brake linings, pawls and ratchets of clutch system;
- connecting hardware and joints such as bolts, fasteners, joints, couplings of a hydraulic system ensuring that they are not coming loose; boom configuration, including its welds, jointing pins and welds of a structural base;
- the mounting frame attached to the lorry for the crane mounting and the lorry chassis for damage or signs of cracking and corrosion etc.;
- where possible, the linkage to the power take off drive and pump, on the lorry ensuring that it is secure and free from damage, excessive wear and leakage; and
- where applicable ensure that the control for the power take off moves freely but does not have excessive play and is properly labelled to identify its function and mode of operation.

5.2.3 Dimensional Examination

5.2.3.1 Dimensional examination includes the check of the dimensional tolerances and distortions of certain critical components and configuration that may affect the stability, performance and function of the lorry-mounted crane. The purpose of dimensional examination is to ensure that the dimensional tolerance and configuration alignment are within the limit as specified by the manufacturer's specifications or relevant safety standards such as British Standards or the equivalence. The main areas of dimensional examination include:

- measurement of linear dimensions such as diameter, thickness, clearance of a component, the diameter of a wire rope, the wear limit of a brake lining, wear and tear of gearing etc.;
- measurement of alignment to verify the structural stability of a load-bearing fabrication; and
- dimensional clearance of safety limit switches.

In most cases, visual examination, hammer test and dimensional
examination are carried out simultaneously to increase the thoroughness and accuracy of a thorough examination.

5.2.4 Functional or Operational Test

5.2.4.1 Having finished the visual and dimensional examinations and if there is no deficiency or irregularity noted, a functional or an operational test should be conducted to check the function of the various operating and safety systems of a lorry-mounted crane. A functional or an operational test consists of a no-load test and a SWL performance test.

5.2.4.2 A no-load test is first conducted before operating the lorry-mounted crane in a loaded condition. This is essentially a safety procedure to ensure that the lorry-mounted crane is capable to take up safely the SWL performance test in the later stage.

5.2.4.3 The no-load test consists of checks on the following elements if applicable:
- boom extension and retraction mechanism;
- swinging or slewing mechanism;
- functions of ASLI, emergency stop switches, and all safety devices;
- brake operation such as hand brake of the lorry;
- outrigger systems; and
- lifting and lowering mechanism, if any.

5.2.4.4 Prior to any load test, the competent examiner should determine by thorough examination with the lorry-mounted crane in motion and at rest whether it is:
- free from any defect that would preclude it from safely handling the test load; and
- in the correct configuration and condition according to the manufacturer’s instructions / manual.

5.2.4.5 When the lorry-mounted crane is found in safe working order under the no-load test, a SWL performance test is conducted to verify the performance of the lorry-mounted crane. With reference to the load chart of the lorry-mounted crane, the SWLs
contained in the previous test certificate, year of manufacture, maintenance record or incident history of the lorry-mounted crane, a correct amount of proof load is selected to conduct the SWL performance test. The test should be conducted by the operator who assists the no-load test.

5.2.4.6 In the case of a lorry-mounted crane operating with various working radii, the SWLs at minimum, intermediate and maximum radii should be at least selected for the SWL performance test. The testing elements of a SWL performance test should be the same as those of the no-load test. In certain cases, a dimensional examination may be incorporated into the SWL performance test to verify the deflection limit as stated in the manufacturer's specifications or relevant safety standards.

5.2.5 Open-up Examination

5.2.5.1 Opening Up Examination includes the check of covered, concealed or encased components such as gearboxes in the drive train, brake linings or brake discs of the braking system whether they are within the limits as recommended by manufacturer's specifications. It is important that opening up examination should be conducted after abnormal conditions and irregularities are observed during the functional test or as recommended by the manufacturer. The opening up procedure stated in the manufacturer’s instruction manual should be strictly followed.

5.2.6 Non-destructive Test

5.2.6.1 Material defects of parts or components such as fatigue cracks or corrosion cracks may be developed during service. When a visual examination or an open-up examination is insufficient to draw a reliable conclusion as to the parts or components being examined, appropriate non-destructive tests should be engaged to further assess the integrity and reliability of those parts in question.

5.2.6.2 The common non-destructive tests include:
liquid penetrant inspection;
- magnetic particle inspection;
- electrical test methods;
- ultrasonic testing; and
- radiography.

5.2.6.3 There are standard procedures, precision equipment and technology to conduct a non-destructive test. The decision to apply any of the above testing methods should be left to the professional judgement of the competent examiner engaged in the thorough examination of the lorry-mounted crane. The competent examiner should also determine the extent, frequency and nature of any non-destructive testing required to supplement thorough examination. The non-destructive test should be applied to structural members, mechanisms and components that are critical to the structural integrity of the lorry-mounted crane. For areas and locations subject to non-destructive test, reference should be made to section 10 of BS 7121-2-4:2013. Non-destructive test have to be carried out only by a competent personnel with relevant qualifications proper training and appropriate experience.
6. Test and Thorough Examination of Lorry-mounted Cranes

6.1 Objective of Test and Thorough Examination

6.1.1 Before the commencement of a ‘test and thorough examination’ in respect of a lorry-mounted crane, a ‘thorough examination’ should be carried out as stated in section 5.

6.1.2 A ‘test’ as required by law is a proof load test. The objective of the test is to demonstrate that the lorry-mounted crane is structurally sound and fit for the use for which it is designed.

6.2 Coverage of Test and Thorough Examination

6.2.1 Test and thorough examination is composed of “thorough examination”, “test” and “re-examination”.

6.2.2 Thorough Examination

6.2.2.1 The degree of coverage of such thorough examination should be the same as stated in section 5.

6.2.3 Test

6.2.3.1 For a lorry-mounted crane which is first put into use, the test is to verify the specifications and performance as recommended by the manufacturer.

6.2.3.2 In the event of any alteration or repair which may affect the stability and the strength of a lorry-mounted crane, proof load test should be carried out to ensure that all parts affected by the alteration or repair are structural sound and stable for further use. Where a periodic test is required by regulations, a proof load test should be conducted to ensure that the performance and the lifting capacity of the lorry-mounted crane are in safe working order.
6.2.3.3 The key elements of a proof load test are to select a particular test and a correct amount of proof loads to verify the performance, stability and structural integrity of the lorry-mounted crane. For lorry-mounted crane, the proof load is in the range of 110% to 125% of the previous or known SWLs as stipulated in Appendix III.

6.2.3.4 Where in testing a hydraulic crane it is, because of the limitation of pressure, impossible to hoist a load which exceeds the safe working load by 25%, it is sufficient compliance with paragraph 2(1) of the First Schedule of LALGR if the crane has the greatest possible load applied to it.

6.2.3.5 Reference should also be made to various relevant national / international safety standards, codes of practice or manufacturer's specifications to determine and select the appropriate type of test.

6.2.3.6 The proof load test should be conducted to cover the following:
- to verify the stability of a lorry-mounted crane; and
- to check the functions of the raising / lowering, slewing and travelling mechanisms of a lorry-mounted crane, with particular attention to the performance and efficiency of the braking system for each of these motions.

6.2.3.7 The test should be carried out at the following radii:
- maximum radius attainable with hydraulic outreach;
- one intermediate radius, preferably corresponding to one of the ratings shown on the load chart; and
- minimum radius given on the load chart.

6.2.3.8 Procedures for test of a crane should be as follows:
- The initial raising of the load should be at the shortest possible radius and with the boom direction facing a stable part of the slewing arc. Once a satisfactory test lift has been made, the load should be carefully extended outwards to its intended radius;
- After intended radius is reached, the load should be stopped to test the stability of the crane;
The load should be kept as close to the ground as possible, allowing for boom deflection and vehicle stability;

Sudden load movements, including load braking, should be avoided to prevent shock loading; and

The proof load shall be then swung as far as is practicable first in one direction and then in the other.

6.2.4 Automatic Safe Load Indicator calibration check and functional test

6.2.4.1 The test and thorough examination of a lorry-mounted crane should include a calibration check and functional test of the Automatic Safe Load Indicator (ASLI) if the lorry-mounted crane is fitted with one.

6.2.4.2 The warning and indicators specified below should be checked at three different loads spanning in the range of the SWL of the crane by keeping the hydraulic boom extensions at the horizontal position:

- The ASLI shall give a clear and continuous audible and visible warning when the load of the crane approaches the SWL. The warning should commence at not less than 90% of the SWL and at not more than 97.5% of the SWL.
- The ASLI shall give a further clear and continuous audible and visible warning of overload. The warning should commence at not less than 102.5% of the SWL and at not more than 110% of the SWL.
- The results of the ASLI calibration check and functional test should be checked against and fall within the tolerance limits as stated above.

6.2.4.3 Deviation from the above warning indication ranges is allowed if the ASLI is designed in accordance with other relevant international standards.

6.2.4.4 Details of the calibration check and functional test should be recorded in Item 5 of the Addendum in Appendix IV.
6.2.5  **Re-examination**

6.2.5.1 According to the First Schedule of LALGR, a thorough examination shall be conducted after the proof load test with an aim to check whether there are any cracking, deformation or loosening of or damage to structural connections developed during the test. “Re-examination” is to ensure that the lorry-mounted crane is still structural sound and stable for safe use until the next cycle of test.

6.2.5.2 Adjustment and tuning of overload protection devices, safety devices and limiting switches may be required during the re-examination in accordance with the manufacturer's specifications. Further functional / operational tests of these switches should be conducted to verify the correct operation of the lorry-mounted crane.
7. **Certification and Report by Competent Examiner**

7.1 **Certification by Competent Examiner**

7.1.1 When a lorry-mounted crane is found to be in safe working order, a competent examiner should issue a certificate in the approved form (Form 3 in Appendix I and Form 5 in Appendix II) to the owner of the lorry-mounted crane as soon as possible to allow the owner to use the lorry-mounted crane. The certificate should contain enough details to indicate the identification, configuration, performance and capacity of the lorry-mounted crane. A certificate not in the approved form (including a temporary certificate) does not fulfill the requirement of LALGR.

7.1.2 The certificate should tabulate all SWLs for which the crane being proof load tested in these different working radii. The number of SWLs listed in the certificate should be the same as the number of load ratings shown in the load chart supplied by the manufacturer.

7.1.3 Addendum (Appendix IV) should be attached in the certificates in the approved forms (Form 3 and Form 5) to list out the testing conditions in particular the conditions of outriggers and levelling of the lorry-mounted crane, etc. in the test and thorough examination, so as to tender detailed information to personnel involved in lifting operations with the use of the crane.

7.2 **Report by Competent Examiner**

7.2.1 A competent examiner should keep an examination log book to note down the major configuration details, performance characteristic, function of safety devices or warning systems, electrical particulars, means of identification and the state of working condition of the lorry-mounted crane undergone thorough examination and testing. Any deficiencies or abnormal conditions detected during the thorough examination and testing should be properly entered in the log book. The owner of the lorry-mounted crane should be promptly informed of the
findings for immediate attention or repair.

7.2.2 Where the test or thorough examination shows that the lorry-mounted crane cannot be used safely unless certain repairs are carried out, the competent examiner shall immediately inform the crane owner of that fact and deliver a report to the owner as well as the Commissioner for Labour in accordance with section 2.6. The report should be clear and provided with sufficient details to enable the crane owner to find out the exact location and nature of the defects, and decide what appropriate actions should be taken to rectify those defects. The use of abbreviations should be avoided in the report.

7.2.3 The crane owner should also immediately take the crane out of service and prevent it from being put into service, unless the defects have been satisfactory rectified and the crane is certified in safe working order by a competent examiner.

7.2.4 The clause ‘in safe working order’ as concluded by the competent examiner in the certificate after he has examined the lorry-mounted crane bears a professional assurance that:

- the lorry-mounted crane is of good mechanical construction, made of strong and sound materials, and free from patent defect;
- the arrangements for mounting the lorry-mounted crane are adequate to secure its safety;
- every structure supporting the lorry-mounted crane is of good construction and adequate strength, of sound materials and free from patent defect;
- all safety devices, limiting switches, and ASLI are functioning properly; and
- under normal operation condition and proper maintenance, lorry-mounted crane is safe to use within the period either defined by the manufacturer's specification or the statutory requirement.
**Appendix I**

**FORM 3**

**CERTIFICATE OF TEST AND THOROUGH EXAMINATION OF CRANE, CRABS AND WINCHES**

*Form approved by the Commissioner for Labour for the purposes of regulation 5(3) & (5) of the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations*

本表格乃由勞工處處長就工廠及工業經營(起重機械及起重裝置)規例第5(3)及(5)條的需要而認可

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Name of owner and address of installation of the appliance</strong>&lt;br&gt;擁有人姓名及機械的裝置地址</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Name and address of maker of the appliance</strong>&lt;br&gt;機械製造廠名稱及地址</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Type of appliance and nature of power (e.g. Scotch derrick-manual; tower derrick-electric; rail mounted tower-electric)</strong>&lt;br&gt;機械類別及所使用的動力(例如：蘇格蘭式；人字起重機——人力；塔式人字起重機——電力；架設軌道的塔式起重機——電力)</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Date of manufacture of the appliance</strong>&lt;br&gt;該機械製造日期</td>
</tr>
<tr>
<td>5.</td>
<td><strong>Identification number</strong>&lt;br&gt;識別編號</td>
</tr>
<tr>
<td></td>
<td>(a) <strong>Maker’s serial number</strong>&lt;br&gt;製造廠編號</td>
</tr>
<tr>
<td></td>
<td>(b) <strong>Owner’s distinguishing mark or number (if any)</strong>&lt;br&gt;擁有人的識別標誌編號(如有此標誌或編號者)</td>
</tr>
</tbody>
</table>

LALG-F3-1
6. Safe working load or loads.
In the case of a crane with a variable operating radius (including a crane with a derrick jib or with interchangeable jibs of different lengths) the safe working load at various radii of the jib, jibs, trolley or crab must be given; test loads at various radii should be given in column (3) and in the case of a safe working load which has been calculated without the application of a test load “NIL” should be entered in that column.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length of jib (metres)</td>
<td>Radius (metres)</td>
<td>Test load (tonnes)</td>
<td>Safe Working load (tonnes)</td>
</tr>
<tr>
<td></td>
<td>吊臂長度 (以米為單位)</td>
<td>半徑 (以米為單位)</td>
<td>試驗所用負荷 (以公噸為單位)</td>
<td>安全操作負荷 (以公噸為單位)</td>
</tr>
</tbody>
</table>

7. In the case of a crane with a derrick jib or jibs the maximum radius at which the jib or jibs may be worked (in metres).
如該起重機係有伸縮性的操作半徑者(包括裝有人字吊臂或有不同長度的吊臂可供調換的起重機)，則應列明吊臂、破輪或起重滑車在使用各種半徑操作時的安全負荷。面試各種半徑時所用的負荷應填於第(3)欄內，如安全操作負荷並非經過負荷測試而屬計算者，則應在該欄內填「無」字。

8. Defects noted and alterations or repairs required before appliance is put into service. If none enter “None” and state whether in safe working order.
如該機械係有人字吊臂者，則註明在該吊臂伸至最長時的半徑(以米為單位)。

9. In the case of a crane, state whether the automatic safe load indicator is in good working order.
如該機械為起重機，註明該機的安全負荷自動顯示器是否處於安全操作狀態。

I hereby certify that on .......................... 19........ the appliance described in this certificate was tested and thoroughly examined by me in accordance with the First Schedule and that the above particulars are correct.

LALG-F3-2
Signature of Registered Professional Engineer .............................................
註冊專業工程師簽署

Qualification ...................................................................................
註冊資格

Discipline ......................................................................................
註冊界別

Name and address of person, company or association by whom the person conducting
the test and examination is employed ..................................................
僱用執行此次測試及檢驗的人士、公司
或機構的姓名或名稱及地址

Date of certificate ...........................................................................
簽發日期

Any competent examiner or competent person who delivers to an owner a certificate or
makes a report which is to his knowledge false as to a material particular shall be guilty of
an offence and shall be liable on conviction to a fine of $200,000 and to imprisonment for
12 months.
任何合資格檢驗員或合資格的人，如向業主交付他明知有任何要項屬虛假的證明書或作出
他明知有任何要項屬虛假的報告，即屬犯罪；一經定罪，可處罰款二十萬元及監禁十二個月。

LALG-F3-3
### Form 5

**Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations**

**LIFTING APPLIANCES**

**CERTIFICATE OF RESULTS OF THOROUGH EXAMINATIONS IN THE PRECEDING TWELVE MONTHS**

Form approved by the Commissioner for Labour for the purposes of regulation 3(1) of the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations

<table>
<thead>
<tr>
<th>Description of appliance, e.g. type, identification marks, maximum safe working load, etc.</th>
<th>Date of examination</th>
<th>Result of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>該機械的說明，例如：類別，識別標誌，最高安全操作負荷等</td>
<td>檢驗日期</td>
<td>如何不妥，請填「無」字並註明是否處於安全操作狀態</td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
</tbody>
</table>

I hereby certify that the appliances described in this certificate was thoroughly examined by me on ........................................ and that the above particulars are correct.

簽發者姓名：

Signature of Registered Professional Engineer: .................................................................

Registered Professional Engineer: ................................. Qualification: ...........................

Date of certificate: .................................................. Discipline: ...............................

Any competent examiner or competent person who delivers to an owner a certificate or makes a report which is to his knowledge false as to a material particular shall be guilty of an offence and shall be liable on conviction to a fine of $200,000 and to imprisonment for 12 months.

任何人依不實之證明書或作成之報告，均屬犯法：一經定罪，可處罰款二十萬元及監禁十二個月。

LALG-F5
Section 2 of First Schedule of LALGR

2. (1) Every crane and every lifting appliance, together with its accessories, other than a lifting appliance referred to in sub-paragraph (1), shall be tested with a proof load which shall exceed the safe working load as follows-

(a) if the safe working load is less than 20 tonnes, the proof load shall exceed the safe working load by at least 25 per cent;
(b) if the safe working load is 20 tonnes but not more than 50 tonnes, the proof load shall exceed the safe working load by at least 5 tonnes;
(c) if the safe working load is more than 50 tonnes, the proof load shall exceed the safe working load by at least 10 per cent.

(2) The proof load shall be hoisted and then swung as far as is practicable first in one direction and then in the other.

(3) Where a crane with a jib which has a variable vertical operating radius is to be tested, the test shall be carried out by applying a proof load in accordance with sub-paragraph (1) at both the maximum radius and the minimum radius of the jib.

(4) Where in testing a hydraulic crane it is, because of the limitation of pressure, impossible to hoist a load which exceeds the safe working load by 25 per cent, it is sufficient compliance with this paragraph if the crane has the greatest possible load applied to it.
Addendum to Certificates in the Approved Forms for (i) Thorough Examination and (ii) Test and Thorough Examination of Lorry-mounted Cranes

Certificate No.: ________________________
Vehicle Registration Mark: ________________________
S/N of the crane: ________________________

1. Visual examination

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Remarks (please specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Are components and parts of the crane, particularly load bearing parts, identical or in conformity with the specifications of the manufacturer and without any patent defect?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>(ii) Are the lorry tyres properly inflated prior to the thorough examination/test?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

2. Levelling conditions

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Remarks (please specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Does the spirit level indicator on the outrigger function properly?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>(ii) Does the levelling of the lorry mounted crane fall within the maximum permissible inclination (i.e.___________°) as specified by the manufacturer?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>
3. Outriggers condition

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Remarks (please specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Do the outrigger jacks, outrigger beams and outrigger beam locks function properly and free from patent defect?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii) Do the outrigger beams extend as per manufacturer’s instructions in thorough examination / test?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iii) * Does the ASLI automatically monitor the deployment of every outrigger to determine SWLs of the crane in accordance with the boom positions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Applicable only to those lorry-mounted crane manufactured conforming BS EN 12999:2011 or equivalent standard and deployment of every outrigger is automatically monitored by ASLI to determine SWLs in accordance with boom positions.

4. Safe working load (SWL) chart

<table>
<thead>
<tr>
<th>Crane radius (Starting from minimum to maximum)</th>
<th>Outrigger extension</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td></td>
<td>SWL</td>
</tr>
<tr>
<td>m</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td></td>
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<tr>
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<tr>
<td>m</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td></td>
</tr>
</tbody>
</table>

(i) The number of entries of safe working loads in the certificate should be the same as the number of load ratings in the load chart supplied by manufacturer; and
(ii) All outriggers of the crane should be fully extended during thorough examination / test unless otherwise specified by the manufacturer.
5. **Automatic Safe Load Indicator (ASLI) calibration check and functional test**

<table>
<thead>
<tr>
<th>Loads</th>
<th>Condition of first warning</th>
<th>Condition of further warning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Radius</td>
<td>% of SWL</td>
</tr>
<tr>
<td>(i)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iii)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. **Area of operation**

The crane has been thoroughly examined / tested in the area(s), where SWLs stipulated in this certificate and addendum are applicable. Please specify the area(s) and the outrigger configuration in the schematic diagram below.

*A sample for illustration only.*
### 7. Others

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Remarks (please specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Does ASLI set in accordance with SWLs specified in certificates in the approved forms and the table in Item 4 above?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(ii) Are relief valve systems and ASLI reinstated after completion of the thorough examination / test?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(iii) Are outrigger beams properly marked or painted to indicate their deployment?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(iv) Please specify any irregularities observed in respect of the crane concerned.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

I hereby certify that on _____________________ the lorry-mounted crane described in this addendum attached to the certificate was tested and thoroughly examined by me and that the above particulars are correct.

**Signature of Registered Professional Engineer**

________________________________________

**Qualification and Discipline**

________________________________________

**Date**

________________________________________
References


6. Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations, Cap. 59

7. Code of Practice for Safe Use of Mobile Cranes issued by the Labour Department, the government of HKSAR

8. Guidance Notes on Inspection, Thorough Examination and Testing of Lifting Appliances and Lifting Gear issued by the Labour Department, the government of HKSAR
Enquiries

If you wish to enquire about these Guidance Notes or require advice on occupational safety and health matters, 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.

For details on the services offered by the Occupational Safety and Health Council, please call 2739 9000.

Complaints

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