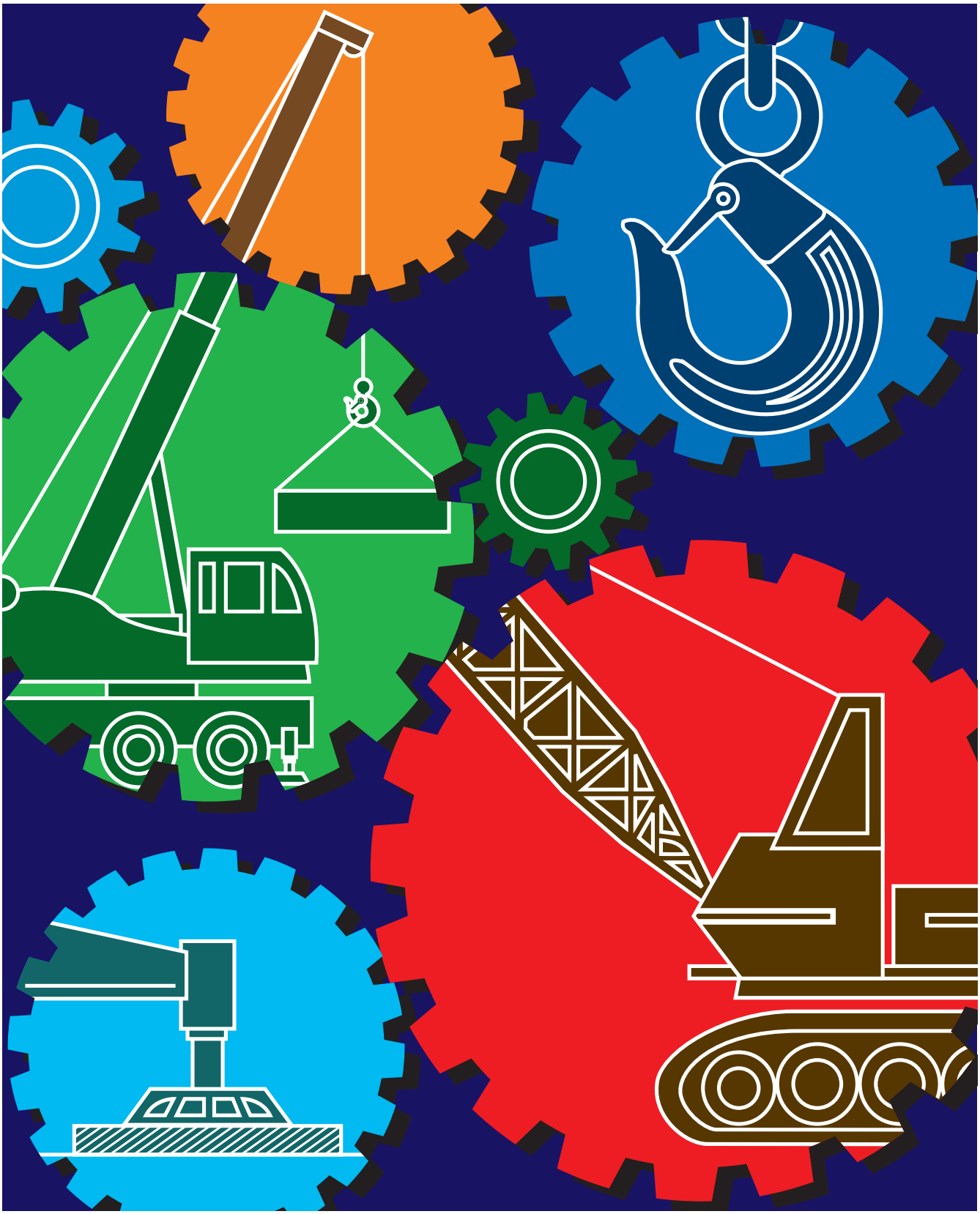
Guidance Notes on

INSPECTION, THOROUGH EXAMINATION and TESTING

of Lifting Appliances and Lifting Gear



Safety at work

Occupational Safety and Health Branch
Labour Department

Guidance Notes on Inspection, Thorough Examination and Testing of Lifting Appliances and Lifting Gear

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1 Introduction

1.1 This Guidance Notes (hereinafter referred to as GN) provides practical guidance on inspections, thorough examinations and tests of lifting appliances and lifting gear as prescribed under the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations (hereinafter referred to as LALGR) to ensure their safety and reliability.

1.2 This GN should be read by all concerned parties, including owners of lifting appliances and lifting gear, competent persons and competent examiners involved in carrying out inspections, thorough examinations or tests of lifting appliances and lifting gear. The advice contained in this GN should not be regarded as exhaustive. It should be read in conjunction with relevant national/international standards, codes of practice and manufacturer's instructions in order to ensure the quality of inspections, examinations and tests.

1.3 To start with, this GN gives a brief account on the main frame of legal requirements of inspections, examinations and tests of lifting appliances and lifting gear. It then lists out the key elements and components of 'inspection', 'thorough examination', and 'test and thorough examination'. The co-relationship between 'thorough examination' and 'test' has also been elaborated. It recommends certain criteria in the scale-down of safe working loads of lifting appliances and a proper way in the tabulation of safe working loads in the current certificates after the tests and thorough examinations. Finally, it advises that, under the general duty provisions, the employer should provide and maintain safe systems of work to ensure the safety of personnel engaged in the job in addition to the carrying out of good quality and accurate inspections, thorough examinations and tests.

1.4 For the purposes of this GN, the following interpretations which are extracted from the LALGR apply:

"competent examiner"(合資格檢驗員), in relation to the carrying out of any test and examination required by the aforesaid regulations, means a person who is —

(a) appointed by the owner required by these regulations 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 for Labour; and

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

As at the date of issue of this GN, mechanical engineering and marine engineering are two disciplines specified by the Commissioner for Labour for the purposes of these regulations;

"competent person"(合資格的人), in relation to any duty required to be performed by him under the aforesaid regulations, means a person who is —

(a) appointed by the owner required by these regulations to ensure that the duty is carried out by a competent person; and

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

"crane"(起重機) 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 conveyor 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"(起重機械) 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;

"lifting gear"(起重裝置) means a chain sling, rope sling, ring or similar gear, and a link, hook, plate clamp, shackle, swivel or eyebolt;

"owner"(擁有人), 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 of management of the lifting appliance or lifting gear 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"(hereinafter referred to as SWL)(安全操作負荷), in relation to a lifting appliance or to lifting gear, means either —

(a) 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 the LALGR; or

(b) where no such certificate is required, the relevant safe working load shown in the table referred to in regulation 18(1)(b) of the LALGR.

2 Legal Requirements

2.1 Inspections, thorough examinations and tests are particularly important for ensuring the safety and reliability of lifting appliances and lifting gear. Statutorily, there are three types of duties as follows:

- inspection by a competent person;
- thorough examination by a competent examiner; and
- test and thorough examination by a competent examiner.

2.2 The legal requirements of 'inspection', 'thorough examination' and 'test and thorough examination' of lifting appliances and lifting gear are summarized in Table 1 and Table 2 respectively. Table 3 tabulates the types of Forms used for inspections, examinations and tests of different lifting appliances or lifting gear.

Types of appliance	Inspection	Thorough examination	Test and thorough examination
Lifting appliance except crane, winch, crab.	within the preceding 7 days (Reg.7A of LALGR)	at least once in the preceding 12 months (Reg.5(1) of LALGR)	before use for the first time or after substantial repair, re-erection, failure, overturning or collapse (Reg.5(2) & 5(4) of LALGR)
Crane	within the preceding 7 days (including the automatic safe load indicator) (Reg.7A & 7B(1)(c) of LALGR)	at least once in the preceding 12 months or before erection (all of the devices used for the anchoring and ballasting of the crane) (Reg. 5(1) & 7E(1) of LALGR)	within the preceding 4 years or after substantial repair, re-erection, failure, overturning or collapse or after each erection and removal to a new location or any adjustment which involves changes in the arrangements for anchoring or ballasting the crane or after exposure to weather likely to have affected the stability of the crane (Reg.5(3), 5(5), 7B(1)(b), 7E(2) & 7G(2)(a) of LALGR
Winch and crab	within the preceding 7 days (Reg.7A of LALGR)	at least once in the preceding 12 months (Reg.5(1) of LALGR)	within the preceding 4 years or after substantial repair, re-erection, failure, overturning or collapse (Reg.5(3) & 5(5) of LALGR)

Table 1 - Legal requirements for 'inspection', 'thorough examination' and 'test and thorough examination' of lifting appliances

Types of gear	Inspection	Thorough examination	Test and thorough examination
Lifting gear	before use on each occasion (Reg.18(1)(ea) of LALGR)	in the preceding 6 months before it is used (Reg.18(1)(e) of LALGR)	before use for the first time (except for a fibre rope or fibre-rope sling) (Reg.18(1)(d) of LALGR)

Table 2 - Legal requirements for 'inspection', 'thorough examination', 'test and thorough examination' of lifting gear

ITEM	Form No. (LALGR)						
	1	2	3	4	5	6	7
Crane	*		*		*		
Crane with anchoring or ballasting devices	*	*	*		*		
Winch, Crab	*		*		*		
Pulley Block, Ginwheel, Sheerlegs, Pile Driver, Pile Extractor, Excavator, Overhead Runway, Dragline, etc	*			*	*		
Lifting Gear						*	*
Fibre Rope							*
Period	7 days	after erection	4 years before use or after substantial repair, re-erection, failure, overturning or collapse		12 months	before put into use	6 months

*Note: *stands for applicable*

Table 3 - Forms for Inspections, Examinations and Tests

3 Inspection

3.1 The safety and reliability of a lifting appliance or lifting gear cannot be ensured unless it has received regular inspections. Regular inspections are particularly important because they provide a useful means of detecting potential hazards which could contribute to accidents. Regular inspections can also forewarn the owner of necessary preventive maintenance or repair, the lack of which can lead to serious deterioration of the lifting appliance and expensive replacement or repair charges.

3.2 An inspection means a visual and physical checking usually supplemented by a functional check to examine the states of individual items of a lifting appliance or lifting gear. The purpose of an inspection is to find out whether there is any item having abnormal wear and tear, malfunction, oil leakage, overheating, corrosion, unusual noise, dislocation, visual cracks, misalignment, overloading, abnormal slackening or elongation, and excessive vibration, etc. and if necessary to arrange for subsequent remedial actions such as repair and replacement of the defective parts, or to stop the lifting appliance or lifting gear from further use if a critical condition exists.

3.3 The key elements of regular inspection are:

- frequency and coverage of inspection;
- competence of persons engaged in inspection; and
- report by competent person.

3.3.1 Frequency and Coverage of Inspection

3.3.1.1 For Lifting Appliance

Weekly Inspection

This is a statutory requirement for the lifting appliance to be inspected within the preceding 7 days prior to use by a competent person. In fact, nearly in

every preventive maintenance schedule, weekly inspection is recommended by the manufacturer's operation and maintenance manuals.

The coverage of a weekly inspection should be as broad as possible. Every lifting appliance has its own specifications. Reference should be made to the manufacturer's operation and maintenance manuals and if necessary the professional advice from the manufacturer should be sought before determining the inspection items.

In general, a weekly inspection should cover but not limited to the following:

- the hoisting mechanism, including wire ropes, pulley blocks and end fastenings;
- the functional mechanisms such as sheaves, brakes, locking mechanisms, hooks, limit switches, control switches and buttons;
- the safety devices such as automatic safe load indicators;
- the fixing and anchorage arrangements;
- the connecting hardware such as bolts and nuts, hooks, wire grips and shackles;
- the electrical systems including earth conductors and circuit protectors;
- the lubrication and cooling systems such as lubricating oil and coolant;
- the hydraulic and fuel supply systems such as oil reservoirs; and
- the configuration such as straightness of the boom or jib, etc.

Daily Inspection

At the beginning of each shift or working day, the operator, if competent for the purpose, or a competent person, should carry out an inspection to ensure that the lifting appliance is in a serviceable state without any defect. All components that have a direct bearing on the safety of the lifting appliance should be inspected on daily basis. Typical examples are the control mechanism, control switches, levers, hydraulic hoses, oil level of hydraulic and fuel systems.

Other Regular Inspection

In many cases, manufacturers require other regular inspections such as monthly/quarterly inspections to be conducted on some components. These inspections are intended to determine the need for repair or replacement of parts as required to maintain the appliances in serviceable condition insofar as safety is concerned. Reference should be made to the manufacturers' operation and maintenance manuals.

3.3.1.2 For Lifting Gear

Inspection Before Use

This is a statutory requirement for each lifting gear to be inspected before use on each occasion by a competent person. All lifting gear should be inspected to ensure that it is free from any abnormal wear and tear, visual cracks, elongation or slackening, etc. In particular, according to the legal requirement, it shall be checked that the total number of visible broken wires for a wire rope, in any length of 10 diameters, shall not exceed 5% of the total number of wires in the rope.

3.3.2 Competence of Persons Engaged in Inspection

Inspection of a lifting appliance or lifting gear shall be carried out by a competent person who may be an operator or a mechanic. A competent person is regarded as competent if he is well trained and possesses adequate knowledge and practical experience in handling the similar type of lifting appliances or lifting gear. He should be able to detect and assess defects and potential hazards that could limit the safe performance of the lifting appliances or lifting gear.

A competent person should be fully familiar with and apply the following aspects of knowledge and skill:

- the operation or use of the lifting appliance or lifting gear that he has to inspect;
- the location and function of safety devices, master switches, on-off switches;

- the safety rules, precautions, servicing and overhaul requirements and limitations as defined in the operation and maintenance manual of the lifting appliances or lifting gear that he inspects;
- the content and application of the LALGR;
- the skill of using hand tools, machine tools, measuring instrument and testing devices to conduct simple functional checks;
- the maintenance record of the lifting appliances or lifting gear that he inspects; and
- the safe system of work to take care of himself and of other persons working with him during inspection.

3.3.3 Report by Competent Person

3.3.3.1 For Lifting Appliance

The use of an inspection checklist is recommended for carrying out the inspection of a lifting appliances. A checklist, clearly listing out all inspection items, definitely systemizes and facilitates the inspection work.

It is strongly recommended that the competent person should keep a logbook to record all defects and comprehensive findings noted during the inspection. Details of all modifications, repairs and maintenance should be entered in the logbook. The logbook should also bear the lifting appliance's brand name, model, serial number and year of manufacture, etc.

The competent person shall issue a certificate in the approved form (Form 1) to record the state of a lifting appliance after the inspection. A statement whether the lifting appliance is in safe working order should be entered by the competent person. He should deliver the certificate to the owner of the lifting appliance as soon as possible. An example of a Form 1 that has been duly completed by a competent person after inspecting a mobile crane is shown at Appendix I. It is important that the owner and/or the person in control of the lifting appliance should be notified as soon as possible if it is found to

be not in safe working order so that appropriate action can be taken to repair or replace the lifting appliance or otherwise ensure that the potentially dangerous lifting appliance is withdrawn from use as soon as possible. A notice should be attached to the lifting appliance stating that it must not be used.

3.3.3.2 For Lifting Gear

As far as reasonably practicable, the use of a checklist listing out the identification markings of all lifting gear to be inspected is recommended. The result of inspection should be recorded.

It is important that the owner and/or the person in control of a lifting gear should be notified as soon as possible if the competent person has revealed any defect which renders the lifting gear no longer in safe working order so that appropriate action can be taken to repair or discard the lifting gear. It should also be noted that lifting gear awaiting repair or taken out of service should be separately and suitably stored. Notices should also be attached stating that they must not be used.

4 Thorough Examination

4.1 The objective of 'thorough examination' is to ensure that the lifting appliance or lifting gear 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 examined.

4.2 The key elements of thorough examination include:

- the period of examination;
- the coverage; and
- report by competent examiner.

4.2.1 The Period of Examination

The criteria to carry out a thorough examination as required by law depends on a time factor which is either within a 6-month period or 12-month period.

6-month period

The owner of any chain, rope, or lifting gear used for raising or lowering or as a means of suspension shall ensure that each chain, rope or lifting gear in use has been thoroughly examined by a competent examiner in the preceding 6 months before it is used.

12-month period

Lifting appliances shall be thoroughly examined by a competent examiner at least once in the preceding 12 months. It is mandatory that a periodic thorough examination shall be carried out by a competent examiner even if the lifting appliance or lifting gear is in serviceable and good condition. In certain lifting appliances, the period of examination is also defined by the

manufacturer besides the legal requirement. Reference should be made to the operation and maintenance manual for any additional requirement.

4.2.2 The Coverage

A thorough examination should cover those components of lifting appliances and lifting gear which are subjected to certain degree of exposure to wear, deterioration, malfunctioning or misalignment. Lifting appliances and lifting gear should be carefully examined to identify any deficiencies that may constitute a hazard. To ensure that the lifting appliance or lifting gear is safe to be used, a thorough examination not limited to the following should be conducted:

- visual examination;
- dimensional examination;
- functional or operational test;
- open-up examination;
- electrical test and examination; and
- non-destructive test.

4.2.2.1 Visual Examination

Visual Examination includes the check and examination of the state of individual items of a lifting appliance or lifting gear. 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 components of the hoisting mechanism, including 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, of a hydraulic or pneumatic system;

- mast or jib configuration, including jointing pins, welds of a structural mast or bases, stoppers or clamps of a travelling system; and
- fixing and anchorage, and ballast arrangements of the appliance which may affect stability.

4.2.2.2 Dimensional Examination

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 lifting appliance or lifting gear. 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;
- measurement of span limit, deflection, alignment to verify the structural stability of a load-bearing fabrication such as deflection of a jib, alignment of the corner frame of the mast of a tower crane; 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.

4.2.2.3 Functional or Operational Test

Having finished the visual and dimensional examinations and there is no deficiency or irregularity noted,an operational or a functional test should be conducted to check the function of the various operating and safety systems

of a lifting appliance. An operational or a functional test consists of a no-load test and a SWL performance test.

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

The no-load test consists of checks on the following elements if applicable:

- lifting and lowering mechanism;
- boom lifting and lowering mechanism;
- travelling mechanism;
- swinging or slewing mechanism;
- functions of all safety alarms, safety devices and indication lamps; and
- brake operation such as the fail-safe mode or free operation.

It is important to ensure the competence of the operator assisting the functional/operational test, e.g. the operator of a crane shall hold a valid certificate under the LALGR. The operation and maintenance manual should be made available for reference during the test.

When the lifting appliance is found in safe working order under the no-load test, a SWL performance test is conducted to verify the performance of the appliance. With reference to the load chart of the lifting appliance, the SWLs contained in the previous test certificate, year of manufacture, maintenance record or accident history of the appliance, a correct amount of proof load is selected to conduct the SWL performance test. The test should be conducted by the same mechanic and operator who assist the no-load test.

In the case of a crane operating with various working radii, the SWLs at minimum 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 such as deflection measurement may be incorporated into the SWL performance test to verify the deflection limit as stated in the manufacturer's specifications or relevant safety standards.

4.2.2.4 Opening Up Examination

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 specification. 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 assembly manual should be strictly followed.

4.2.2.5 Electrical Testing and Examination

Electrical tests on the portable electrical lifting appliance should be carried out by a registered electrical worker registered under the Electricity Ordinance (Cap.406) not limited to the insulation resistance test, earth continuity test and functional test of the appliance.

For a fixed electrical installation (e.g. an over-head travelling crane), thorough examination and testing should be carried out by a registered electrical worker registered under the Electricity Ordinance (Cap. 406) to ensure that:

- the installation is properly protected from earth fault, short circuit and overload;
- the connection to the source of electricity supply is proper and safe;
- the electrical parts and the electric cables/wiring are in good order; and
- the electric cables/wiring are properly laid and protected against damages.

4.2.2.6 Non-destructive Test

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

The common non-destructive testing systems currently engaged in the examination of components are :

- liquid penetrant inspection;
- magnetic particle inspection;
- electrical test methods;
- ultrasonic testing; and
- radiography.

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 lifting appliance. Non-destructive test have to be carried out by a qualified personnel only with proper training and appropriate experience.

4.2.2.7 Conclusion of the Thorough Examination

Depending on the type, model and working capacity of the lifting appliance or lifting gear, the competent examiner is to select the best type of examination that may assist him to determine the safe working condition of a lifting appliance or lifting gear. No matter which types of examinations that the competent examiner may select, it is important that the lifting appliance or lifting gear so examined should be in safe working order under normal usage and maintenance within a working period before the next examination.

The clause ‘in safe working order’ as concluded by the competent examiner in the certificate after he has examined the lifting appliance or lifting gear bears a professional assurance that:

- the lifting appliance or lifting gear is of good mechanical construction, made of strong and sound materials, and free from patent defect;
- the arrangements for fixing and anchoring the lifting appliance are adequate to secure its safety;
- every structure supporting the lifting appliance is of good construction and adequate strength, of sound materials and free from patent defect;
- all safety devices, limiting switches, and safety arrestors are functioned properly;
- the appliance is electrical safe and free from electrical hazards should there be any electrical components; and
- under normal operation condition and proper maintenance, the lifting appliance or lifting gear is safe to use within the period either defined by the manufacturer's specification or the statutory requirement.

4.2.3 Report by Competent Examiner

4.2.3.1 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 lifting appliance or lifting gear undergone thorough examination. Any deficiencies or abnormal conditions detected during the thorough examination should be entered in the log book. The owner of the lifting appliance or lifting gear should be informed of the findings for immediate attention or repair.

4.2.3.2 Where the thorough examination shows that the lifting appliance or lifting gear cannot be used safely unless certain repairs are carried out, the competent examiner should immediately inform the owner of the lifting appliance of that fact and should, within 14 days after the thorough examination, deliver a report to the owner and a copy of it to the Commissioner for Labour.

4.2.3.3 When an appliance is found to be in safe working order, a competent examiner should issue a certificate of thorough examination in an approved form to the owner of the appliance as soon as possible to allow the owner to use the appliance. The certificate should contain enough details to indicate the identification, configuration, performance and capacity of the appliance. A certificate not in the approved form (including a temporary certificate) does not fulfill the requirement of the LALGR.

4.2.3.4 Sufficient number of entries and correct amount of SWLs should be entered in the certificate for the lifting appliance. It is recommended that the number of entries of SWLs in the certificate should be the same as the number of load ratings in the load chart supplied by the manufacturer to provide sufficient data for an operator to operate the lifting appliance without overloading the appliance. When the competent examiner has scaled down the capacity of the lifting appliance, the original load chart of the lifting appliance is no longer applicable and the competent examiner has a duty to ensure the original load chart if being posted or marked on the lifting appliance is removed. The competent examiner also has a duty to list out all newly allocated SWLs in the certificate.

5 Test and Thorough Examination

5.1 Under the LALGR, the owner of a lifting appliance or lifting gear shall appoint a competent examiner to test and thorough examine his lifting appliance or lifting gear in the manner as prescribed in the First Schedule of the LALGR which has been reproduced at Appendix II.

5.2 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;
- the test procedure and requirement of lifting gear; and
- after being tested with proof loads, each part of the lifting appliance or lifting gear should be examined so as to ensure that no part of the lifting appliance and lifting gear has been damaged during the test.

5.3 Test and thorough examination of a lifting appliance and lifting gear (except a fibre rope or fibre-rope sling) shall be conducted within certain period and under specified conditions. For example, crane, crab or winch shall be tested and thoroughly examined during the preceding 4 years by a competent examiner even thorough they are in serviceable states and good conditions. 'Test and thorough examination' is also required under the following specified conditions:

- before the lifting appliance or lifting gear is put into use for the first time,
- after undergoing substantial repair, re-erection, failure, overturning or collapse of the lifting appliance, or
- after exposure to weather conditions likely to have affected the stability of the crane.

5.4 It is worthy to note that the replacement of a suspension rope of a crane also requires further test and thorough examination as almost all replacements will involve lots of alignment and adjustment of limit switches, brakes and end fastenings, etc.

5.5 Process of Test and Thorough Examination

A 'test and thorough examination' is composed of the following:

- a thorough examination,
- a test, and
- a re-examination.

5.5.1 Thorough Examination

5.5.1.1 A 'thorough examination' shall be carried out to ensure the lifting appliance or lifting gear is capable to withhold the proof loads of the test to be conducted. The degree of coverage of such thorough examination should be the same as discussed in Chapter 4.

5.5.2 Test

5.5.2.1 A 'test' as required by law is a proof load test. The objective of the test is to demonstrate that the lifting appliance or lifting gear is structurally sound and fit for the use for which it is designed.

5.5.2.2 For a lifting appliance or lifting gear which is first put into use, the test is to verify the specifications and performance as recommended by the manufacturer. In case of a wire sling, a 'test' means a destructive test to find out the breaking load of the sling and hence to deduce its SWL.

5.5.2.3 In the event of any alteration or repair which may affect the stability or the strength of a lifting appliance, proof load test should be carried out to ensure that all parts affected by the repair or alteration 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 capacity of the appliance are in safe working order.

5.5.2.4 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 lifting appliance. The type and the amount of proof loads are different from one appliance to another. For lifting appliances, the proof load is in the range of 110% to 125% of the previous or known SWL. Reference should also be made to various relevant national/international safety standards, codes of practice or manufacturer's specifications to determine and select the most appropriate type of test and the correct amount of proof loads.

5.5.2.5 The proof load test is conducted to cover the following:

- to verify the configurations of a lifting appliance such as the amount of deflection or degree of inclination of a mast or a span of a lifting appliance. In general, the test is collaborated with dimensional examination. The test is also known as confirmation test; and
- to check the functions of the hoisting, slewing and travelling mechanisms of a lifting appliance, with particular attention to the performance and efficiency of the braking system for each of these motions. Any overrun or creep should be discernible. The test is sometime called a dynamic test.

5.5.3 Re-examination

5.5.3.1 According to the First Schedule of the LALGR, an 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 lifting appliance or lifting gear is still structural sound and stable for safe use until the next cycle of test.

5.5.3.2 Adjustment and tuning of overload protection devices, safety devices and limiting switches should be carried out and reset during the re-examination in accordance with the manufacturer's specifications and a functional test of these switches should be conducted to verify the correct operation of the lifting appliance or lifting gear.

5.6 Report by Competent Examiner

5.6.1 Test certificates shall be issued to indicate the compliance with the appropriate regulations. The certificates shall be in the approved forms and signed by the competent examiner who carried out the test and thorough examination. A certificate not in the approved form (including a temporary certificate) does not fulfill the requirement of the LALGR.

5.6.2 For the lifting appliance with various SWLs at different working radii, such as tower cranes or mobile cranes, the certificate should tabulate all SWLs for which the lifting appliance is certified, not just the ratings at the positions where the proof load was applied.

5.6.3 Every test certificate should be endorsed with all necessary information to ensure that there is no ambiguity as to the appliance rigging at the time of the test, for example, all possible variables such as jib length, counterweight, outriggers condition of a mobile crane, any restrictions or specific conditions. In case the test and thorough examination shows that the lifting appliance or lifting gear cannot be used safely, the competent examiner should report to the owner and the Commissioner for Labour in the same manner as stated in paragraph 4.2.3.2.

6 Relationship between 'Thorough Examination' and 'Test and Thorough Examination'

6.1 A lifting appliance should not be put into a proof load test or overload test without going through a thorough examination prior to the test as there are uncertainties as to whether the appliance could withstand the proof load or not, especially when the appliance has been in a long period of service.

6.2 Prior to the proof load test, the competent examiner should ensure by a thorough examination with the appliance in motion and at rest that it is:

- free from any defect that would preclude it from safely handling the proof load;
- in the correct configuration and condition according to the manufacturer's instructions; and
- equipped with sufficient falls of rope for the load under consideration.

6.3 The degree of coverage of a thorough examination prior to the test should be the same as discuss in Chapter 4. More importantly, the stability of the appliance should be ensured during the thorough examination.

6.4 When the appliance is found in safe working order by a thorough examination, proof load test can be proceeded with according to the test schedule. After the proof load test, a re-examination should be carried to ensure that the appliance is free from any irregularities.

6.5 In conclusion, the proper procedure to conduct a proof load test of an appliance is:

Thorough Examination ⟶ Test ⟶ Re-examination

The procedure is denoted by ETE which can be considered as a one complete process when the appliance is undergone proof load test.

6.6 In essence, when a periodic test and thorough examination is required by law or when a test and thorough examination is required after the appliance has undergone substantial repair, alteration, erection or repositioning, the competent examiner should indeed conduct a ETE to ensure the safety of the appliance during the test and after the test.

6.7 In good practice therefore, a test and thorough examination as required by law means a ETE and this practice should be adopted by all competent examiners during the test and thorough examination of lifting appliances.

7 Granting of Safe Working Loads and Scale Down of Load Ratings

7.1 It must be recognized that, while a lifting appliance or lifting gear is designed and manufactured with a factor of safety, every lifting appliance or lifting gear begins to wear and tear once it is put into service. This process will inevitably continue until the lifting appliance or lifting gear is no longer capable to withstand its designed workload unless all parts subject to wear or failure are regularly inspected, repaired or replaced, examined and tested to ensure their conformity and fitness for the purposes.

7.2 Granting of Safe Working Loads

7.2.1 Each lifting appliance or lifting gear would be accompanied with the manufacturer's specifications and the operation and maintenance manual when it is newly purchased. For the lifting appliance, there is a load chart in the manual specifying the rated (maximum) capacities of the lifting appliance for every permissible configuration and situation. The load chart also specifies the lifting appliance's operational limitations and the conditions necessary for safe operation. These are essential information in connection with the extension of the life cycle of the lifting appliance. In no circumstances should the lifting appliance be operated in the manner that it is beyond the maximum safe working load. Provided that for the purpose of enabling tests of any lifting appliance to be carried out, the safe working load may be exceeded as required by the LALGR to carry out the proof load test and authorized by the competent examiner appointed.

7.2.2 Even if a lifting appliance or lifting gear is new, prior to be put into service, a ETE should be conducted on it in accordance with the LALGR before the appropriate SWLs are entered into the test certificate. The capacities listed in the load chart also provide a reference for selecting appropriate proof loads to be applied during the next ETE.

7.2.3 After the thorough examination or the ETE, the competent examiner should determine the appropriate SWLs for operating the lifting appliance or lifting gear. It is important that the numbers of SWLs so listed in the certificate for the lifting appliance should be equal to the numbers of readings as shown in the load chart of the manufacturer's operations and maintenance manual. Take a mobile crane for example, if the load chart supplied by the manufacturer contains thirty load ratings for various jib lengths and working radii, there should also be thirty SWLs listed in the certificate issued by the competent examiner. A test certificate issued by a competent examiner is illustrated at Appendix III. The item 6 of the certificate is extracted to form an attached chart of the certificate that shows all SWLs.

7.3 Scale Down of Load Ratings

7.3.1 Occasionally, a competent examiner may scale down the load ratings of the lifting appliance which has been put into service for a long period of years. He approves SWLs which are about 50% to 80% of the original load ratings of the lifting appliance. The reasons behind the scale down are complicated, including bad maintenance record, alarming accident history, improper use and operation, and long year of service.

7.3.2 The scale down of the original load ratings of a lifting appliance should be allowed on exceptional basis and provided that the following conditions are satisfied:

- the lifting appliance has been tested and thorough examined to ensure that all components are made of strong and sound material and free from patent defect.The test and thorough examination should accompany with a non-destructive test to confirm the structural integrity of load bearing components, joints and welds;
- approval has been obtained from the manufacturer to determine the amounts of scale down, especially for those lifting appliances the load ratings of which drop in non-linear scale;

- specified conditions should be imposed in the certificate to ensure the safe condition of the lifting appliance before the next test and thorough examination; and
- all load ratings contained in the load chart are proportionally scaled down. The scaled SWLs should be fully tabulated in the certificate.

7.3.3 If the thorough examination or the proof load test revealed that the appliance should be undergone a repair but genuine parts are not available for replacement, it is important to note that scale down of load ratings to form new SWLs should not be allowed. The lifting appliance should be put out of service until the proper repair has been done.

7.3.4 It is not applicable to any lifting gear for scale down of SWLs as the SWLs of lifting gear is determined by the breaking load of the sample gear under a destructive test.

8 Safe System of Work for Inspection, Thorough Examination and Testing

8.1 A safe system of work should be developed to ensure the safety of personnel engaged in the job in addition to carrying out of a good quality and accurate inspection, examination or test. Legally, every employer must ensure the safety and health at work of all his employees. He should provide and maintain a safe system of work that is safe and without risk to health. The safe system of work should be worked out under the advice of a registered safety officer. The system should include the following main ingredients:

- site conditions;
- weather conditions;
- test weights;
- procedure and safety precautions ;
- prevention from swinging or wheeling outwards of loads;
- competence of operator engaged in examination or testing;
- use of information;
- emergency procedure; and
- administration of the safe system of work.

8.2 Site Conditions

8.2.1 When a lifting appliance or lifting gear is to be examined or tested in a site or inside a workshop, due consideration should be given to the condition of the site or premises where examinations or tests are to be conducted. Whenever possible, the lifting appliance or lifting gear should be examined and tested in open area or workshop where no other work activities are carried out concurrently.

8.2.2 The ground or structure for support the lifting appliance should be well consolidated, structurally stable and capable of withstanding 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 when testing of a lifting appliance is conducted. Lifting appliances 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.

8.2.3 The site where the test is conducted should be of sufficient area and have unrestricted overhead clearance to allow the unobstructed movement of the lifting appliance and load throughout all its appropriate test movements.

8.2.4 It should also keep in mind to ensure all personnel not involved in the test be kept away from the test area. Particular care should be taken when a mobile crane or a tower crane is tested near a public area, highway, or occupied buildings. Appropriate time and date should be arranged with all relevant parties to keep away traffic and pedestrians during the test.

8.3 Weather Conditions

8.3.1 If the test site is situated in an open area, examinations or tests should not be carried out in adverse weather condition. Gusting wind may introduce an additional adverse effect on the safe handling of the load and the safe operation of the lifting appliance. Accident may happen to the personnel involved in the examination or test as rainy weather may increase the slipperiness of the frame structure of the lifting appliance on which they may walk. Suitable safety precautions should be devised if examinations and tests in such weather condition could not be avoided.

8.4 Test Weights

8.4.1 The test weights used should comply with the following requirements:

- weights of proven accuracy within +/– 1.0%,
- weights proven on a weighbridge, the weighbridge has been calibrated within the last 12 months, and
- weights suspended from a calibrated weighing device, the weighing device has been calibrated within the last 12 months.

8.4.2 The suspended test weights should be kept as close to the ground as possible, such as in the range of 100mm to 200mm above ground. Safety precautions should be taken to ensure the work safety of the personnel involved in the proof load test if the test weights are required to be hoisted or travelling along a path.

8.4.3 Test weights should be made up of concrete/metal blocks/plates, preferably with markings to show their actual weights. Under no circumstances, should reinforcement bars, wooden planks or life load be used as test weights.

8.5 Procedure and Safety Precautions

8.5.1 A proper procedure should be worked out to clearly define the sequence and the responsibility of each personnel engaged in the inspection, examination or test of a lifting appliance or lifting gear. It should set out which tests to be carried out first and what follows a non-destructive test. It is important to note down all safety precautions from relevant codes of practice, national/international standards and the manufacturer's operation and maintenance manual, and if appropriate, incorporate them into the safe system of work. The proper procedure and safety precautions for manually handling heavy test weights, equipment and lifting tackles should be laid down. If it 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.

8.5.2 A briefing session to explain and highlight the procedure and precautions should be conducted to ensure that every personnel is fully familiar with this topic.

8.6 Prevention from Swinging or Wheeling outwards of Loads

8.6.1 When a lifting appliance operates with various 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 lifting appliance. In case of a horizontal jib crane with trolley, suitable device should be fitted at the maximum radius of the jib, e.g. clamps to prevent the trolley from moving beyond this point.

8.7 Competence of Operator Engaged in Examination or Testing

8.7.1 The safe system of work should specify the competence of the operator who is engaged in the functional test or proof load test. The operator should be familiar with the characteristics of the lifting appliance, the safety precautions in handling overloading and the limitation of the lifting appliance in the brake test, functional test and proof load test. He should be able to put the lifting appliance under control at any time during the examination and testing work.

8.7.2 The operator should hold a relevant certificate, if required under the law, to qualify him in operating the lifting appliance. He should fully understand all signals given by the competent examiner to operate the lifting appliance smoothly and accurately.

8.8 Use of Information

8.8.1 The length of time that a piece of lifting appliance or its component will last is important. There are three engineering factors that influence the lifetime, namely deformation, wear and corrosion.

8.8.2 Nearly everything wears, and wear will usually develop significantly on moving parts such as bearings, gears, pistons, seals and on parts to which there are relative motions with other components. Not every wearing part is required to be removed and replaced, but there is a limitation to the degree of wear for each component. To use equipment with excessive wear developed in certain components is dangerous. The equipment would fail unexpectedly at any time if such situation exists.

8.8.3 Machine members will deform when they are subjected to loading. For example, when an overhead travelling crane is used for lifting a load, its bridge span will deform. A maximum vertical deflection of 1/750 bridge span is allowed when the crane is lifting its maximum SWL at the centre of the bridge. However, undesirable excessive deformation may be resulted if components or structure are irregularly loaded, excessively overloaded or the material of the component has changed its normal working state.

8.8.4 Competent persons and competent examiners should assess materials, tolerances, and assembly of moving parts, gaining an impression as to whether any undesirable conditions exist which will produce unacceptable wear and deform rates. This is an area where it is necessary to rely heavily on manufacturer's specifications. No doubt, the party who is most familiar with the characteristics, performance and limitation of equipment is the manufacturer.

8.8.5 Every lifting appliance comes with a manufacturer's specifications, and an operation and maintenance manual when it is newly purchased. For thorough examination or an ETE of a lifting appliance, the examiner has to make good preparation, and cannot finish the job simply by just a proof load test. A thorough examination or an ETE needs good preparation. Access to the right information is the most important first step for the job. Such information include:

- the specifications of the lifting appliance as stated in the manufacturer's specification sheets;
- the ‘Do’ and ‘Don't’ and the ‘Caution’ statements in the operation and maintenance manual;

- the relevant documents such as standards or codes of practice;
- maintenance records; and
- accident history.

8.8.6 The safe system of work should therefore include such information to make an examination and test complete and reliable to ensure that the lifting appliance can be used safely before the next examination and testing.

8.9 Emergency Procedure

8.9.1 An emergency procedure should be developed and included in the safe system of work. The procedure should specify the equipment for handling the collapsed lifting appliance, removing of test weights, assignment of personnel in charge of the emergency procedure. It is also important to secure medical assistance within the shortest possible time for medical treatment in case of a mishap.

8.10 Administration of the Safe System of Work

8.10.1 The safe system of work should be written in simple language. It should be passed to all personnel engaged in the inspection, examination or testing job. It should be properly executed and administered by a responsible person such as a registered safety officer, a competent examiner, a plant/factory manager or a site agent, who should also help to revise and update it from time to time to meet the demand of the industry.

[reg 7A]
[規例第 7A 條]

FORM 1
表 格 一

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

REPORTS OF RESULTS OF WEEKLY INSPECTIONS OF LIFTING APPLIANCES

Name of owner
擁有人姓名 .....
甲乙丙起重機
.....
工程有限公司
.....

Address of installation
安裝地址 .....
平安達臣五五五號
.....
.....

Form approved by the Commissioner for Labour for the purposes of regulation 7A of the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations

工廠及工業經營(起重機械及起重裝置)規例

起重機械的每週一次檢查結果報告

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 7A 條的需要而認可

Description of lifting appliance and means of identification 起重機械說明及識別標誌	Date of inspection 檢查日期	Result of inspection (including all working gear and anchoring or fixing plant or gear, and where required the automatic safe load indicator and derricking interlock) State whether in safe working order 檢查結果 (包括所有操作裝置及錨定或固定設置或裝置，在需要時並包括安全負荷自動顯示器及人字吊臂聯鎖)。 註明是否處於安全操作狀態。	Signature and designation of person who made the inspection 檢查者簽署及職階
(1)	(2)	(3)	(4)
	8-6-2000		
835AS		處於安全操作狀態	蔡貴泉
Sala T-Crane			機械技師

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，如向擁有人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-F1

Appendix II

First Schedule [regs.5(1) & 18(1)(d)]

Procedure for Testing and Examining Lifting Appliances and Lifting gear

1. (1) Every winch, together with its accessories, (including any derrick, gooseneck, eye-plate, eyebolt, or other attachments) 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 applied either—

(a) by hoisting movable weights; or

(b) by means of a spring or hydraulic balance or a similar appliance, with a derrick at an angle to the horizontal which shall be specified in the certificate of the test.

(3) In the case of a proof load applied under sub-paragraph (2)(a), after the movable weights have been hoisted, or in the case of a proof load applied under sub-paragraph (2)(b), after the proof load has been applied, the derrick shall be swung as far as practicable first in one direction and then in the other.

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 put 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.

3. Every item of lifting gear (whether an accessory to any lifting appliance or not) shall be tested with a proof load in accordance with the following provisions—

(a) if the item is a chain sling, rope sling, ring, hook, shackle, or swivel, the proof load shall be at least twice the safe working load;

(b) if the item is a single sheave pulley block, the proof load shall be at least 4 times the safe working load; (L.N. 191 of 1978)

(ba) if the item is a multiple sheave pulley block with a safe working load of up to and including 20 tonnes, the proof load shall be at least twice the safe working load; (L.N. 191 of 1978)

(c) if the item is a multiple sheave pulley block with a safe working load of more than 20 tonnes, but not more than 40 tonnes, the proof load shall exceed the safe working load by at least 20 tonnes;

(d) if the item is a multiple sheave block with a safe working load of more than 40 tonnes, the proof load shall be at least 11/2 times the safe working load.

4. After being tested in accordance with paragraph 1, 2 or 3 each lifting appliance (including its accessories) and all loose gear shall be examined so as to ensure that no part of the lifting appliance or lifting gear has been damaged during the test. For the purpose of carrying out the examination of a pulley block the examiner shall remove the sheaves and pins of the block.

5. Where any wire rope is tested, a sample of the rope shall be tested to destruction, and the safe working load shall not exceed 20 per cent of the breaking load of the sample tested. (L.N. 238 of 1984)

FORM 3 [regs 5(3) & (5)]
表 格 三 [規例第 5(3)及(5)條]

Certificate No. 01234
證明書編號

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

工廠及工業經營(起重機械及起重裝置)規例
起重機、起重滑車及絞車的測試及徹底檢驗結果證明書
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

1. Name of owner and address of installation of the appliance 擁有人姓名及機械的安裝地址		ABC Construction Co., Ltd.
2. Name and address of maker of the appliance 機械製造廠名稱及地址		3, On Ting Street, Kowloon. Hong Kong
3. Type of appliance and nature of power (e.g.. Scotch derrick-manual; tower derrick-electric; rail mounted tower-electric) 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)		Mobile Crane - mechanical
4. Date of manufacture of the appliance 該機械製造日期		1st September, 1998
5. Identification number 識別編號	(a) Maker's serial number 製造廠編號	1239873321NABC1234
	(b) Owner's distinguishing mark or number (if any) 擁有人的識別標誌編號(如有此標誌或編號者)	Crane 01

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 derricking 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. 安全操作負荷 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)，則須列明吊臂、絞輪或起重滑車在使用各種半徑操作時的安全負荷。測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。	(1) Length of jib (metres) 吊臂長度 (以米為單位)	(2) Radius (metres) 半徑 (以米為單位)	(3) Test load (tonnes) 測試時所用負荷 (以公噸為單位)	(4) Safe Working load (tonnes) 安全操作負荷 (以公噸為單位)
	Please see the attached chart			
7. In the case of a crane with a derricking jib or jibs the maximum radius at which the jib or jibs may be worked (in metres). 如該起重機械裝有人字吊臂者，則註明在該吊臂伸至最長時的半徑(以米為單位)。	31.0			
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. 註明所發現的毛病及起重機於使用前所需作的修改或修理。如無不妥，則填「無」字並註明是否處於安全操作狀態。	None - in safe working order			
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。	in safe working order			

I hereby certify that on 2nd Sept., 20 00 the appliance described in this certificate was tested and
茲證明本人曾於二〇　　年　　月　　日依照附表 1 的規定測試及徹底檢驗本證書所指的
thoroughly examined by me in accordance with the First Schedule and that the above particulars are correct.
機械，且上述各項均屬確實無訛。

Signature of Registered Professional Engineer ..... On Ting Wing .....
註冊專業工程師簽署

Qualification ..... Registered Professional Engineer - #ABCXXXXXX .....
註冊資格

Discipline ..... Mechanical Engineering .....
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

..... 8, Fan Wing Road .....
..... Hong Kong .....
.....

Date of certificate ..... 3rd September, 2000 .....
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，如向擁有人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。

SWL Chart for item 6 of the certificate

Working Radius(m)	With fully extended outrigger-over side and over rear									
	10.8m Boom		18.1m Boom		25.4m Boom		32.7m Boom		40.0m Boom	
	Proof load	SWL	Proof load	SWL	Proof load	SWL	Proof load	SWL	Proof load	SWL
3.0	63.15	50.5	35.00	28.00						
3.5	-	42.20	-	28.00	22.50	18.00				
4.0	-	37.00	-	28.00	-	18.00				
4.5	-	33.00	-	28.00	-	18.00				
5.0	-	30.20	-	28.00	-	18.00	16.25	13.00		
5.5	-	27.50	-	25.60	-	18.00	-	13.00		
6.0	-	25.00	-	23.50	-	18.00	-	13.00		
6.5	-	22.70	-	21.80	-	18.00	-	13.00	9.40	7.50
7.0	-	20.70	-	20.00	-	16.80	-	13.00	-	7.50
7.5	-	18.90	-	18.50	-	15.70	-	13.00	-	7.50
8.0	-	17.40	-	17.00	-	14.80	-	12.30	-	7.50
8.5	-	15.65	-	15.40	-	14.00	-	11.60	-	7.50
9.0	17.50	14.00	-	13.85	-	13.20	-	11.00	-	7.50
9.5			-	12.50	-	12.20	-	10.50	-	7.50
10.0			-	11.40	-	11.15	-	10.00	-	7.30
11.0			-	9.50	-	9.40	-	9.10	-	6.80
12.0			-	8.00	-	7.90	-	8.30	-	6.30
13.0			-	6.80	-	6.60	-	7.40	-	5.90
14.0			-	5.80	-	5.60	-	6.40	-	5.50
16.0			5.40	4.25	-	4.00	-	4.80	-	4.70
8.0					-	2.80	-	3.60	-	4.00
20.0					-	1.85	-	2.70	-	3.25
22.0					-	1.20	-	2.00	-	2.50
24.0					0.75	0.60	-	1.40	-	1.90
26.0							-	0.90	-	1.40
28.0							0.65	0.50	-	1.00
30.0									-	0.65
31.0									0.65	0.50
Parts of Line	12		7		5		4		3	
Critical boom angle									35°	

(in metric ton)

References

1. **Crane handbook –**
   By Donald E. Dickie, Construction Safety Association of Ontario, Canada

2. **Handbook of Mechanical Works Inspection –**
   By Clifford Matthews, Mechanical Engineering Publications Ltd., London and Bury St Edmunds

3. **Introduction to non-destructive testing –**
   By Paul E. MIX, P.E., John Wiley & Sons Inc.

4. **Non-destructive testing**
   By Barry Hull & Vernon John, Macmillan Education Ltd.

5. **Crane hazards and their prevention –**
   By David V. MacColum, ASSE, USA

6. **BS 7121: Part 2: 1991: Code of practice for Safe Use of cranes, part 2 - Inspection, testing and examination, BSI Standard.**

7. **British legislation (Health and Safety) –**
   The lifting Plant and Equipment (Records of Test and Examination etc.) Regulations 1992

8. **British legislation (Health and Safety) –**
   The lifting Operations and Lifting Equipment Regulations 1998

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

Useful Information

If you wish to enquire about this guidebook or require advice on occupational safety and health, you can contact the Occupational Safety and Health Branch through:


: 2559 2297 (auto-recording after office hours)


: 2915 1410


: labourreq@labour.gcn.gov.hk

Information on the services offered by the Labour Department and on major labour legislation can also be found by visiting our Home Page on the Internet. Address of our Home Page is http://www.info.gov.hk/labour.

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Labour Department

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