PLVAC Paper No. 29/2004

PROVISIONAL LOCAL VESSELS ADVISORY COMMITTEE

Code of Practice – Safety Standards for Lifting Appliances of Coastal Cargo Vessels (Draft, Nov 2004)

Purpose

1. This paper is a follow-up of the previous Paper No. 2/2001 - "The Development of Legislation for Coastal Trade Vessels", to brief members on the developments of the relevant applicable requirements and safety standards, and seeks members' endorsement on the enclosed draft documents.

2. The Code of Practice – Safety Standards for Lifting Appliances of Coastal Cargo Vessels (Draft, Nov 2004) (CoP–LA) ***(Attachment-1)*** sets the standards for the survey and certification of lifting appliances and lifting gear of Hong Kong coastal cargo vessels. It is a supplement safety standard document, being part of Chapter 7 of the Code of Practice – Safety and Technical Standards of Coastal Cargo Vessels (Draft, Nov 2004) (CoP–CCV).

Background

3. Merchant Shipping (Coastal Vessels) (Safety Survey) Regulation (a tentative title only) is proposed to be made under the new Merchant Shipping (Local Vessels) Ordinance (LVO).

4. The LVO stipulates that, inter alia, the Director of Marine may -
   (i) approve and issue such codes of practice as in his opinion are suitable for that purpose; and
   (ii) approve different codes of practice for different type of coastal vessels;

Setting the Standards

5. The standards in the draft documents are set out to achieve a common standard between Hong Kong and Mainland coastal cargo vessels trading between Hong Kong and Mainland so as to facilitate the maritime authorities of both sides to exercise better control over the safety of these vessels. The following principles are adopted on the consideration of the standards for Hong Kong coastal cargo vessels:
   (i) a normal practice for the construction and operation of lifting appliances and lifting gear; and
   (ii) a standard comparable to those of the Chinese coastal vessels operating in the same areas.

6. The main points on the requirements of the CoP–LA are as follows:-

(i) it adopts basically the same control, certificates and safety standards for Hong Kong locally licensed vessels; i.e. the requirements under the Merchant Shipping (Local Vessels) (Works) Regulation. The format of certificates are expected to be same; and

(ii) it covers wider varieties of lifting appliances and lifting gear that are expected to be installed or deployed on coastal cargo vessels.

Legal Status of the Code of Practice

7. The CoP–LA (being part of Chapter 7 of CoP-CCV) may be used as proof in any proceedings under the LVO where a person failing to follow the provision of the CoP will be alleged to have breached the clause on ensuring safety or seaworthiness, or the requirements of the regulation made under LVO.

Implications

8 The CoP–LA will provide practical and transparent guidance in respect of safety and technical standards. The CoP–LA will also help the authorized organizations and authorized surveyors under the LVO to conduct survey and certification, partly or fully, as appropriate, for Hong Kong coastal cargo vessels.

Consultation

9 The draft documents have been studied and supported by the Technical Sub-committee of PLVAC.

Application

10. The CoP–LA will come into operation by notice in the Gazette after the relevant subsidiary legislation for coastal vessels under LVO comes into force.

Amendment of the Code of Practice

11. The Director may from time to time approve, revise or withdraw his approval of the whole or any part of any code of practice upon the advice of the LVAC and such other interested persons as he thinks fit.

Advice Sought

12. Members are invited to give comments/views and endorse the CoP-LA that will apply to the Hong Kong coastal cargo vessels.

Marine Department, Multi-lateral Policy Division
December 2004

Draft

Code of Practice – Safety Standards for Lifting Appliances of Coastal Cargo Vessels

[This Code is issued under section 8 of the Merchant Shipping (Local Vessels) Ordinance (Cap.548)]

Note:

1. The 1st draft version issued on 9 Oct.2002

2. The 2nd revised draft issued on Nov 2004. (Amendments made for the Chinese translation of "Lifting Equipment" to adopt the wording "Lifting Appliances" in order to be aligned with relevant Hong Kong Law, and with translation amendments etc.).

Hong Kong Marine Department
Hong Kong Special Administrative Region
(month / Year)

Record on Updating and Amendments

This Code of Practice is issued under section 8 of the Merchant Shipping (Local Vessels) Ordinance, Cap. 548, through Gazette notice. Subsequent updating and amendments would be notified to the industry through further notice in the Gazette from time to time. This record sheet is intended for good record keeping of this Code.

Amendment No.	Gazette No.	Gazette Date.	Effective Date	Topic Areas / pages

Introduction

The legislation relating to the control, licensing and regulation of coastal cargo vessels is contained in the *Merchant Shipping (Local Vessels) Ordinance (Cap.548)* and its subsidiary legislation. This is an approved Code of Practice issued by the Director of Marine under s*ection 8* of the *Merchant Shipping (Local Vessels) Ordinance (Cap.548)*.

This Code is used in conjunction with *Code of Practice – Safety and Technical Standards for Coastal Cargo Vessels*. It is of the most importance to note that compliance with this Code of Practice does not confer immunity from the legal liability in Hong Kong. In addition, owners of vessels, masters, designers and persons in charge of works are reminded to observe other relevant legal requirements during the construction and maintenance of vessels and their lifting appliances and lifting gear.

Contents

Code of Practice – Safety Standards of Lifting Appliances on Coastal Cargo Vessels

Chapter 1 Examination, Issue of Certificates and Approval

1. General Rules

1.1 Scope

1.1.1 This Code is applicable to the following lifting appliances and their lifting gear used by coastal (Note) cargo vessels:

(1) derrick system including derrick cranes;

(2) cranes;

(3) passenger and crew lifts; and

(4) cargo lifts (the issue of certificate of lifting appliances is needed).

Note: "Coastal" as defined in "Code of Practice – Safety and Technical Standards for Coastal Cargo Vessels " namely the "Coastal class A plying zone" or "Coastal class B plying zone" (refers to paragraph 2.1.2 of this Chapter).

1.1.2 This Code of Practice is to lay down the safety and technical standards in the design, construction, maintenance and examination for the lifting appliances and lifting gear on coastal cargo vessels. The technical standards of the recognized classification societies or the People's Republic of China may also be drawn as reference if necessary.

1.1.3 The design, construction, examination, test and issue of certificates of the lifting appliances and lifting gear of coastal cargo vessels should comply with the requirements of this Code and also the general rules of the *Code of Practice – Safety and Technical Standards for Coastal Cargo Vessels* and the relevant requirements of the Chapter 1 of this Code.

1.1.4 Those lifting appliances which are not mentioned in Paragraph 1.1 of this chapter may be considered on the basis of this Code.

1.1.5 Regarding the various tests and examinations mentioned in this chapter, apart from the requirements specified in this Code, they should be conducted according to the current corresponding specified requirements of the recognized classification societies in general.

1.2 Statutory Regulations and Other Relevant Standards

1.2.1 This Code should be used with reference to the following provisions of legislations and regulations and, if any, their amendments, and relevant codes of practice:-

(1) Merchant Shipping (Local Vessels) Ordinance;

(2) Merchant Shipping (Local Vessels) (Works) Regulation;

(3) Merchant Shipping (Local Vessels)(Safety Survey) Regulation;

(4) Code of Practice – Safety Standards for Class I, II, III Vessels; and

(5) Code of Practice –Safety and Technical Standards for Coastal Cargo Vessels.

1.2.2 The strength and materials, etc., and the design and installation of the lifting appliances and lifting gear should be appropriate for the intended purpose. This department may accept the current corresponding standards and other equivalent ones of the recognized classification societies as measuring standards.

1.2.3 This Code complies with the requirements of *Protection against Accidents (Dockers) Convention (Revised)* (Convention 32) amended by the International Labour Organization in 1932.

1.3 Statutory Certificates

1.3.1 The following statutory certificates should be issued after passing the statutory examination:

1. Register of Lifting Appliances and Lifting Gear
   (With reference to the form specified by the Director of Marine: Form 1);

2. Certificate of Test and Examination of Lifting Appliances
   (With reference to the forms specified by the Director of Marine: Form 2 & Form 3);

3. Certificate of Test and Examination of Lifting Gear

   (With reference to the forms specified by the Director of Marine: Form 4 & Form 5); and

4. Certificate of Test and Examination of Wire Rope
   (With reference to the form specified by the Director of Marine: Form 6).

1.3.2 Recognition of Certificates

Certificates issued by the competent examiners stipulated by the Regulation or authorized inspection institutions or their surveyors should be recognized when they are used within the scope specified by this Code.

1.3.3 Conditions of Maintaining the Effectiveness of Certificates

(1) Various examinations of the lifting appliances should be conducted in accordance with the requirements of this Code and the lifting appliances and lifting gear should be maintained in good technical conditions for being appropriate for the intended purpose.

(2) Operation of the lifting appliances and lifting gear should be in accordance with the conditions specified by the certificates.

2. Examinations and Certification

2.1 General Requirement

2.1.1 Lifting appliances and lifting gear of coastal cargo vessels shall be applied for statutory examination.

2.1.2 Vessel owner or operator shall, according to the nature of the vessel, apply to below relevant institutions for statutory examinations of their lifting appliances and lifting gear:-

(1) For cargo vessels navigating in Coastal class "A" plying zone (i.e. classed vessels), application for statutory examination of lifting appliance and lifting gear shall be made to authorized organization (Classification Society);

(2) For vessels navigating Coastal class "B" plying zone, application for statutory examination of lifting appliance and lifting gear shall be made to competent examiner or person authorized by the Director of Marine.

2.1.3 Lifting appliances include derrick system, crane, goods lift and passenger lift, etc. Derrick crane is one of the derrick systems.

2.1.4 Lifting appliances shall be tested and examined prior to use. Periodic thorough examination, inspection as well as testing and examination shall be carried out after operation.

2.1.5 Lifting appliances and lifting gear shall be tested and examined before first operation as well as in use when parts affecting the strength have been replaced or repaired.

2.1.6 When major incident has occurred and major defect has been found in a lifting appliance, shipmaster or ship owner shall make prompt report upon replacement or repairing of compositions or parts affecting strength, so as to carry out examination on the lifting appliance in time.

2.1.7 The testing and examination, thorough examination and inspection mentioning in this Code shall be carried out in compliance with the requirements stipulated in this Code and this Chapter respectively, or with recognized equivalent requirements.

2.1.8 Lifting gear including wire ropes, shall be inspected by a competent person on board prior to use every time unless they have been inspected within recent three months. If any wire has broken in such rope, it shall be inspected once at least in every month.

2.1.9 The following examinations shall be carried out for the certification of lifting appliance and lifting gear:-

(1) Initial testing and examination;

(2) Annual thorough examination;

(3) Testing and examination for certification renewal.

2.1.10 The above examinations shall be carried out in compliance with the requirements stipulated in paragraph 2.3 to 2.8 of this Chapter.

2.2 Definition

2.2.1 General Definition

(1) Lifting Appliance: means derrick system, derrick crane, crane and lift, as well as any appliance for use in hoisting or carrying cargo, equipment, goods and personnel.

(2) Light Derrick: means derrick system and derrick crane with a safe working load equals to and less than ten tonnes (10 tonnes or 98kN).

(3) Heavy Derrick: means derrick system and derrick crane with a safe working load more than 10 tonnes (10 tonnes or 98kN).

(4) Derrick Crane: means derrick system with double topping lifts which can be operated by a person to carry out rotation, hoisting and lowering as well as swinging during loading.

(5) Lifting Gear: means accessories not permanently attached to lifting appliances such as chains, triangular eye plates, hooks, pulley blocks, shackles, swivels, wire rope sockets, preventer guy with pitched clips and rigging screws. Lifting beam, lifting frame, lifting cage and similar devices are also called lifting gear.

(6) Permanent Attachment: means lifting appliance attachments permanently attached to derrick boom, mast or derrick post, deck, superstructures and other structural components of the vessel, it includes eye plate, derrick heels, foot of derrick including gooseneck, derrick bands and built-in sheave, etc.

(7) Safe Working Load (SWL):-

1. Safe working load for a lifting appliance: means the maximum static load that a properly installed lifting appliance has been proved to be capable of hoisting during design operation conditions.

2. Safe working load for a lifting gear: means the maximum load that a designed, tested and examined lifting gear has been proved to be capable of carrying. Such maximum load shall not be less than, when lifting appliance is in safe working load condition, the maximum load carrying by lifting gear.

(8) Standard Operation Conditions: means the operation conditions of lifting appliance when the safe working load is assessed, including:-

1. The heel and trim of the vessel is 5 degrees and 2 degrees respectively when lifting appliance is in operation;
2. Operation within harbour;
3. Wind speed and corresponding wind pressure shall not exceed 20m/s and 250Pa respectively when the lifting appliance is in operation;
4. The movement of the load being hoisted shall not be restricted by external force;
5. Nature of the hoisting operation i.e. the operation frequency and characteristics of dynamic loading to be matched with the factor loading required in this Code.

(9) Special Operation Conditions: means the operation conditions being considered during the design of lifting appliance is beyond the standard operation conditions, including:-

1. The heel and/or trim of the vessel is greater than the requirement of the standard operation conditions;
2. Operation within non-sheltered waters and exposed to waves;
3. Wind speed and corresponding wind pressure has exceeded 20m/s and 250Pa respectively when lifting appliance is in operation;
4. The load is not in static condition during hoisting;
5. The movement of the load being hoisted has been restricted by external force;
6. Nature of hoisting operation i.e. the operation frequency and characteristics of dynamic loading is not complying with the factor loading required in this Code.

(10) Factor Loading: means the loading needs to be considered during the design of lifting appliance but excluding the wind loading.. Such loading can be expressed as follows:

$$\text{Factor Loading} = \text{Hoisting Loading} \times \text{Duty Factor} \times \text{Dynamic Loading Coefficient}$$

(11) Hoisting Loading: means the deadweight of both safe working load for lifting appliance and the moving parts of lifting appliance. Such parts have been directly linked to and moving together with the safe working load.

(12) Duty Factor: means the margin coefficient given by considering the frequency of operation of the lifting appliance and the loading conditions.

(13) Dynamic Loading Coefficient: means a coefficient for considering all dynamic loading effects when the lifting appliance is in operation. Such coefficient, when multiplying by hoisting loading, represents the loading of all dynamic loading effects exerting on the system.

(14) Mass Loading: means the mass of the parts of lifting appliance that excluded in the hoisting loading.

(15) Design Stress: means the maximum allowable stress of the parts of lifting appliance (i.e., in consideration of the factor loading, and the lateral loading and wind loading which the lifting appliance is also subjected to.) as required in this chapter when the lifting appliance is at the safe working load condition.

2.2.2 Definition of Examination

(1) Test and Examination: For lifting appliances or lifting gear, it refers to the test and examination to be conducted in accordance with the procedure listed in Annex 1.

(2) Thorough Examination: To conduct thorough examinations by means of visual (eye) examination, supplemented if necessary by other means such as hammer tests, as carefully as the circumstances permit, in order to arrive at a reliable conclusion as to the safety of the parts to be examined. For this purpose, the parts or components should be stripped down for inspection, if necessary. Other non-destructive tests, such as ultrasonic, radioactive and magnetic particle tests, can also be taken to facilitate the thorough examination.

(3) Inspection: Visual (eye) inspection to check if there are deformations and other deficiencies, such as cracks or excessive wear and tear as well as rusting and corrosion.

(4) Authorized Organizations: refers to the recognized classification societies that have been authorized by the Director of Marine under Section 7(1) of the Merchant Shipping (Local Vessels) Ordinance, Cap 548.

(5) Recognized Classification Societies: refers to the classification societies approved or authorized by the Government of the Hong Kong Special Administrative Region under Section 8 of the Merchant Shipping (Safety) Ordinance, Cap 369.

(6) Authorized Surveyor: refers to a person or a person belonging to a class of persons, who is not a public officer, and who is authorized by the Director of Marine as a surveyor under Section 7(1) of the Merchant Shipping (Local Vessels) Ordinance, Cap 548, for the purposes of the Ordinance.

(7) Competent Examiner: refers to officers specified in the Shipping and Port Control (Works) Regulation, Cap 313 or Merchant Shipping (Local Vessels) (Works) Regulation, Cap 548.

2.3 Initial Test and Examination

2.3.1 Initial test and examination should cover:

(1) Inspection of design drawings and technical papers of the lifting appliance. Please refer to paragraph 3 of this Chapter for the list of required drawings.

(2) Inspection of main structural parts, equipment, arrangement, material, welding and workmanship of the lifting appliance.

(3) Test and examination of the parts of the lifting gear of the lifting appliance.

(4) Test and examination of lifting appliance upon its installation on board.

2.3.2 Confirm that the lifting appliance and lifting gear satisfy with the applicable requirements of this Code or recognized equivalent requirements.

2.3.3 Relevant Certificates (Please refer to the forms specified by the Director of Marine: Form 2 to 6) should be issued after the initial test and examination is passed.

2.3.4 In addition to the issue of the above-mentioned Certificates after the initial test and examination is passed, relevant particulars should be entered in the Register of Lifting Appliances and Lifting Gear (Please refer to the form specified by the Director of Marine: Form 1).

2.4 Annual Thorough Examination

2.4.1 An annual thorough examination should be carried out within three months before or after the anniversary day of the Certificate and the following items should be covered:

(1) Thorough examination of the derrick boom of the derrick systems and permanent attachments to the derrick boom, mast or derrick post and deck;

(2) Thorough Examination should be carried out to the lifting gear;

(3) Wire ropes should be inspected;

(4) Thorough examination should be carried out to the winches, cranes, cargo lifts and lifts for passenger or crew.

2.4.2 Sign the Register of Lifting Appliances and Lifting Gear after the annual thorough examination is passed.

2.5 Test and Examination for Renewal of Certificate

2.5.1 Test and Examination should be carried out within two months before or after the expiry date of the Certificate with a validity period of four years. The following items should be covered:

(1) Thorough examination of the derrick boom of the derrick systems and permanent attachments to the derrick boom, mast or derrick post and deck should be carried out. The derrick appliances should be tested and examined;

(2) Cranes and lifts should be tested and examined;

(3) An lifting appliance should be tested and examined if there are substantial repairs or replacement of major parts or equipment.

2.5.2 A new Certificate of Test and Examination for the lifting appliance (Please refer to the forms specified by the Director of Marine: Form 2 and 3) should be issued after the test and examination for the certificate renewal is passed and relevant particulars should be entered to the Register of Lifting Appliances and Lifting Gear.

2.5.3 The new Certificate should be effective on the date when the test and examination for certificate renewal is completed, irrespective the test and examination concerned is completed within three months before the expiry date of the Certificate with a validity period of four years. The validity of the new certificate should at most be four years, as counting from the expiry date of the original certificate.

2.6 Deferred Test and Examination

2.6.1 Owners of vessels can apply to defer the test and examination as required by paragraph 2.5 if such test and examination have not been carried out when the certificate with a validity period of four years is due for renewal. However, the test and examination could at most be deferred for six months. In this connection, a general inspection, the scope of which should at least be the scope of annual examination as required by paragraph 2.4 of this Chapter, should be carried out in order to confirm the lifting appliance is fit for the specific purposes and is at the normal working conditions.

2.7 Maintenance Inspection

2.7.1 Lifting gear should be inspected by competent persons on board each occasion before use, unless it has been inspected within three months.

2.7.2 Wire ropes should be inspected by competent persons on board each occasion before use, unless it has been inspected within three months. Ropes with broken wires should be inspected at least once a month.

2.8 Exemptions and Equivalents

2.8.1 Regarding to the exemptions and equivalents, requirements as stated in the General Principles of the "Code of Practice---Safety and Technical Standards for Coastal Cargo Vessels" should be followed.

2.9 Stamp Markings

2.9.1 Stamp markings on lifting gear:

(1) For identification purposes, lifting gear should be stamped with markings and provided with a Certificate of Test and Examination by the test and examination unit after the test and examination as required by paragraph 2.1.5 of this Chapter is passed. Lifting gear without stamp markings are not allowed to be used with the lifting appliance.

(2) Stamp markings should bear:

1. Safe working load (in tonnes);
2. Date of test and examination;
3. Distinguishing number of lifting gear;
4. Markings of the test and examination authorities.

(3) For small lifting gear where there is insufficient space to accommodate the above-mentioned markings, the date of test and examination as well as the distinguishing number can be omitted.

2.9.2 Stamp markings on lifting appliances

(1) After the initial test and examination of the lifting appliances, markings should be stamped near to the foot of the derrick boom, jib of crane or the corresponding structural parts.

(2) If the lifting appliances in operation have been altered or the safe working load has been changed, new marking should be stamped on the above position upon the completion of the test and examination.

(3) The content of the stamp marking should include:

1. safe working load in tonne;
2. date of the test and examination;
3. the topping angle of the boom to the horizontal, or the operating radius of the jib of crane during the test;
4. the stamp marking of the test and examination unit.

2.10 To deliver and keep certificates

2.10.1 The competent examiner or relevant authorized surveying organization should issue the statutory certificates directly to the vessel/owner of vessel and copies to the Department.

2.10.2 The certificates should be kept onboard the vessel readily available for inspection.

3. Approval of Drawings and Documents

3.1 The following drawings and documents of the derrick system should be submitted for approval:

(1) As fitted drawing of the derrick system (including the derrick crane) which specifies the general arrangement of the light derrick boom, heavy derrick boom or the union purchase and the specific positions of all lifting gear;

(2) strength diagram of the derrick system, and the operating range and data of union purchase;

(3) structural drawings of the mast, derrick post and rigging (if any);

(4) structural drawing of the derrick boom, including accessories of the header and the heel;

(5) derrick socket and the rotor shaft, topping lift block eye plate, guy eye plate and similar accessories; if recognized international and national standards applicable to this usage are adopted, only the schedule should be submitted, and specifies their materials, safe working load and the standards adopted;

(6) schedule of the tackle, chain, shackle, hook, swivel and other lifting gears, and specifies the materials, safe working load, proof load and the standards adopted;

(7) schedule of the construction, dimensions, coating and breaking load of the wire rope and fibre rope being used. The nominal tensile strength of the wire should be indicated for the wire rope;

(8) the class of the steel being used, the welding materials and the specifications of the welding seam should be indicated in (3), (4) and (5) above;

(9) the strength and/or stability calculation of the mast, Samson post, rigging (if any) and the derrick boom.

3.2 The following plans and documents of the crane should be submitted for approval:

(1) general arrangement of the crane, including illustration of the main working parameters;

(2) stress-bearing analysis of the crane system;

(3) arrangement plan of the hoisting and lowering, up and down moment, rotating

and the traveling mechanism of the crane, including the arrangement and illustration of function of the overload protection, over-moment protection and various caging devices;

(4) strength calculation of the main parts, and specifies the basis of the design, operation criteria, working parameters, quality and gravity of the lifting parts and the standards adopted;

(5) stability calculation of the crane (if applicable);

(6) construction, dimensions, class of the steel, welding materials and specification of welding seam of the main structural parts. These parts include the boom, pylon, platform, crane span structure, wheel carrier, gyration back-up ring, foundation, rail and depository facilities;

(7) detailed plan of the pulley and its axis, trunnion, sheave, stage bearer, gyration back-up ring and its screw and similar items, and specifies the class of steel being used;

(8) detailed plan of the tackle, hook, swivel, lifting beam, lifting rack and other lifting gears, and specifies their materials, safe working load, proof load and the standards adopted;

(9) the construction, dimensions, coating, breaking load of the wire rope being used, and the nominal tensile strength of the wire.

3.3 The following plans and documents of the lift should be submitted for approval:

(1) Structure

1. illustration of the design, including the materials being used;
2. all main structural plans;
3. detailed plan of the pulley and its support;
4. detailed plan of the hydraulic oil tank and the working system (if any);
5. installation plan of the coil;
6. dimensions, construction, coating and breaking load of the wire rope and chain;
7. laying devices.

(2) The following plans and documents related to the lift should be submitted for approval:

1. general arrangement, including detailed plan of construction of the trunk and leader;
2. diagram of the door;
3. illustration of fire resistance of hoistway door;
4. wiring arrangement and detailed plan, including safety facilities.

3.4 The following plans and documents of the machinery, electrical and control system should be submitted for approval:

(1) usage and operation illustration;

(2) arrangement plan of the engine room, including the power unit and its illustration;

(3) arrangement of the control room and/or control station;

(4) arrangement plan of the hoisting and lowering, up and down moment, rotating and traveling mechanism, and the technical illustration of its equipment and parts;

(5) layout and wiring plan of the switchboard;

(6) electrical wiring system plan, and indicates the specification, class of insulation, normal working circuit of the equipment and cable, and the model, capacity and manufacturer of various kinds of electric protection;

(7) short circuit current calculation of the main and auxiliary switchboards running contact and transformer output end;

(8) wiring diagram of the control circuit, interlock and alarm system, including hydraulic, pneumatic and electrical;

(9) detailed plan of the safety facilities, including the securing device and locking arrangement.

Chapter 2 Derrick Rig

1. Working Conditions and Loads for Calculation

1.1 Application

The requirements of this Chapter are applicable to slewing derricks, derricks system and derrick cranes. Consideration will be given to those derrick rigs with special design on the basis of the requirements of this Chapter.

1.2 Angle of Elevation of Derrick Boom

(1) In calculating the loads on the derrick rig, the angle of elevation of the derrick boom is to be 15 ° for light-lift derricks, and 25 ° for heavy-lift derricks. If the derrick booms are not able to work at such angles, the minimum angle of elevation occurring in actual service may be taken as the angle for elevation. Nevertheless, under no circumstances shall the angle of elevation of light-lift derricks be exceeded 30 ° and that of heavy-lift derricks be exceeded 45 ° .

(2) In calculating the loads on cargo blocks and built-in sheaves (if installed), the maximum angle of elevation of the derrick boom in actual service is to be taken and usually not less than 70 ° .

1.3 Vessel List

(1) The heel 5 ° and the trim 2 ° of a vessel is its hypothetical basic mode when the derrick rig is in service.

(2) For light slewing derricks and derricks system, the influence of a vessel in listing mode mentioned in (1) above may be ignored.

(3) For heavy-lift derricks and derrick cranes, the influence of a vessel in listing mode mentioned in (1) above should be counted. If the vessel list caused by the actual service is greater then the heel 5 ° or the trim 2 ° , influence caused by the actual angle of listing should be counted.

1.4 Basic Load of Derrick Rig

(1) The basic load of slewing derricks and derrick cranes are calculated in terms of the safe working load and the self-weight of the derrick booms, hooks and their accessories.

(2) The basic load of the derricks system is to be the safe working load.

1.5 Frictional Coefficient

When the steel wire ropes run through blocks or sheaves, combined allowance for sheave friction and wire stiffness is to be considered, and this allowance should be 5% for sheaves with sliding bearings and 2% for rolling bearings. This requirement is also applicable to all other lifting appliances.

1.6 Factor of Safety of Rope

The factor of safety n of steel wire ropes and fibre ropes in regard to the breaking load is not to be less than the values as prescribed in Table 1.6.

Factor of Safety , n Table 1.6

Types and Application of Ropes		Factor of Safety
Steel Wire Ropes	Running Rigging: Cargo Ropes, Span Ropes, Slewing Guys (Topping Lift)	5
	Standing Rigging: Mast Stays Preventer Guys	$n = \frac{10^4}{8.83 \times SWL + 1910}$ Not greater than 3.5 but not less than 3
Fibre Ropes		8

Note : *SWL* is the safe working load (tonne) of a derrick rig.

2. Slewing Derrick and Derricks System

2.1 In calculating or illustrating the working conditions and loads for calculation of the force on derrick rig, requirements mentioned in 1 of this Chapter are to be complied with.

2.2 When the span rope and cargo rope of a heavy-lift derrick are parallel, the tensile force on the span rope is the subtraction of the tensile force of the cargo rope from the total force of the span rope, and is calculated in accordance with the descending mode of the cargo rope.

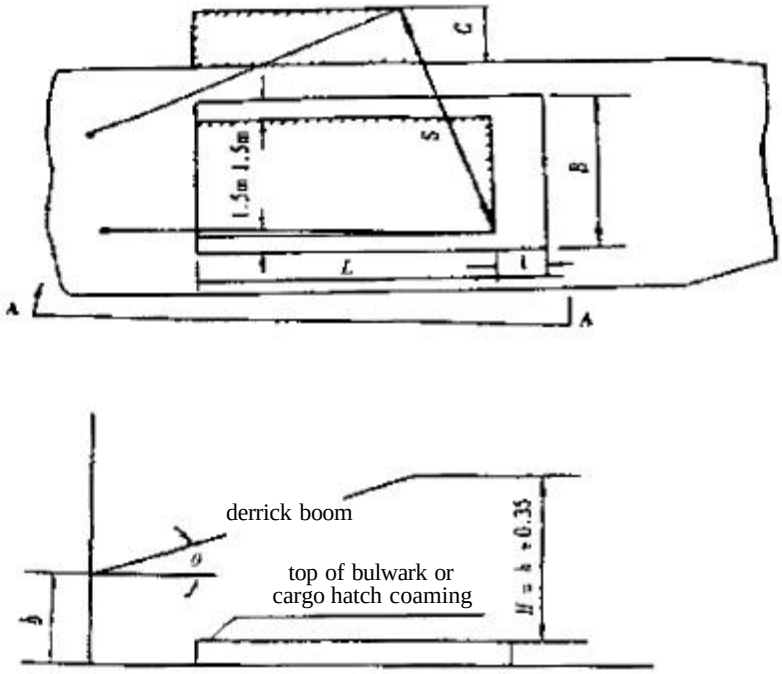
2.3 The working load of slewing guys shall be calculated in accordance with Table 2.3.

Working Load of Slewing Guys Table 2.3

Safe Working Load of Derrick Boom (tonnes)	Working Load of Slewing Guys (tonnes)
$SWL \leq 5$	$0.5SWL+0.5$
$5 < SWL \leq 15$	$0.1SWL+2.5$
$16 < SWL \leq 60$	$0.25SWL$
$SWL \geq 75$	$0.2SWL$

Note: When the *SWL* is between 60 and 75 tonnes, the working load of slewing guys may be obtained by interpolation.

2.4 For derricks working in Union Purchase, when the inboard and outboard derrick booms are under the minimum angle of elevation in the same actual service, the working area and length of the derricks shall satisfy the following requirements (Table 2.4):



A – A View

Fig. 2.4 Position of Derricks Worked in Union Purchase Rig

?:	The angle of elevation of derrick booms, both are the same
L:	length of cargo hatch (m)
B:	breadth of cargo hatch (m)
C:	outreach (m)
S:	horizontal distance between boom heads, projected position (m)
b:	height from gooseneck to deck (m)
l:	see 2.4(2)
h:	see 2.4(3)

(1) The outboard derrick boom is to give an outreach C not less than 3.5m beyond the midship breadth, or an outreach as required by the shipowner.

(2) The projected position of the inboard derrick boom head within the hatch area should be:

① when the hatch is served by one pair of derricks, the distance *l* between the boom head and the opposite hatch end is not to be greater than L/5 (*L*-length of cargo hatch, see Fig. 2.4);

② when the hatch is served by two pairs of derricks, the distance *l* between the boom head and the opposite hatch end is not to be greater than L/3;

③ 1.5m away from the hatch end.

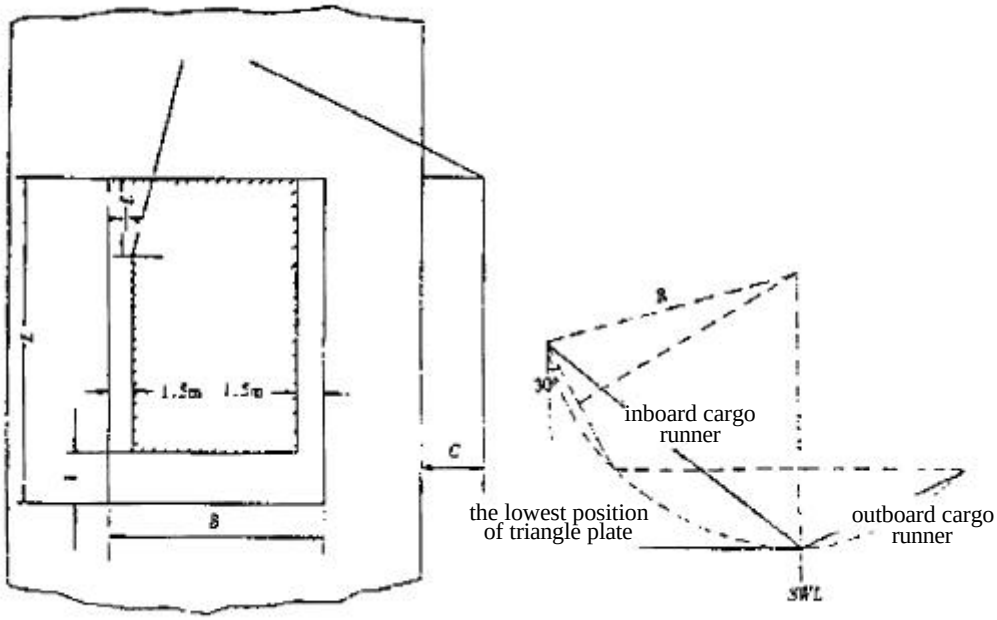
(3) When the included angle between cargo runners is 120^0, the height *h* of the joint (triangle eyeplate) of the cargo runners over the top of the bulwark or cargo hatch coaming is not to be less than:

5m for SWL= 2 tonnes;
6m for SWL> ;2 tonnes;

whereas SWL— safe working load of derricks worked in Union Purchase (tonne)

In certain cases, if the above-mentioned height h is not appropriate for the service required, it may be suitably increased.

2.5 When derricks are worked in Union Purchase rig the loads are to be so calculated in accordance with the practical working areas, that the loads on the derricks and preventer guys obtained from the calculations will be the largest (including diagram calculation). Under general conditions the calculations are carried out in accordance with the working positions of the derrick booms as given in Fig. 2.5(a). Meantime, the included angle between cargo runners is to be taken as 120^0. The triangle plate connecting two cargo runners is located at the lowest position as illustrated in fig. 2.5(b).



(a) (b)

Fig 2.5 (Symbols *L, l, B and C* as illustration of fig. 2.4)

(a) Position of derricks working in Union Purchase rig
(b) Cargo runners and triangle plate

2.6 The derricks worked in Union Purchase are to be such that the derrick booms will not be in danger of jack-knifing in any working position. In order to meet this requirement the value obtained from the span relief f_h (the resultant load of horizontal components of cargo runner and preventer guy) multiplied by tg? (?-the angle of elevation of derrick boom) is not to be greater than the resultant load of vertical components of cargo runner and preventer guy f_r (see Fig. 2.6).

2.7 Boom head guys intended for cross-connecting the heads of the derricks when used in Union Purchase system are to have a working load of 20% of the safe working load of the derricks in Union Purchase but it is not to be less than 1 tonne.

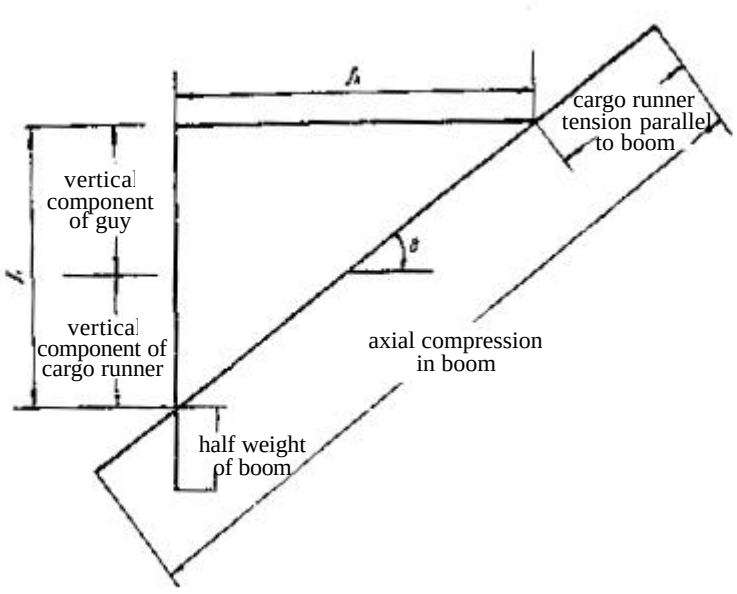


Fig 2.6 The load of derrick boom, cargo runner and guy

3. Derrick Boom

3.1 Structures of derrick boom:

(1) Derrick boom could be a cylinder-shaped uniform section member that maintains an invariant diameter and thickness within the whole length, or a variant section member that maintains a certain invariant length for the diameter and thickness of the boom tube at its middle length and the diameter of the boom tube at its middle length gradually reduces towards the boom ends;

(2) The diameter of the boom tube at its middle length is to be maintained at least over a distance of one third of the boom's length, and the diameter may be gradually reduced towards the boom ends to a diameter equal to 70% of the middle portion;

(3) The thickness of a steel boom tube is not to be less than 1/50 of the outside diameter of the boom tube at its middle length and needs not greater than 1/30. In any conditions, it is not to be less than 4mm.

(4) The slenderness ratio ? of the derrick boom is not to be greater than 150;

(5) Derrick head within places such as span eyes, eyeplate for upper cargo block and preventer guys are to be suitably strengthened or increased thickness.

3.2 The material of derrick booms and attachments thereto should comply with the requirements of Table 3.2 or the requirements of applicable rules.

Table 3.2

Steel Class of Derrick Booms and Attachments thereto (t is the thickness of the material)				
Thickness (mm)	t≦20	20<t≦25	20<t≦40	t>40
Steel Class	A/A32, A36	B/A32, A36	D/D32, D36	E/E36, E36

3.3 The factor of safety of stability *n* about the axial critical thrust on a derrick boom should not be less than the values as prescribed in Table 3.3(a), and the axial force of the derrick boom *p* may be obtained from the following formula:

$$p = \frac{mEJ_0}{nL^2} \times 10^{-5} \quad \text{(kN)}$$

Where: *m*— coefficient to be selected in accordance with Table 3.3(b), the intermediate values may be obtained by interpolation;

E— modules of elasticity of steel, 2.06×10^5 MPa;

L— length of the boom, m, measured from the centre of eyeplate for upper cargo block to the centre of the derrick heel pin;

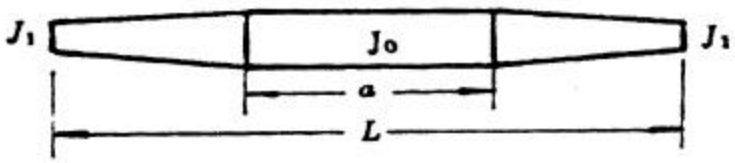
J_0— moment of inertia of cross section at mid-length of the derrick boom, cm^4;

N— factor of safety of stability, to be selected from Table 3.3(a), the intermediate values my be obtained by interpolation.

Factor of Safety of Stability of Derrick Boom Table 3.3(a)

Safe working load of derrick boom (tonnes)	≦10	30	≧60
Factor of safety of stability *n*	5	4.5	4

Note: When applying the factor of safety of stability given in the Table, the slenderness ratio l of the derrick boom is not to be less than 145.



Coefficient *m* Table 3.3(b)

a / *L* / J_1/J_0	0.2	0.4	0.6	0.8
	Coefficient *m*			
0.1	6.32	7.84	9.14	9.77
0.2	7.31	8.49	9.39	9.81
0.4	8.38	9.12	9.62	9.84
0.6	9.02	9.46	9.74	9.85
0.8	9.50	9.69	9.81	9.86

Notes: ① *a* is the length of the middle portion of the derrick boom;

② J_1 is the moment of inertia at the cross section of boom ends.

3.4 The axial force of the derrick boom may also be calculated in accordance with the theory of elastic stability. The effects of the self-weight bending moment of the boom and the bending moment of the boom head are to be taken into consideration in calculation. When the derrick boom subject to the axial force is to be calculated for stability, the factor of safety of stability *n* should not be less than the values prescribed in Table 3.4, and the intermediate values may be obtained by interpolation.

Factor of Safety of Stability of Derrick Boom subject to Axial Force Table 3.4

Safe working load of derrick boom (tonnes)	≦10	≧60
Factor of safety of stability *n*	2.5	2

3.5 When the yield strength of steel σ_s is greater than 70% of the tensile strength σ_b, the yield strength σ_s should be divided by the coefficient ß for correction. The coefficient ß is to be selected from Table 3.5, and the intermediate values may be obtained by interpolation.

Coefficient ß Table 3.5

Yield ratio σ_s/σ_b	$\leqq$0.7	0.75	0.80	0.85
Factor ß	1.0	1.045	1.084	1.120

3.6 The bending moment of the boom head of traditional derrick rig is the algebraic sum of the vertical bending moment derived from the axis of the boom head when the tension of the span rope and the load of the cargo block act on the eyeplate. The horizontal bending moment of the slewing guy or the preventer guy in the direction of the boom head can be ignored.

3.7 The boom head of a derrick crane is connected by two span ropes. When the boom is not at the longitudinal section of the vessel, the tension of the two span ropes varies. Therefore, when such derrick boom is calculated for stability in accordance with paragraph 3.4 of this Chapter, the torsion of the boom head should be taken into consideration.

4. Masts and Derrick Posts

4.1 A mast and a derrick post should at least have two decks as points of support and be effectively connected to the main structure of the hull. A deckhouse of adequate strength can be considered as a point of support. The hull structure or the deck of the deckhouse at the connection point should be strengthened. Special consideration will be given to other effective means of supporting the mast or the derrick post.

4.2 The places of masts or derrick posts that subject to concentrated loads, such as gooseneck bearings, span eye fittings, stay eyeplates, etc., should be suitably strengthened. Bracket toes and corners of attachments should not be fitted on unstrengthened plates. The method of plate thickening should be adopted for the purpose of strengthening.

4.3 The structure should be of continuity and sudden changes to any cross sections should be avoided. The opening of manholes and lightening holes on places subject to concentrated loads and great shear force should be avoided.

4.4 The outer diametre of a mast or a derrick post D should not be greater than the value obtained from the following formula:

When $t \leqq 15$ mm, $D = 1000t$ (mm);

$$25 - t$$

When $t > 15$ mm, $D = 100t$ (mm);

Where: t— wall thickness of the mast or the derrick post (mm)

The minimum wall thickness of the mast or the derrick post should not be less than 6mm. When the mast or the derrick post is also used as a ventilator, its thickness should not be less than 7mm.

4.5 It is recommended that the outside diameter of the masts or derrick posts in way of the topping lift eyeplates should not be less than 85% of the outside diameter in way of heel.

4.6 The force effected on the masts or derrick posts by the cargo runners, topping lifts and derrick shoes should be derived from calculation (including graphical calculation) as the relevant requirements prescribed in Chapter 2, from which the compound stress of the various sections of the masts or derrick posts is then calculated.

4.7 When calculating the strength of the masts or derrick posts, the most undesirable loading combinations of the derrick booms below should also be taken into consideration:

(1) Masts or derrick posts fitted with one derrick boom:

① the derrick boom to be suspended at the minimum angle of elevation over one cargo hatch;

② the derrick boom to be swung to the most outboard working position.

(2) Masts or derrick posts fitted with two or more derrick booms:

① two derrick booms to be suspended at the minimum angle of elevation over one cargo hatch;

② two derrick booms (one at the forward hatch and one at the aft hatch) to be swung to the most outboard working position on one side of the vessel.

(3) When heavy-lift or light-lift derrick booms are fitted on the same mast or derrick post, the loading combination of the two derricks working simultaneously would not be considered in general.

(4) Other working conditions for calculation under which the stress larger than those stated above may occur in the masts or derrick posts (including mast riggings) arising from the derrick booms at other working positions.

4.8 The compound stress s_t of a certain section of the masts or derrick posts should be derived from the following formula:

$$s_t = [(s_b + s_c)^2 + 3t^2]^{1/2} \quad \text{(MPa)}$$

Where: s_b— bending stress (MPa);
s_c— compression stress (MPa); the weight load of the mast or derrick post itself can be ignored;
t— stress arising from torque (MPa).

4.9 The factor of safety of the masts and derrick posts, including the hounds of the masts and suspended structures, in comparing with that of the yield strength s_s of steel, should not be less than that prescribed in Table 4.9.

4.10 If the yield strength s_s of steel is greater than the tensile strength s_b by 70%, the yield strength should be modified as prescribed in Section 3.5 of this Chapter.

4.11 The class of steel for making the masts, derrick posts and their accessories should not be lower than that prescribed in Table 3.2 of this Chapter.

4.12 The layout of the mast riggings should not obstruct the operation of the derrick booms. The end of the riggings should be fitted with turnbuckles and connected to the eyeplates of the decks, sidescuttles or deckhouses. The fitting of the riggings should be tightened at the beginning and the pre-stress should be about 30 MPa. The modulus of elasticity taken for calculating the elongation of the riggings should be 1.1×10^5 MPa, and the sectional area of the nominal diameter of the riggings should be taken for the sectional area. A larger value of the modulus of elasticity may be taken if it is based on test.

Factor of safety of masts and derrick posts Table 4.9

Safe working load of derricks (tonnes)	Factor of safety	
	Mast riggings	No mast rigging, hound nor suspended structure
SWL≤10	2.20	2.0
SWL≥60	1.76	1.6
10<SWL<60	Interpolation used	

Chapter 3 Cranes and Hoists

1. General Requirements

1.1 This chapter applies to the following types of cranes:

(1) Deck cranes mounted on vessels for handling cargo and containers in harbour conditions;

(2) Floating or grab cranes mounted on barges or pontoons for operating in harbour conditions;

(3) Engine room and stores cranes mounted on vessels for handling equipment, stores, etc. in harbour conditions;

(4) Cranes mounted on vessels for handling non-manned equipment in an offshore environment, e.g., pipe laying cranes.

1.2 Derrick cranes are not covered in this Chapter. They should be designed in accordance with the requirements of Chapter two of this Code.

1.3 Cranes mounted on vessels can normally be designed in accordance with the standard operation condition.

2. Ordinary Cranes

2.1 General requirements

2.1.1 The requirements stated in paragraph 2 of this Chapter generally apply to cranes in paragraphs 1.1 (1) to (3) of this Chapter designed to operate in a harbour or sheltered water environment where there is no significant movement of the vessel due to wave action and the sea state is not worse than that described for Beaufort No. 2.

2.1.2 The forces and loads acting on the crane structure are to be determined in accordance with the operating and environmental conditions. When designing a crane, the working condition of the crane should be clearly specified, such as the safe working load, lifting load, working radius, lifting height, working speeds and brake times of cranes, etc.

2.2 Forces and loads to be considered when a crane is in service

2.2.1 According to the usage and operational characteristics of the crane, the following forces and loads should be considered:

(1) quality loads (see paragraph 4.1(14) of Chapter 1);

(2) lifting loads (see paragraph 4.1(11) of Chapter 1);

(3) inertia forces due to the various crane movements;

(4) forces due to vessel inclination;

(5) load swing caused by non-vertical lift;

(6) wind forces and environmental effects; and

(7) loads on access ways, platforms, etc.

2.2.2 The crane structure and any stowed arrangement are also to be examined for the following:

(1) forces due to the vessel motion and inclination; and

(2) wind and environmental effects.

2.3 Basic loads

2.3.1 The basic loads acting on the crane comprise the quality load and the lifting load.

2.4 Duty factor

2.4.1 Cranes are grouped depending on the nature of their duty they perform and each group is designed a duty factor f_d as given in Table 2.4.1. This duty factor depends on the frequency of operation and the severity of the load lifted, and assumes normal marine use, operating life (number of operating cycles) not in excess of 6 x 10^5 cycles, and consideration is to be given to increasing these values where extra heavy duty is envisaged.

2.4.2 The lifting load and quality load should take into account the effect of duty factor $f_{d.}$

Duty factor f_d Table 2.4.1

Crane types and use	Duty factor f_d
Stores cranes, engine room cranes	1.0
Deck jib cranes, container cranes, gantry cranes, floating cranes	1.05
Grab cranes	1.20

2.5 Hoisting dynamic forces and hoisting factor f_h

2.5.1 When the lifting load is hoisted, hoisting dynamic forces applied to the crane structure increase due to the effect of acceleration and shock. The hoisting factor f_h is calculated from the following formula:

$$f_d = 1+CV$$

Where: V— hoisting speed, in m/s but need be taken as 1.0 m/s when hoisting speed is greater than 1.0 m/s,

C— a coefficient depending on the stiffness of the crane concerned. 0.3 for jib type cranes and 0.6 for gantry type cranes.

Under no circumstances should f_d of jib type cranes be less than 1.10 and that of gantry type cranes be less than 1.15.

2.6 Inertia forces due to travel motions

2.6.1 Inertia forces that have to be considered when a crane is travelling are as follows:

(1) The vertical counter-forces which occur when a crane travels along a smoothly laid track or rail can usually be neglected.

(2) Horizontal inertia forces are the product of the lifting load, the self-weight of the crane, travel motions or the acceleration and deceleration which occur due to the motion and braking of the crane.

Acceleration and deceleration speeds can be obtained from the physical data provided by manufacturers. If physical data is not available, acceleration and deceleration speeds can be calculated from the following requirements in accordance with the known travelling speed and working conditions:

① For cranes with low travel speed, travel speed V of 0.4~1.5 m/s and lesser acceleration, acceleration a can be obtained from:

$$a = 0.15 \sqrt{V} \quad (m/s^2)$$

② For cranes with moderate to high travel speed, travel speed V of 1.5~4.0 m/s and normal acceleration, acceleration a can be obtained from:

$$a = 0.25 \sqrt{V} \quad (m/s^2)$$

③ For cranes with travel speed V of 1.5~4.0 m/s and high acceleration, acceleration a can be obtained from:

$$a = 0.33 \sqrt{V} \quad (m/s^2)$$

2.7 Transverse forces due to travel motions

2.7.1 When a crane is travelling, consideration should be given to the couple which occurs when two pairs of wheels move along a set of rails. The couple is formed by horizontal forces normal to the rail direction. The horizontal forces of the couple F_1 is calculated from the following formula:

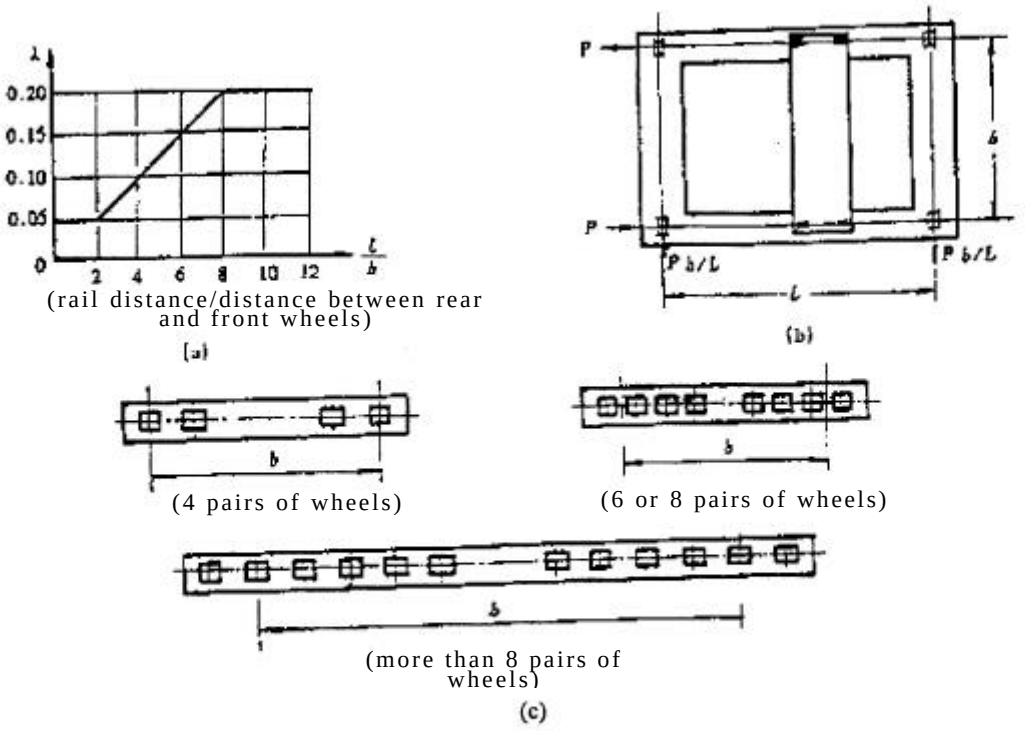
$$F_1 = \lambda \quad P \qquad (N)$$

Where: P = vertical load on wheels, N;

λ = coefficient dependent on the ratio of rail distance to distance between front and rear wheels as obtained from Fig. 2.7.1(a). Rail distance is obtained from the requirements of Fig. 2.7.1(b) and Fig. 2.7.1(c).

2.8 Buffers and impact

2.8.1 For travelling cranes, consideration should be given to the impact applied to the crane structure when buffers are bumped.



Where :-

(a) Coefficient l; (b), (c) rail distance and wheel distance

Fig. 2.7.1

2.8.2 When calculating the impact applied to the crane structure, it is assumed that the buffers can absorb part of the kinetic energy of the crane travelling at 70% rated speed under no-load condition. The impact can be calculated from the reduced speed as a result of buffer action.

2.8.3 If cranes are fitted with deceleration devices and are able to operate automatically for effective deceleration before they reach the buffers, the impact can be calculated from the speed after deceleration.

2.8.4 For cranes where the lifting load is free to swing, when calculating the impact of the crane against the buffer, the lifting load need not be included in the self-weight of the crane. For cranes where the lifting load is restricted from swing by rigid guides, the lifting load should be included in the self-weight of the crane.

2.9 Inertia forces resulting from slewing, hoisting and swinging motion

2.9.1 Inertia forces acting on the lifting load and crane structure resulting from the slewing, hoisting and swinging of the crane should be considered.

2.9.2 The horizontal inertia forces acting on the lifting load as a result of the slewing and hoisting motion of the crane should be calculated from the horizontal forces produced by the oscillation range of the lifting wire sling (vertical part).

2.9.3 The horizontal inertia forces acting on the motion parts and lifting load when the slewing, hoisting and swinging mechanism accelerate or decelerate should be 1.5 times the product of the load and the acceleration speed.

2.9.4 The centrifugal forces acting on the crane structure can be neglected.

2.10 Inclined load of vessels

2.10.1 Shipboard cranes are to be designed to operate safely and efficiently in a harbour or sheltered water environment at an angle of heel of 5° and angle of trim of 2° occurring simultaneously. If the designed crane is intended to operate at an angle greater than the above tilt angle, such condition should be taken into consideration. When designing the crane fitted on a non-regular vessel, lesser angles of heel and trim should be considered and approval be obtained.

2.11 Technical requirements to be considered

2.11.1 The following technical requirements should be taken into account. For details, please refer to the relevant requirements stipulated by licensing inspection bodies or the relevant requirements of shipboard lifting appliances in the People's Republic of China:

(1) forces due to vessel motions

(2) wind loading

(3) checking of the overall stability of the jib

(4) calculation guideline for the slenderness ratio l of the jib

(5) bending stability of part of the plate

(6) bending stability of the thin-walled drum

(7) allowable stress of connecting heads and connectors

(8) slewing supporting rings and connecting bolts

2.12 Platform and access way loading

2.12.1 Platforms and access-ways are to be designed to carry a uniformly distributed load of 5000 N and a concentrated load of 3000 N on any individual member.

2.13 Load cases and load combinations

2.13.1 The crane design is to be considered with respect to loads resulting from the following four types of cases.

2.13.2 Case 1: For the crane operating without wind, the load combinations to be considered are as follows:

(1) quality load;

(2) [hoisting load + horizontal component of the hoisting load due to the inclination of vessel (heel and trim)] x hoisting factor $f_{h;}$

(3) the other most unfavourable horizontal force (usually due to slewing acceleration); and

(4) horizontal component of the quality load due to the inclination of vessel (heel and trim).

Load combinations may be expressed in the following way:

[(1) + (2) + (3) + (4)] x duty factor f_d

2.13.3 Case 2: For the crane operating with wind, the load combination to be adopted is:

The load combination defined in accordance with 2.14.2 adds the most unfavourable wind load.

2.13.4 Case 3: For the crane being in its stowed condition, the various load combinations to be adopted are as follows:

The forces result from the vessel' s inclination and the vessel' s motions. The effects of anchorages, locks and lashings, etc., are to be taken into consideration.

2.13.5 Case 4: The crane may be subjected to exceptional load conditions which are:

(1) forces due to the coming into contact with buffers;

(2) failure of the hoist wire or sudden release of load for cranes with counterweight; and

(3) test load when the crane is being tested.

2.14 Stability against overturning

2.14.1 Loaded traveling cranes are to examined with regard to stability against overturning for the following four cases:

(1) crane operating without wind;

(2) crane operating with wind;

(3) crane subjected to storm in stowed condition; and

(4) crane subjected to exceptional load defined in 2.14.5 of this Chapter.

Loads and forces of the four cases mentioned above are to be multiplied by the load factor required in Table 2.15.1 respectively as the calculation of the overturning moment with regard to any one side. If the sum of the overturning moment of each case is less than or equal to the righting moment, the crane is to be considered as being stabilized.

Loading factors of four working conditions Table 2.14.1

Crane types	Working conditions	Self-weight load	Hoisting load	Force of inertia (including hoisting load)	Wind force	Remarks
Bridge type crane	1 2 3 4	0.95 0.95 0.95 0.95	1.4 1.2 0 -	0 1 0 -	0 1 1.15 -	Calculation for cranes with jibs: (1) Longitudinal (plane of jib) stability (working conditions 1 and 2) (2) Athwartships (direction of running) stability (working condition 3) Calculation for cranes without jibs: Athwartships stability (working condition 3)
Derrick crane	1 2 3 4	0.95 0.95 0.95 0.95	1.50 1.35 0 -0.20	0 1 0 0	0 1.0 1.1 1.0	

2.14.2 If anchor securings (reverse roller, grasp, etc.) are used during a crane operation to ensure its stability, the bearing capacities of them may be included in the calculation of righting moment.

2.14.3 The overturning load generated by vessel inclination is to be considered.

2.15 Allowable stress

2.15.1 The allowable stresses [s] for crane components are to be calculated from the following formula:

$$[s] = \frac{s_s}{ß \cdot n} \quad \text{(Mpa)}$$

Where: s_s — yield strength of steel, in MPa;

n — factor of safety, in accordance with the four working conditions as given in 2.14 of this Chapter by Table 2.16.1.

Selection

ß — factor, to be selected in accordance with the yield strength ratio of steel by Table 3.5 of Chapter 2.

Factor of safety, *n* Table 2.15.1

Working condition	1	2	3	4
Factor of safety, *n*	1.5	1.33	1.15	1.15

2.15.2 When steel is in elastic mode, the failure stress s of each stress condition is to be selected in accordance with Table 2.15.2.

Failure stress s Table 2.15.2

Stress condition	Signs	Failure stress s (MPa)
Stretching stress	s_t	$1.0s_s$
Compression stress	s_c	$1.0s_s$
Shearing stress	t	$0.58s_s$
Bearing stress	s_{br}	$1.0s_s$

2.15.3 For components subjected to combined stresses, the allowable stress criteria should satisfy the following formula:

$$s_{cp} = (s^2_x + s^2_y - s_x s_y + 3t^2)^{1/2} = 1.1\,[s] \qquad \text{(Mpa)}$$

Where: s_{cp} — combined stress after combination, in MPa;
s_x — normal stress in *x*-direction, in MPa; $s_x < [s]$;
s_y — normal stress in y-direction, in MPa; $s_y < [s]$;
t — shearing stress, in MPa, $t < 0.58[s]$;
[s] — same as abovementioned 2.16.1.

2.16 The stable allowable stresses for compression and bending members

2.16.1 The stable allowable stresses for compression members are the resulting stresses from dividing the critical compressive stresses for members by the safety factor *n* stipulated in Table 2.15.1. Besides checking the local stability of a single member within the derrick, the overall stability of the derrick should also be checked when checking the stability of the derrick crane.

For members of compression stresses, the stable allowable stresses are to be calculated from the following formula:

$$[\sigma_{st}] = \frac{\sigma_{cr}}{n} \quad \text{(Mpa)}$$

Where: $[\sigma_{st}]$— stable allowable stress, in MPa;

$[\sigma_{cr}]$— critical compressive stresses of members, in MPa; to be obtained in accordance with the slenderness ratios and the cross-sectional areas of the members and to be obtained from Appendix 1 of this Chapter; refer to the relevant stress information from recognized classification societies and the *Rules For the Cargo Handling Gear of the People's Republic of China*.

n— safety factor, see table 2.15.1.

2.16.2 For members subjected to compression and bending at the same time, the stability should be checked in accordance with the following stress criterion:

$$\frac{\sigma_m}{\sigma_s} + \frac{\sigma_c}{\sigma_{cr}} = \frac{1}{n}$$

Where: σ_m— flexural stress bear by member, in MPa;

σ_c— compressive stress bear by member, in MPa;

σ_s— yield strength of steel, in MPa;

σ_{cr} and n are same as abovementioned 2.17.1

When members are subjected to flexural stresses from two directions, x-axis and y-axis, at the same time, σ_m within the formula should be replaced by the sum of flexural stress σ_{mx} of x-axis and flexural stress σ_{my} of y-axis.

2.17 Materials

2.17.1 The crane is to be constructed of materials which comply with the approved specifications, requirements and standards.

2.17.2 The selection of steel grade should take into account the material tensile strength and thickness and the environment in which the crane is operated. The Charpy V notch impact test requirements should comply with the requirements of table 2.17.2 in general.

Steel impact energy Table 2.17.2

Thickness (mm)	Test temperature (^{o}C)	Maximum tensile strength (MPa)		
		540	590	630
		Charpy V-notch impact energy, in (J)		
t = 20	Room temperature①	27	31	34
20 < t = 30	0	27	31	34
30 < t = 40	-10	27	31	34
40 < t =50	-20	27	31	34
50 < t = 60	-40	27	31	34

① Charpy impact test is not required provided the carbon content is not greater than 0.23 percent and the manganese content is not less than 2.5 times the carbon content.

2.18 Rope safety factors, breaking load and sheave ratio

2.18.1 Rope safety factor n (for running or standing application) should not be less than the value obtained from the below formula, however, under whatever circumstances, the value should not be greater than 5 and less than 3:

$$n = \frac{10^4}{0.9SWL + 1910}$$

Where: SWL— safe working load of crane, kN.

2.18.2 The minimum breaking load Q_b of the rope should be obtained from the following formula:

$$Q_b = nW \qquad (N)$$

Where: n— safety factor of steel rope, to be obtained in accordance with the abovementioned 2.18.1.

W— electrostatic load on the steel rope, including the friction N resulting from the steel rope going through the block and sheave unit.

2.18.3 The ratio of the bottom of the rope groove diameter of the sheave to wire rope diameter is not to be less than 19 to 1.

2.19 Factor of safety of braking

2.19.1 The factor of safety of braking for the brakes of the machinery means the ratio of the braking torque to the maximum static torque (including torque caused by wind pressure and by heel of the vessel) on the brake shaft likely to occur in service. The factor of safety of braking for hoisting and luffing machinery brakes is to comply with the requirements prescribed in Table 2.26.1.

Factor of safety of braking Table 2.19.1

Description of machinery	Factor of safety of braking
Hoisting machinery	> 1.5
Luffing machinery	> 1.5

3. Offshore Cranes

3.1 Scope of application

3.1.1 This Section applies to cranes which are installed onboard or on platform and are designed to operate in offshore conditions. These are defined as open sea environment in which there is significant movement of the vessel or platform. The sea state will, generally, be in excess of that described by Beaufort No. 2.

The above-mentioned crane covers derrick crane and jib crane, 'A' frames and fixed structures used in lifting operations.

3.1.2 The requirements of Section 2 are to apply to those cranes required by Section 3 of this Chapter.

3.1.3 Cranes used solely for lifting operations on the platform itself may be considered in accordance with Section 2 of this Chapter.

3.1.4 Travelling gantry or mobile cranes will be specially considered on the general basis of Section 3 of this Chapter.

3.2 Service category and duty factor

3.2.1 Except as otherwise provided, the offshore cranes should be designed in accordance with the special working conditions and the duty factor f_d should be taken as 1.20.

3.3 Dynamic forces

3.3.1 The dynamic force due to hoisting for offshore cranes is to include the effect of relative movement of the crane and load in addition to normal hoisting shock and dynamic effects.

3.3.2 The hoisting factor f_h which considered hoisting dynamic forces is to be calculated from the following expression in accordance with the design operational sea conditions (defined by the Beaufort No., Sea State No. or wave height and period):

$$f_h = 0.83 + f_w \sqrt{(K/Q_l)}$$

Where: f_w — wave factor, obtained from Table 3.3.2;
K — the crane system stiffness, in N/mm;
Q_l — hoisting load, in N;

For initial design calculations $\sqrt{(K/Q_l)}$ may be taken as 0.057.

Minimum hoist speed, wave factor and offlead angle for various sea conditions Table 3.3.2

Beaufort no.	Sea state no.	Significant wave height, H? m	Minimum hoist speed, V_h m/s	Wave factor, f_w	Offlead angle in degrees (^{O})			
					Working condition 1		Working condition 2	
					a	ß	a	ß
2	1	0.6	0.2	8.1	5	2	2	5
4	2~3	1.6	0.33	13.7	6	3	3	6
6	5~6	3.9	0.46	21.7	8	4	4	8
8	7	7.0	0.64	33.3	12	6	6	12

Notes: a— offlead in plane of jib;

ß— offlead normal to plane of jib.

Refer to 2.13 of this Chapter for working conditions 1 and 2.

3.3.3 When the design operational sea conditions are known, the hoist factor f_h may be calculated from the following expression but in whatever conditions, it should not be less than that given in 2.5 of this Chapter:

$$f_h = 0.83 + 45.5 \frac{H^?}{T} \sqrt{(K/Q_l)}$$

Where: $H^?$ — design wave height, in metres;

T— design wave period, in seconds;

K, Q_l— same as above 3.3.2.

3.3.4 To calculate the crane system stiffness, the combination of hoist rope system, luffing rope system and crane jib are to be considered. For wire ropes, Young's modulus is to be taken as 1.1×10^5 (MPa).

3.3.5 When a motion compensator, shock absorber, or similar device is fitted, proposals to use lesser hoist factors will be specially considered.

3.4 Offlead angles of hoist rope

3.4.1 The offlead angles of hoist rope should be selected in accordance with the relevant sea condition of Table 3.3.2. Proposals to use lesser values will be specially considered where arrangements to reduce the offlead angle exist.

3.5 Hoisting speed

3.5.1 When a load is lifted from a vessel, the load hoist speed is to be high enough to ensure that after the load is lifted it does not cause the vessel to re-contact the load. The minimum load hoist speed to avoid re-contact for the various sea conditions is given in Table 3.3.2.

$$V_h = 0.93 \frac{H^2}{T} \quad \text{(m/s)}$$

Where: H^2 *and* T are same as 3.3.3 of this Chapter.

3.6 Slew rings

3.6.1 When steel which used for making slew rings are at -20^{O}C, the average impact value of the three samples of impact test of Charpy V-notch should not be less than 42 J, in which one of the samples should not be less than 27 J. The selection of steel having lower values but adequate bearing properties will be specially considered.

The ultimate tensile strength of steel should not be less than 950 to 1100 MPa in general. The yield strength and the elongation rate should not be less than 700 MPa and 15 percent respectively.

3.6.2 The factor of strength safety of a slewing ring with static load design is not to be less than 2.5 and the maximum load should be derived from the load combinations required in 2.14 of this Chapter. The factor of safety of a slewing ring with fatigue load design is not to be less than 1.5. The fatigue load is to be calculated in accordance with the load combination cases with 2 multiplied by the load spectrum factor 0.7. The fatigue failure stress to be derived from S – N curves is not to be less than 2×10^6 cycles.

The slewing ring is to be complied with the requirements of the static strength and fatigue strength simultaneously.

3.6.3 The impact properties of the materials of the slewing ring bolts is to be not less than that required by 3.6.1 mentioned above. Whether the bolts can bear the static strength and fatigue strength as required by 3.6.2 mentioned above under the mode of being pretensioned is to be considered.

3.6.4 The machinery surface of the slewing ring bolts are to be undergone magnetic particle examination.

3.7 Materials

3.7.1 The materials for constructing the cranes shall comply with the relevant recognized provisions, requirements or standards.

3.7.2 The selected steel grade is to provide adequate assurance against brittle fracture. The requirements of the Charpy V notch impact test shall comply with the requirements of Table 3.7.2 in accordance with the thickness and tensile strength of the steel.

3.7.3 When the operating temperature is below -10℃, the requirements of the steel Charpy V notch impact test will be given special consideration.

3.8 Factor of safety of steel wire ropes and breaking load

3.8.1 The factor of safety of steel wire ropes of offshore cranes *n?* should be derived in accordance with the following formula but should not be less than the factor of safety *n* required by 2.25.1 of this Chapter:

$$n = 0.625 f_h \times n$$

Where: *n*— the factor of safety derived in accordance with 2.25.1 of this Chapter;
f_h— the factor of hoisting derived in accordance with 3.3.2 of this Chapter.

3.8.2 The minimum breaking load required by the steel wire ropes is to be calculated in accordance with 2.18.2 of this Chapter, but with regard to the *n* in that formula, *n?* required in 3.8.1 mentioned above shall be substituted by ?.

Steel impact energy value Table 3.7.2

Thickness (mm)		Test temperature (℃)	Maximum tensile strength (MPa)		
Primary structure	Secondary structure		540	590	630
			Charpy V-notch energy, in J		
t = 10	t = 20	Room temperature ?	27	31	34
10 < t = 15	20 < t = 30	0	27	31	34
15 < t = 20	30 < t = 40	-10	27	31	34
20 < t = 25	40 < t = 50	-20	27	31	34
25 < t = 60	50 < t = 60	-40	27	31	34

Note: ① Test may be omitted provided carbon content is not greater than 0.23 per cent and the manganese content is not less than 2.5 times the carbon content.

4. Crane Pedestals

4.1 General requirements

4.1.1 Pedestals of cranes shall undergo strength calculation in accordance with the loading conditions provided in 2, 3 and 4 of this Chapter and the allowable stress shall be calculated in accordance with 4.2 of this Chapter.

4.1.2 Crane pedestals, in general, are to be carried through the deck and satisfactorily scarphed into the main structure of the hull. Proposals for other support arrangements will be specially considered. The pedestal flange installed with slew ring should be rigid and level. When the crane pedestals are to be stiffened by brackets, the spacing of the brackets is to be not greater than that achieved by positioning them between every second bolt.

4.2 Allowable stresses

4.2.1 The allowable stress [?] of the pedestal is to be calculated in accordance with the following formula:

$$[?] = \frac{?s}{ß \cdot n} \quad (MPa)$$

Where: ?s— yield strength (MPa);

n— factor of safety, selected in accordance with Table 4.2.1 under the four types of load cases mentioned in 2.13 of this Chapter;

ß- factor, selected in accordance with Table 3.5 of Chapter 2 under the ratio of the yield strength of steel.

Factor of safety n Table 4.2.1

Load case	1	2	3	4
Factor of safety, n	2.0	1.75	1.6	1.6

4.2.2 For steel under flexible modes, the failure stresses for the various failure states should be selected in accordance with the requirements of Table 2.15.2 of Chapter 3.

4.3 Materials

4.3.1 The materials for constructing the crane pedestals shall comply with the requirements of Table 4.3.1.

Materials for constructing crane pedestals Table 4.3.1

Steel plate thickness, t(mm)	Steel grade
t = 20	A/A32, A36
20< t =25	B/A32, A36
25< t =40	D/D32, D36
t > 40	E/E32, E36

5. Cargo Lifts

5.1 General requirements

5.1.1 The cargo lifts mentioned in Paragraph 5 of this Chapter apply to the vessels which are operated in a harbour and sheltered water environment, and to the vessels at which cargo may be stowed on them in their stowed position whilst it is at sea. This kind of lifts may be designed in accordance with the standard working conditions, otherwise it is to be designed in accordance with special working conditions.

5.1.2 The operating and stowed loading conditions of the lifts are to be clearly specified in the information and documents submitted for verification, including hoisting speeds and braking times.

5.1.3 When the lifts are in operation, consideration should be given to the following loads and forces:

(1) quality load of the lift;

(2) load capacity of the lift;

(3) dynamic forces due to hoisting/lowering;

(4) static forces due to inclination of the vessel.

5.1.4 The lift structure and locking mechanism are to be checked and verified with respect to the stowed condition in accordance with the following criteria appropriate to the characteristics of the vessel:

(1) quality load of the lift;

(2) applied load due to cargo loading;

(3) forces due to vessel motion and static inclination; and

(4) weather load (where appropriate).

5.2 Basic loads

5.2.1 The quality level, *Lm*, is the load imposed on the hoisting mechanism by the lift structure and machinery.

5.2.2 The applied load, *Le*, is the load imposed on the lift structure by the cargo.

5.2.3 The safe working load (*SWL*) of the lift is the maximum load for which the lift is certified and is equal to the maximum value of *Le*.

5.3 Dynamic forces and factors

5.3.1 The influence of acceleration and shock loading is to be taken into account. The quality load *Lm* and the applied load *Le* of the lift are to be multiplied by factor of dynamic force 1.2.

5.4 Technical requirements are to be considered

5.4.1 The following technical requirements are to be considered. The information may be referred to the relevant requirements stipulated by the licensing inspection bodies or the relevant requirements of the shipboard lifting appliances in the People' s Republic of China:

(1) forces due to vessel motion

(2) design loads

(3) load combinations of various operating conditions

(4) allowable stress

(5) allowable stress-plate buckling failure

(6) deck plating thickness

(7) deflection criteria

(8) guide rails

(9) stowage lock

(10) hoisting arrangements

(11) materials

6. Passenger and Crewmember Lifts

6.1 General requirements

6.1.1 Paragraph 6 of this Chapter applies to those lifts complied with the following conditions:

(1) electric and hydraulic powered;

(2) an enclosed car permanently installed in vessels;

(3) suspended by ropes;

(4) running between rigid guides between the decks;

(5) for transferring persons, or persons and goods; and

(6) with the rated speed of hoisting/lowering not to exceed 1 m/s. Lifts designed with rated speed of hoisting/lowering of greater than 1 m/s will be specially considered.

6.1.2 The rated load, minimum stopping distance, buffer stroke, type of hoisting drive, type of safety gear and buffer are to be specified in detail in all lift submissions.

6.1.3 The lift can be stowed, either manually or automatically, in the event of the specified operational conditions being exceeded.

6.1.4 For the operating conditions the lift is to be considered with respect to the following forces:

(1) quality load of car;

(2) rated load;

(3) dynamic forces due to lift motion; and

(4) forces due to vessel motion and static inclination.

6.1.5 For the stowed condition the lift is to be considered with respect to the following forces:

(1) quality load of car; and

(2) forces due to vessel motion and static inclination.

6.2 Basic loads

6.2.1 The quality load, *Lm* (N), is the load imposed on the hoisting mechanism and belongs to the quality of the permanent component of the lift car structure and machinery. (Lm = gross weight of the hoisting machine kg x 9.81 (N)).

6.2.2 The rated load, *Le* (N), is the load imposed on the lift car by the passengers and is to be not less than that listed in Table 6.2.2. (Le = gross weight of the passengers kg x 9.81 (N)).

Rated load of lift car Table 6.2.2

Rated load (N)	Maximum available car area, in m^2	Maximum number of passengers
980	0.40	1
1764	0.50	2
2205	0.70	3
2940	0.90	4
3675	1.10	5
3920	1.17	5
4410	1.30	6
5145	1.45	7
5880	1.60	8
6615	1.75	9
7350	1.90	10
8085	2.05	11
8820	2.20	12

Notes: ① For intermediates loads, the area is derived by interpolation.

② The maximum number of persons carried is given by:

$\frac{Le}{735}$ rounded down to the nearest whole number.

③ If the rated load exceeds by more than 15 % that indicated in the table for maximum available car area, the maximum number of passengers permitted shall correspond to that area.

6.3 Dynamic forces resulting from operation of safety device or car striking buffers

6.3.1 The dynamic forces, F, due to the operation of the safety devices or the car striking the buffers are to be considered and are calculated in accordance with the following formula:

$$F = f_s (Lm + Le) \qquad (N)$$

Where: $f_s = 2 + \frac{1.35V^2}{s}$;

V— rated speed, in m/s;

s— minimum stopping distance or buffer stroke, whichever is the lesser;

*L*m, *L*e— may be referred to the specification in 6.2.1 and 6.2.2 of this Chapter.

6.3.2 The rated speed, minimum stopping distance and buffer stroke are to be obtained from the lift specification to which the lift is constructed. The governor tripping speed and stopping distances in common use may be referred to Table 6.3.2 and the buffer strokes in common use may be referred to Table 6.3.2.

Rated speed and stopping distances of car Table 6.3.2

Rated speed, in m/s	Governor tripping speed, in m/s	Stopping distances (m)	
		Minimum	Maximum
0 0.62	0.88	0.15	0.38
0.75	1.05	0.15	0.41
1.00	1.40	0.23	0.56

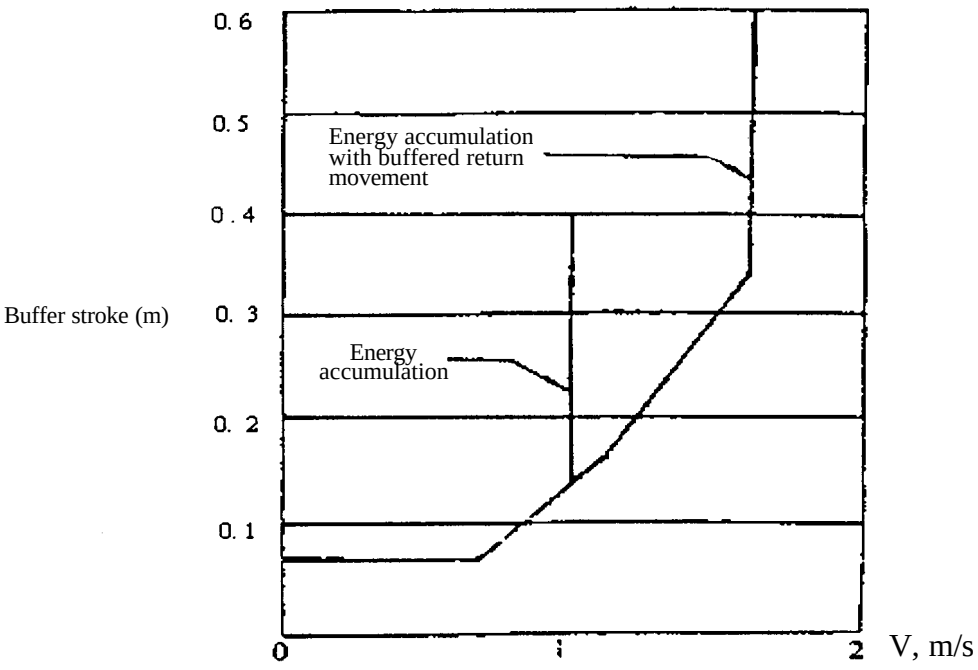


Fig. 6.3.2 Stroke for buffer

6.4 Force due to vessel motion

6.4.1 Passenger lifts, their machinery and structure should be able to operate at sea under the following conditions:

(1) Roll: ±10°, with 10 second period;

(2) Pitch: ±7.5°, with 7 second period

6.4.2 In addition to the above operational conditions, the lifts, their machinery and structure should also be able to withstand the force resulting from consideration of the following conditions when in the stowed condition:

(1) Roll: ±22.5°, with 10 second period;

(2) Pitch: ±7.5°, with 7 second period;

(3) Heave: Amplitude = 0.0125*L* (*L* is the length of the vessel), with 10 second period.

6.5 Load combination

6.5.1 The lifts, their machinery and structure should be considered with respect to design load resulting from the following conditions:

(1) Working condition 1: The load is calculated in accordance with the following formula:

$$(L_m + L_e)\varphi_s + L_{h1} + L_{h2}$$

Where: L_m— self-weight of the lift;
L_e— rated load;
φ_s— the dynamic factor due to safety devices operation or car striking buffers as stated in Para. 6.3.1 of this Chapter;
L_{h1}— horizontal force due to roll;
L_{h2}— horizontal force due to pitch.

(2) Working condition 2: The self-weight of the lift should be considered with respect to the force resulting from the acceleration due to vessel motion as stated in Para. 6.4.2 of this Chapter.

6.6 Allowable stress

6.6.1 The safety factor and allowable stress should be in compliance with the technical requirements of the allowable stress as stated in Para. 5.4(4) of this Chapter.

6.7 Deformation criteria

6.7.1 The deformation of the car structural members should not exceed l/600 mm (where l is the distance between supports, in mm).

6.7.2 The deformation of the guides should not exceed l/400 mm (where l is the distance between supports, in mm) or 3 mm, whichever is the lesser.

6.7.3 The car walls or doors in their closed position should be able to withstand without permanent deformation or elastic deformation of 15 mm a force of 300N evenly distributed over a circular or square area of 500 mm^2 applied parallel to the deck from inside towards the outside of the car. The doors should be capable of operating normally after being subjected to this load.

6.7.4 The car roofs should be able to withstand without permanent deformation a force of 2000N applied at any position perpendicular to the deck.

6.8 Guides

6.8.1 At least two steel guides should be installed and the surface finish should be sufficiently smooth to allow free running of the cars or counterweights.

6.8.2 The force resulting from the application of the safety devices that the guides can withstand should be calculated in accordance with the following formula:

$$(L_m + L_e)\varphi_{s1}$$

Where: φ_{s1}— the factor, to be chosen in accordance with Table 6.8.2;
Lm, Le— same as described in Para 6.5.1(1) in this Chapter.

6.8.3 The allowable stress of the guides should be calculated in accordance with the technical requirements in Para 2.16 of this Chapter and that of the allowable stress of stability of the bending parts. The relevant slenderness ratio should be calculated in accordance with the calculation guideline for the slenderness ratio λ of the related booms.

Table 6.8.2

Factor φ_{s1}	
Type of safety devices	Factor φ_{s1}
Instantaneous type safety devices	25
Captive roller type safety devices	14
Stepless type safety devices	10

6.9 Safety gears

6.9.1 The cars and counterweights should be provided with safety gears capable of operating only in a downward direction by gripping the guides. The safety gears should be capable of stopping the fully laden cars or counterweights, at the tripping speed of the overspeed governors, even if the suspension devices break. The safety gears should be tripped by the overspeed governors, but the counterweights may be tripped by failure of the suspension gears or by safety ropes.

6.9.2 The safety gears may be of instantaneous type with buffered effect or of instantaneous type where the rated speed is not in excess of 0.63m/s.

6.9.3 The safety gears of the counterweights may be of instantaneous type.

6.9.4 The jaws of safety gears should not be used as guide shoes.

6.10 Overspeed governors

6.10.1 Tripping of the overspeed governors should occur at a speed of over 115% of the rated speed and not more than:

(1) 0.8 m/s for instantaneous type safety gears (except for captive roller type);

(2) 1.0 m/s for captive roller type safety gears;

(3) 1.5 m/s for instantaneous type safety gears with buffered effect.

6.10.2 The tripping speed of the overspeed governors for the counterweights should be higher than that for the safety gears of the cars but not exceeding it by more than 10%.

6.10.3 The tripping force exerted by the overspeed governors should not be less than the greater of:

(1) 300N;

(2) twice the force needs to pull the safety gears.

6.10.4 The breaking load of the pulling ropes of the overspeed governors should have a safety factor of 8.0 with respect to the force required to pull the safety gears. The diameter of the pulling ropes should not be less than 6.0 mm and the ratio of the diameter of the sheave groove bottom to the diameter of the ropes should not be less than 30:1.

6.11 Buffers

6.11.1 The cars and counterweights should be provided with buffers at their bottom limit of travel. If the buffers travel with the cars or counterweights, they should be struck against a pedestal not at least 0.5 m higher at the end of the travel.

6.11.2 Where buffers are of energy accumulation type, the total possible stroke of the buffers should be at least equal to twice the gravity stopping distance corresponding to 115% of the rated speed but not less than 0.65 m, i.e.:

$$s = 0.135V^2 \qquad \text{(m)}$$

Where: s— stroke, in m;
V— rated speed, in m/s.

Buffers should be designed for the above stroke, under a static load of four times the self-weight of the cars plus the rated load or four times the weight of the counterweights as appropriate.

6.11.3 With the rated load in the cars, the average deceleration due to the buffers acting on the free falling cars should not exceed 1.0g and the maximum deceleration not exceed 2.5g.

6.12 Hoisting arrangements

6.12.1 The hoisting arrangements may be of:

(1) Traction drive using wire ropes and sheaves; or

(2) forced drive (if the rated speed is not greater than 0.63 m/s) using:

① drums or wire ropes without counterweights: or

② sprockets and chains.

6.12.2 The ratio of the diameter of sheave grooves or drums to the diameter of wire ropes should not be less than 40:1. Where drum drive is used, the drums should be grooved and the fleet angle of the grooves should not be greater than 4°.

6.12.3 Not more than one layer of wire rope should be wound on the drums and when the cars rest on the fully compressed buffers, not less than one and a half turns of wire rope should remain in the grooves.

6.12.4 The safety factor of the wire ropes, defined as the ratio of the breaking load to the maximum load on the wire ropes (when the cars are subjected to the rated load and are at the lowest level) should not be less than that as required in Table 6.12.4.

Safety factor of wire rope Table 6.12.4

Mode of drive	Safety factor
Friction drive with more than three wire ropes	12
Traction drive with two wire rope	16
Drum drive	12

6.12.5 Devices should to be fitted at one end of the hoisting arrangements to equalize the tension in the wire ropes or chains.

6.12.6 Where compensating wire ropes are used, the ratio between the diameter of sheave grooves and the diameter of the wire ropes should not be less than 30:1.

6.13 Lift trunks and motor rooms

6.13.1 All lift trunks and machinery spaces should be completely enclosed, suitably ventilated, and constructed to give fire protection in compliance with the requirements of the corresponding vessels.

6.13.2 Clearances around the cars should be guarded or arranged to preclude the possibility of personnel falling between the cars and trunks.

6.13.3 Only pipes and cables belonging to the lifts may be installed in the trunks. Traveling cables should be protected by an internally smooth metal trough which should be provided with a slot having rounded edges to allow free passage of the cables leaving the lift cars, and of sufficient width to allow passage of the free hanging loops of the traveling cables.

6.13.4 Where two or more lifts are fitted into one trunk, each car and its associated counterweight should be separated by means of sheet steel over the full height of the trunk.

6.13.5 The ventilation of the trunks should not be part of the vessel's ventilation ducting but an independent system.

6.13.6 The trunk entrances should be located to prevent the ingress of water or cargoes into the trunk, and the deck areas at the entrances should be non-slip and of approved material which will not readily ignite.

6.13.7 Where the lifts are for crew, the headroom (the space above the car roof when the car is in its highest position) of the trunk should incorporate an escape hatch with minimum dimensions of 500 mm ×500 mm.

6.14 Lift cars and counterweights

6.14.1 The cars should be constructed of steel or equivalent non-flammable material, having non-slip floor and be provided with at least one handrail where access for persons is clearly available. Load plates should be permanently displayed specifying number of passengers and the safe working load.

6.14.2 The car entrances should be provided with doors of imperforate type fitted with devices to prevent untimely opening and slamming. The clearances between the cars and car doors should not be more than 6.0 mm.

6.14.3 The cars and counterweights should be guided over their full travel, including overtravel and independent guidance installations to limit the car movement in the event of casting failure should be provided where cast iron housings are used.

6.14.4 Counterweights should be constructed of steel or equivalent material and filler weights should be securely clamped in position within steel frames. Concrete filler weights are not permitted. Suitable devices should be fitted to stop and support the counterweights in the event of wire rope failure.

6.14.5 Lifts of traction drive should incorporate devices to stop and support the cars if:

(1) When a start is initiated, the lift machines do not rotate;

(2) the cars or counterweights are stopped in downwards movement by an obstruction which causes the wire ropes to slip on the driving pulleys.

6.14.6 The devices stated in Para. 6.14.5 of this Chapter should function in a time not greater than the lesser of the following values:

(1) 45 seconds;

(2) time for the cars to travel at the full travel plus 10 seconds, with a minimum of 20 seconds if the full travel time is less than 10 seconds. The devices should not affect either the inspection or electrical recall operation.

6.15 Emergency means of escape

6.15.1 For crew lifts, the trunk should be fitted with a ladder over its entire length leading to the escape hatch.

6.15.2 For lifts intended solely for passengers, a suitable ladder should be provided to give access to the lift car roof from a landing door and either the same or another should be provided to give access into the car from the emergency opening in the car roof. These ladders should be kept in a watchkeeping room or room accessible to competent persons.

6.15.3 A trap door in the roof of the lift car with suitable access to it from the inside should to be provided. Where the lifts are solely for passengers, the trap door is to be fitted with mechanical lock which can only be opened from the outside. Where the lifts are solely for crew, the trap door should be fitted with mechanical lock which can be opened either from inside or outside of the car.

6.15.4 For crew lifts, an escape hatch should be provided in the trunk. Opening of the hatch from the outside should only be possible by means of a special key which is kept in a box immediately by the hatch.

6.15.5 Notices in Chinese, English and pictographs (as necessary), describing the means of escape should be fixed in the following locations:

(1) inside the car;

(2) on the car roof;

(3) inside the trunk, adjacent to every exit.

Chapter 4 Mechanical, Electrical and Control Systems

1. General

1.1 General Requirements

1.1.1 This Chapter applies to the mechanical, electrical and control systems of the following lifting appliances:

(1) derrick rigs and derrick cranes;

(2) cranes;

(3) passenger and crew lifts; and

(4) cargo lifts.

1.1.2 The lifting, lowering, hoisting, slewing and travelling mechanism of lifting appliances should be designed in accordance with the recognized standard or ripe experience.

1.1.3 The machinery of lifting appliances should be able to support the static and dynamic loads that occur at work, as well as the additional loads affected by the environment. The brake of the winch should be able to stop the static load 1.5 times the rated load of the winch.

1.1.4 The electrical installations should be designed in accordance with the requirements of the relevant specification and standard.

1.1.5 Lifting appliances should be equipped with control systems to ensure safe operation of lifting appliances and compliance with the relevant requirements of safe protection, alarm, interlock and control.

1.1.6 The moving direction of the control handle or hand wheel for controlling the operation of a lifting appliance should be in line with the moving direction of the hook or the lifting appliance. When the control handle is pulled towards the operator or upwards, the hook is lifted or the jib raised accordingly. When the control handle is moved to the right, the crane rotates to the right accordingly.

When the control hand wheel is turned clockwise, the hook is lifted, the jib raised or the crane rotates to the right accordingly and so on.

A data plate containing information on the use, parts and moving direction of the control unit should be affixed thereto.

1.2 Drawings and Information

1.2.1 The drawings and information of the mechanical, electrical and control systems that have to be submitted are contained in paragraph 3 of Chapter 1.

1.3 Inspection and Test

1.3.1 The manufacturing and installation of mechanical equipment should be subject to inspection and test.

1.3.2 The electrical equipment should be inspected and tested in accordance with the relevant national or international standard, including the insulation resistance measurement and actions of the protective equipment and interlock.

1.3.3 The control system including the alarm and safety device should be tested to prove that they are in good working condition.

2. Controlling and Security Devices for Passenger and Crew Lifts

2.1 General Requirements

2.1.1 While a lift is in operation, the controlling device should be able to operate reliably at an angle of trim or list of 10°. When the lift has stopped, the controlling device should be able to bear an inclination of 22.5° at any position.

2.1.2 Devices to ensure safely and effectively control the speed, direction of running and stoppage of the car should be fitted.

2.2 Safety Devices

2.2.1 Interlocking devices should be fitted to prevent the movements of controlling and driving chains under the following conditions:

(1) where the car door or its part is not closed; or

(2) where the entrance and exit doors or their parts of the lift access are not closed.

2.2.2 The entrance of the power-operated split doors should be fitted with protective devices to protect passengers, crewmembers or staff from injuries. These should be complied with the following requirements:

(1) to be installed at the leading edges of the car and the door plank;

(2) to be installed over the entire height of the door which is 25 mm above the floor to the top of the door;

(3) forces to activate protective devices is not to be exceeded 14.7 N;

(4) in case the leading edge of the door plank is obstructed, the protective device should be activate immediately.

2.2.3 In addition to the stopping controls for normal up-and-down embarkations, independent means should also be provided to stop the lift in case it goes beyond the top or the bottom.

2.2.4 Safety devices should be fitted on the car and the counterweight to make a stop and a securing in case there is an over-speeding condition or a failure of the hoisting steel wire rope or the securing devices.

2.2.5 Safety devices should be provided to stop the car and keep it in position in case the hoisting steel wire rope has slackened.

2.2.6 The lift should be fitted with interlocking devices to stop the operation of it upon the opening of the emergency escape hatch.

2.2.7 Alarm, telephone or similar communication equipment should be provided inside the car.

2.2.8 Floor indicators should be provided inside the car and outside every car entrance.

2.2.9 Emergency lighting should be provided inside the car, the lift, the machine room and the lift access and at its entrance. The emergency lighting should be switched on automatically upon the failure of the normal lighting.

3. Control and Safety Gears of Lifting Devices for Cargo Handling

3.1 General Requirements

3.1.1 Lifting devices should be fitted with control systems for effective control of speed, operation direction and stopping of operation to ensure operational safety.

3.1.2 The control stations should be arranged at a position where the operators could observe the working site and the load lifted.

3.1.3 The control stations should be fitted with emergency disconnecting gears for stopping the lifting devices in emergency situations. The gears should be independent of the control systems mentioned in 3.1.1 of this Chapter, and there should be clear marks and appropriate protection to avoid accidental motions.

3.1.4 Warning should be given when operation power fault occurs to the lifting devices. Also, the lifting devices and the load lifted should be automatically remained at their position.

If they are driven by electricity, when the electrical supply resumes, the control mechanisms should resume their position before the lifting devices could continue to operate.

3.1.5 Each control station should be fitted with an indicator showing the condition of operation or reserve mechanisms (if not fitted).

3.2 Cranes

3.2.1 Control systems for hoisting, rotation, lifting and swinging and moving (if applicable) mechanisms should be fitted.

3.2.2 Cranes should be fitted with:

(1) Lifting height limiters;

(2) Maximum and minimum jib amplitude limiters;

(3) Rotation angle limiters, suitable for cranes which rotation angle is limited;

(4) Tavelling limiters, suitable for the travelling cranes of the moving cranes and bridge cranes.

Warning should be given after the above limiters are activated, and the operation power should be cut off and the load lifted and the cranes should be maintained in the position where the limiters activate.

3.2.3 If certain mechanism of the cranes has to cross the position limited by the limiters (e.g. the jibs need to be put down), override switch may be fitted for stopping the motion of the limiters. This switch should be properly protected to avoid accidental motions.

Buffers and buffered gears should be fitted behind the travelling limiters of the moving cranes and travelling cranes.

3.2.4 Cranes should be fitted with overload protectors or loading indicators. The overload protectors should be adjusted to activate when the safe working load does not exceed 110%.

3.2.5 Cranes with different operation radius corresponding to different safe working load should give warning when there is no loading indicator to automatically showing the maximum safe working load by the rated operation radius and when the load reaches 95% of the safe working load, and the operation power should be able to cut off automatically when the safe working load reaches 100%.

3.2.6 Various operation mechanisms of the cranes should be fitted with brakes. The brakes of hoisting and lifting and swinging mechanisms should be of normal close type and fitted with emergency releasing installations to enable any load to be lowered and in place. The safety factor (ratio between the braking moment and rated moment) of the brakes should be less than 1.5.

3.2.7 Moving cranes should be fitted with rail clamping gears in order to avoid taxying effected by wind and lay down.

3.2.8 Moving cranes should be fitted with anchorage gears for fixing the cranes when they stop operating.

3.2.9 Cranes should be fitted with alarm ring. Alarm ring should be sounded while the moving cranes are travelling on the rail.

3.2.10 Cranes should be fitted with jib amplitude indicators.

3.3 Lift

3.3.1 Anti-control and anti-starting gears are to be installed with respect to the following conditions:

(1) any covering thing that is not taken away;

(2) the lift is in excessive load.

3.3.2 Sequential light and sound alarm is to be given when the lift is in operation.

3.3.3 When the lift is fixed by a telescopic locking gear, device ensuring the non-interruption of dynamic forces when the locking gear is close is to be installed in order to prevent the lift from being going down before the locking gear has been unlocked.

3.3.4 If a remote locking gear is used, a substitute device for locking the lift is to be installed when the locking control or locking mechanism is in failure.

3.3.5 At the two ends and two sides of the lift platform and the deck opening, sequential safety releasing rings or equivalent device is to be installed, and device for stopping the lift and keeping it in position after the tripper has been operated is to be installed.

3.4 Winch

3.4.1 The wire rope on the winch drum is to be arranged tidily and coilers to be fitted when necessary. The length of the drum is proposed to be in such a manner that the wire rope can be reeled onto the drum in one single layer. If the arrangement of one single layer for reeling up the wire rope does not work, the wire rope reeled up by the drum is not to be more than three layers.

3.4.2 The length of the wire rope on the winch drum is to be suitable for use in any position within the design area. The wire rope remained in the drum is not to be less than three coils no matter under whatever circumstances.

3.4.3 When the wire rope that has to be reeled up has been reeled onto the drum, the flange is to be at least 2.5 times of the diameter of the wire rope higher than the uppermost wire rope.

3.4.4 The non-power driven topping winch is to be installed with ratchet wheels which are to be able to bear the maximum loading transmitted by the topping winch.

3.4.5 The power driven winch is to be installed with a braking device. The load is to be kept in position when the power for operation is in failure. The effective braking moment of the winch braking device is not to be less than 1.5 times of the rated value of the winch.

Chapter 5 Lifting Gear and Ropes

1. General Requirements

1.1 Permanent attachments, lifting gear, wire ropes and fibre ropes should generally be manufactured in accordance with an approved standard. Attachments or lifting gear that is not designed in accordance with the above standard should be subject to approval.

1.2 The safe working load of the parts mentioned in paragraph 1.1 should not be less than the required load for the parts thereof as mentioned in this Chapter.

1.3 The steel class for the eyeplates and welding fittings mentioned in paragraph 2 of this Chapter should generally comply with the requirements prescribed in the table below. The steel used for other parts should generally comply with an equivalent approved standard.

Material for the crane base (t is the thickness of the material)

Thickness of steel plate (mm)	Steel class
$t \leqq 20$	A/A32, A36
$20 < t \leqq 25$	B/A32, A36
$20 < t \leqq 40$	D/D32, D36
$t > 40$	E/E32, E36

1.4 The lifting gear including the hooks, hoisting rings, swivels and shackles mentioned in paragraph 3 of this Chapter should not be made of iron casting or steel casting.

1.5 Steel casting or steel forging should be subject to homogenization treatment, normalize tempering or other heat treatment suitable for the material performance.

2. Permanent Attachments

2.1 Eyeplates for fastening the cargo block, span block and preventer guys are to pass through the derrick head and welded on both sides along the perimeters. The use of eyeplates of other construction is subject to approval. Eyeplates of the light-lift derrick may not pass through the derrick head and be welded to the derrick directly.

2.2 The diameter of the heavy-lift derrick boom inserted in the block should not be less than that required in Table 3.4 of this Chapter or less than 1.2 times the outer diameter of the boom thereof.

2.3 Derrick heel fittings may be constructed of mild steel and may be forged, welded or cast. Derrick heel pins are to be provided with nuts and cotter pins.

2.4 Gooseneck bearings may be constructed of mild steel and may be welded or cast. The goosenecks are to be safe guarded against lifting out of their bearings by means of check rings with a through bolt and a split pin.

2.5 Span eye bearings fitted on the mast or the king post may be constructed of mild steel and may be forged, welded or cast. Suitable means are to be provided to prevent the bolts from rotating with trunnion piece or slipping out of the bearing.

2.6 Eyeplates are to be so arranged that will not be subject to the cross bending under working conditions in so far as this is practicable. The contour of eyeplates or bearings is to suit the parts to which they are attached.

Places where the eyeplates are to be fastened should have adequate strength and be partially strengthened if necessary.

2.7 The scantlings of the fixed fittings of the derrick system should be subject to its design load and relevant statute requirements.

3. Lifting Gear

3.1 The tips of the C-shaped hooks are to be sheltered to prevent catching members or other objects onboard while lifting.

The special-purposed lifting appliances used in lifting cargoes should comply with relevant international standard requirements.

3.2 Swivels are to be provided between the cargo hook and the short chain. The swivels are to be able to turn round freely and also to prevent working loose.

3.3 The tips of the shackle pins are to have screw threads, and in general, means are to be provided to prevent them from working loose. The shackles used for securing hoisting appliances (e.g. cargo hooks, weight and short chains, etc.) are to have pins with half countersunk slotted head.

3.4 The blocks are to be so designed that the clearance between the sheave and the shell plate will be kept to a minimum to prevent the rope from jamming. Provisions are to be made for the effective lubrication of the blocks. Lubricants are to be applied to all bearings and hoisting rings without carrying out demolition.

Sheaves for wire ropes are to be made of steel. Special attention should be paid to the use of cast iron materials.

The snatch blocks are not permitted for use in lifting appliances. The ratio of the diameter of sheaves (measured from the bottom of the groove) to the diameter of the ropes is not to be less than that defined in Table 3.4:

Ratio between sheave diameter and rope diameter Table 3.4

Application of sheaves		Sheave diameter/Rope diameter	
		Running riggings	Standing riggings
Steel wire ropes	Derrick rigs (including derrick cranes)	13	8
	Cranes, diving apparatus hoisting systems	19	8
Fibre ropes		6	

3.5 The triangle plates for use with a short length of cargo chains and with cargo runners should have a thickness suitable for the shackles secured to them and to keep a minimum clearance so far as possible.

3.6 The rigging screws should be so designed that would be able to prevent the threaded rod from working loose. The eyes at both ends and the threaded rods should be forged in one piece. Rigging screws with hooks should not be used for the lifting device systems.

3.7 It is preferable that the cargo hooks are added with a weight (e.g. balance weight), or fitted with a short length of cargo chains so as to prevent twisting between steel wire ropes when the winch is running with no load.

3.8 The span chains and the preventer guy chains for Union Purchase rig should be studless long link chains. Where the preventer guy chains with pitched dips are used to replace preventer guy chains, the end of preventer guy with pitched dips should be provided with anti-slipping device. The distance between the end clip and the anti-slipping device should be as short as possible and in general, not greater than one clip pitch.

4. Ropes

4.1 The manufacturer of the steel wire ropes should be an approved manufacturer. Special consideration should be given if adopting steel wire ropes from an unapproved steel wire manufacturer.

4.2 The nominal tensile strength of the steel wires should not be less than 1420 MPa and not greater than 1770 MPa. The steel ropes should be made of not less than six strands. The main core of the steel wire ropes could be fibre core or steel wire core.

4.3 The steel wire ropes for running riggings should be flexible. The steel wires in each strand should not be less than 19 and the core could be fibre core or steel wire core. Regarding the steel wire ropes for standing riggings, the core should usually be steel wire core.

4.4 If the steel wire rope end eyes or thimbles are made by cut-in method, it should be cut in according to one of the following ways:

(1) A thimble or loop splice made in any wire rope shall have at least 3 tucks with a whole strand of the rope and 2 tucks with one half of the wires cut out of each strand, and the strands in all cases shall be tucked against the lay of the rope;

(2) Other forms of splice may be accepted provided they are to be as efficient as the two forms of splice mentioned above in all cases.

4.5 Such joining device as sockets and clamps may be used for joining the wire rope ends in accordance with different uses.

4.6 Wire rope is not to be extended for use by any form of splice.

4.7 Fibre rope is to be made of natural fibre or artificial fibre.

(1) Artificial fibre should have appropriate stability and should not become aging after being affected by the ultra purple light.

(2) Natural fibre is to be made of linen, manila or sisal in general.

(3) Fibre rope is to be consisted of 3 strands in general. Special consideration will be given to other structure.

4.8 In the lifting appliance system, fibre rope is only permitted to be used in the derrick system in general.

4.8.1 Derrick system : the slewing guys running through the blocks or the internal guys of the derrick head when the derricks working in Union Purchase rig.

4.9 The splice of the fibre rope end eyes is to be complied with the following requirements:

(1) Natural fibre rope: 3 tucks with each whole strand and with 2 tucks with one half of the wires cut out of each strand;

(2) Artificial fibre rope: 3 tucks with each whole strand and with 2 tucks with one half of the wires cut out of each strand. The end of each strand is to be fused.

4.10 Fibre rope is not to be extended for use by any form of splice.

CHAPTER 6 TEST AND EXAMINATION

1 General Requirements

1.1 Before being taken into use for the first time, a lifting appliance should be tested and examined. After the lifting appliance has been taken into use, periodical tests and examinations should be carried out regularly. Please refer to the Appendix 1 for the procedures of testing and examination, the content of which is consistent with this chapter.

1.2 Should any stress-bearing parts of the lifting appliance have been altered or repaired after the appliance has been taken into use, the lifting appliance should be tested and examined in accordance with the provisions stipulated in Section 5 of this Chapter.

1.3 Before initial use of lifting gear, or after alteration or repair on its stress-bearing parts, the lifting gear should be tested and examined in accordance with the provisions in Section 2 of this Chapter.

1.4 Where testing machines are used to apply test loads they should be calibrated biennially by a recognized organization and the accuracy should be within ±2%. If test weights are used to apply test loads, the weights should be calibrated with accuracy to be within ±2%.

1.5 Whenever serious incident occurs on the lifting appliance, the coxswain or owner of vessel should immediately report to the Director of Marine so that examination can be initiated.

1.6 During testing and examination, if the lifting appliance or lifting gear is found not complying with the provisions under this Code or to have unsatisfactory condition of its technical nature, the test and examination should be terminated and the appliance or gear should be forbidden for further use.

1.7 General requirements for examining the lifting appliance and lifting gear can be referred to the Chapter One.

2 Test and Examination of Lifting Gear

2.1 Every item of lifting gear should be tested and examined in accordance with the proof load prescribed in Table 2.1 and the requirements of its associated Notes. Proof load test for lifting gear may be carried out either by testing machine or by application of test weight. However the test load should be maintained for not less than 5 minutes.

Proof Load of Lifting Gear **Table 2.1**

No.	Items	Proof Load (tonne)
1	Single Sheave Block	4x *SWL*
2	Multiple Sheave Block *SWL £* 20(tonnes) 20(tonnes)< *SWL* ≤ *40*(tonnes) *SWL >40*(tonnes)	 2x *SWL* *SWL* + *20*(tonnes) 1.5x *SWL*
3	Chains,hooks,rings,shackles,swivels *AnySWL*	 2x *SWL*
4	Lifting beam,lifting spreader, lifting frame and items of similar construction *SWL* ≤ 10 (tonnes) 10(tonnes) < *SWL* ≤ 160(tonnes) *SWL* > *160*(tonnes)	 2x *SWL* 1.04x *SWL* + 9.6(tonnes) 1.1x *SWL*

The safe working load for a single sheave block including single sheave blocks with beckets is to be taken as one half of the resultant load on the head fitting.
The safe working load for a multi-sheave block is to be taken as the resultant load on the head fitting.

2.2 After proof load test, every item of lifting gear should be thoroughly examined for deformations, cracks or other defects. Rotating parts of loose gear should be inspected for free rotation.

2.3 Proof load of lifting gear for cranes used on near-coastal vessels should be (*f h*/1.6*)* times the proof load of the corresponding items indicated in Table 2.1. The multiplier (*f h*/1.6*)* is the hoisting coefficient of the hoisting starting load in the related rules.

2.4 The proof load testing may be applied to Ramshorn hook as indicated in Figure 2.4(a) or Figure 2.4(b), but in the latter case, an additional load equal to half of the proof load is subsequently to be applied as in Figure 2.4(c).

(a) (b) (c)

Figure 2.4 Testing of Hooks

2.5 Chain (long link or short link) should be subjected to a breaking test in addition to the proof load test required by Table 2.1. One sample of length equal to 5 rings should be taken from each length of chain measuring 55 m and should withstand a breaking load of 4 times safe working load for the chain.

2.6 Where the design of a lifting beam or similar item is such that the load can be lifted and supported in more than one manner, each arrangement should be separately tested.

3 Breaking Test of Ropes

3.1 The breaking load of steel wire rope should be determined by one of the following methods:

A sample should be cut from the completed rope for testing to destruction. Before a test sample is cut from the rope, both ends should be securely seized or clamped so as to prevent any slacking of wires within the test length. Sample length should be 36 times the diameter of the wire ropes. Before the applied loading has reached 80% of the nominal breaking load, the loading can be applied quickly. Thereafter the load should be applied slowly and steadily until the maximum load is attained. Tests in which a breakage occurs adjacent to the grips may be neglected and re-test by using another sample is required.

3.2 The breaking load of fibre rope should be determined by testing to destruction a sample cut from the completed rope. Sample length, speed of the loading being applied on the testing machine and initial load should be in accordance with Table 3.2. Tests in which a breakage occurs within 150 mm from the grips may be neglected and re-test by using another sample is required.

Breaking Test of Fibre Rope **Table 3.2**

Material	Test length (mm)	Initial Load(%)	Speed of loading (mm/min)
Natural fibre	1800	2	150±50
Man-made fibre	900	1	75±25

4 Test and Examination of Lifting Appliance

4.1 Testing and examination of derrick system and derrick crane

4.1.1 Every derrick should be tested with test load in accordance with Table 4.1.1. The test procedure should be agreed. The derrick should be tested in a position and angle as shown in the approved designed drawing. During the testing, certified test weight should be used for suspending on the cargo hook or shackle. After the test weight has lifted out from main deck, it should be maintained for not less than 5 minutes.

Proof Load for Derrick Equipment or Cargo or Vehicle Lift Table 4.1.1

SWL(tonnes)	Test load (tonnes)
$SWL \leq 20$	1.25x *SWL*
$20 < SWL \leq 50$	*SWL* + 5
$SWL > 50$	1.1x *SWL*

4.1.2 During the test, hoisting or lowering operation should be carried out at slow speed and the winch brake control should be tested to demonstrate its adequacy. The derrick with test load should be slewed in both directions to its maximum slewed position.

4.1.3 Derrick system or derrick crane equipped with overloaded cutout, safe load indicators should be tested to verify its functional adequacy. Emergency braking of the winch should be tested to check if the test load can be held stationary in situ.

4.1.4 In case of union purchase rig, apart from each derrick system being tested in accordance with Section 4.1.1 – 4.1.3, the rig in union purchase should be tested to the proof load in accordance with Section 4.1.1. During the test, the exact headroom at the junction of both cargo runners, runner angle and preventer guy position should be checked in accordance with the approved drawing.

4.1.5 In addition to the test and examination in accordance with Section 4.1.1~4.1.3, derrick crane should be luffed and slewed at slow speed while bearing the proof load. The luffing angles should be the designed operating luffing angles. The slewing operation should be tested at the lowest angle to the horizontal for which it has been approved in the design and the slewing angles should be in accordance to the angles limited by the approved drawing.

4.1.6 After derrick appliance and derrick crane being tested in accordance with Section 4.1.1-4.1.5, thorough examination should be conducted to ensure no deformation, flaw or other defects.

4.2 Test and Examination of Derrick Crane

4.2.1 Every derrick crane should be tested and examined in accordance with Table 4.1.1. The test procedure should be agreed. The test should be carried out when the derrick boom is at the maximum radius as indicated in the approved designed drawing. The test load should be the certified weights suspended from the cargo hook or lifting attachment and should be maintained under suspension for not less than 5 min. after it has been lifted out from main deck.

4.2.2 During test, the crane bearing proof load should be hoisted, luffed and slewed at slow speed. Meanwhile, the test should demonstrate the adequacy of the braking system on hoisting, luffing and slewing operations. Travelable crane should be tested to demonstrate its traveling adequacy by carrying a proof load to complete its journey at slow speed.

4.2.3 In the case of a variable load-radius crane the test should be carried out at each radius with the proof load appropriate for that radius. Special consideration would be given to the request of waiving off the tests at the radii of medium range.

4.2.4 Functional test should be carried out on the overload protection device and the limit switch for excessive bending moment.

4.2.5 Where it is not practicable for the hydraulic crane to raise the test load to the required load, a reduced test load can be applied but in no case is this to be less than 1.1 times safe working load.

4.2.6 After the proof load test, the crane should be loaded with its safe working load and carried out functional tests to demonstrate its satifisfactory hoisting, luffing and slewing operations, effectiveness of overload and load indicators, limits switches, etc. After test, the crane should be thoroughly examined for deformations and other defects.

4.3 **Test of Lift**

4.3.1 Every lift should be tested with its applied or rated load to demonstrate the satisfactory operation of the lift and all control and safety system.

4.3.2 In addition, after installation or any major repair, renewal or alteration, each lift should be subjected to the following tests:

(1) The brake should hold the lift with a proof load of 1.25 times the applied or rated load.;

(2) The lift should be operated through one complete round trip with a proof load of :

Passenger lifts:-- 1.1 times the applied or rated load.

Cargo lifts:-- The proof load should be accordance with Table 4.1.1.

4.3.3 After testing, the lift should be thoroughly examined for deformations and other defects. During testing the ramp with proof load, the maximum deflection should not exceed $L/400$(L is the distance between supports under test).

5. Retest and re-examination of Lifting Appliance

5.1 Derrick system, derrick crane, crane and lift should be retested and re-examined in case the circumstances as indicated in Section 1.1 or 1.2 arise.

5.2 Proof load, elevation angle of derrick boom, operating radius of derrick system, derrick crane and crane should satisfies the provisions in Section 4.1.1 and 4.2.1.

5.3 Retest of derrick system, derrick crane and crane should include hoisting at slow speed and testing of the braking system. Derrick crane and crane should also be tested to luff and slew in accordance with Section 4.1.5 and 4.2.2, but these may be waived at discretion of the Surveyor.

5.4 For retest of light derrick, spring or hydraulic weighing machine may be used. The testing machine should have an accuracy in accordance with Section 1.4. While using testing machine, the load should be applied for at least 5 min.

5.5 Lift should be re-tested every 4 years or when repairs or alterations have been carried out on the parts affecting the strength of the item. The re-test should be in accordance with 4.3.2.

5.6 For re-test and re-examination of the lifting appliance whose structure and parts have been altered or repaired, you may consult the view of surveyor to agree on items of re-test and re-examination which can practically reflect the situation of structure and parts being altered or repaired.

5.7 After re-test, examination should be conducted to ensure no deformation or other defects.

6. Unacceptable Defects

6.1 Maximum limits of weardown and corrosion for metal structures of lifting appliance and its permanent attachments should not exceed 10% of its original thickness. Apparent residual deformation should not be accepted.

6.2 Maximum weardown and corrosion of lifting gear such as rings, chain, ring bolt, tension plate and hooks etc. is 10% of its original scantling. Maximum wear limit of axle pin is 6% of its original diameter. Crack or apparent residual deformations, or cracks or fracture in the verge of sheave is not acceptable and the gear in question should not be used again.

6.3 Wire ropes should be replaced if excessive wear or corrosion is found or in any length of 10 diameters total number of visible broken wires exceeds 5% of total number of wires.

6.4 If brake lining of lifting appliance is found to have excessive wear, or the securing screws on the lining surface is found to have exposed, the brake lining should be renewed.

6.5 If the teeth of transmission gear are found to have excessive wear, or crack is found on the edge of the gear and gear body, the defective components should not be used.

6.6 This section cannot lay down all the defects exhaustively. Please refer to the requirements of the National and the Authorized Organizations.

Chapter 7 Marking

1 Marking of Lifting Gear

1.1 The lifting gear which has been successfully tested and examined in accordance with the requirements in section 2 of Chapter 6 should be stamped with marking and provided with certificate of test and examination by the manufacturer or the testing institution.

1.2 The marking should include the following data:

(1) safe working load of lifting gear, tonnes (SWL, t);

(2) date (month and year) of test and examination;

(3) distinguishing number of lifting gear; and

(4) marking of manufacturer or testing institution.

1.3 The marking should be stamped at a readily visible portion for easy inspection, but it should not be stamped at a high stress-bearing or concentrated stress-bearing portion. The position of marking should be as follows：

(1) hooks: on the wide portion of the hook body, but not at the bent portion;

(2) pulley blocks: on the strap or shell (cheek plate) of the pulley block;

(3) shackles: on any side of the shackle close to the eye;

(4) swivels: on any side of the eye of the swivel;

(5) chains: on any side of the end links of each length;

(6) preventer guy with pitched clips: on each clip.

Where small dimension of the lifting gear making stamping impracticable, the distinguishing number and the date of test and examination may be omitted.

2 Marking of Lifting Appliances

2.1 The lifting appliance which has undergone the initial test and examination, is to be marked on the place 50 cm from the derrick boom heel fitting, or from the lower end of the jib close to the bearing. For the existing lifting appliance having been tested and examined after the modification or alteration of safe working load, is to be stamped with a new marking on the aforesaid place.

2.2 The marking should include the following data:

(1) safe working load, tones (SWL,t);

(2) date (month and year) of test and examination;

(3) the angle to the horizontal of the derrick boom or the operating radius of the jib during the test;

(4) the stamp of the competent examiner or the approved organization.

For the sample of the marking on a derrick see Fig.2.2(a)

For the sample of the marking on a crane see Fig.2.2(b)。

2.3 In addition to the above stated marks, the safe working load (may be expressed with "*SWL*") and the angle to the horizontal of the boom or the radius of the jib should be marked with colour paint at readily visible places on the derrick boom or the jib of the crane. For example:

(1) safe working load of single boom 10 tonnes, angle to horizontal 30° : *SWL* 10t 30°;

(2) safe working load of union purchase 5 tonnes : *SWL* (U) 5t ;

(3) safe working load of crane, main hoist 50 tonnes, auxiliary hoist 10 tonnes, operating radius main hoist 4~12m, auxiliary hoist 5~20m :

SWL 50t (4~12m) ;

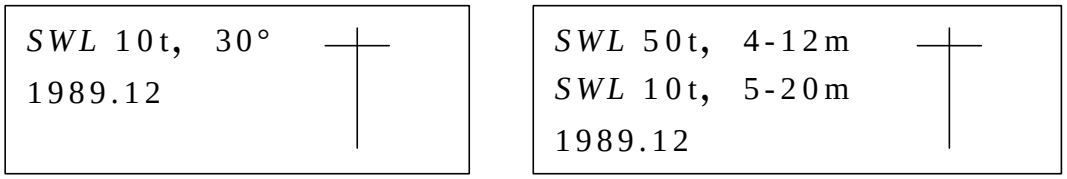
SWL 10t (5~20m)。

(4) the main hoist of the crane has different safe working loads corresponding to different radii, e.g., safe working load of main hoist 350 tonnes(t), radius 8~16m; safe working load 250 tonnes, radius 8~20m; safe working load of auxiliary hoist 30 tonnes, radius 10~40m:

SWL 350t (8~16m);

SWL 250t (8~20m);

SWL 30t (10~40m).



(a) (b)

Fig.2.2

(a) Marking of lifting appliance;

(b) Marking of lifting appliance (the tonnes and radii are the safe working loads for the main and auxiliary hoist and their corresponding radii.)

Appendix 1

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 or more 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 the derrick at an angle to the horizontal which shall be specified in the certificate of the test.

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

2. (1) Every crane and every other lifting appliance, together with its accessories, other than a lifting appliance referred to in 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 or more 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 or hoist 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, 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 or if a shackle is attached thereto, the proof load shall be at least 4 times the safe working load;

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

(d) 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;

(e) if the item is a multiple sheave pulley block with a safe working load of more than 40 tonnes, the proof load shall be at least 1 1/2 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 lifting 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 examinations of a pulley block the sheaves and pins of the block shall be removed.

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.

Appendix 2

References Relating to Lifting Appliances

1. Vessels & Marine Installation Statutory Requirements -
(Rules for the Statutory Survey of Lifting), 1999, published by the Ships Inspection Bureau of the People's Republic of China.

2. British Standard BS 7121 : Part 2:1991 Code of Practice for Safe Use of Cranes Part 2. Inspection Testing and Examinations, published by British Standard Institution, U.K.

3. Code for Lifting Appliances in a Marine Environment, published by Lloyd's Register of Shipping.

4. Rules and Guidance for the Survey and Construction of Cargo Handling Appliances, 1987, published by Nippon Kaiji Kyokai, Japan.

5. OSHA Crane Safety Handbook, 1995, published by J.J. Keller & Associates, Inc., U.S.A.

6. Marine Orders, Part 32 (Cargo and Cargo Handling Equipment and Safety Measures), 1986, published by Department of Transport, Australia.

7. Guide to Safety and Health in Dock Work, 1988, published by International Labour Office, Geneva.

8. Code of Practice - Safety Standards for Class I, II and III Vessels, issued by Marine Department, Hong Kong.

9. A Guide to the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations, 1998, issued by Labour Department, Hong Kong SAR.

10. Code of Practice for Safe Use of Mobile Cranes and Tower Cranes, 1998, issued by Labour Department, Hong Kong SAR.

Appendix 3

List of Recognized Inspection Organisations

1. American Bureau of Shipping
2. Bureau Veritas
3. China Classification Society
4. Det Norske Veritas
5. Germanischer Lloyds
6. Lloyd’ s Register of Shipping
7. Nippon Kaiji Kyokai
8. Korean Register of Shipping
9. RINA (Registro Italiano Navale)

Appendix 4

Marine Department Relevant Contact Information

1. General Manager, Local Vessels Safety Branch

Address:	Marine Department Room 2202A, 22/F, Harbour Building 38 Pier Road, Central
Fax No.:	(852) 2854 9416
Tel. No.:	(852) 2852 4406

2. Local Vessels Safety Section

Address:	Marine Department Room 2308, 23/F, Harbour Building 38 Pier Road, Central
Fax No.:	(852) 2542 4679
Enquiry No.:	(852) 2852 4444
Tel. No. of Section Head :	(852) 2852 4430

3. Marine Industrial Safety Section

Address:	Marine Department Room 2315, 23/F, Harbour Building 38 Pier Road, Central
Fax No.:	(852) 2543 7209
Enquiry No.:	(852) 2852 4477
Tel. No. of Section Head :	(852) 2852 4472

4. Licensing and Port Formality Section

Address:	Marine Department Central Marine Office Room 308, 3/F, Harbour Building 38 Pier Road, Central
Fax No.:	(852) 2545 8212
Enquiry No.:	(852) 2852 3081 -3
Tel. No. of Section Head	(852) 2852 4455

5. Vessel Traffic Centre

Fax No.:	(852) 2543 7209
Tel. No.:	(852) 2233 7801

Appendix 5

Forms Specified by the Director of Marine

1. Form 1 — Register of Lifting Appliances and Lifting Gear

2, Form 2 — Certificate of Test and Examination of Winches, Derricks and their Accessory Gear

3. Form 3 — Certificate of Test and Examination of Lifting Appliances and their Accessory Gear other than Derricks

4. Form 4 — Certificate of Test and Examination of Pulley Blocks

5. Form 5 — Certificate of Test and Examination of Lifting Gear

6. Form 6 — Certificate of Test and Examination of Wire Rope

HONG HKSAR Emblem **KONG**

香 港

表格一
FORM 1

香港特別行政區政府海事處

MARINE DEPARTMENT
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

船舶及港口管制(工程)規例
商船(本地船隻)(工程)規例

SHIPPING AND PORT CONTROL (WORKS) REGULATIONS
MERCHANT SHIPPING (LOCAL VESSELS) (WORKS) REGULATION

海事處處長指明的表格

起重裝置及起重工具登記冊

(船舶貨物處理機械及工具登記冊)

Form specified by the Director of Marine for

REGISTER OF LIFTING APPLIANCES AND LIFTING GEAR

(Register of Ship's Cargo Handling Machinery and Gear)

船名
Name of Vessel _____

牌照編號或船舶登記號碼
Licence Number or Official Number _____

船籍港 Port of Registry _____

船隻擁有人/船東的名稱
Name of Owner _____

_____

_____

地址 Address _____

_____

_____

_____

本表格的編訂是根據國際勞工組織認可的測試及檢驗船上裝卸貨物的起重機械及工具標準國際證明書格式
This Register is based on the standard international form of register approved by the International Labour Organisation for the test and examination of lifting machinery and gear used in the loading and unloading of ships.

第一部份
PART 1

人字吊臂及人字吊臂、桅杆及甲板的固定配件(包括制動鏈)的週年徹底檢驗及每四年一次的徹底檢驗
ANNUAL AND QUADRENNIAL THOROUGH EXAMINATION OF DERRICK AND PERMANENT ATTACHMENTS (INCLUDING BRIDLE CHAINS) TO THE DERRICKS, MAST AND DECKS.

倘若全部人字吊臂及上述的工具是於同日進行徹底檢驗，可在第(1)欄內寫上「全部人字吊臂及上述的工具」。否則須清楚說明在所述日期曾被徹底檢驗的各部件。第(3)欄應清楚說明在每四年一次的徹底檢驗中曾拆下檢驗的部件。

If all the derricks and above-named gear are thoroughly examined on the same date, it will be sufficient to enter in column (1) "All derricks and above-named gear". If not, the parts which have been thoroughly examined on the dates stated must be clearly indicated. Column (3) should show clearly the parts being dismantled at the quadrennial thorough examination.

接受檢驗的人字吊臂及固定配件的位置及說明，及其可資識別的號碼或記號(如有)　(須提供足夠資料以識別該人字吊臂，例如：船艙編號，吊桿長度，索具布置資料等) Situation and description of derrick and permanent attachments examined, with distinguishing number or mark (if any) (Sufficient particulars must be given to identify the derrick - e.g. the number of the hold, length of the derrick boom, rigging particulars, etc.) **(1)**	**測試及檢驗證明書編號** Number of Certificate of Test and Examination **(2)**	**現證明第(1)欄內所示的人字吊臂及固定配件曾於本人附加簽署的日期由本人進行徹底檢驗，並無發現任何足以影響其安全工作情況的缺點，而其他發現的缺點已列於第(3)欄。** I certify that on the date to which I have appended my signature the derrick and permanent attachments shown in column (1) was thoroughly examined by me and no defects affecting its safe working condition were found and other defects found are shown in column (3). **合資格檢驗員的簽署、姓名、資格和聯絡電話及日期** Signature, name, qualification and contact telephone number of competent examiner and date	**備註(用縮寫簽署及註明日期)** Remarks (To be initialled and dated) **(3)**
		(簽署Signature)　姓名 Name : ..... **資格** Qualification : ..... **聯絡電話** Contact Telephone No.: ..... **日期** Date :	
		(簽署Signature)　姓名 Name : ..... **資格** Qualification : ..... **聯絡電話** Contact Telephone No.: ..... **日期** Date :	
		(簽署Signature)　姓名 Name : ..... **資格** Qualification : ..... **聯絡電話** Contact Telephone No.: ..... **日期** Date :	

第二部份
PART 2

起重裝置及其附件工具(人字吊臂及其固定配件除外)的週年徹底檢驗及每四年一次的徹底檢驗
ANNUAL AND QUADRENNIAL THOROUGH EXAMINATION OF LIFTING APPLIANCES AND ACCESSORY GEAR OTHER THAN DERRICKS AND PERMANENT ATTACHMENTS THERETO

倘若全部起重裝置及其附件工具是於同日進行徹底檢驗，可在第(1)欄內寫上「全部起重裝置及其上述工具」。否則須清楚說明在所述日期曾被徹底檢驗的各部件。第(3)欄應清楚說明在每四年一次的徹底檢驗中曾拆下檢驗的部件。

If all the lifting appliances and above-named gear are thoroughly examined on the same date, it will be sufficient to enter in column (1) "All lifting appliances and above-named gear". If not, the parts which have been thoroughly examined on the dates stated must be clearly indicated. Column (3) should show clearly the parts being dismantled at the quadrennial thorough examination.

接受檢驗的起重裝置及其附件工具的位置及說明，及其可資識別的號碼或記號(如有)　(須提供足夠資料以識別該起重裝置，例如：船艙編號、起重機型號及識別編號、吊臂長度，索具布置資料等) Situation and description of lifting appliances and accessory gear examined, with distinguishing number or mark (if any) (Sufficient particulars must be given to identify the lifting appliance - e.g. the number of the hold, model number and identification number of the crane, length of the jib, rigging particulars, etc.) **(1)**	**測試及檢驗證明書編號** Number of Certificate of Test and Examination **(2)**	**現證明第(1)欄內所示的起重裝置及其附件工具曾於本人附加簽署的日期由本人進行徹底檢驗，並無發現任何足以影響其安全工作情況的缺點，而其他發現的缺點已列於第(3)欄。** I certify that on the date to which I have appended my signature the lifting appliances and accessory gear shown in column (1) was thoroughly examined by me and no defects affecting its safe working condition were found and other defects found are shown in column (3). **合資格檢驗員的簽署、姓名、資格和聯絡電話及日期** Signature, name, qualification and contact telephone number of competent examiner and date	**備註(用縮寫簽署及註明日期)** Remarks (To be initialled and dated) **(3)**
		(簽署Signature)　姓名 Name : ..... **資格** Qualification : ..... **聯絡電話** Contact Telephone No.: ..... **日期** Date :	
		(簽署Signature)　姓名 Name : ..... **資格** Qualification : ..... **聯絡電話** Contact Telephone No.: ..... **日期** Date :	
		(簽署Signature)　姓名 Name : ..... **資格** Qualification : ..... **聯絡電話** Contact Telephone No.: ..... **日期** Date :	

第三部份 起重工具的週年徹底檢驗

PART 3 ANNUAL THOROUGH EXAMINATION OF LIFTING GEAR

所有鏈條(附於人字吊臂或桅杆上的制動鏈除外)及所有環、鉤、鉤環或轉環及滑輪組，均須每12個月由合資格檢驗員徹底檢驗至少一次。

All chains, other than bridle chains attached to derricks or masts, and all rings, hooks, shackles, swivels and pulley blocks shall be thoroughly examined by a competent examiner once at least in every 12 months.

接受檢驗的起重工具的位置及說明，及其可資識別的號碼或記號 Situation and description of lifting gear examined, with distinguishing number or mark **(1)**	**測試及檢驗證明書編號** Number of Certificate of Test and Examination **(2)**	**現證明第(1)欄內所示的起重工具曾於本人附加簽署的日期由本人進行徹底檢驗，並無發現任何足以影響其安全工作情況的缺點，而其他發現的缺點已列於第(3)欄。** I certify that on the date to which I have appended my signature the gear shown in column (1) was thoroughly examined by me and no defects affecting its safe working condition were found and other defects found are shown in column (3). **合資格檢驗員的簽署、姓名、資格和聯絡電話及日期** Signature, name, qualification and contact telephone number of competent examiner and date	**備註(用縮寫簽署及註明日期)** Remarks (To be initialled and dated) **(3)**
		(簽署Signature) 姓名Name : ..... **資格** Qualification : ..... **聯絡電話**Contact Telephone No.: ..... **日期**Date :	
		(簽署Signature) 姓名Name : ..... **資格** Qualification : ..... **聯絡電話**Contact Telephone No.: ..... **日期**Date :	
		(簽署Signature) 姓名Name : ..... **資格** Qualification : ..... **聯絡電話**Contact Telephone No.: ..... **日期**Date :	

起重工具的週期檢查
PERIODIC INSPECTIONS OF LIFTING GEAR

所有鏈條(附於人字吊臂或桅杆上的制動鏈除外)及所有環、鉤、鉤環或轉環及滑輪組，均須於緊接其每次使用之前由合資格的人檢查，但如已於前3個月內接受檢查，則屬例外。

All chains, other than bridle chains attached to derricks or masts, and all rings, hooks, shackles, swivels and pulley blocks shall be inspected by a competent person immediately before each occasion on which they are used, unless they have been inspected within the preceding 3 months.

現證明第(1)欄內所示的起重工具曾於本人附加簽署的日期由本人進行檢查，並無發現任何足以影響其安全工作情況的缺點，而其他發現的缺點已列於第(4)欄。

I certify that on the date to which I have appended my signature the gear shown in column (1) was inspected by me and no defects affecting its safe working condition were found and other defects found are shown in column (4).

合資格的人的簽署、姓名及日期 Signature and name of competent person and date			**備註(用縮寫簽署及註明日期)** Remarks (To be initialled and dated) (4)
（**簽署** Signature） **姓名** Name : ..... **日期** Date :	（**簽署** Signature） **姓名** Name : ..... **日期** Date :	（**簽署**Signature） **姓名** Name : ..... **日期** Date :	
（**簽署** Signature） **姓名** Name : ..... **日期** Date :	（**簽署** Signature） **姓名** Name : ..... **日期** Date :	（**簽署** Signature） **姓名**Name : ..... **日期**Date :	
（**簽署** Signature） **姓名** Name : ..... **日期** Date :	（**簽署** Signature） **姓名** Name : ..... **日期** Date :	（**簽署** Signature） **姓名** Name : ..... **日期** Date :	

第四部份 **鋼絲纜索的週期檢查**

PART 4 PERIODIC INSPECTIONS OF WIRE ROPES

所有一般作升降之用的鋼絲纜索，須每3個月由合資格的人檢查至少一次，但在上述纜索有任何鋼絲斷裂後，則須每一個月檢查至少一次。

Every wire rope in general use for hoisting or lowering shall be inspected by a competent person once at least in every 3 months, except that after any wire has broken in such rope it shall be inspected once at least in every month.

接受檢查的鋼絲纜索的尺碼及說明，及其可資識別的號碼或記號(如有) Size and description of wire ropes inspected, with distinguishing number or mark (if any) (1)	**測試及檢驗證明書編號** Number of Certificate of Test and Examination (2)	**現證明第(1)欄內所示的鋼絲纜索曾於本人附加簽署的日期由本人進行檢查，並無發現任何足以影響其安全工作情況的缺點，而其他發現的缺點已列於第(3)欄。** I certify that on the date to which I have appended my signature the wire ropes shown in column (1) was inspected by me and no defects affecting its safe working condition were found and other defects found are shown in column (3).	
		合資格的人的簽署、姓名及日期 Signature and name of competent person and date	**備註(用縮寫簽署及註明日期)** Remarks (To be initialled and dated) (3)
		_____ **(簽署** Signature) **姓名** Name : ..... **日期** Date :	
		_____ **(簽署** Signature) **姓名** Name : ..... **日期** Date :	
		_____ **(簽署** Signature) **姓名** Name : ..... **日期** Date :	

測試證明書編號 Test Certificate No. …… **表格二**
FORM 2

HKSAR Emblem

香港特別行政區政府海事處
MARINE DEPARTMENT
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

船舶及港口管制(工程)規例
商船(本地船隻)(工程)規例
SHIPPING AND PORT CONTROL (WORKS) REGULATIONS
MERCHANT SHIPPING (LOCAL VESSELS) (WORKS) REGULATION

海事處處長指明的表格

絞車、人字吊臂及其附件工具的測試及檢驗證明書

Form specified by the Director of Marine for

CERTIFICATE OF TEST AND EXAMINATION OF WINCHES, DERRICKS AND THEIR ACCESSORY GEAR

船名 Name of vessel: ……　　**牌照編號/船舶登記號碼** Licence No./ Official No.: ……

起重裝置擁有人的名稱 Name of owner of the lifting appliance: ……

起重裝置製造日期 Date of manufacture of the lifting appliance: ……

起重裝置及附件工具的位置及說明，及其可資識別的號碼或記號(如有)(須提供足夠資料以識別該起重裝置，例如：船艙編號，吊桿長度，索具布置資料等) Situation and description of lifting appliance and accessory gear, with distinguishing number or mark (if any) (Sufficient particulars must be given to identify the lifting appliance - e.g. the number of the hold, length of the derrick boom, rigging particulars, etc.) (1)	**試驗時，吊桿與水平線的角度** Angle to the horizontal of derrick boom while the load was applied (2)	**施加的驗證負荷(以公噸為單位)** Proof load applied (tonnes) (3)	**在第(2)欄所示的角度時的安全操作負荷(以公噸為單位)** Safe working load at the angle shown in column (2). (tonnes) (4)

(5) **已進行的特殊功能測試** (例如：防障控制、用以載人的慢速和緊急停止)： ……

Special functional tests done (e.g. failsafe control, slow speed and emergency stop for carrying persons) : ……

本人(合資格檢驗員姓名) ……，**現證明本人曾於二○　　年　　月　　日依照《船舶及港口管制(工程)規例》/《商船(本地船隻)(工程)規例》附表一的規定，在該船隻上測試及檢驗本證明書所指的裝置及其附件工具，該起重裝置及其附件工具曾承受驗證負荷而並無損壞及永久變形，且上述各項均屬確實無訛。**

I (name of competent examiner) ..... , hereby certify that on ..... 20 ..... the appliance together with the accessory gear described in this certificate was tested and examined by me on the vessel in accordance with the Schedule 1 of Shipping and Port Control (Works) Regulations / Merchant Shipping (Local Vessels) (Works) Regulation, that it had withstood the proof load without injury or permanent deformation, and that the above particulars are correct.

合資格檢驗員簽署 ..... **簽發日期** .....
Signature of Competent Examiner Date of Certificate

資格 Qualification : .....

通訊地址Corresponding Address: .....

.....

電話號碼 Tel.No. : .....

傳真號碼 Fax.No. : .....

本表格的編訂是根據國際勞工組織認可的測試及檢驗船上裝卸貨物的起重機械及工具標準國際證明書格式
This form is based on the standard international form of certificate approved by the International Labour Organisation for the test and examination of lifting machinery and gear used in the loading and unloading of ships.

附註

甲. 在驗證前，合資格檢驗員須對該起重裝置及起重工具的設計、構造、強度、布置和安全系數滿意，及對在測試及檢驗證明書上說明的安全操作負荷，認為合適及滿意。合資格檢驗員應遵從《本地船隻上的人字吊臂起重機強度計算、測試及檢驗工作守則》及《沿岸貨船起重設備安全標準》提供的指引。

乙. 船舶及港口管制(工程)規例、及商船(本地船隻)(工程)規例訂明，絞車連同其附件的測試與檢驗程序如下：

1. (1) 每一絞車連同其附件(包括任何人字吊臂、鵝頸形管、環端板、有眼螺栓或其他配件)均須以超逾安全操作負荷的驗證負荷進行測試，超逾之量如下 -

(a) 如安全操作負荷低於20公噸，則驗證負荷須超逾安全操作負荷最少百分之二十五；

(b) 如安全操作負荷為20公噸或以上但不高於50公噸，則驗證負荷須超逾安全操作負荷最少5 公噸；

(c) 如安全操作負荷高於50公噸，則驗證負荷須超逾安全操作負荷最少百分之十。

(2) 驗證負荷須以下列任何方式施加 -

(a) 升起可移動的定量重物；或

(b) 使用彈簧或液壓水平秤或類似裝置，

按測試證明書內指明的人字吊臂與水平線之間的角度施加。

(3) 如屬第(2)(a)節施加的驗證負荷，則在可移動的定量重物升起後，人字吊臂須在切實可行範圍內盡可能先向一個方向擺動，再反向擺動；如屬第(2)(b)節施加的驗證負荷，在施加的驗證負荷時人字吊臂須在切實可行範圍內盡可能先向一個方向擺動，再反向擺動。

2. 測試後，每部起重裝置(包括其附件)及所有起重工具均須予以檢驗，以確保並無起重裝置或起重工具的任何部份在測試中受損害。為對滑輪組進行檢驗，滑輪組的輪子及輪栓須予除下。

丙. 試吊驗證負荷時，人字吊臂應以正常索具佈置，及吊桿與水平線的角度不應超逾30度，若不實際可行時，以最低可行角度，惟不應超逾45度驗證。測試時的角度應註明在本表格第(2)欄內。所有驗證負荷應以準確的秤覆檢。

丁. 施行測試時，應在實際可行下儘可能使用可移動的定量重物；在船隻上測試起重裝置時，應常使用可移動的定量重物。若在更換或更新後而並未備有可移動的定量重物，則可使用準確的彈簧或液壓水平秤，而此等測試不

應被確定為滿意，除非儀器的負荷指示器顯示有不少於五分鐘的穩定負荷時段。

戊. 第⑷欄的安全操作負荷適用於搖擺的人字吊臂或人字吊臂起重機。當使用固定的人字吊臂時，例如"雙桿連吊法"，重要的是，應以人字吊臂的實際使用情況及索具布置方式去確定安全操作負荷。當測試時，所有在正常時操作的動作應以慢速進行。

己. 若然是重型人字吊臂，應小心布置圍帶及牽索。

庚. "公噸"意指一"公噸"是一千千克。

Notes

A. The competent examiner should satisfy himself prior to proof testing that the design, construction, strength and arrangement of the lifting appliances and lifting gear are adequate with a good factor of safety for the appropriate safe working load as shown in the certificate of test and examination. The competent examiner should observe the guidance provided in the Code of Practice, such as 《Code of Practice for Strength Calculations, Test and Examination of Derrick Cranes on Local Vessels》 and 《Code of Practice - Safety Standard of Coastal Cargo Ship Lifting Appliances》.

B. Shipping and Port Control (Works) Regulations and Merchant Shipping (Local Vessels) (Works) Regulation state that the procedure for testing and examining winches together with their accessory gear is as follows:

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 or more 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 the derrick at an angle to the horizontal which shall be specified in the certificate of the test.
   (3) In the case of sub-paragraph (2)(a), after the movable weights have been hoisted, the derrick shall be swung as far as practicable first in one direction and then in the other and in the case of sub-paragraph (2)(b) the proof load shall be applied with the derrick swung as far as practicable first in one direction and then in the other.
2. After being tested, each lifting appliance (including its accessories) and all lifting 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 examinations of a pulley block the sheaves and pins of the block shall be removed.

C. The proof load should be lifted with normal tackle with a derrick at an angle which should not be more than 30 degrees to the horizontal, or, when this is impracticable, at the lowest practicable angle but not exceeding 45 degrees. The angle at which the test was made should be inserted in column 2. All proof loads should be verified by an accurate weighing device.

D. In carrying out tests, movable weights should be used whenever practicable; they should always be used in the testing of lifting appliances aboard vessels. In the case of testing replacement or renewals where movable weights may not be available, an accurate spring or hydraulic balance may be used, in which case the test should not be regarded as satisfactory unless the indicator of the instrument remains constant under loads for a period of at least 5 minutes.

E. The safe working load in column 4 is applicable to a swinging derrick or derrick cranes. When using fixed derricks, such as 'Union Purchase' it is important that the safe working load should be determined with due regard to the actual conditions of use and the manner of rigging the derricks. All the motions which occur in normal operation should be carried out at a slow speed during the test.

F. In the case of heavy derricks, care should be taken that the appropriate shrouds and stays are rigged.

G. The expression 'tonne' means a 'tonne' of 1000 kilograms.

測試證明書編號 Test Certificate No. …….　　**表格三**
FORM 3

HKSAR Emblem

香港特別行政區政府海事處
MARINE DEPARTMENT
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

船舶及港口管制(工程)規例
商船(本地船隻)(工程)規例
SHIPPING AND PORT CONTROL (WORKS) REGULATIONS
MERCHANT SHIPPING (LOCAL VESSELS) (WORKS) REGULATION

海事處處長指明的表格

起重裝置及其附件工具(人字吊臂除外)的測試及檢驗證明書

Form specified by the Director of Marine for

CERTIFICATE OF TEST AND EXAMINATION OF LIFTING APPLIANCES AND THEIR ACCESSORY GEAR OTHER THAN DERRICKS

船名 Name of vessel: ……　　**牌照編號/船舶登記號碼** Licence No./Official No.: ….....……

起重裝置擁有人的名稱 Name of owner of the lifting appliance: …..……..……

起重裝置製造日期 Date of manufacture of the lifting appliance: ……

起重裝置及附件工具的位置及說明，及其可資識別的號碼或記號(如有)（須提供足夠資料以識別該起重裝置，例如：船艙編號，起重機型號及識別編號，吊臂長度，索具資料等） Situation and description of lifting appliance and accessory gear, with distinguishing number or mark (if any) (Sufficient particulars must be given to identify the lifting appliance - e.g. the number of the hold, model number and identification number of the crane, length of the jib, rigging particulars, etc.) (1)	**如為吊臂起重機，施加驗證負荷時的半徑(以米為單位)** For jib cranes, radius at which the proof load was applied (metres) (2)	**施加的驗證負荷(以公噸為單位)** Proof load applied (tonnes) (3)	**安全操作負荷(如為吊臂起重機，在第(2)欄所示的半徑時)(以公噸為單位)** Safe working load (for jib cranes at radius shown in column (2)). (tonnes) (4)

(5) **已進行的特殊功能測試**（例如：防障控制、用以載人的慢速和緊急停止）：　…….....…….
Special functional tests done (e.g. failsafe control, slow speed and emergency stop for carrying persons)：……..……..

本人(合資格檢驗員姓名) ……..，**現證明本人曾於二○　　年　　月　　日 依照《船舶及港口管制(工程)規例》/《商船(本地船隻)(工程)規例》附表一的規定，在該船隻上測試及檢驗本證明書所指的起重裝置及其附件工具，該起重裝置及其附件工具曾承受驗證負荷而並無損壞及永久變形，且上述各項均屬確實無訛。**

I (name of competent examiner) ..... , hereby certify that on …… 20 …… the lifting appliance together with the accessory gear described in this certificate was tested and examined by me on the vessel in accordance with the Schedule 1 of Shipping and Port Control (Works) Regulations / Merchant Shipping (Local Vessels) (Works) Regulation, that it had withstood the proof load without injury or permanent deformation, and that the above particulars are correct.

合資格檢驗員簽署 …….. **簽發日期** ……..…….....
Signature of Competent Examiner Date of Certificate

資格 Qualification : ……

通訊地址Corresponding Address: ……

……

電話號碼 Tel.No. : ……

傳真號碼 Fax.No. : ……

本表格的編訂是根據國際勞工組織認可的測試及檢驗船上裝卸貨物的起重機械及工具標準國際證明書格式

This form is based on the standard international form of certificate approved by the International Labour Organisation for the test and examination of lifting machinery and gear used in the loading and unloading of ships.

附註

甲. 在驗證前，合資格檢驗員須對該起重裝置及起重工具的設計、構造、強度、布置和安全系數滿意，及對在測試及檢驗證明書上說明的安全操作負荷，認為合適及滿意。

乙. 船舶及港口管制(工程)規例、及商船(本地船隻)(工程)規例訂明，起重裝置的測試與檢驗程序如下：

1. (1) 每部起重機及每部其他的起重裝置連同其附件(人字吊臂起重裝置除外)，均須以超逾安全操作負荷的驗證負荷進行測試，超逾之量如下 -

(a) 如安全操作負荷低於20公噸，則驗證負荷須超逾安全操作負荷最少百分之二十五；

(b) 如安全操作負荷為20公噸或以上但不高於50公噸，則驗證負荷須超逾安全操作負荷最少5 公噸；

(c) 如安全操作負荷高於50公噸，則驗證負荷須超逾安全操作負荷最少百分之十。

(2) 驗證負荷須先被升起，然後在切實可行範圍內盡可能先向一個方向擺動，再反向擺動。

(3) 如要測試具有可變垂直操作半徑的吊臂的起重機，則須按照第(1)節的規定，在吊臂處於最大及最小操作半徑的位置時施加驗證負荷以進行測試。

(4) 測試液壓起重機或吊重機時，凡因壓力限制而不可能升起超逾安全操作負荷百分之二十五的負荷物，則如已對起重機施加最大的負荷，即為已符合本段的規定。

2. 測試後，每部起重裝置(包括其附件)及所有起重工具均須予以檢驗，以確保並無起重裝置或起重工具的任何部份在測試中受損害。為對滑輪組進行檢驗，滑輪組的輪子及輪栓須予除下。

丙. 所有驗證負荷應以準確的秤覆檢。當以超逾安全操作負荷的驗證負荷進行測試時，所有在正常時操作的動作應以慢速進行。

丁. 起重機亦應以適當的安全操作負荷進行測試。測試時，所有在正常時操作的動作應以正常速度進行。

戊. "公噸"意指一"公噸"是一千千克。

Notes

A. The competent examiner should satisfy himself prior to proof testing that the design, construction, strength and arrangement of the lifting appliances and lifting gear are adequate with a good factor of safety for the appropriate safe working load as shown in the certificate of test and examination.

B. Shipping and Port Control (Works) Regulations and Merchant Shipping (Local Vessels) (Works) Regulation state that the procedure for testing and examining lifting appliances is as follows:

1. (1) Every crane and every other lifting appliance, together with its accessories (other than a derrick) 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 or more 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 or hoist 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.

2. After being tested, each lifting appliance (including its accessories) and all lifting 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 examinations of a pulley block the sheaves and pins of the block shall be removed.

C. All proof loads should be verified by an accurate weighing device. All the motions which occur in normal operation should be carried out at a slow speed during the test with a proof load which exceeds the safe working load.

D. Cranes should also be tested with the appropriate safe working load and all motions which occur in normal operation should be carried out at normal speed during the test.

E. The expression 'tonne' means a 'tonne' of 1000 kilograms.

測試證明書編號 Test Certificate No.: ……..…. **表格四**
FORM 4

HKSAR Emblem

香港特別行政區政府海事處
MARINE DEPARTMENT
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

船舶及港口管制(工程)規例
商船(本地船隻)(工程)規例
SHIPPING AND PORT CONTROL (WORKS) REGULATIONS
MERCHANT SHIPPING (LOCAL VESSELS) (WORKS) REGULATION

海事處處長指明的表格
滑輪組的測試及檢驗證明書

Form specified by the Director of Marine for
CERTIFICATE OF TEST AND EXAMINATION OF PULLEY BLOCKS

船名 Name of vessel: …… **牌照編號/船舶登記號碼** Licence No./Official No. : …..……

滑輪組擁有人的名稱 Name of owner of the pulley block: ..……

滑輪組的製造商或供應商的名稱及地址：.....
Name and address of the maker or supplier .....

可資識別的號碼或記號 Distinguishing number or mark	**滑輪組的說明** Description of pulley block			**測試及檢驗日期** Date of test and examination	**施加的驗證負荷(以公噸為單位)** Proof load applied (tonnes)	**安全操作負荷(以公噸為單位)** Safe working load (tonnes)
	輪子的外直徑(以毫米為單位) Outside diameter of sheave (millimetres)	**說明軸栓及接頭配件是否用軟或高拉力鋼製造** State whether the axle pin and head fitting are of mild or high tensile steel	**接受測試及檢驗的數目** Number tested and examined			
(1)	(2)	(3)	(4)	(5)	(6)	(7)

本人(合資格檢驗員姓名) ……..…. , **現證明本人曾於二○ 年 月 日 依照《船舶及港口管制(工程)規例》/《商船(本地船隻)(工程)規例》附表一的規定，測試及檢驗本證明書所指的滑輪組，該滑輪組承受驗證負荷後被拆除檢驗，確定曾承受驗證負荷而並無變形，無裂縫、裂痕或其他毛病，且上述各項均屬確實無訛。**

I (name of competent examiner) ……...……...…… hereby certify that on …… 20 …… the pulley blocks described in this certificate were tested and examined by me in accordance with the Schedule 1 of Shipping and Port Control (Works) Regulations / Merchant Shipping (Local Vessels) (Works) Regulation, that the sheaves and pins of the pulley blocks were removed after the application of the proof load and all parts then examined and found to have withstood the proof load without deformation and to be free from cracks, flaws or other defects, and that the above particulars are correct.

合資格檢驗員簽署 …….. **簽發日期** ……..…….....
Signature of Competent Examiner Date of Certificate

資格 Qualification : ……..……

通訊地址Corresponding Address: ……
……

電話號碼 Tel.No. : ……

傳真號碼 Fax.No. : ……

本表格的編訂是根據國際勞工組織認可的測試及檢驗船上裝卸貨物的起重機械及工具標準國際證明書格式

This form is based on the standard international form of certificate approved by the International Labour Organisation for the test and examination of lifting machinery and gear used in the loading and unloading of ships.

附註

甲. 船舶及港口管制(工程)規例、及商船(本地船隻)(工程)規例訂明，滑輪組的測試與檢驗程序如下：

1. 每一起重工具(不論是否任何起重裝置的附件)，均須按照下述條文以驗證負荷進行測試 -

(a) 如該起重工具為單輪滑輪組，或如有一個 環附加其上，則驗證負荷最少須為安全操作負荷的4倍；

(b) 如該起重工具為複輪滑輪組，而其安全操作負荷不高於20公噸，則驗證負荷最少須為安全操作負荷的兩倍；

(c) 如該起重工具為複輪滑輪組，而其安全操作負荷高於20公噸但不高於40公噸，則驗證負荷須超逾安全操作負荷最少20公噸。

(d) 如該起重工具為複輪滑輪組，而其安全操作負荷高於40公噸，則驗證負荷最少須為安全操作負荷的1-1/2倍。

2. 測試後，所有起重工具均須予以檢驗，以確保並無起重工具的任何部份在測試中受損害。為對滑輪組進行檢驗，滑輪組的輪子及輪栓須予除下。

乙. "公噸"意指一"公噸"是一千千克。

丙. 此表格不應被用作鏈條、環、 u 環或轉環的測試及檢驗證明書，應該使用表格五。

Notes

A . Shipping and Port Control (Works) Regulations and Merchant Shipping (Local Vessels) (Works) Regulation state that the procedure for testing and examining pulley blocks is as follows:

1. 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 single sheave pulley block or if a shackle is attached thereto, the proof load shall be at least 4 times the safe working load;

(b) if the item is a multiple sheave pulley block with a safe working load of not more than 20 tonnes, the proof load shall be at least twice the safe working load;

(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 pulley block with a safe working load of more than 40 tonnes, the proof load shall be at least 1-1/2 times the safe working load.

2. After being tested, all lifting gear shall be examined so as to ensure that no part of the lifting gear has been damaged during the test. For the purpose of carrying out the examinations of a pulley block the sheaves and pins of the block shall be removed.

B. The expression 'tonne' means a 'tonne' of 1000 kilograms.

C. This form should NOT be used as a certificate of test and examination of chains, rings, hooks, shackles or swivels. Form 5 should be used.

測試證明書編號 Test Certificate No.: …….

表格五
FORM 5

HKSAR Emblem

香港特別行政區政府海事處
MARINE DEPARTMENT
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

船舶及港口管制(工程)規例
商船(本地船隻)(工程)規例
SHIPPING AND PORT CONTROL (WORKS) REGULATIONS
MERCHANT SHIPPING (LOCAL VESSELS) (WORKS) REGULATION

海事處處長指明的表格
起重工具的測試及檢驗證明書

鏈條、鏈式吊索、纜吊索(纖維纜吊索除外)或類似的工具、
環、鏈環、 ų 板、夾鉗、 碾、轉環、有眼螺栓、抓斗及吊籠

Form specified by the Director of Marine for
CERTIFICATE OF TEST AND EXAMINATION OF LIFTING GEAR

CHAINS, CHAIN SLINGS, ROPE SLINGS (except a fibre rope sling) OR SIMILAR GEAR
RINGS, LINKS, HOOKS, PLATES, CLAMPS, SHACKLES, SWIVELS, EYE-BOLTS, GRABS AND CAGES.

船名 Name of vessel: ……

牌照編號/船舶登記號碼
Licence No./Official No. : ....……..…….……

起重工具擁有人的名稱 Name of owner of the lifting gear: ……..…..……

起重工具的製造商、供應商或修理商的名稱及地址：.....….....….....
Name and address of the maker, supplier or repairer .....….....….....

可資識別的號碼或記號 Distinguishing number or mark (1)	**項目說明** **應包括尺碼、材料及任何熱處理的資料** Description of item This should include size, material and particulars of any heat treatment (2)	**接受測試及檢驗的數目** Number tested and examined (3)	**測試及檢驗日期** Date of test and examination (4)	**施加的驗證負荷** **(以公噸為單位)** Proof load applied (tonnes) (5)	**安全操作負荷** **(以公噸為單位)** Safe working load (tonnes) (6)

本人(合資格檢驗員姓名) ……..**, 現證明本人曾於二○ 年 月 日 依照《船舶及港口管制(工程)規例》/《商船(本地船隻)(工程)規例》附表一的規定, 測試及檢驗本證明書所指的起重工具, 該起重工具曾承受驗證負荷而經檢驗後發現並無裂縫、裂痕或其他毛病, 且上述各項均屬確實無訛。**

I (name of competent examiner) ……..…….....…… hereby certify that on …… 20 …… the lifting gear described in this certificate were tested and examined by me in accordance with the Schedule 1 of Shipping and Port Control (Works) Regulations / Merchant Shipping (Local Vessels) (Works) Regulation, that after the application of the proof load and the gear then examined and found to have withstood the proof load and to be free from cracks, flaws or other defects, and that the above particulars are correct.

合資格檢驗員簽署 …….. **簽發日期** ……..…….....
Signature of Competent Examiner Date of Certificate

資格 Qualification : ……..……

通訊地址Corresponding Address: ……

……

電話號碼 Tel.No. : ……

傳真號碼 Fax.No. : ……

本表格的編訂是根據國際勞工組織認可的測試及檢驗船上裝卸貨物的起重機械及工具標準國際證明書格式

This form is based on the standard international form of certificate approved by the International Labour Organisation for the test and examination of lifting machinery and gear used in the loading and unloading of ships.

附註

甲. 船舶及港口管制(工程)規例、及商船(本地船隻)(工程)規例訂明，起重工具的測試與檢驗程序如下：

1. 每一起重工具(不論是否任何起重裝置的附件)，均須按照下述條文以驗證負荷進行測試 -

(a) 如該起重工具為鏈條、環、 u 環或轉環，則驗證負荷最少須為安全操作負荷的兩倍。

2. 測試後，所有起重工具均須予以檢驗，以確保並無起重工具的任何部份在測試中受損害。

乙. 測試抓斗時，凡因設計限制而不可能抓起超逾安全操作負荷百分之二十五的負荷物，如已對抓斗施加最大的負荷，即為已符合要求。

丙. "公噸"意指一"公噸"是一千千克。

丁. 此表格不應被用作滑輪組的測試及檢驗證明書，應該使用表格四。

戊. 此表格不應被用作鋼絲纜索的測試及檢驗證明書，應該使用表格六。

Notes

A . Shipping and Port Control (Works) Regulations and Merchant Shipping (Local Vessels) (Works) Regulation state that the procedure for testing and examining lifting gear is as follows:

1. 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, ring, hook, shackle, or swivel, the proof load shall be at least twice the safe working load.
2. After being tested, all lifting gear shall be examined so as to ensure that no part of the lifting gear has been damaged during the test.

B. Where in testing a grab it is, because of the limitation in design, impossible to grab a load which exceeds the safe working load by 25 per cent, it is sufficient compliance with requirements if the grab has the greatest possible load applied to it.

C. The expression 'tonne' means a 'tonne' of 1000 kilograms.

D. This form should NOT be used as a certificate of test and examination of pulley blocks. Form 4 should be used.

E. This form should NOT be used as a certificate of test and examination of wire rope. Form 6 should be used.

測試證明書編號 Test Certificate No.: ……　　表格六
FORM 6

HKSAR Emblem

香港特別行政區政府海事處
MARINE DEPARTMENT
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

船舶及港口管制(工程)規例
商船(本地船隻)(工程)規例
SHIPPING AND PORT CONTROL (WORKS) REGULATIONS
MERCHANT SHIPPING (LOCAL VESSELS) (WORKS) REGULATION

海事處處長指明的表格
鋼絲纜索的測試及檢驗證明書

Form specified by the Director of Marine for
CERTIFICATE OF TEST AND EXAMINATION OF WIRE ROPE

船名 Name of vessel: ……　　**牌照編號/船舶登記號碼** Licence No./Official No. : ……..……...……

鋼絲纜索擁有人的名稱 Name of owner of the wire rope: ……..……..

鋼絲纜索的製造商或供應商的名稱及地址：.....
Name and address of the maker or supplier .....

鋼絲纜索的尺碼 (說明直徑或圓周) Size of wire rope (state whether diameter or circumference)	
索股數目 Number of strands	
每股鋼絲數目 Number of wires per strand	
捻索法 Lay	
鋼絲的拉力強度 Tensile strength of wire	
鋼絲纜索樣本的測試日期 Date of test of sample of the wire rope	
此樣本斷裂時的負荷 (以公噸為單位) Load at which this sample broke (tonnes)	
安全操作負荷 (以公噸為單位) Safe working load (tonnes) **說明任何限制條件，例如滑輪的最小直徑、直接拉力負荷等** State any qualifying conditions, such as minimum pulley diameter, direct tensile load, etc.	

本人(合資格檢驗員姓名) …… 現證明本人曾於二〇　　年　　月　　日 依照《船舶及港口管制(工程)規例》/《商船(本地船隻)(工程)規例》附表一的規定，測試及檢驗本證明書所指的鋼絲纜索，且上述各項均屬確實無訛。

I (name of competent examiner) ……...……...…...… hereby certify that on …… 20 ……. the wire rope described in this certificate was tested and examined by me in accordance with the Schedule 1 of Shipping and Port Control (Works) Regulations / Merchant Shipping (Local Vessels) (Works) Regulation, and that the above particulars are correct.

合資格檢驗員簽署 …….. **簽發日期** ……..…....
Signature of Competent Examiner Date of Certificate

資格 Qualification : ……...……

通訊地址Corresponding Address: ……
……

電話號碼 Tel.No. : ……

傳真號碼 Fax.No. : ……

本表格的編訂是根據國際勞工組織認可的測試及檢驗船上裝卸貨物的起重機械及工具標準國際證明書格式

This form is based on the standard international form of certificate approved by the International Labour Organisation for the test and examination of lifting machinery and gear used in the loading and unloading of ships.

附註

甲. 船舶及港口管制(工程)規例、及商船(本地船隻)(工程)規例訂明，鋼絲纜索的測試與檢驗程序如下：

凡測試鋼絲纜索，纜索樣本須測試至其毀壞，而鋼絲纜索的安全操作負荷不得超逾該測試樣本的斷裂負荷的百分之二十。

乙. 如果鋼絲纜索被用作吊索或吊索組合時，其安全操作負荷不能超逾該纜索的最低斷裂負荷的五分之一。

丙. "公噸"意指一"公噸"是一千千克。

Notes

A. Shipping and Port Control (Works) Regulations and Merchant Shipping (Local Vessels) (Works) Regulation state that the procedure for testing and examining wire rope is as follows:

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.

B. In the case of a wire rope used as a sling or in a sling assembly, the safe working load of the rope itself should not exceed one-fifth of the minimum breaking load of the rope.

C. The expression 'tonne' means a 'tonne' of 1000 kilograms.