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# UNIT 3 LOADING OF CARGO AND CARGO REGULATIONS

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## 3.1 INTRODUCTION

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A code is a collection of requirements, which pertain to a specific subject, to regulate specific practices to be followed for the safety of the ship, crew, cargo and environment.

The purpose of the codes is to provide guidelines to have safer ships, safe environment and safe carriage of cargoes. The codes help us in making sure to protect the safety, health and welfare of the crew. They provide uniformity in followed practices in the maritime industry and also provide consistent standards.

### Objectives

After learning this unit, you would familiarize yourself with:

- basic aims, purpose, contents and applicability of various codes,
- the characteristics of different cargoes,
- precautions required to be taken when loading, stowing, securing, carrying or discharging cargo,
- procedures to be followed for preparing cargo hold/ tanks prior loading cargoes, and
- precautions taken when securing cargoes.

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## 3.2 DOCK LABOUR REGULATIONS

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The Dock Labour Regulations address different issues regarding various processes" that includes all work which is required for the loading or unloading of cargo into or from a ship and is done on board the ship or alongside it. These issues will be mainly with regard to safety of the labour employed to carry out the processes at the docks within a port.

The Dock Labour Regulations are standardized by the International Labour Organization (ILO). However, some countries (e.g. India) have certain additional requirements. The dock labour regulations will generally apply to the entire country, though some local areas or specialized equipments may have additional requirements.

Chief inspector will be appointed by the government of the concerned country who in turn will appoint inspectors at all major ports to confirm that a ship complies with the regulations. The inspector, along with his team, is authorized to board a vessel which is loading or discharging. The inspector then makes examination of the premises of the ship and the machinery and gear, fixed or loose, used for the working of the cargo and of any prescribed registers and notices. The examinations will include the lifting gear. He/she may additionally take, on the spot comments or otherwise such evidence of any person as he may deem necessary for carrying out the purposes of this regulations. However, all ships are not necessarily boarded by the inspector.

With regard to the lifting appliances, the inspector may check the chain register (cargo gear book) for a record of proper testing by a competent person or authority and certification. Certificates of all blocks, wires, loose gear and other relevant parts of the lifting appliance must be filed properly to confirm the lifting appliance is in a good condition and safe to operate. The current rigging plan may also be scrutinized. The inspector may physically check the appliance and its accessories to confirm its safety or at times even ask the ship's staff to demonstrate the use of the appliance.

Once convinced that the appliance is safe for use, permission is granted for carrying out the process using the lifting appliances. It is of utmost importance to note that the inspectors can exercise the powers bestowed upon them by these regulations.

A sample of crane certificate and a wire certificate are shown in the **Appendix** at the end of this unit.

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## 3.3 CODE OF SAFE PRACTICE FOR SOLID BULK CARGOES (BC CODE)

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For more than 100 years cargoes such as grain and coal, etc. have been shipped in bulk. However, in recent years there has been a marked change in the variety of bulk cargoes carried by sea.

Every year millions of tonnes of cargoes such as coals, concentrates, grains, fertilizers, minerals and ores, etc. are being shipped in bulk by sea. During the transportation of these cargoes there have been a number of serious casualties which resulted not only in the loss of the ship but also in loss of life.

The problems involved in the carriage of bulk cargoes were recognised in 1960 in international Conference on Safety of Life at Sea but at that time it was not possible to frame detailed requirements except for the carriage of grain cargoes. The conference did recommend that an internationally acceptable code of safe practice for the shipment of bulk cargoes should be drawn up under the auspices of IMO. This work was undertaken by the organisation's Sub-committee on Containers and cargoes and thereafter several editions of the Code of Safe Practice for Solid Bulk Cargoes (BC Code) have been published, the first appearing in 1965.

The primary aim of code:– To promote safe stowage and shipment of bulk cargoes by:

- (a) Highlighting the dangers associated with the shipment of certain types of bulk cargoes.
- (b) Giving guidance on the procedures to be adopted when shipment of bulk cargoes is contemplated.
- (c) Listing typical materials currently shipped in bulk together with advice on their properties and handling.
- (d) Describing test procedures to be employed to determine various characteristics of the bulk cargo materials.

#### **Hazards associated with the shipment of materials**

- (a) Structural damage due to improper distribution of cargo.
- (b) Loss or reduction of stability during a voyage resulting from:  
A shift of cargo in heavy weather due to cargo having been inadequately trimmed or improperly distributed Cargoes liquefying under the stimulus of vibration and motion of a ship in a seaway and then sliding or flowing to one side of cargo hold.
- (3) Chemical reactions e.g. emission of toxic or explosive gases, spontaneous combustion or severe corrosive effects.

#### **Contents of this code are:**

- Section 1 : Definitions
- Section 2 : General precautions
- Section 3 : Safety of personnel and ship
- Section 4 : Assessment of acceptability of consignments for safe shipment
- Section 5 : Trimming procedures
- Section 6 : Methods of determining the angle of repose
- Section 7 : Cargoes, which may liquefy
- Section 8 : Cargoes which may liquefy: test procedures
- Section 9 : Materials possessing chemical hazards
- Section 10: Transport of solid wastes in bulk
- Section 11: Stowage factor cans version tables
- APPENDIX A: List of bulk materials which may liquefy
- APPENDIX B: List of bulk material possessing chemical hazards
- APPENDIX C: List of bulk materials which are neither liable to liquefy nor to possess chemical hazards
- APPENDIX D: Laboratory test procedures, associated apparatus and standards
- APPENDIX E: Emergency schedule (EmS) for materials listed in appendix b
- APPENDIX F: Recommendations for entering enclosed spaces aboard ships
- APPENDIX G: Procedures for gas monitoring of coal cargoes

**Refer to the BC code for the example form for Enclosed Space Entry Permit.**

#### **SAQ 1**

- (a) Describe the aims and objectives of BC code.
- (b) Describe the hazards associated with the shipment of bulk cargoes.
- (c) Describe the information provided in BC code.

### 3.4 CODE OF PRACTICE FOR THE SAFE LOADING AND UNLOADING OF BULK CARRIERS (BLU CODE)

This code has been developed by the International Maritime Organization to minimize losses of bulk carriers on 27 Nov 1997 vide resolution A.862(20).

The purpose of the code is to assist persons responsible (ship and terminal) for the safe loading or unloading of bulk carriers to carry out their functions and to promote the safety of bulk carriers. The code primarily covers the safety of ships loading and unloading solid bulk cargoes, excluding grain and takes into account the current issues, best practices and legislative requirements.

The recommendations in this code provide guidance to ship-owners, operators of bulk carriers, masters, charterers, shippers and terminal operators for the safe handling, loading and unloading of solid bulk cargoes.

The recommendations are subject to terminal and port requirements or national regulations. Persons responsible for the loading/unloading of bulk carriers should be aware of these regulations and requirements.

Code is divided into six sections which contain following :

- (a) **Definitions:** Section A contains definitions.
- (b) **Suitability of ships and terminals:** It recommends that the ship shall in all respect be able to make fast to the berth safely in port and shall also be able to load bulk cargoes safely.
- (c) **Procedures between ship and shore prior to the ship's arrival:** Exchange of information in detail regarding the ship and terminal as well as port shall take place prior arrival of the vessel. In this case port and terminal information book shall be provided to the vessel prior to its arrival in port.
- (d) **Procedures between the ship and terminal prior to cargo handling:** Loading/unloading plan and ship shore safety checklist need to be agreed upon. This would provide exchange of information on sequence of cargo handling and handling of ballast, emergency procedures and cargo trimming procedures.
- (e) **Cargo loading and handling of ballast:** Loading plan needs to be agreed upon regarding quantity of cargo to be loaded in each pour and quantity of ballast to be discharged during the loading operation.
- (f) **Unloading cargo and handling of ballast:** Unloading plan need to be agreed upon regarding quantity of cargo to be discharged and quantity of ballast to be taken during the unloading operation. Ship as well as terminal are responsible to confirm the methods of cargo operations so as to make sure that the ship is in safe condition at all times.

Apart from the above sections there are five appendices in this code which are as follows:

- (a) Recommended contents of port and terminal information books.
- (b) Loading/unloading plan.
- (c) Ship/shore safety checklist.
- (d) Guidelines for completing the ship/shore safety checklist.
- (e) Form for cargo information.

**SAQ 2**

- (a) Describe the aims and objectives of BLU code.
- (b) Describe the information provided in BC code.

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### **3.5 CODE OF SAFE PRACTICE FOR SHIPS CARRYING TIMBER DECK CARGOES, 1991**

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This code was enacted considering the continuous occurrence of casualties involving shift and loss of timber deck cargoes, the employment of larger and more sophisticated ships in the trade of transporting timber deck cargoes, the introduction of new techniques and the desirability of having more comprehensive safety recommendations in this particular maritime activity.

The purpose of this code is to make recommendations on stowage, securing and other operational safety measures designed to ensure the safe transport of timber deck cargoes.

Although this Code is directed primarily at providing recommendations for the safe carriage of timber deck cargo, appendix B contains recommendations applicable to the under-deck stowage of logs.

This code applies to all ships of 24 meters or, more in length engaged in the carriage of timber deck cargoes. Ships which are provided with and making use of their timber load line should also comply with the requirements of the applicable regulation of the load line convention.

There are six chapters in this code which deals with stability requirements, stowage, securing, personal protection and safety devices and actions to be taken during the voyage. Four appendices in the end deal with advice on stowage practices, general guidelines for the under-deck stowage of logs, stability requirements for passenger and cargo ships under 100 meter in length with respect to ships carrying deck cargoes and text of regulation 44 of the International Convention on Load Lines, 1966.

**SAQ 3**

- (a) Describe the aim of the above mentioned code.
- (b) Is this code applicable to ships carrying timber cargo under deck?

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### 3.6 INTERNATIONAL CODE FOR THE SAFE CARRIAGE OF GRAIN IN BULK (INTERNATIONAL GRAIN CODE)

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In response to the growing need for broader regulation of the carriage of all cargoes which may pose a hazard to ships or personnel, it was decided by the Maritime Safety Committee decided to replace the original chapter VI of the 1974 SOLAS Convention, which contained detailed regulations on the carriage of grain in bulk, with requirements of a more general nature and to place the detailed provisions on grain in a mandatory code.

The contents of the code are as follows:

#### Part A

##### *Specific Requirements*

- (a) Application
- (b) Definitions
- (c) Document of authorization
- (d) Equivalents
- (e) Exemptions for certain voyages
- (f) Information regarding ship's stability and grain loading stability requirements
- (g) Stability requirements
- (h) Stability requirements for existing ships
- (i) Optional stability requirements for ships without documents of authorization carrying partial cargoes of bulk grain
- (j) Stowage of bulk grain
- (k) Strength of grain fittings
- (l) Divisions loaded on both sides
- (m) Divisions loaded on one side only
- (n) Bundling of Bulk Grain
- (o) Over stowing arrangements
- (p) Strapping or lashing
- (q) Securing with wire mesh
- (r) Divisions loaded on both sides

#### Part B

##### *Calculation of assumed heeling moments and general assumptions*

- (a) General assumptions
- (b) Assumed volumetric heeling moment of a filled compartment, trimmed
- (c) Assumed volumetric heeling moment of a filled compartment, untrimmed
- (d) Assumed volumetric heeling moments in trunks
- (e) Assumed volumetric heeling moment of a partly filled compartment
- (f) Other assumptions

#### SAQ 4

- (a) Describe the aim and purpose of Grain Code.

- (b) On which type of ships these rules are applicable?
- (c) What type of information is given in this code?

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### **3.7 INTERNATIONAL CODE FOR SAFE CARRIAGE OF CHEMICALS IN BULK (IBC CODE)**

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The purpose of this Code is to provide an international standard for the safe carriage by sea in bulk of dangerous and noxious liquid chemicals as listed in the Code by prescribing the design and construction standards of ships, regardless of tonnage, involved in such carriage and the equipment they should carry so as to minimize the risk to the ship, to its crew and to the environment, having regard to the nature of the products involved.

The basic philosophy is to assign to each chemical tanker one of the ship types according to the degree of the hazards of the products carried by such ship. Each of the products may have one or more hazardous properties, which include flammability, toxicity, corrosivity and reactivity, as well as the hazards they may present to the environment if accidentally released.

The Code primarily deals with ship design and equipment. In order to ensure the safe transport of the products, the total system must, however, be appraised. Other important facets of the safe transportation of the products, such as training, operation, traffic control and handling in port, are being or will be examined further by the Organization.

#### **SAQ 5**

- (a) Describe the aim and purpose of IBC Code.

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### **3.8 INTERNATIONAL CODE FOR SAFE CARRIAGE OF LIQUIFIED GASES IN BULK (IGC CODE)**

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This Code applies to ships regardless of their size, including those of less than 500 tons gross tonnage, engaged in the carriage of liquefied gases having a vapour pressure exceeding 2.8 bar absolute at a temperature of 37.8°C, and other products as given in the code, when carried in bulk.

The purpose of this Code is to provide an international standard for the safe carriage by sea in bulk of liquefied gases and certain other substances listed in the code, by prescribing the design and construction standards of ships involved in such carriage and the equipment they should carry so as to minimize the risk to the ship, to its crew and to the environment, having regard to the nature of the products involved.

The basic philosophy of the code is one of ship types related to the hazards of the products. Each of the products may have one or more hazardous properties, which include flammability, toxicity, corrosivity and reactivity. A further possible hazard may arise due to the products being transported under cryogenic or pressure conditions. Severe collisions or stranding could lead to cargo tank damage and result in uncontrolled release of the product. Such release could result in evaporation and dispersion of the product and, in some cases, could cause brittle fracture of the ship's hull. The

requirements in the Code are intended to minimize this risk as far as is practicable, based upon present knowledge and technology.

The Code primarily deals with ship design and equipment. Other important facets of the safe transport of the products, such as training, operation, traffic control and handling in port, are being examined further by the Organization.

This code is also dealing with operation of liquefied gas carriers The layout of the Code is in line with the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) adopted by the Maritime Safety Committee.

### **SAQ 6**

- (a) Describe the aims and objective of IGC code.

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## **3.9 INTERNATIONAL MARITIME DANGEROUS GOODS CODE 2004 EDITION**

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The international maritime dangerous goods (IMDG) code has become the standard guide to all aspects of handling dangerous goods and marine pollutants in sea transport. The code lays down basic principles, detailed recommendations for individual substances, materials and articles and a number of recommendations for good operational practice including advice on terminology, packing, labelling, stowage, segregation and handling, and emergency response action.

The two-volume Code is divided into seven parts:

- (a) General provisions, definitions, training.
- (b) Classification.
- (c) Dangerous Goods List with limited quantities exceptions.
- (d) Packing and tank provisions.
- (e) Consignment procedures.
- (f) Construction and testing of packagings, IBCs, large packagings, portable tanks and road tank vehicles.
- (g) Transport operations.

Parts a, b, d, e and f are in Volume 1.

Part c, index and several appendices are in Volume 2.

The Supplement contains the following texts related to the IMDG Code:

Emergency Procedures

Medical First Aid Guide (new edition)

Reporting Procedures

Packing Cargo Transport Units

Safe Use of Pesticides

INF Code (now mandatory)



## SAQ 7

- (a) Describe the aims and objective of IMDG code.
- (b) How many parts are there in IMDG code Volumes 1 and 2 ?
- (c) Describe the contents of supplement of IMDG code.

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### 3.10 CODE OF SAFE PRACTICE FOR CARGO STOWAGE AND SECURING

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The proper stowage and securing of cargoes is of the utmost importance for the safety of life at sea. Improper stowage and securing of cargoes have resulted in numerous serious ship casualties and caused injury and loss of life, not only at sea but also during loading and discharge.

In order to deal with the problems and hazards arising from improper stowage and securing of certain cargoes on ships, the International Maritime Organization has issued guidelines in the form of either Assembly resolutions or circulars adopted by the Maritime Safety Committee; these are listed hereunder.

- Safe stowage and securing of cargo units and other entities in Ships other than cellular container ships.
- Provisions to be included in the Cargo Securing Manual to be carried on board ships.
- Elements to be taken into account when considering the safe stowage and securing of cargo units and vehicles in ships.
- Guidelines for securing arrangements for the transport of road vehicles on Ro-Ro ships.
- IMO/ILO guidelines for packing cargo in freight containers or vehicles.
- Hazards associated with the entry into enclosed spaces, MSC/Circ.487.

The accelerations acting on a ship in a seaway result from a combination of longitudinal, vertical and predominantly transverse motions. The forces created by these accelerations give rise to the majority of securing problems.

The hazards arising from these forces should be dealt with by taking measures both to ensure proper stowage and securing of cargoes on board and to reduce the amplitude and frequency of ship motions.

The purpose of this Code is to provide an international standard to promote the safe stowage and securing of cargoes by:

- Drawing the attention of ship-owners and ship operators to the need to ensure that the ship is suitable for its intended purpose.
- Providing advice to ensure that the ship is equipped with proper cargo securing means.
- Providing general advice concerning the proper stowage and securing of cargoes to minimize the risks to the ship and personnel.
- Providing specific advice on those cargoes which are known to create difficulties and hazards with regard to their stowage and securing.
- Advising on actions which may be taken in heavy sea conditions.

- Advising on actions which may be taken to remedy the effects of cargo shifting.
- In providing such advice, it should be borne in mind that the master is responsible for the safe conduct of the voyage and the safety of the ship, its crew and its cargo.

### General Principles

All cargoes should be stowed and secured in such a way that the ship and persons on board are not put at risk.

The safe stowage and securing of cargoes depend on proper planning, execution and supervision.

Personnel commissioned to tasks of cargo stowage and securing should be properly qualified and experienced.

Personnel planning and supervising the stowage and securing of cargo should have a sound practical knowledge of the application and content of the "Cargo Securing Manual", if provided.

In all cases, improper stowage and securing of cargo will be potentially hazardous to the securing of other cargoes and to the ship itself.

Decisions taken for measures of stowage and securing cargo should be based on the most severe weather conditions which may be expected by experience for the intended voyage.

Ship-handling decisions taken by the master, especially in bad weather conditions, should take into account the type and stowage position of the cargo and the securing arrangements.

### SAQ 8

- (a) Describe the aims and purpose of the above mentioned code.
- (b) Describe the principles involved in securing the cargoes.

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## 3.11 CODE OF PRACTICE: ROLL-ON/ROLL-OFF SHIPS STOWAGE AND SECURING OF VEHICLES

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Following extensive consultation with the shipping industry a Code of Practice on the stowage and securing of vehicles on Ro/Ro ships was published.

This Code of Practice, which includes the standards developed by the International Maritime Organisation, provides guidance and information on safe procedures to be followed during roll-on/roll-off operations in order to reduce the safety risks to people and ships. The Code is addressed to all parties associated with either the design or the operation of the ship or with the design of freight vehicles or with the presentation of vehicles for loading. Sections of the Code deal with: principal sources of danger; the safety of personnel; vehicle decks, ramps and lifting appliances; vehicle suitability for transport by sea; stowage and securing; specialised freight vehicles and cargoes.

## 3.12 HOLD PREPARATION

Prior to commencement of loading, cargo holds should be prepared diligently for receiving cargo. In preparing holds, following are the main points to be taken into consideration but not limited to:

- The hold should thoroughly swept down (washed, if required) taking care to remove all the residues of previous cargo.
- Hold should be fumigated, if required.
- All loose rust and paint should be removed to prevent contamination of cargo.
- Check weather tightness of hatch cover and any defective hatch cover seal should be replaced immediately. Same should be done with hold ventilation flaps.
- Natural and/or mechanical hold ventilation should be checked thoroughly. Spark arresters are fitted over hold ventilators.
- Bilges and strum boxes should be cleaned and checked and bilge suction tested and hosed down with fresh water. It must be made sure that there is no accumulation of rust due to corrosion. To prevent corrosion a paint coat (bitumen paint) shall be applied inside the bilges.
- Tween deck scuppers should be checked and tested.
- Fire extinguishing system should be tested. CO<sub>2</sub> lines should be blown through.
- Hold lighting (fixed or portable) should be checked for proper functioning.
- All cargo battens (spar ceiling) should be examined. Broken or rotten spars should be replaced.
- Guardrail, chains or ropes and stanchions in tween deck are in good order.
- Hold ladder is in good condition.
- All obstructions in hold are prominently marked.
- All cargo gear, dunnage and segregation material required for cargo is readily available for use.
- 'No Smoking' sign is posted in each hold.
- Weather tightness of hatch covers should be in good order.
- Water tightness of tanks around the cargo hold to be in good order.

### 3.12.1 Types of Permanent Dunnages

With the ever increasing cost of dunnage material and labour, a number of permanent dunnage are now in use especially in insulated compartment. These may be in the form of Permanent Collapsible Dunnage (PCD), Aluminium Strip Dunnage, Steel Grating Dunnage, Permanent Gratings. ISO Containers, Spar ceiling fitted on frames, bulkheads and tank top.

### 3.12.2 Materials used for Dunnages

Many different types of wood and materials are in use for dunnage. It is very important that dunnage is of sound quality, dry, clean and free from oil, grease and stains, free from infestation of insects or maggots.

Second-hand timber for dunnage is quite common in use. Inspection of such timber should be carried out to check for odour, stains, splinters and nails. New timber has disadvantage of having resin and strong smell of wood.

Dunnage may be fumigated, if required. Some common types of material used as dunnage are stated below:

BAMBOO	FOR DRY GOODS
BATTENS WOODEN BOARDS	FOR REEFER CARGO USED AS PLATFORMS
COIR	FOR OIL DRUMS
INFLATABLE BAGS	FOR RESTRAINING FRAGILE CARGO
HARDBOARD,CHIPBOARD	FOR BAGGED/BALED CARGO
PAPER (CRAFT PAPER)	USED AS SEPARATOR
SAWDUST	TO ABSORB DRAINAGE FROM CERTAIN CARGO

### 3.12.3 Cargo Battens Fitted on Ship Side

#### Spar Ceiling

Spar ceiling or cargo battens are the permanent dunnage attached to ship's sides. They are made of timber of size 150mm × 50mm fitted over the side frames. They are fitted horizontally into the cleats, which are mounted on frames. Vertical distance of 230mm is generally kept between two consecutive battens. Spar ceiling may also be fitted on the end bulkheads of the compartment.

The tank top of some ships may be covered with the double layer of dunnage. The bottom layer may be of pieces of wood 50mm × 50mm or 75mm × 50mm laid athwart ship, if bilges are at side of hold, or fore and aft, if bilges at the end of hold, ensuring the free drainage to bilges. The dunnage is placed 700mm to 1000mm apart. Upper layer consists of boards 25mm × 150mm in size laid perpendicular to bottom dunnage and placed 150mm to 300mm apart. Burlap may be spread over them to give a better appearance and to collect droppings. A permanent wooden ceiling of about 65mm thickness protects tank top in the square of the hatch. Similar arrangements may be prepared for the tween decks.

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## 3.13 HANDLING OF CARGO

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Considerable damage to cargo may result if due care is not taken while handling. The possibility of this source of damage occurs in both loading and discharging. The cargo officer shall give efficient attention on all occasions.

Lack of care during loading may result in damage which may not be immediately apparent; the results may begin to show during the voyage as damage not only to the specific consignment, but also to other cargo with which it is stowed. Improper handling at discharge port will not only spoil a ship's record for efficient carriage, but also cause damage heavy claims which could be avoided by careful supervision.

Some of the causes which can cause damage to cargo due to mishandling are as follows:

- Inefficient and improper slinging methods
- Improper use of fork lift trucks
- Improper handling of cargo gear
- Crushing of cargo due to excessive load on top

For the safe shipment of cargo, it is very important to handle the cargo with care and in correct way. While picking up the cargo, make sure it's slinging is done as planned, SWL of all slings and other lifting gears have been crosschecked. When the cargo is rigged properly, make sure that the floating block is vertically up. Otherwise the cargo will drag.

Make sure ship is upright and trimmed as per plan. While slinging make sure the following:

- The sling is certified.
- The SWL of sling is equal to or more than the weight of cargo.
- If using one leg of double leg sling, the SWL of sling becomes half.
- If lifting sharp cornered object, suitable pads should be used to protect the sling.
- There should not be extra knots on the slings.
- Slings should not be dragged on deck or wharf.
- When picking up the load, the lifting hook should be above the center of the sling to avoid any drag.

### 3.13.1 Slings

Slings are used for suspending a load from a hook. In general cargo ships, cargo is either connected to a sling or the cargo is stowed into a sling and the sling is connected to a hook for lifting. Slings are also used to pick up other loads such as ship stores, provisions, etc. The work of the persons who sling the load is of particular importance, since they must ensure that the sling does not slip or become loose.

A variety of materials is used in the manufacture of slings and associated gear. Generally, the materials used are natural fibre, man made fiber, steel wire having varying number of strands and wires, metal items of the gear such as chains, hooks, rings and shackles.

#### (a) Principles of Slinging

- (i) Ensure that the load is safe for slinging and when slung, is as secure in the air as it was on the ground.
- (ii) The slinging method must be suitable for the type of load to be lifted, having adequate means of attachments to both the load and the lifting appliance.
- (iii) The weight of the load must not exceed the SWL of the slinging gear.
- (iv) The complete load must be contained securely by the slinging gear.
- (v) The load must be so slung that it will not suffer collapse, change of form or internal displacement when subjected to jerks, swings and bumps after the initial tightening.
- (vi) The load must not damage or be damaged by the slinging gear.

#### (b) Types of Slings

The type of the sling depends on the load to be lifted, its shape weight and its volume. A few common types of slings are explained below:

- (i) **Rope Slings:** The two ends of a 28 mm diameter manila rope, about 10 to 15 metres in length are joined together by a short splice. This is used for lifting/lowering light weights such as small cases, bales, etc. by attaching the sling around the cargo tightly. They are commonly known as strops.
- (ii) **Wire Slings:** Eye splices are made on both ends of a wire, about 4 to 8 metres in length. The wire is then taken around the cargo, one eye is passed through the other eye and attached to the cargo hook. This is used for lifting/lowering heavier and larger weights than those lifted by rope slings viz. large cases, unpacked machinery, spares, etc. Wire splices are also known as snotters.

- (iii) **Chain Slings:** A chain of about 4 to 8 metres in length is connected with a hook at one end and a link at the other end. It is used for lifting/lowering metal objects in particular such as pipes, plates, rods, etc.
- (iv) **Cargo Net:** It is a large rope net, generally square in shape, with an eye at each corner. It is generally used for lifting/lowering light weights. They come in various sizes as suited to the user. It is important that material which could slip through the net should not be loaded into a sling. When the weight is taken on to a net sling, the packages get compactly packed. Hence, care should be taken not to load material which is fragile and which could get crushed.
- (v) **Trays:** Trays of wood or metal are connected to a 4 legged bridle. It is used for any material, which can easily fit and remain on the tray such as small cartons bags, etc. There is no danger of the material getting crushed or of the material getting damaged. However, it must be carefully used keeping in mind the dangers of the material slipping through.

The slinging of containers is done in two ways namely Automatic and Manual. In automatic slinging, the spreader is connected with Magnetic shoes, which are moved into the slots at the four corners of a container and locked automatically. Reference must be made to the section of Portainers to understand the methods of slinging of containers.

(c) **Safe Slinging Methods**

The diagrams given below show some do's and don'ts in different methods of slinging. Note the care taken in slinging different items.

- Pallets should either be lifted by bars (using wings), rope fours with hooks or forks.
- Sling is free to move on the hook. The balance of the load is adversely affected by such a movement.
- In this slinging too, the load is free to move and may slip off.

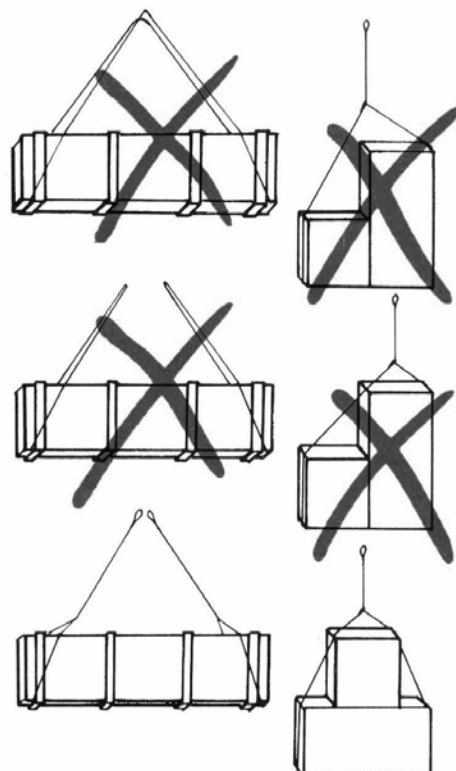


Figure 3.1

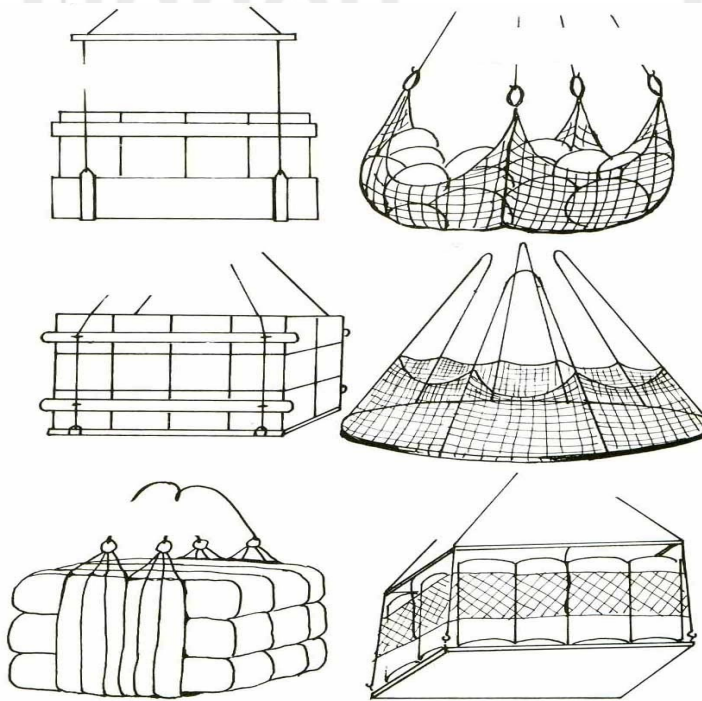


Figure 3.2

- The load is firmly held and the sling is firmly attached to the hook.

If slings do not hold the load securely and there is the possibility of a part of the load being displaced and falling out. Suitable devices should be used either to hold the load in the sling or prevent a displaced part of the load from falling down. Examples of this are shown in the figures on the left.

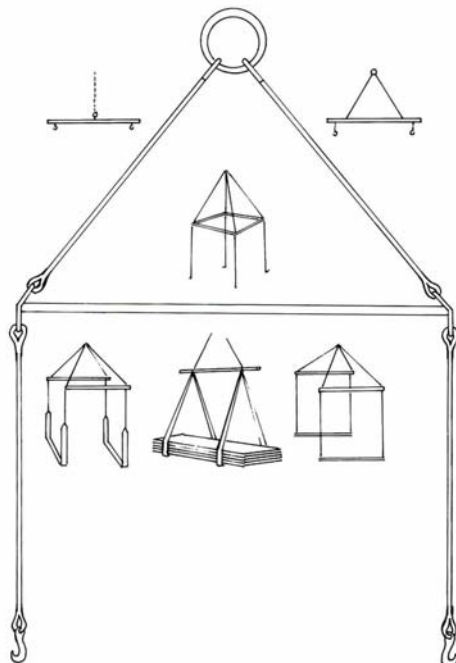


Figure 3.3

The principle of a spreader is to even the strain upon the sling legs. This is done to avoid the involvement of angles and to protect the load from damage.

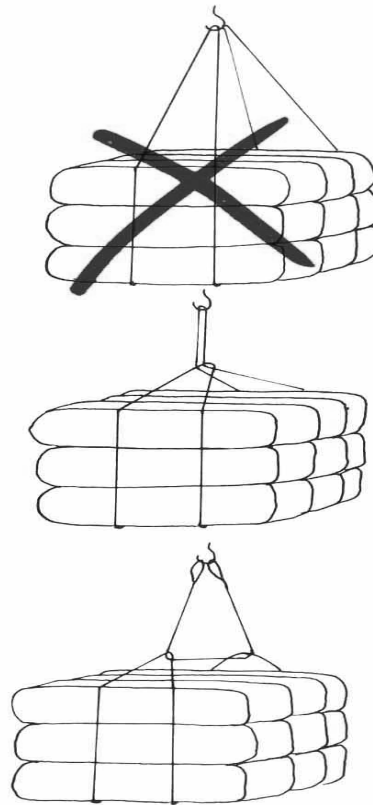


Figure 3.4

- The load is not securely held by the sling and not firmly attached to the hook.
- If the slings are off-centre, the load can tip sideways and fall out.
- The load is firmly held and there is no opportunity for the sling to move on the hook.
- If the size of the load is such that the angle at the bight or hook becomes too acute, the use of an additional single leg of adequate SWL will reduce the working strain on the endless sling.

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### 3.14 SECURING OF CARGO

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A ship is subjected to various types of motion which can be categorized in two types:

- (a) Lateral Motion
  - (i) Heaving (Vertically up and down)
  - (ii) Swaying (side to side)
  - (iii) Surging (fore and aft)
- (b) Rotary Motion
  - (i) Rolling
  - (ii) Pitching
  - (iii) Yawing

The most dangerous motions for shifting of cargo is rolling and pitching. Improper securing of cargoes has resulted in many serious ship casualties, injury to personnel and loss of life. The motion of the ship may cause the shifting of the cargo and other items that are left unsecured. All loose material and cargo should be kept secured at all times to protect the ship, items, cargo and personnel. Equipments used for securing cargoes depend on the type of cargo loaded.



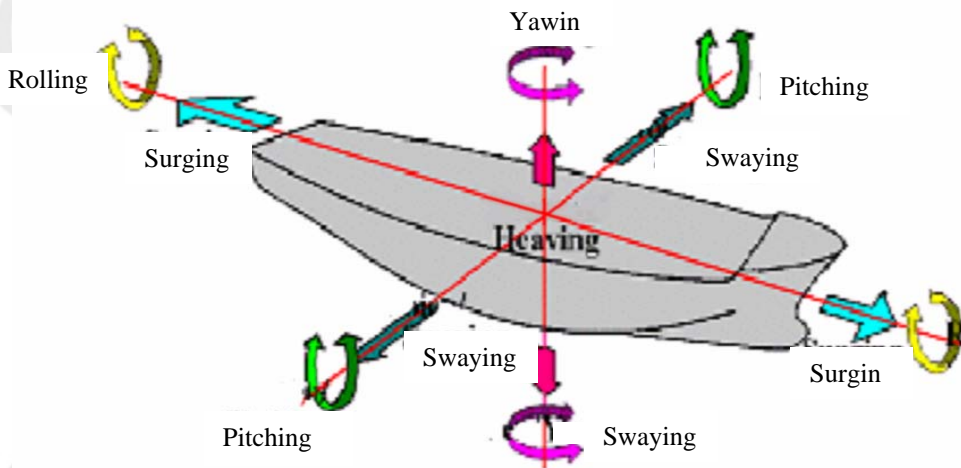


Figure 3.5

Various types of equipments are available on ships for securing practically every type of commodity. Some of the most common items used for securing general cargo are:

- Fibre and wire ropes
- Grips
- Turnbuckles
- Shackles
- Chains
- Dunnage for shoring, tomming and bracing
- Webbing slings
- Straps and crimp seals

Fibre ropes (mainly synthetic ropes) are used for securing light weights and small packages since they are not as strong as wires.

Wires are used for lashing various types of general cargoes on deck and under deck. The breaking load of these items can be easily determined from their size.

We need to use bulldog grips with wire rope to secure cargoes. The SWL of bull dog grips depends on the material and also the diameter of the stud from which the bulldog grip is made. Minimum three numbers of bulldog grip preferably four shall be used at each temporary eye.

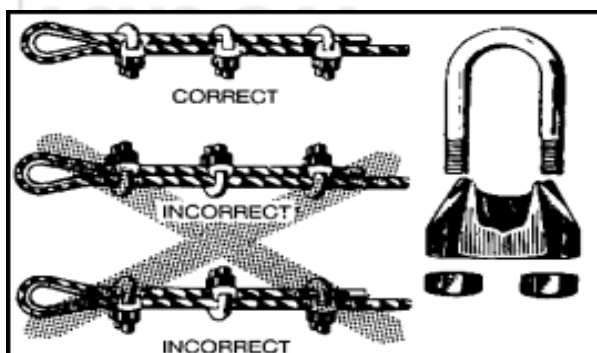


Figure 3.6 : Making a Temporary Eye on Wire Rope

Turnbuckles are the stretching devices which are used with wire ropes to make the lashings tight. There are two types of turn buckles – bottle screw and open body.

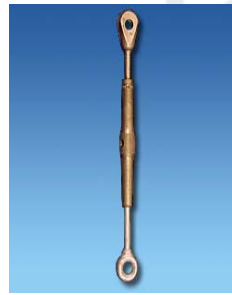


Figure 3.7 : Bottle Screw

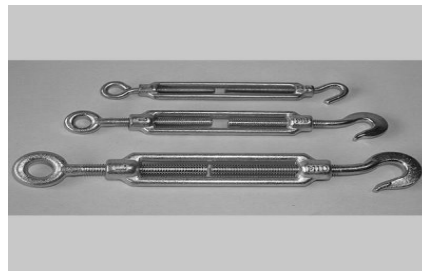


Figure 3.8 : Hook and Eye Turn Buckle



Figure 3.9 : Open Body Stretching Screw



Figure 3.10 : Bulldog Grip



Figure 3.11 : Bow-Shackle



Figure 3.12 : D-Shackle with no

Snag Pin



Figure 3.13 : D-Shackle

### Methods of Securing

Methods of securing cargo is directly dependant on type of cargo loaded. Certain guidelines have been made to secure specific types of cargoes in a definite way. Such guidelines may be obtained from “CARGO SECURING MANUAL” OF SHIP and also “CODE OF SAFE PRACTICE FOR CARGO SECURING”.

It is more important to give due diligence and use good seamanship in deciding the number and type of lashings required for cargo. It is always better to have two extra lashings than one less.

### General Principles for Cargo Securing

- All cargoes should be stowed and secured in such a way that the ship and persons are not put at risk.
- The safe stowage and securing of cargoes depend on proper planning, execution and supervision, both prior to sailing and at sea.
- Personnel planning and supervising the stowage and securing of cargo should have a sound and practical knowledge of the application and content of the “CARGO SECURING MANUAL”.
- Personnel commissioned to tasks of cargo stowage and securing should be properly qualified and experienced.
- In all cases, improper stowage and inadequate securing of cargo will be potentially hazardous to the securing of other cargoes and to the ship itself.
- Decisions taken for measures of stowage and securing cargo should be based on most severe weather conditions, which may be experienced during the intended voyage.



Figure 3.14 : Picture Showing Securing of a Heavy Cargo with Lashing Chain

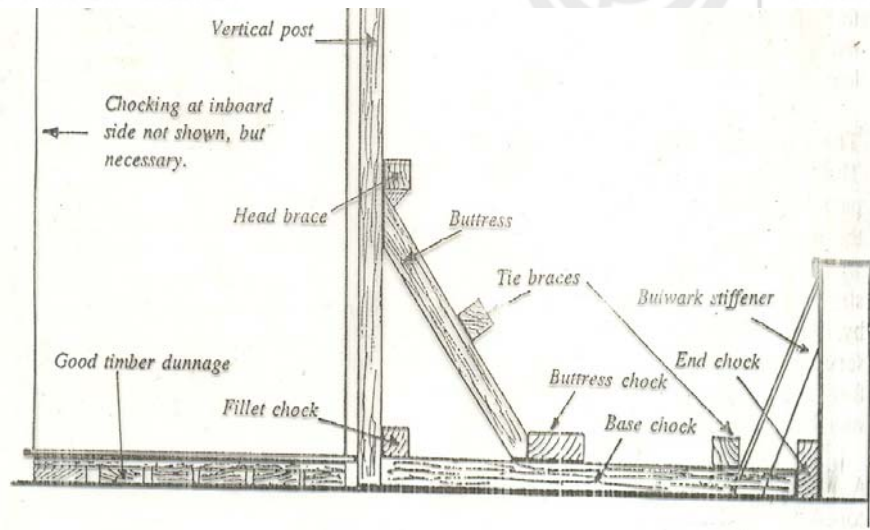


Figure 3.15 : Picture Showing use of Dunnage to Secure the Cargo

### SAQ 9

- Describe the procedures to be followed to prepare a cargo hold for loading cargo.
- Describe the types of motions experienced by a ship in a seaway.
- Describe the types of lashing material used on board Break Bulk ships.

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### 3.15 SUMMARY

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Dock labour regulations are applicable in every country where the ship loads or discharges. The officer on watch must ensure that all the loading/discharging equipment is tested as per the relevant requirements and safety procedures are followed meticulously.

International Maritime Organisation has issued guidelines and published codes with the aim of promoting safe stowage and Shipment of various Cargoes such as "BC" code and "BLU code" for bulk cargoes, and other similar codes for Timber, Grain, Chemicals, Gases and other Dangerous Goods.

We have also learnt in this unit that it is important not only to stow the cargo on board in a safe manner, but also to secure it properly before the vessel proceeds out of ports.

We have also learnt the precautions required to be taken when handling various cargoes.

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### 3.16 ANSWERS TO SAQs

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For answers to SAQs, please see the relevant text.

COPY

Test Certificate No. 4JB-0090CG3

Form NO. CB.3  
01.06e

**NIPPON KAIJI KYOKAI**

**CERTIFICATE OF TEST AND EXAMINATION OF CRANES OR HOISTS  
AND THEIR ACCESSORY GEAR REPAIRS.**

Name and Official Number of Ship  
On which Machinery is fitted .....XYZ.....

Name and Address of Owner .....

Port of Registry .....HONG KONG .....IMO Number 1234567.....

Classification Number .....98765.....

(1) Situation and description of crane or hoist, with distinguishing number of mark (if any)	(2) For jib crane radius at which the proof load was applied	(3) Prof load applied	(4) Safe working load	(5) Allowable maximum radius for jib crane	(6) Remark
DECK CRANE AT FR.NO.78 (C)	(meters) 28	(tons) 45	(tons) 40	(meters) 28	36.0 t – 32.0 m
		- The End -			

Name and address of association witnessing the test and making the examination: Nippon kaiji kyokai

Position of signatory in association: Surveyor to Nippon Kaiji Kyokai

I certify that on the 1 December 2004 the above machinery, together with its accessory gear, was tested in the manner set forth on the reverse side of this certificate; that a careful examination of the said machinery and gear after the test showed that it had withstood the proff load without injury or permanent deformation; and that the safe working load of the said machinery and gear is as shown above (4).

The 1 December 2004

Surveyor to NIPPON KAIJI KYOKAI

\* Delete as appropriate

Port

Form IV

Test Certificate No. KG 04JB-016Form4

**THE PAKISTAN DOCK LABOURERS REGULATIONS, 1948**

Regulation 27 (I)

**CERTIFICATE OF TEST AND EXAMINATION OF CRANES OR HOISTS AND THEIR ACCESSORY GEAR**

Situation and Description of Crane or Hoists with distinguishing number or mark (if any).  (1)	For jib cranes, radius at which the proof load was applied  (2)	AFTER REPAIR Proof load applied  (3)	Safe working load [for jib cranes at radius shown in col. {2}].  (4)
	(meter)	Tons	Tons
Deck Crane of Fr. No.78 (Center)	28.0	45	40 (30.0 t – 32.0 m)
	- The End -		

I certify that on the 1<sup>st</sup> day of December, 2004, the above machinery together with its accessory gear was tested by a competent person in the manner set forth overleaf; that a careful examination of the said machinery and gear by a competent person after the test showed that it had withstood the proof load without injury or permanent deformation; and that the safe working load of the said machinery and gear is as shown in col. 4.

Signature.....Date.....1 December 2004.....

Surveyor to NIPPON KAIJI KYOKAI

Qualification (see Note 3).....

**NOTES**

1. Column 1. Sufficient particulars must be given to identify the crane or hoist. If on a ship, the name of the ship must be stated.
2. Column 2. If the jib has a variable radius proof loads must be applied at the maximum and minimum radii,
3. "competent person" means:-
  - (a) in this case of machinery or plant no:curried on board a ship, any person appointed in that behalf by the Port Authority with the sanction of the Central government;
  - (b) in the case of machinery or plant carried on board a ship, an official of a workshop approved in that behalf by the Central Governemtn, or, except for the purposes of Regulation, 9(2). A person nominated in that behalf by an authority approved by the Central Government for the purpose of nominating competent persons and includes in the case of machinery and plant carried on board a ship registered elsewhere than in Pakistan, ay person who is recognized as a competent person for the purposes of the national regulations in force for the implementation of the Protection against Accidents (Deckers) Convention (Revised), 19, adopted by the International Labour Conference.

1. Substituted for "194" by Notification No. LR. 12 (19)/54, dated the 4<sup>th</sup> December, 1954, see Gazette of Pakistan, 1954, Part I, page 310

Test Certificate No. CG01S1381

Form NO. CG.3  
98.12e

**NIPPON KAIJI KYOKAI**

**CERTIFICATE OF TEST AND EXAMINATION OF CRANES OR HOISTS  
AND THEIR ACCESSORY GEAR, BEFORE BEING TAKEN INTO USE\*.**

Name and Official Number of Ship

On which Machinery is fitted ..... HK-0756.....

Name and Address of Owner .....

Port of Registry ..... HONG KONG ..... IMO Number .....

Classification Number .....

(1) Situation and description of crane or hoist, with distinguishing number or mark (if any)	(2) For jib crane radius at which the proof load was applied  (meters)	(3) Proof load applied  (tons)	(4) Safe working load  (tons)	(5) Allowable maximum radius for jib crane  (meters)	(6) Remark
Deck Crane at Fr. No.145 (center)	28.0	45.0	40.0	28.0	36.0 t – 32.0 m
Deck Crane at Fr. No.78 (center)	28.0	45.0	40.0	28.0	36.0 t – 32.0 m
General Use Crane at Fr. No. 19 (p.sie)	9.5	2.5	2.0	9.5	---
- The End -					
"Load tests by movable weight"					

Name and address of association witnessing the test and making the examination: Nippon kaiji kyokai

Position of signatory in association: .....

Surveyor to Nippon Kaiji Kyokai

I certify that on the 25<sup>th</sup> day of September, 2001, the above machinery, together with its accessory gear, was tested in the manner set forth on the reverse side of this certificate; that a careful examination of the said machinery and gear after the test showed that it had withstood the proof load without injury or permanent deformation; and that the safe working load of the said machinery is as shown above (4).

The 25<sup>th</sup> day of September, 2001

Surveyor to NIPPON KAIJI KYOKAI