MODEL RULES FOR INLAND VESSELS

Under

Inland Vessels Act 1917

(1 of 1917)

Prepared By

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CHAPTER 1

GENERAL PROVISONS

1.1 Application	*Application*
1.1.1 These Regulations shall apply to inland vessels registered in the State of * (NAME) or which ordinarily ply on inland waterways passing through the State of (NAME).	
1.1.2 Subject to 1.1.1 the following are excluded from Regulations: a) Fishing vessels; b) Defence, coast guard vessels; c) Ship registered under the Merchant Shipping Act, 1958 (44 of 1958) subject to applicability of provisions under section 19S of the Act.	
1.1.3 All existing vessels shall, as a rule, comply with the requirements existing prior to coming into force of the Regulations. Where no such requirements are applicable, vessels shall comply with the Regulations to the extent the State Government considers being reasonable and practicable. Existing vessels that undergo replacement of equipment or outfitting related thereto shall comply with the requirements specified in the Regulations as far as it is considered reasonable and practicable by the Administration.	
1.2 General Definitions	
1.2.1 In these rules, unless the context otherwise requires,-	*General Definitions*
i) ***'Accommodation'*** means any space intended for the use of persons normally living on board, or of passengers, and includes the galley, storage space for provisions, toilets and washing facilities, laundry facilities, landings and gangways, but not the wheelhouse; ii) ***'Act'*** means the Inland Vessels Act, 1917(Central Act 1 of 1917); iii) '***Administration'*** means the State Government department or State Maritime Board having responsibility for maritime and/or inland waterways matters and in particular for the administration of the Regulations; iv) ***'Amidships'*** means at the middle of the length L; v) ***'Approved'*** means approved by the Administration; vi) ***'Approved life-buoy'*** shall mean a life buoy approved by the Administration in accordance with either the specifications of the International Life Saving Appliances Code **or** the specifications notified by the Administration for the approval of such lifesaving appliances carried on board the Inland Vessels; vii) ***'Approved consultant'*** means a naval architect or a marine engineer qualified to certify the safe construction of hull/machinery of the vessel for the purpose of survey and duly approved by the Administration; viii) ***'Dumb Barge'*** means a vessel that is not fitted with any means of propulsion;	

ix) ***'Bulkhead deck'*** means the uppermost deck to which transverse watertight bulkheads are carried;

x) ***'Buoyant apparatus'*** means rectangular rafts approved by the Administration and fitted with buoyancy tanks/materials sufficient to support the approved number of persons in the water and includes buoyant deck seat;

xi) ***'Cargo-passenger vessel'*** means a cargo vessel that is approved by the Administration to carry more than twelve passengers on identified services and that meets safety requirements set out in the Regulations for that type of vessel and such other safety requirements specified by the Administration as are deemed necessary to provide a satisfactory level of safety;

xii) ***'Certificate of Survey'*** means the certificate of survey granted under section 9 of the Act;

xiii) ***'Class Survey of Classification Society'*** means survey by a ship classification society to assign characters and class notations of inland vessel;

xiv) ***'Classification society'*** means an organization that complies with the standards adopted by the Organization and is recognized, or otherwise authorized, by the Administration for the purpose of conducting inspections and surveys in accordance with applicable rules on behalf of the Administration;

xv) ***'Channel marks'*** means any mark capable of being used as an aid to navigation by an inland vessel navigating in an inland waterway. These include coconut piles/bamboo marks, conspicuous building or structure, buoys and beacon*;*

xvi) ***'Chief examiner Inland Water Transport'*** means an officer so appointed by the State Government in-charge of syllabus, examination and issue of certificates;

xvii) ***'Chief surveyor'*** means an officer duly appointed by the State Government under these rules;

xviii) '***Company'*** means the owner of the vessel or any other organization or person such as the manager who has assumed responsibility for operation of the vessel from the owner of the vessel and who, on assuming such responsibility has agreed to take over all the duties and responsibilities connected with vessel safety and the prevention of pollution;

xix) ***'Competent Authority'*** means an authority so appointed by the State Government consisting of experienced Naval Architects and Marine Engineers.

xx) ***'Convoy'*** means a group of vessels, floating equipments or rafts towed or pushed by an inland mechanically propelled vessel;

xxi) ***'Design Declaration'*** means a format of application backed by vessel's preliminary General Arrangement Plans, Stability Booklet and preliminary Safety Plans.

xxii) ***'Drifting'*** means being driven by the stream with the engine stopped;

xxiii) ***'Engine room'*** means the space in which the propulsion machinery and auxiliaries are installed;

xxiv) ***'Existing vessel'*** means a vessel that is not a new vessel;

xxv) ***'Ferry boat'*** means any vessel providing a transport service across or along a waterway;

xxvi) ***'Fishing vessel'*** is a vessel used for catching fish, or other living resources of the water;

xxvii) ***'Floating equipment'*** means any floating structure carrying mechanical installations and intended for work on waterways or in ports (e.g. a dredger, elevator, sheer-legs or crane);

xxviii) ***'Floating installation'*** means a raft or any other structure, object or assembly capable of navigation not being a vessel or floating equipment;

xxix) ***'Form'*** means form appended to these rules;

xxx) ***'Freeboard'*** means the distance measured vertically downwards amidships from the upper edge of the deck line to the position at which the upper edge of the appropriate load line mark lies;

xxxi) ***'G.T'*** means gross tonnage;

xxxii) ***'Government'*** means the State Government unless otherwise specified;

xxxiii) ***'Inland vessel' or 'inland mechanically propelled vessel'*** means a mechanically propelled vessel, which ordinarily plies on inland water, but does not include fishing vessels and a ship registered or required to be registered under the Merchant Shipping Act, 1958 (44 of 1958);

xxxiv) ***'Inland water'*** means

(a) any canal, river, lake or other navigable water within a State,

(b) any area of any tidal water deemed to be the inland water as defined by the Central Government under section 70 of the Act,

(c) waters declared by the Central Government to be smooth and partially smooth waters under clause (41) of section 3 of the Merchant Shipping Act, 1958(44 of 1958);

xxxv) ***'Length and breadth of a vessel'*** means maximum length and breadth of a vessel;

xxxvi) ***'Lock'*** means confined section of river or canal where level can be changed for raising and lowering boats between adjacent sections by use of gates and sluices;

xxxvii) ***'Lock basin'*** means the approach to the lock narrowing towards the lock from upstream and downstream;

xxxviii) ***'Margin line'*** is a line drawn at least 76mm below the upper surface of the deck from which freeboard is measured;

xxxix) ***'Master'*** means the person having command of a vessel and includes any person in charge of a vessel;

xl) ***'Mechanically propelled vessel'*** means every description of vessel propelled wholly or in part by electricity, steam or other mechanical power including dumb vessel towed by the mechanically propelled vessel and vessel propelled by outboard motor;

xli) ***'Miles'*** means nautical miles;

xlii) ***'Name of the vessel'*** includes the registration mark referred to in section 19H of the Act;

xliii) ***'Navigable channel'*** means the channel intended for uninterrupted passage of vessels;

xliv) ***'New vessel'*** means a vessel the keel of which is laid or that is at a similar stage of construction on or after the date of these rules coming into force;

xlv) ***'Operating Areas'*** For the purpose of these regulations where applicable, the inland waterways operating area is divided as follows:

a) Zone-1: A zone where maximum significant wave height does not exceed 2.0 metres.

b) Zone-2: A zone where maximum significant wave height does not exceed 1.2 metres.

c) Zone-3: A zone where maximum significant wave height does not exceed 0.6 metre.

xlvi) ***'Organization'*** means the International Maritime Organization;

xlvii) ***'Owner'*** means the owner of a vessel and carries same meaning as 'Company' as defined above;

xlviii) ***'Passenger'*** includes any person carried in a mechanically propelled vessel other than the master and crew and the owner, his family and servants;

xlix) ***'Passenger vessel'*** means any vessel built and operated to carry more than 12 passengers and that is not a cargo-passenger vessel;

l) ***'POB (Persons on board) or complements'*** means total number of people to be taken on board. i.e. crew + passengers.

li) ***'Pleasure vessel'*** means a vessel that is used, or, being a vessel in the course of construction, is intended to be used, wholly for recreational or sporting activities;

lii) ***'Prescribed'*** means prescribed by any rule under the Act or any rule under these Regulations;

liii) ***'Recognized standards'*** are standards accepted by the Administration, which may include applicable international or national standards or standards adopted by a classification society;

liv) ***'Registering Authority'*** means the registering Authority appointed under the Act;

lv) ***'Regulations'*** mean the Model safety regulations for inland waterways vessels operating in the Indian Inland Waterways.

lvi) ***'Restricted visibility'*** means any condition in which visibility is restricted by fog, mist, heavy rainstorms, sandstorms or any other similar causes;

lvii) ***'Sailing vessel'*** means any vessel under sail, without using the propelling machinery;

lviii) ' ***Safety Plan':*** A plan which shows, the disposition of Life Saving Appliances, Fire Fighting Appliances, Light and Sound Signal System. This plan needs to be APPROVED **by the** competent authority or Registering Authority.

lix) ***'Schedule'*** means the schedule appended to these Rules;

lx) ***'Short voyage'*** means a voyage of 8 hours or lesser duration;

lxi) **'Survey**' means the survey of a mechanically propelled vessel under the Act or these Rules;

lxii) ***'Surveyor*** means a surveyor appointed under the Act or in accordance with these Rules and includes Chief Surveyor also;

lxiii) ***'Tidal water'*** has the meaning assigned to it in clause (49) of section 3 of the Merchant Shipping Act, 1958;

lxiv) ***'Underway'*** means a vessel which is not at anchor or made fast to the shore or aground;

lxv) ***'Vessel"*** means an inland vessel or inland mechanically propelled vessel;

lxvi) ***'Vessel not under command"*** means a vessel, which through some exceptional circumstances is unable to manoeuvre as required by these rules and is therefore unable to keep out of the way of another vessel.

lxvii) ***'Voyage'*** includes the plying of a mechanically propelled vessel at or about any place.

lxviii) ***'Wheelhouse'*** means the space in which all the equipment necessary for navigating and controlling the vessel is installed;

1.2.2 Words and expressions used, but not defined in these Rules, shall have the meaning assigned to them in the Act.

1.3 Exemptions

Exemptions

1.3.1 The Government may exempt from the application of all or part of the Regulations:

a) vessels or classes of vessels operating on navigable waterways as designated by the Government, where it considers that the sheltered nature and conditions of such operations are such as to render the application of any specific provisions of the Regulations unreasonable or unnecessary; and

b) Vessels the keels of which were laid down before the entry into force of these regulations are exempted for a period of twenty four (24) months.

1.3.2 The Government may authorize, in respect of navigation on its National/State waterways, exemptions from one or more provisions of the Regulations for limited local voyages or in harbour areas provided that it complies with such other requirements that are, in the opinion of the Government, adequate for the intended voyage. Such exemptions and the voyages or areas to which they apply shall be specified in the vessel's Certificate of Survey.

1.3.3 Where a vessel is exempted from these regulations under **1.3.1(a)**, the Government may require compliance with the provisions of the Regulations as far as is practicable and reasonable.

1.3.4 The Government may exempt a vessel that embodies features of a novel kind from any of the provisions of the Regulations, the application of which might seriously impede research into development of such features and their incorporation in vessels. Any such vessel shall, however, comply with such safety requirements that, in the opinion of the Administration, are adequate for the service for which it is intended and are such as to ensure the overall safety of the vessel.

1.4 Force Majeure 1.4.1 A vessel which is not subject to the provisions of the Regulations at the time of its departure on any voyage shall not be subject to such provisions on account of any deviation from its intended voyage due to stress of weather or any other cause leading to force majeure. 1.4.2 In applying the provision of the Regulations, the Government shall give due consideration to any deviation or delay caused to any vessel owing to stress of weather, or any other cause leading to force majeure.	***Force Majeure***
1.5 Equivalents Where the Regulations require that a particular fitting, material, appliance, apparatus or type thereof, shall be fitted or carried in a vessel, or that particular provision shall be made, the Government may allow any fitting, material, appliance, apparatus or type thereof to be fitted or carried, or any other provision to be made in that vessel, if it is satisfied by trials thereof or otherwise that such fitting, material, appliance, apparatus or type thereof is at least as effective as that required by the Regulations.	***Equivalents***
1.6 Standards 1.6.1 The construction, installation, structural strength, fittings, material, appliances and apparatus unless expressly provided by the Regulations, shall be of recognized standards. 1.6.2 In addition to the requirements and standards referred to in the Regulations, other requirements and standards recommended by the other statutory bodies may be applied whenever the Government considers such requirements and standards to be appropriate.	***Standards***
1.7 Carriage of passengers 1.7.1 Inland Vessels shall not carry any passenger unless specifically authorized by the Government. 1.7.2 The maximum number of passengers carried on board a passenger vessel or a cargo-passenger vessel shall not exceed the number identified on the Certificate of Survey. . 1.7.3 A notice showing the maximum number of passengers permitted to be carried on specific decks and in specific spaces, calculated in accordance with the Regulations, shall be clearly displayed at the access to each such deck and other prominent space.	***Carriage of Passengers***

1.8 Plans, signs, instruction manuals, name plates and languages 1.8.1 All name plates, signs, instructions, notices, plans and documents on board vessels, relating to safety and operation of the vessel and its machinery, shall be drawn up in English and Hindi or in the official language of the State. 1.8.2 All mechanically propelled inland vessels shall carry adequate information including drawings, plans and instruction manuals necessary for their safe operation and safety of life.	***Plan, Signs, Instruction Manuals, Name Plates and Languages***
1.9 Casualties and incidents In the event of a casualty or incident involving the vessel resulting in loss of life or the vessel being materially damaged, stranded, abandoned or lost, the master or the Company shall act as detailed in Chapter V of these regulations.	***Casualties and Incidents***
1.10 Repairs, Alterations, Modifications of major character 1.10.1 Repairs, alterations and modifications of a major character and out-fitting related thereto on existing vessels should meet the requirements prescribed for a new vessel to such an extent as the Government deems reasonable and practicable. The Owner shall inform the Government of the proposed alterations and modifications before such alterations and modifications are carried out. 1.10.2 For the purpose of the Regulations, the following repairs, alterations and modifications shall be recognized as being of “major character” a) Any changes that substantially alters the dimensions of the vessel. b) Any changes that substantially increases vessel’s service life. c) Any conversion that alters the functional aspects of the vessel.	***Repairs, Alterations, Modifications***
1.11 Management of safety and environmental protection 1.11.1 The Company and the master of the vessel shall be responsible for compliance with the applicable provisions of the Regulations and for management of the vessel so as to achieve safety in operation and protection of the environment. 1.11.2 The Company and the master of the vessel shall comply with the requirements of the Government in relation to the management of safe operation and environmental protection.	***Management of Safety and Environmental Protection***
1.12 Vessel identification The Registration Mark assigned by the registering authority under section 19H of the ‘Act’ shall be entered on the Certificate of Survey and also displayed conspicuously as per requirements of these regulations.	***Vessel Identification***

1.13 Official log book	*Official Log Book*
1.13.1 The master and engineer/driver of the vessel shall keep an official log book in the form specified in these rules in Form No. 0 and shall make, or cause to be made, such entries in that log book as required. 1.13.2 An entry in an official log book shall be made by the Master, Engineer/Driver or officer in- charge of the inland vessel: a) as soon as possible after the occurrence to which it relates; and b) the date and time of the occurrence and the entry. 1.13.3 An entry in the official log book shall be made by the Master or the officer in-charge and counter signed by the Competent Authority carrying out any inspection of the vessel stating the outcome of the inspection and action taken if any.	
1.14 Inland Vessel State Inspection	***Inland Vessel State Inspection***
1.14.1 Every vessel when in a port of another State is subject to inspection by officers duly authorized by such Government in so far as this inspection is directed towards verifying that the certificates issued under Chapter 2 are valid. 1.14.2 Such certificates, if valid, shall be accepted unless there are clear grounds for believing that the condition of the vessel or of its equipment does not correspond substantially with the particulars of any of the certificates or that the vessel is not river worthy. 1.14.3 In the circumstances specified in **1.14.2** or where a certificate has expired or ceased to be valid, the officer carrying out the inspection shall take steps to ensure that the vessel shall not leave the port unless it can proceed to the next port of call, or leave the port for the purpose of proceeding to an appropriate repair yard, without danger to the vessel or persons on board. 1.14.4 The officer carrying out the inspection shall make an entry in the 'Official log book' stated in Regulation 1.13 above.	

CHAPTER 2

SURVEY OF INLAND MECHANICALLY PROPELLED VESSELS

2.1 Certificate of Survey 2.1.1 An inland mechanically propelled vessel shall not proceed on any voyage or be used for any service unless she has a certificate of survey in force in voyage intended for operation and in the zone intended for operation and applicable to such voyage or service in such zone in such voyage. 2.1.2 Nothing in this section shall apply to any mechanically propelled vessel proceeding on a voyage during the interval between the time at which her certificate of survey expires and the time at which it is first practicable to have the certificate renewed.	***Certificate of Survey***
2.2 Categorization of Vessels 2.2.1 For the purpose of survey inland vessels may be classified into two categories as follows:- a) Category A: All Inland Vessels constructed for operating /operating in Zone 1 b) Category B: All Inland Vessels other than Category A.	***Categorization of Vessels***
2.3 Types of Survey 2.3.1 Every vessel to which the provisions of the Act and these rules apply shall be subjected to the surveys specified herein;- i. Initial Survey - survey before the vessel is put in service. ii. Periodical Survey - once in every twelve months. iii. Dry Docking Survey as per details in 2.3.4 below. iv. Special Survey - Additional surveys as occasion demands.	***Types of Survey***
The Initial Survey shall be aimed at ensuring the following:- i. The vessel's construction is meeting the safety standards and is in accordance with approved plans and design. ii. The freeboard mark and draft marks are appropriately marked. iii. The tonnage computation of the vessel is approvedby Administration. iv. Safety Equipment plan is approved by the Administration. v. Stability Booklet of the vessel is prepared by the Designer and approved by the Administration. vi. Vessel is adequately equipped to effectively contribute to Prevention of Pollution of Inland Waterway.	***Initial Survey***

The survey to include a complete inspection of the hull, machinery and equipment to ensure that arrangements, material, scantlings of hull, main and auxiliary machinery, life-saving appliances, fire appliances and other equipment fully comply with the requirements under the Act and these Rules as are applicable in its case provided that the bottom of the vessel which has been surveyed or examined by a surveyor before the vessel is launched may be exempted unless the surveyor has special reasons for considering it necessary. 2.3.3 The periodical survey of the vessel shall include an inspection of the whole of the hull, machinery and equipment to ensure that hull, machinery and equipment are in satisfactory condition and fit for the service for which the vessel is intended and that she complies with the requirements under this Act and these rules as are applicable in its case.	***Periodical Survey***
2.3.4 The Dry Docking survey as and when becoming due shall be carried out together with the periodical/special survey. All Category A Vessels shall undergo a dry docking survey at interval not exceeding 3 years and category B vessels at interval not exceeding 5 years. The dry docking survey shall be carried out by a surveyor in a dry dock or on a slipway such that all portions of hull external can be examined during the light condition to the satisfaction of the surveyor. If a dry docking survey is carried as part of a Special Survey (even if the periodical survey is not due), periodical survey shall be carried out as part of the dry docking survey and date of the periodical survey harmonized with the dry docking survey. 2.3.5 A certificate of survey shall remain valid if the vessel undergoes and meets the requirements of surveys detailed in section 2.3.1.	***Dry Docking Survey***
2.3.6 A Special Survey either general or partial or dry docking survey, according to the circumstances shall be carried out:- (a) If the efficiency or performance of the equipments of the vessel has changed or whenever a request for extension of certificate of survey is being considered, (b) Every time a defect affecting safety of the vessel is discovered or an accident (such as Collision, Grounding and capsizing) occurs which affects the safety of the vessel. 2.3.7 The special survey shall be conducted in such a manner so as to ensure that the necessary repairs or renewals have been effectively made, that the material and workmanship of such repairs or renewals are in all respects satisfactory and that the vessel is fit for the service for which she is intended. 2.3.8 On the application made by the owner or his authorized representative or master of an Inland Vessels, as per procedure laid down in 2.7.1 of these regulations, the validity of a certificate of survey may be extended up to three months on the exigencies of the situation and if the surveyor recommends for the grant of the certificate for that period.	***Special Survey***

2.3.9 If exigencies of the situation warrant, dry docking period may be revalidated beyond the periods stipulated in sub-section 2.3.4 of these regulations on application by the owner, or his authorized representative or master of an Inland Vessel on deposit of full survey fees. The extension of validity of the docking period shall not exceed one year provided the surveyor recommends the grant of validity for that period and the Inland Vessel is surveyed by him.	
2.4 Appointment of Surveyors and Places of Survey	
2.4.1 The places of Survey in the State shall be as listed in Schedule I. The State Government may by notification in the Official Gazette bring about a change in the list of places of survey.	***Places of Survey***
2.4.2 Following persons are appointed as "Surveyor" subject to each of them individually seeking the authorization of the Chief Surveyor and notified by the State Government in the Official Gazette: 1. Surveyors of Indian Register Shipping (IRS), 2. Surveyors of International classification Society which is member of IACS, 3. Institute of Marine Engineers, 4. Individuals appointed as Surveyors by the Chief Surveyor.	***Surveyors***
2.4.3 No person shall be appointed as Chief Surveyor unless he meets the qualifications and experience enumerated in any one of the following: a) possesses a degree or equivalent in Marine Engineering and Ministry of Transport First Class certificate of competency issued by Director General of Shipping, Government of India or equivalent certificate recognized by Government of India **or** b) a basic degree in Naval Architecture with 10 years' experience in sea going regular vessels / Classification Societies / Ship Building yards/reputed International Shipping Corporations or State Port Department **or** c) Diploma in ship building with 20 years experience in sea going regular vessels / Classification Societies / Ship Building yards/reputed International Shipping Corporations or State Port Department **or** d) has served in the capacity of a Surveyor for a minimum period of 5 years in the DGS/State IWT Department/ State Maritime Board.	***Qualification of Chief Surveyor***
2.4.4 A Chief Surveyor shall discharge the following duties; namely:- (a) Receive applications for survey of vessels, and confirm that they are in order. (b) Fix the date and place of surveys and conduct the survey as per rules. (c) Verify and ensure that the vessels are constructed as per the approved drawings, General Arrangement plans etc. (d) Determine whether the hull of the vessel is in proper condition and fit for service. (e) Test the stability of the vessel so as to ensure safety against capsizing under any conditions;	***Duties of Chief Surveyor***

(f) Ascertain that the machinery and machinery layout, propeller, shafting, gears and steering, pipe lines such as bilge and ballast, oil transfer etc., wheel house, crew accommodation , passages, galleys, stores, service place etc., ventilation, change of air for engine room etc., life-saving, fire-fighting, light and sound signals, Navigation and communication equipment etc. are in order and that generally the vessel is fully equipped for the safety and convenience of crew and passengers; (g) Issue declaration of survey to the vessel surveyed by him to the owner or master of the vessel; (h) Give copies of documents on payment of fees specified in these rules and maintain accounts of all dues connected with survey and miscellaneous receipts;	
2.4.5 The surveyor should possess any of the following qualifications and experience: a) Marine/ Mechanical/ Electrical Engineer in possession of minimum First/Second class Motor/Steam MOT Certificate issued by Director General of Shipping, Government of India or equivalent certificate recognized by Government of India and having minimum 5 years of sailing experience after first certificate of competency of which minimum 2 years sailing experience must be at Management Level **or** b) a basic degree in Naval Architecture with 7 years' experience either/or in sea going regular vessels / Classification Societies / Ship Building yards/reputed International Shipping Corporations or State Port Department **or** c) Diploma in ship building with 15years experience either/or in sea going regular vessels / Classification Societies / Ship Building yards/reputed International Shipping Corporations or State Port Department **or** d) Master Mariner with 2 years of sailing experience or experience in maritime training / marine survey after having obtained master's certificate issued by Director General of Shipping, Government of India or equivalent international certificate. In case of surveyor being an agency, the concerned agency shall have personnel with above qualification on their panel/role.	***Qualification of Surveyor***
2.4.6 The surveyor shall be subordinate to the Chief surveyor and shall discharge the following functions and duties, namely:- (a) Attend to the survey of vessel as per directions from the Chief surveyor; (b) Maintain registers of vessels; (c) Conduct periodical inspection as per statutory provisions on board vessels and verify the records to be maintained on board, validity of crew certificate, survey certificate, Life Saving Appliances, Fire Fighting Appliances, navigation	***Duties of Surveyor***

and communicating equipments, machineries etc. In case of default he shall detain the vessel and make necessary recommendations for suspension/cancellation of the certificate of registration/survey to the competent authority. Such detention order shall be in Form No. 11(a);

2.4.7 Every surveyor shall, for the purposes of any survey made by him, be deemed to be a public servant within the meaning of the Indian Penal Code.

2.5 Power of Surveyors

Powers of Surveyors

2.5.1 For the purpose of a survey, the surveyor may, at any reasonable time, go on board any inland mechanically propelled vessel, and may inspect the mechanically propelled vessels and every part thereof, including the hull, engines and other machinery, and all equipment and articles on board. Provided that he shall not unnecessarily hinder the loading or unloading of the mechanically propelled vessel, or unnecessarily detain or delay her from proceeding on any voyage.

2.5.2 The owner, master and officers of the mechanically propelled vessel, shall afford to the surveyor all reasonable, facilities for the survey, and all such information respecting the mechanically propelled vessel, and her machinery or any part thereof, and all equipment and articles on board, as he may require for the purposes of a survey.

2.6 Fees in respect of survey

Fee in respect of Survey

2.6.1 Before a survey is commenced, the owner or master of the mechanically propelled vessel, to be surveyed shall pay the fees payable under the Act & these rules as specified in the Schedule- II of these rules.

2.6.2 Where a resurvey is necessitated on account of any default, act or omission on the part of owner or master or any member of the crew the owner shall be liable to pay such fee as may be payable for a survey.

2.6.3 Any fee payable under the Act or under these rules shall be paid by remittance into a Government Treasury or otherwise as notified by the Government to the credit of the Government under such head of account as the Government may specify from time to time.

2.6.4 No fee paid under the Act or these Rules shall be refundable.

2.7 Survey for new construction

Procedure for Survey

2.7.1 Category A vessels shall be designed, constructed and maintained under the survey of a classification society who is a member of International Association of Classification Societies (IACS) as per schedule VI.

2.7.2 Category B vessels shall be designed, constructed and maintained either under class survey of a recognized classification society stated in 2.7.1 above or under the authority of the Chief Surveyor, assisted by Surveyors appointed under section 2.4.2 following Classification Society (member of IACS) Rules for construction of Inland Vessels or Approved Standard Rules for such construction adopted by the State Government. 2.7.3 The owner or builder who intends to build a vessel shall, before laying the keel of the vessel, submit a preliminary application expressing his intention to build a vessel, in Form No.1 along with particulars and details specified therein, to the Chief Surveyor so that the progress of construction can be monitored by the Surveyor from the very beginning and at different stages of construction. 2.7.4 Upon receipt of application as above, the Chief Surveyor shall verify the same and decide the category to which the vessel is to be included and intimate it to the applicant. 2.7.5 The date and place of laying the keel for the new vessel shall be intimated to the Chief Surveyor, in writing, for the purposes of official records of the date of laying the keel.	
2.8 Application for Survey 2.8.1 Every application for survey shall be made to the chief surveyor or surveyor notified by the Government by the registered owner or his authorized agent or master or in case of minor his/her legal/natural guardian. 2.8.2 The application shall be made in Form No. 2 and shall contain the particulars required therein. 2.8.3 Every application for vessel's periodical, dry docking or special survey shall be accompanied by the following records in respect of the vessel, namely: (i) copy of registration of the vessel or records evidencing the title of the applicant in respect of the vessel; (ii) copy of latest certificate of Survey , if it is an existing vessel and in case the vessel undergoing the first initial survey, a declaration to that effect; (iii) Authorization from the registered owner, in the cases where the applicant is not the registered owner; (iv) documentary proof of his legal/natural guardian in case of minor; (v) challan receipt/appropriate document evidencing payment of such fees as specified in Schedule-II for the survey; (vi) duplicate of latest declaration, if any, given to the owner;	***Application for Survey***

(vii) the name of port or place at which survey is expected to be carried out; (viii) such other records as are necessary for and in connection with the survey; 2.8.4 For application for the initial survey of Inland Vessel either newly constructed or existing vessel being surveyed for the first time, application shall be accompanied by:- a) particulars in Form No. 3 b) General Arrangement plans, safety equipment plans, structural drawings, freeboard marking, shell expansion, machinery and machinery layout, propeller, shafting, gears and steering plans, pipeline such as bilge and ballast, oil transfer etc; c) particulars of wheel house, crew accommodation, passages , galleys, stores/ service place etc. d) particulars of ventilation/change of air for engine room, crew accommodation etc. e) particulars of Life Saving, Fire Fighting, Light and Sound signals, Navigational and Communication equipment. f) computation of the strength of the hull, decks, bulkhead including collision bulkhead etc; g) computation of stability, free board clearly showing amount of cargo and method of its placement, depicting calculation of metacentric height; h) all possible data from the Ex Registering Authority regarding stability, drawings as mentioned above etc. and builders certificate, if available; Provided that , if previous Surveying Authority is unable to supply such data, for any reason and communicates the same in writing, the owner shall produce such communication; i) Certificate of machineries from manufacturers or classification societies or surveyors. Copy of Registration Certificate of vessel, if applicable. 2.8.6 On receipt of an application for survey, the chief surveyor/surveyor shall fix mutually convenient date, time and place of survey which shall not be later than 7 working days and shall give intimation thereof to the applicant in Form No. 4. **2.9 Manner of survey** 2.9.1 The survey shall be made at such time, place and date, as may be specified in the intimation referred to in rule 2.8.6. Provided that the surveyor may postpone the survey for reasons to be recorded and in the case of such postponement, the survey shall be made within 7 working days and no further postponement should be allowed. The fresh intimation, in the manner herein before specified shall be given;	 ***Manner of Survey***

2.9.2 Provided further that the surveyor may require the vessel to be brought over to dry dock or any other suitable place, if such a step is, for reasons to be recorded, considered necessary by the surveyor for the purpose of the survey and no survey need be made in pursuance of an application unless the directions of the surveyor in this regard are complied with by the applicant: 2.9.3 The survey shall be made by actual inspection of the vessel and every part thereof including the machinery and any other equipment, fittings, appliances in the vessel, the inspection of which is relevant for the purposes of the Act. 2.9.4 During the survey, the surveyor shall satisfy himself as to the requirements specified in section 7 of the Act & applicable clauses of these Regulations. 2.9.5 If, as a result of the survey any defect is noticed in the vessel or in any part thereof or in any machinery or article therein, a) Intimation of such defect shall be given to the applicant with a direction to rectify such defect within the period to be specified in such intimation. Form 5 b) On receipt of information from the applicant regarding rectification of such defects, further survey shall be made within 7 working days and during survey, the surveyor shall, before giving the declaration referred to in section 7 of the Act, satisfy himself as to the rectification of such defect. c) The surveyor shall not give the declaration referred to in section 7 of the Act unless and until the defect is rectified as directed by him. 2.9.6 Where a vessel is offered for survey in pursuance of an application in that behalf by the owner is withdrawn by the owner owing to any default or any other act or conduct by the owner and the survey is hindered or made impossible, no survey of the vessel shall be made based on that application; provided that nothing in this sub rule shall prevent the owner from filing a fresh application for survey. 2.9.8 The surveyor shall, as and when so required by the Government, furnish to the Government such information as he has in respect of any vessel and if he is not in possession of such information, he shall obtain such information from the owner or master and furnish it to the Government. 2.9.9 The owner or master of the vessel shall be bound to give such information on a requisition in that behalf by the surveyor.	

2.9.10 Notwithstanding anything contained in these rules, the surveyor is authorized to go on board any vessel and inspect it or any part thereof or any machinery or article thereon relevant to the purpose of the Act, if such inspection becomes necessary for or in connection with any of the purposes of the Act. 2.9.11 No surveyor shall enter a vessel for the purpose of survey of the vessel under the Act except under a notice to the owner or master of the vessel. Such survey shall be carried out in the presence of owner's representative(s) during daytime, preferably from sunrise to sunset except when demanded otherwise by circumstances involving exigencies/emergencies.	
2.10 Declaration of Survey 2.10.1 The declaration referred to in section 7 of the Act shall be in a Form No. 6 and shall be given in duplicate forthwith upon satisfactory completion of Survey. 2.10.2 The owner or master to whom the declaration is given shall within fourteen days after the date of receipt thereof, send the declaration to such officer, as the Government may by notification appoint in this behalf. 2.10.3 If the owner or master fails to send a declaration as required by section 2.10.2 above (subsection 8(1) of the Act), he shall forfeit a sum as prescribed in the Act. 2.10.4 The surveyor giving such a declaration shall obtain from the owner or master of the vessel the current or expired certificate of survey in respect of the vessel and forward the same to the Chief Surveyor with information regarding the survey made by him of the vessel and regarding the declaration given by him to the owner under section 7 of the Act.	***Declaration of Survey***
2.11 Notice regarding Certificate of Survey A notice under clause (b) of sub section (1) of section 9 of the Act shall be in Form No. 7 and shall contain the particulars specified therein.	***Notice Regarding Certificate of Survey***
2.12 Application for certificate of survey An application for a certificate of survey shall be made to such officer authorized under sub section (2) of section 9 of the Act in Form No. 8 and shall contain the particulars specified therein. In case State Government sets up State Maritime Board/Authority/Commission under section 9(4) of the Act, such body may be empowered for overall development of maritime activities in the State including authorizations under sub section (2) of section 9 of the Act.	***Application for Certificate of Survey***
2.13 Certificates of Survey The certificate of survey in respect of class A vessels shall be in Form No. 9 and in respect of class B vessels shall be in Form No. 10 and shall contain the details specified therein.	***Certificate of Survey***

2.14 Temporary Permit The surveyor who conducted the survey may, without following the procedure laid down in section 9 of the Act, grant a permit to be effective for a period which shall not in any case exceed forty-five days, to authorize the inland mechanically propelled vessel to proceed on voyage or use in service temporarily pending the issue of the certificate of survey. **2.15 Certificate of survey to be affixed in conspicuous part of mechanically propelled vessel** The owner or master of every mechanically propelled vessel, for which a certificate of survey has been granted, shall forthwith, on the receipt of the certificate, cause one of the duplicates thereof to be affixed and kept affixed so long as it remains in force and the mechanically propelled vessel is in use, on some conspicuous part of the mechanically propelled vessel where it may be easily read by all persons on board. **2.16 Term of certificates of survey** Any Certificate of Survey issued under the provisions of this Chapter shall be subject to terms of certificate of survey contained in section 11 of the Act. **2.17 Change of name** 2.17.1 Where a change of name of a vessel in respect of which a certificate of survey had been granted under the Act is required, the owner or master of the vessel shall forward the certificate of survey to the authority who issued the certificate along with an application for change of the name of the vessel entered in the certificate of survey. 2.17.2 Such application shall be in Form No. 11 and shall contain the particulars required therein. 2.17.3 Such officer shall, after due enquiry by himself or through any other officer satisfy that the new name is not allotted to any other vessel and cause such change as is necessary to be effected in the certificate of survey, which shall thereupon be returned to the owner after due process of carving/marking of the changed name on vessel and upon due changes effected by the Registering Authority in Registration Certificate and Book of Registration. **2.18 Renewal of certificates of survey** After a certificate of survey has ceased to be in force, the same shall only be renewed after a fresh survey of the mechanically propelled vessel to which the certificate relates, has been held in accordance with the provisions of this Chapter, save so far as any relaxation thereof may be prescribed.	***Temporary Permit*** ***Display of Certificate of Survey*** ***Terms of Certificate of Survey*** ***Change of Name*** ***Renewal of Certificate of Survey***

2.19 Suspension or Cancellation of certificate of survey

Suspension or Cancellation of Certificate of Survey

A certificate of survey or any endorsement thereon made under section 10A of the Act may be suspended or cancelled by the Government, if that Government has reason to believe:

(a) that the declaration by the surveyor of the sufficiency and good condition of the hull, engines or other machinery or of any of the equipment of the mechanically propelled vessel has been fraudulently or erroneously made; or
(b) that the certificate has otherwise been granted upon false or erroneous information; or
(c) that since the making of the declaration the hull, engines or other machinery, or any of the equipment of the mechanically propelled vessel have sustained any material injury, or have otherwise become insufficient.

2.20 Delivery of expired or cancelled certificate

Delivery of Expired or Cancelled Certificates of Survey

2.20.1 The owner or master of every mechanically propelled vessel, for which a certificate of survey has expired on has been cancelled shall cause certificate of survey, which has expired or has been suspended or cancelled, to be delivered up to officer who had issued the certificate of survey.

2.20.2 Where an endorsement on any certificate of survey for the State has been suspended or cancelled, the certificate of survey to be delivered up to such officer who had issued the endorsement in order that particulars of the suspension or cancellation of the endorsement may be noted on the certificate.

2.21 Report of suspension or cancellation of certain certificates

Reporting Suspension or Cancellation of Certificates issued by other Government

If the Government suspends or cancels endorsement made under section 10A of the Act on a certificate of survey, it shall report the fact of suspension or cancellation, together with the reasons therefore, to the State Government which (or whose delegate) granted the certificate.

2.22 Survey by two surveyors

Survey by Two Surveyors

2.22.1 A survey shall ordinarily be made by one surveyor, but two surveyors may be employed if the Government, by order in writing, so directs at any place of survey, or specially in the case of any particular mechanically propelled vessel or class of mechanically propelled vessel at any such place

2.22.2 If the surveyor making a survey of a mechanically propelled vessel refuses to give a declaration under section 7 of the Act with regard to the mechanically propelled vessel, or gives a declaration with which the owner or master of the mechanically propelled vessel is dissatisfied, the State Government may, on the application of the owner or master, and the payment by him of fee twice the amount of the fee payable for the previous survey, direct two other surveyors to survey the mechanically propelled vessel. 2.22.3 The surveyors so directed shall forthwith survey the mechanically propelled vessel, and may, after the survey, either refuse to give a declaration or give such declaration as, under the circumstances, seems to them proper. 2.22.4 Any declaration given, or any refusal to give a declaration under sub section 17(2) of the Act shall be final. 2.22.5 When a survey is made by two surveyors under either section 16 or section 17 of the Act each of the surveyors shall perform the prescribed portion of the duties assigned to a surveyor by the Government.	

CHAPTER 3

REGISTRATION OF INLAND MECHANICALLY PROPELLED VESSELS

3.1 Application

Application

3.1.1 An inland mechanically propelled vessel shall not proceed on any voyage or be used for any service, unless it has a certificate of registration in force in respect thereof and granted under the Act.

3.1.2 Nothing in this section shall –

a) Apply to any mechanically propelled vessel built at any place other than a place of registry and making her first voyage to any such place for the purpose of registration; or
b) Be in derogation of the provisions contains in section 3 of the Act.

3.1.3 Every certificate of registry and every certificate of survey issued in respect of a mechanically propelled vessel under the Merchant Shipping Act, 1958, shall be valid and effective as a certificate of registration or certificate of survey, as the case may be, issued under the Act and the relevant provisions of the Act shall apply in relation to such vessel as they apply to an inland mechanically propelled vessel registered under these regulations and the Act.

3.1.4 An inland vessel required to be registered by the Act may be detained until the Master of the vessel, if so required, produces a certificate of registry in respect of the vessel.

3.2 Place of registry

Places of Registry

Places in the State shall be as listed in Schedule III or amended subsequently by notification in the Official Gazette

3.3 Registering authorities

Registering Authorities

Qualification

3.3.1 No person shall be appointed as Registering Authority unless he meets the qualifications and experience enumerated in any one of the following:

e) possesses a degree or equivalent in Marine Engineering and Ministry of Transport First Class certificate of competency issued by Director General of Shipping, Government of India or equivalent certificate recognized by Government of India with 5 years sailing experience at Management Level **or**
f) a basic degree in Naval Architecture with 10 years' experience in sea going regular vessels / Classification Societies / Ship Building yards/reputed International Shipping Corporations or State Port Department **or**
g) Diploma in ship building with 20 years experience in sea going regular vessels / Classification Societies / Ship Building yards/reputed International Shipping Corporations or State Port Department **or**
e) Master Mariner with 5 years experience as surveyor with DGS/IWT Department/State Maritime Board.

Powers, Functions and Duties

3.3.2 The Registering Authority shall:

a) Ensure that all documents as specified in Rule 3.5 are received and are in order.
b) conduct enquiry after giving a notice to the applicant informing the date and time of enquiry
c) For the purpose of such enquiry the authority shall be competent to:-
    i. Inspect the vessel or any part thereof or any machinery thereon or any article therein relevant to the purpose of such enquiry.
    ii. Call for any record from the owner or master of the vessel and examine it in so far as such records are relevant for the purpose of such enquiry.
    iii. Have such assistance as he deems fit for the purpose of such inspection.
d) Issue/deny certificate of registration and maintain all records related to registration of vessels.
e) Inspect any vessel under his jurisdiction, or get it inspected by an officer appointed on his behalf at any time and to suspend the registration of the vessel if satisfied that she is not fit to ply in Inland Waters.
f) Cancel certificate of registration after necessary formalities, if found necessary.
g) Issue duplicate copy of certificates issued by the authority.

3.3.3 Every person appointed as a registering authority shall, for the purposes of any registration made by him, be deemed to be a public servant within the meaning of the Indian Penal code.

3.4 Book of registration

Book of Registration

3.4.1 At every place of registry, a book shall be kept by the registering authority in the Form No. 12 in which all the particulars contained in the form of the certificate of registration, shall be duly entered.

3.4.2 The book of registration shall be kept in bound volumes with machine numbered pages.

3.4.3 Registering authority shall, immediately after registering any inland mechanically propelled vessels or within one month at the furthest, send to the State Government a true and exact copy, together with the number of every certificate which shall be so granted by it.

3.5 Application for registration

Application for Registration

An application for registration of an inland mechanically propelled vessel shall be made by the owner or master of the vessel in Form No. 13 and shall contain such particulars as required therein and shall be accompanied by:

a) A statement by the owner that the provisions of the Act and these rules have been complied with; b) In the case of a newly built vessel, the builder's certificate and inspection certificate issued by the surveyor along with approved drawing of the vessel, documents relating to purchase of the vessel and document of its ownership. In case of a new vessel under construction the builder's certificate may be submitted forthwith upon issue by the respective organization/authority after the completion of the vessel. c) In the case of renovated vessels, builder's certificate and inspection certificate issued by the surveyor along with approved drawing of the vessel and document of its ownership. d) a duplicate of the certificate of survey if issued by the authority; e) challan receipt evidencing payment of such fees as specified in the Schedule-IV for the registration of the vessel or as prescribed under section 19R (e) of the Act; f) Copy of insurance certificate submitted forthwith when the vessel is insured as per Chapter 7 of these Rules before plying/trading. (Note: The vessel will be insured after registration is done and insurance company is given the identity (registration) of the vessel and survey certificate copies).	
3.6 Fees payable 3.6.1 The fees payable under the Act shall be as specified in the Schedule IV of these rules. 3.6.2 Any fee payable under the Act or under these rules shall be paid by remittance into a Government Treasury/Bank or otherwise as notified to the credit of the Government under such head of account as the Government may specify from time to time. 3.6.3 No fee paid under the Act or these Rules shall be refundable	***Fees for Registration***
3.7 Places of Registration 3.7.1 Every application for registration shall be made on a registering authority of the Place of Registry listed in section 3.2 of these rules within the local limits of whose jurisdiction the owner of the inland mechanically propelled vessels ordinarily resides or carries on business 3.7.2 Where the owner applying for a certificate of registration is a company within the meaning of section 3 of the Companies Act, 1956, the application may be made to a registering authority within the local limits of whose jurisdiction the principal office of the company is situated. 3.7.3 Notwithstanding anything contained in this section, an inland mechanically propelled vessel may be registered by a registering authority in the State, although the owner does not ordinarily reside or carry on business in the State or, if a company, the principal place of business of the company is not situated in the State, provided that the Government of the State in which the owner ordinarily resides or carries on business, or in the case of a company the	***Places of Registration***

Government of the State where the principal places of business of the company is situated has accorded its previous approval thereto and such approval accompanies Application of Registration in addition to documents stated in section 3.5. **3.8 Procedure for registration** 3.8.1 The owner of an inland vessel wishing to have it registered at a place of registry in the State shall make an application for registration and submit to the concerned Registering Authority: a) A declaration of ownership – in the prescribed Form No. 14 b) A certificate signed by the builder (builder's certificate) of the vessel containing a true account of the proper dimensions/particulars and of the tonnage of the vessel as estimated by him and the time, when and the place where the vessel was built, (for new vessel). c) The instrument of sale under which the property of the vessel was transferred to the applicant who requires it to be registered in his name, (for second hand vessel). d) To give a minimum of 14 days' notice to the Registering Authority of the name proposed for the vessel. The Registering Authority on receipt of the application for registration of the vessel shall approve the name after ensuring from records that there is no other vessel in the same name and shall allot an official number for the vessel. 3.8.2 On being satisfied that the inland vessel, on the strength of the evidence placed before him, is entitled to be registered at the place of registry, the Registering Authority shall give a notice to the applicant in format as prescribed in Form No. 15, informing him of the time and date of the enquiry in respect of the vessel. 3.8.2 For the purpose of enquiry under these rules, it shall be competent for such authority: a) to inspect the vessel or any part thereof or any machinery therein or any article therein relevant to the purpose of such enquiry; b) to call for any record from the owner or master of the vessel and examine it in so far as such records are relevant for the purpose of such enquiry and c) to have such assistance as it deems fit for the purpose of such inspection 3.8.3 The owner, the master and every member of the crew of the vessel shall afford to such authority all reasonable facilities for the enquiry and furnish such information as the authority requires for the purpose of such inquiry. 3.8.4 After the formalities enumerated above have been gone through, the Registering Authority issues a carving and marking note in the format as prescribed in Form No. 16. This note is to be returned to the Registering Authority after carving and marking have been duly carried out on the vessel in the prescribed manner and certified by a Surveyor. The carving and marking is to be done as detailed in 3.11 below.	***Procedure for Registration***

3.8.5 On completion of the preliminaries to registry as described in the preceding paragraphs, the Registering Authority enters in the Book of Registration the particulars of the inland vessel such as: a) Name of the vessel and the place of registry. b) Details contained in the Certificate of Survey. c) Particulars respecting her origin as revealed in the declaration of ownership. d) the name and description of her registered owner and, if there are more owners than one, the number of shares owned by each of them; and	
3.9 Grant of certificate of registration 3.9.1 If, in respect of any inland mechanically propelled vessel, the registering authority, after making such inquiry as in section 3.8 of these rules, thinks fit, is satisfied that the provisions of the Act or of any rules made hereunder have been complied with, it shall grant to the applicant thereof a certificate of registration retaining the Surveyor's certificate, builders certificate, instrument of sale by which the ship was sold, and the declaration of ownership. The certificate may also be in electronic form like smart card, in place of conventional paper certificate. 3.9.2 In special circumstances and for reason to be recorded in writing the registering authority may grant a temporary pass to an inland vessel to enable it to ply during the period of the preparation of certificate or registration. The pass shall be valid for the time and within the limit therein mentioned. The said pass shall be valid for 30 days and shall have the same effect as a certificate of registration subject to the conditions laid down in the pass. 3.9.3 It shall be the duty of the owner or master of the inland vessel to produce Certificate of Registration on demand by authority engaged in the enforcement of Act and rules. 3.9.4 A registering authority may refuse to register an inland mechanically propelled vessel, if she is found to be mechanically defective, or if the applicant fails to furnish satisfactory evidence in support of any of the statements made in his this application. 3.9.5 Provided that where the registering authority refuses to register any inland mechanically propelled vessel, it shall furnish to the applicant a statement in writing containing the reasons for such refusal.	***Grant of Certificate of Registration***
3.10 Duplicate of the certificate 3.10.1 The authority which issued the certificate of registration shall issue a duplicate of the certificate of registration to replace a certificate lost, destroyed or mutilated.	***Duplicate Certificate of Registration***

3.10.2 Provided that no such duplicate certificate shall be issued unless:

a) in the case of a certificate lost, it is proved to the satisfaction of the Registering Authority that all measures possible for tracing out the certificate have been exhausted;
b) in the case of a certificate destroyed, such authority is satisfied after due enquiry that the certificate has actually been destroyed; and
c) in the case of mutilated certificate, the owner delivers up such certificate to such authority.

3.10.3 Every duplicate of the certificate shall, on the face of it, be stamped with the word ‘duplicate’ in red ink.

3.10.4 In the case of a certificate lost if, subsequent to the issue of a duplicate certificate, the original certificate is found, the later shall be delivered up to the issuing authority that shall cancel the certificate and record the same.

3.11 Marking of Inland mechanically propelled vessels

Markings of Vessels

3.11.1 Where an inland mechanically propelled vessel has been registered under this Chapter, the registering authority shall assign to the vessel, to be displayed thereon conspicuously registration mark comprising of registration number, port of registry and name of Vessel as described in following subsections of this section.

3.11.2 Every registered vessel shall bear the following identification marks on its hull;-

a) Name of vessel - Name shall be inscribed on each bow and stern of the mechanically propelled vessel. In the case of dumb barges/vessels Name and official number on each bow;
b) Registration No and year of registration on the main superstructure and /or engine room bulkhead/main beam in mechanically propelled vessels.
c) Place/Port of registry on the stern / transom.

3.11.3 The identification mark shall be inscribed not less than 200mm x 150mm (height x breadth) with each letter 25mm wide and shall be curved/marked/welded in light colour on a dark background or in a dark colour on a light background,

3.11.4 Inland Vessels registration marks and the number denoting its gross tonnage shall be curved / marked on its main beam or any permanent bulkhead at a prominent place.

3.11 .5 Additionally, every vessel shall be painted and displayed on a fixed board, exhibited on the upper deck, the following information;

a) Gross tonnage;
b) maximum permissible number of passengers ;
c) name of the owner ;
d) date of last survey.
e) loaded draft and deadweight ton in case of cargo vessels.

3.11 6 Inland vessels load line shall be curved/marked/welded Plimsoll mark on port and starboard side where practicable on vessels above 20 metre in length and in case of small vessels/crafts a load line mark shall be curved / marked / welded 300 mm long and 25 mm wide and shall coincide with maximum draught level of the inland vessel in fair weather conditions 3.11.7 Scale of draught marks shall be curved/marked/welded in meters and millimetres/decimetres, forward and aft of Inland vessels on both the port and the starboard side and on midship in particular on cargo vessels above 20 meters in length with Plimsoll mark. **3.12 Prohibition against transfer of certificate of registration** 3.12.1 A certificate of registration granted in respect of any inland mechanically propelled vessel shall be used only for the lawful navigation of that vessel. 3.12.2 A certificate of registration in respect of an inland mechanically propelled vessel issued by a registering authority in the State shall be valid for the State only, but where any such vessel plies in inland waters of any other State, nothing in this section shall be deemed to require the owner or master of the vessel to obtain a fresh certificate of registration in relation to the State or States in which the vessel is not so registered. 3.12.3 When an inland mechanically propelled vessel registered in another State has been kept in the State for a period exceeding thirty six months, the owner or master of the vessel shall make an application under section 19K of the Act to the registering authority, within whose jurisdiction the vessel then is, for the transfer of registry from the registering authority of the place where the vessel is registered.	***Prohibition against transfer of certificate of registration***
3.13 Registration of alterations 3.13.1 No alteration to a vessel shall be made without obtaining sanction from the Registering Authority. 3.13.2 Subsequent to obtaining the sanction of the registering authority in sub section 3.13.1, when an inland mechanically propelled vessels is so altered as not to correspond with the particulars relating to her or the description entered in the certificate of registration, then the owner of the vessel shall, within 30 days, make a report of such alteration to the registering authority of the place where the vessel is registered. 3.13.3 The report under sub-section 3.13.2 shall be made in Form No. 17 and shall contain such particulars with respect to the alteration as may be prescribed and shall be accompanied by the certificate of registration in force in respect of the vessel at the time of the report.	***Registration of alterations***

3.13.4 The registering authority, on receipt of the report under sub-section 3.13.1 and on payment of the prescribed fee as per schedule IV, shall either cause the alteration to be registered or direct that the vessel be registered anew. 3.13.5 The registering authority in deciding whether alteration will be recorded or whether the inland vessel should be registered a new shall be guided by the following considerations:- a) Whenever any material alteration is made in the hull affecting the length or breadth or depth of the inland vessel or wherever there is alteration in the means of propulsion including addition of removal of an auxiliary engine the vessel shall require new registration. b) Where the alteration consists merely of a change in the dimensions of close in space, the addition or removal of poop or deckhouse etc. or an allowance or disallowance or crew space of other similar change or an alteration from motor or steam crew to another motor or steam crew or reverse. The registering authority may allow such alteration to be recorded provided the stability of the vessel is not endangered thereby. 3.13.5 Provided that where the registering authority directs that the vessel be registered anew, it shall either grant a provisional certificate describing the vessel as altered or provisionally endorse the particulars of the alteration on the existing certificates. 3.13.6 Any provisional certificate granted or endorsement made under the provisions of this section shall be valid for a period of one month from the date thereof, within which period the owner shall cause all necessary steps to be taken to have the vessel registered anew. **3.14 Transfer of registry** 3.14.1 The registry of an inland mechanically propelled vessel may be transferred from one place in a State to another place in another State on the application in the prescribed format as in Form No. 18 by the owner or master of the vessel to the registering authority of the State in which the vessel is kept. 3.14.2 On receipt of such application, the registering authority shall transmit notice thereof to the registering authority of the place where the vessel is registered, who shall communicate no objection or otherwise to such transfer within a fortnight or earlier. 3.14.3 The certificates of registration in respect of the vessel shall be delivered up to the registering authority of the intended place of registry along with the application. 3.14.4 On receipt of the application under sub-section 3.14.1 and the prescribed fee which is same as in Schedule IV, the registering authority of the intended place of registry shall enter in its register book, all the particulars relating to the vessel and grant a fresh certificate of registration in respect of the vessel and henceforth such vessel shall be considered as registered at the new place of registry.	***Transfer of registry***

3.14.5 A State Government may make rules under section 19R of the Act requiring the owner or master of an inland mechanically propelled vessel not registered within the State which is brought into or is, for the time being in the State, to furnish to a prescribed authority in the State such information with respect to the inland mechanically propelled vessel and its registration as may be prescribed.	
3.15 Transfer of vessel 3.15.1 If a vessel is transferred to any person, whether resident within the State or not, the transferor and the transferee shall make joint report of the transfer to the registering authority within whose jurisdiction the transferee resides or carries on business within thirty days of such transfer along with a chalan or deposit receipt evidencing payment of fees specified in Schedule -IV, for such transfer. 3.15.2 Provided that no transfer shall be made to any person resident in another State or in any country outside India, without the previous approval of the Government. 3.15.3 The certificate of registration in respect of the vessel shall also be surrendered along with the report referred to in sub section 3.15.1 in order that the particulars of the transfer of the ownership may be entered thereon.	***Transfer of vessel***
3.16 Change of residence or place of business 3.16.1 If the owner of an inland mechanically propelled vessel ceases to reside or carry on business at the address recorded in the certificate of registration of the vessel, he shall, within thirty days of the change of address, intimate his new address to the registering authority by which the certificate of registration was granted, or if the new address is within the jurisdiction of another registering authority, to that registering authority, and shall at the same time forward the certificate of registration to the registering authority in order that the new address may be entered thereon. 3.16.2 Where a registering authority other than the original registering authority makes any such entry, it shall communicate the new address to the original registering authority.	***Change of residence or place of business***
3.17 Prohibition against transfer of ownership of registered vessel 3.17.1 An inland mechanically propelled vessels registered under this Act in one State shall not be transferred to a person resident in another State in India or in any country outside India, without the previous approval of the Government of the State in which the vessel is registered; 3.17.2 Provided that where an inland mechanically propelled vessel is registered or deemed to be registered under the Merchant Shipping Act, 1958 this sub-section shall have effect as if for the words “the Government of the State in which the vessel is registered” the words “the Central Government’ had been substituted.	***Prohibition against transfer of ownership of registered vessel***

3.17.3 Subject to the provision of sub-section 3.17.1, the owner of an inland mechanically propelled vessels registered under the Act and the transferee thereof shall, within thirty days of the transfer of ownership of the said vessel to the transferee, jointly make a report of the transfer to the registering authority within the local limits of whose jurisdiction the transferee resides or carries on business and shall also forward the certificate of registration to that registering authority, together with the prescribed fee, in order that particulars of the transfer of ownership may be entered thereon. **3.18 Suspension of certificates of registration** 3.18.1 A registering authority may suspend, for such period and subject to such conditions as it thinks fit, the certificate or registration of an inland mechanically propelled vessels, if it has reason to believe that after the granting of the certificate the vessel has become unfit to ply in inland waters. 3.18.2 Where the registration of an inland mechanically propelled vessel is suspended under sub-section 3.18.1, the registering authority ordering the suspension shall, if it is not the original registering authority, inform that other authority of the fact of such suspension. 3.18.3 The registering authority suspending the certificate may require the owner or master of the vessel to deliver up the certificate so suspended to itself or, if it is not the original registering authority, to that other authority. 3.18.4 A certificate of registration surrendered under this section shall be returned to the owner when the order suspending the certificate has been rescinded or has ceased to operate. **3.19 Cancellation of registration** 3.19.1 If an inland mechanically propelled vessel has been destroyed or has been rendered permanently unfit for service, the owner of the vessel shall, with the least practicable delay, report the fact to the registering authority of the place where the vessel is registered and shall also forward to the authority, along with the report, the certificate of registration of the vessel and thereupon the registering authority shall have the certificate of registration cancelled. 3.19.2 The registering authority or any officer authorized by the State Government in this behalf may go on board, detain, or inspect any vessel at any hour for the purpose of satisfying himself that the provision of the Act, are being complied with. It shall be the duty and responsibility of the owner or master of the inland vessel to give all reasonable assistance to the inspecting officer in carrying out the inspection and to comply with any lawful direction that he may give. 3.19.3 In case any inland vessel is detained a report of the circumstances in which the detention is ordered shall be sent to the registering authority and the Administration within forty eight hours.	 ***Suspension of certificates of registration*** ***Cancellation of registration***

3.19.4 The registering authority at any time, if satisfied that the vessel is in a condition not fit to ply in the Inland water, suspend the registration of the vessel and require the owner thereof to surrender forth with certificates of survey and registration in respect of that vessel. 3.19.5 No certificate shall be suspended under section 19N of the Act without giving owner a reasonable opportunity of being heard in respect of the grounds on which the suspension of the certificate is proposed. **3.20 Appeals** 3.20.1 Any person aggrieved by an order – a) Refusing to register any inland mechanically propelled vessels under section 19F of the Act; or b) Suspending a certificate of registration under section 19N of the Act; c) Cancelling a certificate of registration under sub-section (2) of section 19O of the Act, may within thirty days of the date on which he receives notice of such order, appeal against it to the State Government who in turn may appoint an appellant authority other than registering authority. 3.20.2 Every such appeal shall be in Form No. 19 and shall contain the particulars required therein. 3.20.3 The appeal shall be accompanied by the following, namely:- a) two copies of the order appealed against; (of which at least one shall be the original or an attested copy) b) challan receipt evidencing payment of the fee for the appeal specified in Schedule- IV; c) such other records as are necessary for the disposal of the appeal 3.20.4 The notice of appeal referred to in sub-section (2) of section 19 P of the Act shall be in Form No. 19 and shall contain the particulars specified therein; 3.20.5 The notice shall be communicated to the registering authority through post or through a messenger or by any other method which has the effect of communicating the notice. **3.21 Reciprocity** 3.21.1 Where the Central Government is satisfied that by the law or practice of any country outside India, inland mechanically propelled vessels having a certificate of registration in force under this Act (a) obtain by reason of such registration any special exemption in that country while plying in the inland waters thereof, or (b) are required as a condition of plying in the inland waters of that country to comply with any special requirement, whether by way of registration a new or payment of a fee or otherwise,	***Appeals*** ***Reciprocity***

3.21.2 The Central Government, may by notification in the Official Gazette, for the purpose of reciprocity, direct that the same exemption or requirement, or an exemption or a requirement as similar thereto as may be granted to, or imposed upon, inland mechanically propelled vessels registered in that country while plying in the inland waters of the territories to which this Act extends. **3.22 Mortgage of mechanically propelled inland vessel or share** 3.22.1 Mortgage of inland mechanically propelled vessel or share – 1) A registered inland mechanically propelled vessel or a share therein may be made a security for a loan or other valuable consideration, and the instrument creating the security (called mortgage) shall be in the prescribed form or as near thereto as circumstances permit, and on the production of such instrument the Registering Authority of the inland mechanically propelled vessels port of registry shall record it in the Book of Registration and endorse the same in the Certificate of Registry. 2) Mortgages shall be recorded by the Registering Authority in the order in time in which they are produced to him for that purpose, and the Registering Authority shall, by memorandum under his hand, notify on each mortgage that it has been recorded by him stating the day and hour of that record. 3.22.2 Entry of discharge of mortgage– Where a registered mortgage is discharged, the Registering Authority shall, on the production of the mortgage deed with a receipt for the mortgage money endorsed thereon, duly signed and attested, make an entry in the Book of Registration to the effect that the mortgage has been discharged, and on that entry being made the estate, if any, which passed to the mortgagee shall vest in the person in whom (having regard to intervening acts and circumstances, if any) it would have vested, if the mortgage had not been made. 3.22.3 Priority of mortgages-- If there are more mortgages than one recorded in respect of the same inland mechanically propelled vessel or share, the mortgagees shall, notwithstanding any express, implore or constructive notice, have priority according to the date on which each mortgage is recorded in the Book of Registration and not according to the date of each mortgage itself. 3.22.4 Mortgagee not deemed to be owner– Except in so far as may be necessary for making a mortgaged inland mechanically propelled vessel or share available as a security for the mortgage debt, the mortgagee shall not, by reason of his mortgage, be deemed to be the owner of the inland mechanically propelled vessel or share, nor shall the mortgagor be deemed to have ceased to be owner thereof. 3.22.5Rights of Mortgagee– 1) Where there is only one registered mortgagee of an inland mechanically propelled vessel or share, he shall be entitled to recover the amount due under the mortgage by selling the mortgaged inland mechanically propelled vessel	***Mortgage***

or share without approaching the High Court. Provided that nothing contained in this sub-section shall prevent the mortgagee from recovering the amount so due in the High Court as provided in sub-section (2) below.

2) Where there are two or more registered mortgagees of an inland mechanically propelled vessel or share they shall be entitled to recover the amount due under the mortgage in the High Court, and when passing a decree or thereafter the High Court may direct that the mortgaged inland mechanically propelled vessel or share be sold in execution of the decree.
3) Every registered mortgagee of an inland mechanically propelled vessel or share who intends to recover the amount due under the mortgage by selling the mortgaged inland mechanically propelled vessel or share under sub-section (1) shall give, an advance notice of fifteen days relating to such sale to the Registering Authority of the inland mechanically propelled vessels port of registry.
4) The notice under sub-section (3) shall be accompanied with the proof of payment of all wages and other amounts due to seamen in connection with their employment on that vessel.

3.22.6 Mortgage not affected by insolvency– A registered mortgage of an inland mechanically propelled vessel or share shall not be affected by any act of insolvency committed by the mortgagor after the date of the record of such mortgage, notwithstanding that the mortgagor, at the commencement of his insolvency, had the inland mechanically propelled vessel or share in his possession, order or disposition, or was the reputed owner thereof, and the mortgage shall be preferred to any right, claim or interest therein of the other creditors of the insolvent or any trustee or assignee on their behalf.

3.22.7 Transfer of mortgages—

1) A registered mortgage of an inland mechanically propelled vessel or share may be transferred to any person and the instrument effecting the transfer shall be in the prescribed form or as near thereto as circumstances permit, and on the production of such instrument, the Registering Authority shall record it by entering in the Book of Registration the name of the transferee as mortgagee of the inland mechanically propelled vessel or share and shall, by memorandum under his hand, notify on the instrument of transfer that it has been recorded by him stating the day and hour of the record.
2) The person to whom any such mortgage has been transferred shall enjoy the same right of preference as was enjoyed by the transferor.

3.22.8 Instrument creating a mortgage of a vessel or a share therein shall be in Form No. 20.

3.22.9 Instrument creating a transfer of a mortgage or a share therein shall be in Form No. 21.

3.22.10 Instrument creating the discharge of mortgage shall be in Form No. 22.

CHAPTER 4

MASTERS INCLUDING SERANGS AND ENGINEERS INCLUDING ENGINE- DRIVERS OF INLAND MECHANICALLY PROPELLED VESSELS

4.1 Minimum Crew/Manning

Minimum Manning

4.1.1 Every inland vessel registered under these rules shall have minimum manning on-board to ensure safety of the vessel, passengers/cargo and environment. The minimum manning applicable to each vessel shall be prescribed by the Surveyor in its Certificate of Survey and shall take into account the type and size of the vessel, its operating area, engine capacity and any other factor considered necessary.

4.1.2 For the purpose of this chapter, the vessels may be classified into categories as follows:

a) Category A: All Inland Vessels constructed for operating /operating in Zone 1
b) Category B: All Inland Vessels other than Category A.

4.1.3 (a) Every inland vessel shall have on board minimum following crew when in operation:

	Vessels < 226 BHP	**226 BHP ≤ Vessels < 565 BHP**	**Vessels ≥ 565 BHP**
Category A	a) One master with Master Class 3 / Serang certificate b) One engineer with Engine Driver Class 2 certificate c) Three General Purpose Ratings for attending duties of deck hands, engine hands & cooking	a) One master with Master Class 2 certificate b) One engineer with Engine Driver Class 1 certificate c) Three General Purpose Ratings for attending duties of deck hands, engine hands & cooking	(a) One master with Master Class 1 certificate (b) One engineer with Engineer certificate / License Driver Certificate up to 960 BHP (c) Four General Purpose Rating for attending duties of deck hands, engine hands & cooking

Category B	a) One master with Master Class 3 / Serang certificate b) One engineer with Engine Driver Class 2 certificate c) Two General Purpose Rating for attending duties of deck hands, engine hands & cooking	a) One master with Master Class 2 certificate b) One engineer with Engine Driver Class 1 certificate c) Two General Purpose Ratings for attending duties of deck hands, engine hands & cooking	(a) One master with Master Class 1 certificate (b) One engineer with Engineer certificate / License Driver Certificate up to 960 BHP (c) Three General Purpose Rating for attending duties of deck hands, engine hands & cooking	

4.1.3 (b) Every dumb craft of less than 15m length shall be manned by minimum one General Purpose Rating and every dumb craft of 15m or more in length shall be manned by minimum two General Purpose Ratings.

4.1.4 A mechanically propelled vessel less than 565 BHP shall be deemed to have complied with the requirements of master and engineer if she has as her master and engineer a person possessing both certificates of appropriate class.

4.1.5 The Surveyor may specify minimum manning of higher order than prescribed in sub rule 4.1.3 above if in his opinion other factors like nature of trade of the vessel, length of voyage necessitates such additional manning in the interest of Safety of life, property, environment and the inland waterways.

4.2 Appointment of Examiners & Examination Centres

Appointment of Examiners & Examination Centres

4.2.1 The Chief Examiner appointed by the State shall be responsible for the Examination and issue of Certificate of Competency to the persons desirous of obtaining such Certificates of Competency.

4.2.2 The Chief Examiner shall be assisted by suitable number of Examiners appointed by the State.

4.2.3 The places as listed in Schedule V shall be the Examination Centres in the State for the purpose of this Chapter. The State Government may by notification in the Official Gazette bring about a change in the list of Examination Centers.

4.2.3(a) Each Examination center shall announce its Examination schedule for various Grades based on the assessment of local needs, ensuring adequate frequency of the examination so that the candidates do not have to wait for more than 6 months to appear in the examination from the date of application.

4.2.4 No person shall be appointed as Chief Examiner unless he fulfils one of the following requirements of qualification and experience: a) Possesses a Ministry of Transport Master (FG) or M.E.O. Class I Certificate of Competency issued by Director General of Shipping with minimum 8 years shipboard experience as Certificated Officer; b) Possesses a Ministry of Transport First Mate (FG) or MEO Class II Certificate of Competency issued by Director General of Shipping with minimum 10 years shipboard experience as Certificated Officer; c) Possesses an Inland Vessel Master Class I or Inland Engineer Certificate with a minimum of 20 years of service onboard inland vessels as Certificated Officer of which at least 5 years must be in the capacity of a master / inland engineer. d) Possesses a qualification as in (a), (b) or (c) above and experience as a faculty or examiner in an Institute or Department of/or approved by Director General of Shipping or IWAI or State Inland Waterways department. The tenure of experience as faculty or examiner may be counted towards shipboard/inland vessel experience required under para (a), (b) and (c) above. Has worked as an Examiner appointed under these Rules.	***Qualification of Chief Examiner***
4.2.5 A Chief Examiner shall discharge the following duties; a) Supervise overall conduct of examinations for various grades of Certificate of Competency in the State. b) Supervise overall issuance of various grades of certificates of competency. c) Fix the frequency and schedule of examination for various grades of certificate of competency in State. d) Frame guidelines for approval of Training Institutes offering Inland Vessel courses in the State. e) Inspect and approve Training Institutes in the State desirous of offering Inland Vessel courses in the State.	***Duties of Chief Examiner***
4.2.6 No person shall be appointed as an Examiner unless he fulfills one of the following requirements of qualification and experience: a) Possesses a Ministry of Transport Master (FG) or M.E.O. Class I Certificate of Competency issued by Director General of Shipping with minimum 5 years shipboard experience as Certificated Officer; b) possesses a Ministry of Transport First Mate (FG) or MEO Class II Certificate of Competency issued by Director General of Shipping with minimum 7 years shipboard experience as Certificated Officer;	***Qualification of Examiner***

(c) Possesses an Inland Vessel Master Class I or Inland Engineer Certificate with a minimum of 15 years of service onboard inland vessels as Certificated Officer of which at least 5 years must be in the capacity of a master / inland engineer.

4.2.7 An Examiner shall discharge the following duties; namely:-

(a) Supervise and conduct examinations for various grades of Certificate of Competency at an examination centre.
(b) Issuance of various grades of certificates of competency.
(c) Assist Chief Examiner in discharge of his duties and responsibilities.

4.3 Issuance of Certificate of Competency

Issuance of Certificate of Competency

4.3.1 No candidate shall be granted a Certificate of Competency under these Rules without passing the relevant examination of Competency specified hereunder. The examination for each grade of Certificate of Competency shall comprise of a written and oral examination. The syllabus for each grade of examination shall be as contained in Schedule VI.

4.3.2 The above clause does not apply to issuance of Certificate of Service issued under these Rules.

4.3.3 A Certificate of Competency may be issued for the following grades, namely:

i. Deck Department-
   a) Master Class 1 Certificate
   b) Master Class 2 / License Master Certificate
   c) Master Class 3 / Serang Certificate

ii. Engine Department-
   a) Inland Engineer Certificate
   b) Engine Driver Class 1 / License Driver Certificate
   c) Engine Driver Class 2 Certificate

4.4 Master and Deck Department

Master and Deck Department

4.4.1 Examination for the grant of Certificate of Competency as inland vessel Master Class 1, Master Class 2 and Master Class 3 / Serang shall be held by the examiner at the places of examination in the State on such dates as may be published by the examination centre.

4.4.2 Every application for examination shall be filled and submitted in Form 23 appended to these rules together with copies of documents stated therein. The application so filled shall be received at the examination centre as per the schedule announced before the date fixed for examination together with the supporting documents required for ascertaining eligibility of the candidate detailed in clauses 4.4.3 to 4.4.6 herein.

4.4.3 **Minimum requirements for certification of Master Class 1 of an inland mechanically propelled vessel:** Every candidate for certification as Master Class 1 shall: i. Hold a valid Certificate of Competency as Master Class 2 of an inland mechanically propelled vessel issued under these rules. ii. have served as Master Class 2 in-charge of an inland vessel of not less than 226 BHP for minimum of three years; **or** while possessing a Master Class 2 Certificate have served as Second Serang of an inland vessel for not less than four years; **or** hold Master/Chief Mate/Second Mate (FG) or Master/Chief Mate NCV/Home Trade granted under the Merchant Shipping Act,1958 and have served as a Second in command under a Master of an inland vessel for not less than one year; **or** have served not less than three years on sea-going vessels and three years as Mate (Sukhani) of an inland vessel; **or** have served not less than six years as a Mate (Sukhani) of an inland vessel; iii. Have successfully completed Inland Vessel Maneuvering Simulator course at National Inland Navigation Institute, Patna or from any other institute recognized by the State Government. iv. Produce a medical certificate as to his physical fitness in Form No. 24. v. Have successfully attended approved Preparatory Course for Master Class 1. The Preparatory Course for Master Class 1is to be approved by IWAI or the State Government. The minimum course duration, contents and structure of the Preparatory Course for Master Class 1 shall be same as followed by NINI Patna and amended by it from time to time. vi. Have completed the four basic safety courses for inland vessels approved by IWAI or DGS or State Government namely: a) Elementary First Aid (EFA) b) Proficiency in survival techniques (PST) c) Personal safety and social responsibility (PSSR) d) Fire Prevention and Fire Fighting (FPFF)	***Master Class 1***
4.4.4 **Minimum requirements for certification of Master Class 2 of an inland mechanically propelled vessel:** Every candidate for certification as Master Class 2 shall: i. In possession of valid Master Class 3/Serang Certificate of Competency issued under these rules. ii. have served at least five years on inland vessels or sea-going vessels, the last three years of which must have been as Master Class 3/Serang in an inland vessel with a Master Class 3/Serang certificate granted under the Act **or** shall have served at least six years as a lascar/deck hand/General Purpose Rating in an inland vessel of not less than 226BHP iii. Shall produce a medical certificate as to his physical fitness in Form No. 24. iv. Have successfully attended approved Preparatory Course for Master Class 2. The Preparatory Course for Serang is to be approved by IWAI or State Government. The minimum course duration, contents and structure of the Preparatory Course for Master Class 2 shall be same as followed by NINI Patna and amended by it from time to time.	***Master Class 2***

v. Have completed the four basic safety courses for inland vessels approved by IWAI or DGS or State Government namely:

a) Elementary First Aid (EFA)
b) Proficiency in survival techniques (PST)
c) Personal safety and social responsibility (PSSR)
d) Fire Prevention and Fire Fighting (FPFF)

4.4.5 **Minimum requirements for certification of Master Class 3/Serang of an inland mechanically propelled vessel:** Every candidate for certification as Master Class 3/Serang shall be:

Master Class 3

i. A Citizen of India
ii. Not less than twenty years of age
iii. Medically fit and produce a medical certificate as to his physical fitness in Form No. 24.
iv. Have successfully attended approved Preparatory Course for Master Class 3/Serang. The Preparatory Course for Serang is to be approved by IWAI or State Government. The minimum course duration, contents and structure of the Preparatory Course for Master Class 3/Serang shall be same as followed by NINI Patna and amended by it from time to time.
v. Have completed the four basic safety courses for inland vessels approved by IWAI or DGS or State Government namely:
 a) Elementary First Aid (EFA)
 b) Proficiency in survival techniques (PST)
 c) Personal safety and social responsibility (PSSR)
 d) Fire Prevention and Fire Fighting (FPFF)

vi. **Only For Existing Lascars/Deck Hands (who have started service in inland vessels before these rules)** –
 a) Shall be 8th class pass from a board recognized by Central/State
 b) Be able to read and write Hindi/English and Regional Language of the State
 c) Meeting any one of the following minimum service criteria – Four years of service on Inland vessels or sea going vessels having engine not less than 226BHP **or**
 Five years on vessels having engine not less than 85BHP or
 Six years on vessel having engine not less than 40BHP, one year of which service shall be as helmsman or an Assistant Master (Deck) or Seacunny, or
 such candidates who have served on the vessels of Defence, Police, P.A.C. or other Paramilitary forces for 5 years or more.
 e) should have performed at least six months service as Lascar / Deck Hand on board the vessel plying in ports/Inland Waters of the State

vii. **For New Entrants Through Rating Route (which includes existing Lascars/Deck Hands/General Purpose Rating who meet these requirements)** – a) Passed 10^{th} class examination from board recognized by Central / State Government. b) Successfully completed General Purpose Rating Course at National Inland Navigation Institute, Patna or similar training establishment approved by the State c) Have minimum three years of services on Inland vessels or sea going vessels out of which one year of the service shall be as helmsman or as Seacunny. viii. **For New Entrants Through Cadet Training Route** – a) Such candidates who have passed class 12^{th} class examination from board recognized by Central/State Government. b) Successfully completed Inland Vessel Cadets Training at National Inland Navigation Institute (NINI), Patna or similar training establishment approved by the State c) Shall have two years of services on Inland vessels or sea going vessels provided the total service has been performed as Inland Vessel cadet apprentice with onboard vessel Structured Training Program verified in record book and approved or conducted by NINI or State approved training establishment and should have performed at least six months watch keeping service under qualified Master Class 1/2/3/Serang on board the vessel plying in the port/Inland vessels of the State.	
4.4.6 A candidate who has served as a master, or as an engineer of a vessel of the Coast Guard, Indian Navy or regular Army for a period of 5 years may be granted a certificate of service as a first-class master, second-class master or serang, depending on the size of vessel served and on successful completion of relevant preparatory course including the four basic safety courses from National Inland Navigation Institute, Patna or from any other institute recognized by Transport Department. Such candidates shall be exempted from written examination but will be required to qualify the oral examination. 4.4.7 A certificate of service granted as per 4.4.6 shall have the same effect as a certificate of competency granted under these Rules. **A certificate of Service so issued shall be issued in Form No. 25.**	***Certificate of Service***
4.4.8 The Chief Examiner may if he thinks fit grant a license as per format prescribed in Form No. 26 authorizing a person to act as master of any inland mechanically propelled vessel having engines of 961 BHP or of such less Brake Horse Power as he may deem fit who is in possession of a second-class master's certificate granted as per these rules and has, by virtue of such certificate, acted as master of an inland mechanically propelled vessels having engines of 226 BHP or more brake horse-power for a period of not less than five years. 4.4.9 Any license granted under para 4.4.8 above shall remain in force only for such time as the person holding the same is in the possession of Master class 2 Certificate referred to in para 4.4.8 above. Provided that the State Government may if it thinks fit, suspend, cancel or vary the conditions of any such licenses.	***License to act as Master***

4.5 Engineering Department 4.5.1 Examination for the grant of certificate of competency as Inland Engineer Certificate, Engine Driver Class 1 Certificate, Engine Driver Class 2 shall be held by the examiner at the places of examination in the State on such dates as may be published by the examination centre. 4.5.2 Every application for examination shall be filled and submitted in Form No. 23 appended to these rules together with copies of documents stated therein. The application so filled shall be received at the examination centre before the date fixed for examination together with the supporting documents required for ascertaining eligibility of the candidate.	***Engineering Department***
4.5.3 **Minimum requirements for certification of Engineer of an Inland Mechanically propelled vessel:** Every candidate for certification as Inland Vessel Engineer shall be: i. In possession of Engine Driver Class 1 Competency Service issued under the Inland Vessels Act, 1917 (Central Act 1 of 1917) ii. Should have worked for 18 months on a vessel having engines more than 565 BHP or 36 months on a vessel more than 226 BHP while holding Engine Driver Class 1 certificate issued under the Inland Vessel Act, 1917 (Central Act 1 of 1917). iii. Shall produce a medical certificate as to his physical fitness in Form No. 24. iv. Shall have successfully attended approved Preparatory Course for Inland Vessel Engineer. The Preparatory Course for Inland Vessel Engineer is to be approved by IWAI or State Government. The minimum course duration, contents and structure of the Preparatory Course for Inland Vessel Engineer shall be same as followed by NINI Patna and amended by it from time to time. v. Have completed the four basic safety courses for inland vessels approved by IWAI or DGS or State Government namely: a) Elementary First Aid (EFA) b) Proficiency in survival techniques (PST) c) Personal safety and social responsibility (PSSR) d) Fire Prevention and Fire Fighting (FPFF)	***Engineer of Inland Vessel***
4.5.4 **Minimum requirements for certification of Engine Driver Class 1 of an inland mechanically propelled vessel:** Every candidate for certification as Engine Driver Class 1 shall: i. Be in possession of Engine Driver Class 2 Competency Service issued under the Inland Vessels Act, 1917 (Central Act 1 of 1917) ii. have served for a period not less than one year as Assistant to Engine driver on regular watch on the main engines of a motor vessel of not less than 565 break horse power, while holding an Engine Driver Class 2 Certificate for a motor vessel; **or** for a period of not less than 24 months as Assistant to Engine Driver/Oil man with a Second Class Engine Driver's Certificate of motor vessel in change of a watch on the main engine of a motor vessel of not less than 226 brake horse power; **or**	***Engine Driver Class 1***

for a period of not less than three years in the engine room of a motor vessel of not less than 226 brake horse power of which period not less than one year should have been served as an assistant to driver or oilman whilst holding a Second Class Engine Driver's Certificate for motor vessels; **or** for a period of not less than 18 months with an Engine Driver Class 2 certificate for motor vessels as driver in-charge of the engine of a motor vessel up to 226 BHP. iii. Produce a medical certificate as to his physical fitness in Form No. 24. iv. Have successfully attended approved Preparatory Course for Engine Driver Class1. The Preparatory Course for Engine Driver Class 1 is to be approved by IWAI or State Government. The minimum course duration, contents and structure of the Preparatory Course for Engine Driver Class 1 shall be same as followed by NINI Patna and amended by it from time to time. v. have completed the four basic safety courses for inland vessels approved by IWAI or DGS or State Government namely: a) Elementary First Aid (EFA) b) Proficiency in survival techniques (PST) c) Personal safety and social responsibility (PSSR) d) Fire Prevention and Fire Fighting (FPFF)	
4.5.5 **Minimum requirements for certification of Engine Driver Class 2 of an inland mechanically propelled vessel:** Every candidate for certification as Engine Driver Class 2 shall be: i. A Citizen of India ii. Not less than twenty years of age iii. Shall have successfully undergone approved Induction Training for Rating (Engine)/General Purpose Rating. The duration and curriculum of the Induction Training shall be same as adopted by NINI. Such candidate should have served for a period of not less than four years in the engine room of a motor vessel of not less than 226 brake horse power, of which period not less than one year must have been served as Assistant Driver **or** total of four years' service as GP rating or rating (engine) of which at least six month shall be on Inland vessel; **or** for period of not less than five years in the engine room of motor vessel having engines of not less than 85 break horse power, or six years in the engine-room of a vessel having engines of not less than 40 brake horse power of which period not less than one year should have been as assistant driver or oilman; **or** such candidate who has passed Class 10 / Matric Examination from recognized school board must have three years of service at or on Inland Waters, one year of which service must be as an Oilman or as an Assistant Driver and should have performed at least six months service on board the vessel plying in the Port/Inland Rivers of the State/candidate is appearing for the examination of 2nd Class Engine Driver.	***Engine Driver Class 2***

iv. Shall produce a medical certificate as to his physical fitness in Form No. 24. v. Shall have successfully attended approved Preparatory Course for Engine Driver Class 2. The Preparatory Course for Engine Driver Class 2 is to be approved by IWAI or State Government. The minimum course duration, contents and structure of the Preparatory Course for Engine Driver Class 2 shall be same as followed by NINI Patna and amended by it from time to time. vi. Have completed the four basic safety courses for inland vessels approved by IWAI or DGS or State Government namely: a) Elementary First Aid (EFA) b) Proficiency in survival techniques (PST) c) Personal safety and social responsibility (PSSR) d) Fire Prevention and Fire Fighting (FPFF)	
4.5.6 A candidate who has served as an engineer of a vessel of the Coast Guard, Indian Navy or regular Army for a period of 5 years may be granted a Certificate of Service as Engine Drivers and Engineers on Inland Vessels, depending on the size of vessel served and on successful completion of relevant preparatory course including the four basic safety courses from National Inland Navigation Institute (NINI), Patna or from any other institute recognized by State Government.	***Certificate of Service***
4.5.7 A certificate of service granted as per Para 4.5.6 shall have the same effect as a certificate of competency granted under these Rules. **A certificate of Service so issued shall be issued in Form No. 25.**	
4.5.8 The Chief Examiner may if he thinks fit grant a license as per format prescribed in Form 26 authorizing a person to act as engineer of any inland mechanically propelled vessels having engines of 960 BHP or of such less nominal horse power as he may deem fit who is in possession of an Engine Driver Class 1 Certificate granted under these rules or an engine-driver's certificate granted or deemed to be granted under the Merchant Shipping Act, 1958, and has, by virtue of such certificate, served as an engine driver of an inland mechanically propelled vessels having engines of not less than 395 BHP seventy nominal horse-power for five years, for not less than two and a half years of which period he has been the engine-driver of such vessel.	***License to act as Engineer***
4.5.9 Any license granted under para 4.5.8 above shall remain in force only for such time as the person holding the same is in the possession of Engine Driver Class 1 Certificate referred to in para 4.5.8 above. Provided that the State Government may if it thinks fit, suspend, cancel or vary the conditions of any such licenses.	

4.5(a) General Purpose Rating **Minimum requirements to join as General Purpose Rating of an inland mechanically propelled vessel:** Every candidate for certification as General Purpose Rating shall be: i. A citizen of India ii. Not less than 18 years of age iii. Passed minimum 8th class for existing Deck/Engine Hands of Inland Vessel and passed minimum 10th for new entrants. iv. Produce a medical certificate as to his physical fitness in Form No. 24. v. If new entrant – completed approved induction training for General Purpose Ratings at National Inland Navigation Institute (NINI), Patna or similar training establishment approved by the State. vi. Existing Deck/Engine Hand – completed minimum 2 years as assistant Deck/Engine Hand on an Inland Vessel and have obtained a Certificate of Proficiency from a Master Class 1/2/3 for Deck Hand or from Engineer/Engine Driver Class 1/2 for Engine Hand under whom he has completed last six months of training as assistant deck/engine hand. Such existing Deck/Engine Hands will be required to undergo an approved conversion course to General Purpose Rating. The Conversion Course for General Purpose Rating is to be approved by IWAI or State Government. The minimum course duration, contents and structure of the Conversion Course to General Rating Course shall be same as followed by NINI Patna and amended by it from time to time. vii. Have completed the four basic safety courses for inland vessels approved by IWAI or DGS or State Government namely: a) Elementary First Aid (EFA) b) Proficiency in survival techniques (PST) c) Personal safety and social responsibility (PSSR) d) Fire Prevention and Fire Fighting (FPFF)	***General Purpose Rating***
4.6 Certificate to be made in duplicate Every certificate of competency or service and every license granted under these Rules and / or the Act shall be made in duplicate, and one copy shall be delivered to the person entitled to the certificate, or license and the other shall be kept and recorded with the issuing authority with one set of such record forwarded to Chief Examiner on quarterly basis.	***Certificates to be made in Duplicate***
4.7 Copy of certificate or licences to be granted in certain cases Whenever a master or serang, or an engineer or engine-driver, proves, to the satisfaction of the authority which granted his certificate, or licence that he has, without fault on his part, lost or been deprived of it, a copy of the certificate or licence to which according to the record kept under section 4.6, he appears to be entitled shall be granted to him and shall have the same effect as the original.	***Copy of Certificates & Licences***

4.8 Area in which certificates of competency or service and licences shall have effect

Applicability of Certificates of Competency or Service and Licenses

4.8.1 A certificate of competency or service and licence granted under this chapter shall have effect throughout India. Provided further that such certificate or licence may be endorsed by the State Government of any other State, or with the general or special sanction of the State Government of such other State, by the authority granting it so as to have effect in such other State or any part thereof and thereupon shall have effect accordingly.

4.8.2 Provided that the authority granting such certificate or licence may, by endorsement thereon, restrict the effect of such certificate or licence to any part of such State.

4.8.3 A certificate of competency or service and licence granted by Government of any other Indian State under the Inland Vessel Act 1917 shall have same effect and applicability in the Inland Vessels and Inland Waterways of this State subject to compliance of following additional conditions:

a) Master and Deck Department: The certificate holder serves for a minimum period of 6 months on an inland vessel plying in the State under the charge of a Master duly qualified to command an inland vessel plying within the State.
b) Engineering Department: No additional requirements.

4.9 Validity of Certificates of Competency and Licences

Validity of Certificates of Competency

The validity of all competency certificates issued for the first time to the candidates who pass the Masters, Serangs, Engineers, Engine Drivers or General Purpose Rating's examination shall be for period of five years.

4.10 Revalidation of Certificates of Competency

Revalidation of Certificates of Competency

4.10.1 In case the holder of Certificate of Competency has served in Inland Vessel for minimum period of 1 year during the last 5 years, he shall apply for renewal to the Examiner at any examination centre in Form No. 27 together with supporting documents and appropriate fees. On processing of his documents the Certificate shall be revalidated for next 5 years till the applicant attains an age of 60 years. After 60 years the certificates shall be revalidated for a period of 2 years at a time up to 65 years of age subject to medical fitness and/or as regulated by the issuing authority.

4.10.2 In case the holder of Certificate of Competency does not fulfill the requirement of service on Inland Vessels prescribed in sub section 4.10.1 above, but has served in Inland Vessel for a minimum period of 1 year in last 10 years, he shall be required to undergo the Preparatory Course for grant of that grade of Certificate of Competency at NINI or Institute approved by State Government. On successful completion of the course, he shall apply for renewal to the Examiner at any examination centre in form No 27 together with supporting documents and appropriate fees. On processing of his documents the Certificate shall be revalidated for next 5 years.

4.10.3 In case a holder of Certificate of Competency does not fulfill the requirements of sub section 4.10.1 or 4.10.2, his lapsed Certificate of Competency may be revalidated on successful completion of Preparatory Course for applicable grade and accruing 3 months service on inland vessel in lower grade.

4.11 Cancellation of Certificate of Competency /Licence

4.11.1 Any certificate or Licence granted or any endorsement made therein under this chapter may be suspended or cancelled by the State in any of the following cases-

i. if, on any investigation made under the IV Act, the Court reports that the wreck or abandonment of or loss or damage to, any vessel, or loss of life has been caused by the wrongful act or default of the holder of such certificate,
ii. that the holder of such certificate is incompetent,
iii. has been guilty or any gross act of drunkenness, tyranny or other misconduct,
iv. if the holder of such certificate is proved to have been convicted of any non-bailable offence, or
v. if the holder of such certificate is proved to have deserted his vessel or has absented himself, without leave and without sufficient reason, from his vessel or from his duty; or
vi. if, in the case of a person holding a certificate of competency or service as second-class master or serang, or as engine-driver, such person is or has become, in the opinion of the State Government, unfit to act as a second-class master or serang or an engine-driver, as the case may be;

4.11.2 Every person whose certificate is suspended or cancelled under this Chapter shall deliver it up to the Chief Examiner.

4.11.3 State Government or Chief Examiner may revoke any order of suspension or cancellation which it may have made under this Chapter to grant new certificate, or grant, without examination to any person whose certificate it has so cancelled a new certificate. A certificate so granted shall have the same effect as a certificate of competency granted under this Act after examination.

CHAPTER 5

INVESTIGATIONS INTO CASUALITIES

5.1 Report of Causalities to be made to nearest Police Station Wherever- a) any inland mechanically propelled vessel has been wrecked, abandoned or materially damaged, or b) by reason of any causality happening to, or onboard of, any inland mechanically propelled vessel loss of life has ensued, or c) any inland mechanically propelled vessel, has caused loss or material damage to, any other vessel, The master of the mechanically propelled vessel shall forthwith give notice of the wreck, abandonment, damage, causality, or loss to the officer in-charge of the nearest police- station. The officer in-charge of the police station receiving the information shall besides taking steps as warranted by the circumstances shall also forthwith inform the Administration. The owner/master of the inland vessel shall also notify and report the occurrence to the Registration Authority and the Chief Surveyor/Maritime Directorate/Board/Commission of the State.	***Report of Causalities***
5.2 Appointment of Court of investigation 5.2.1 Preliminary inquiry: - On receiving information about the inland vessel casualty, the Administration shall appoint an appropriate officer with the knowledge of Inland Vessel operations and navigation to conduct a Preliminary inquiry into the accident. The purpose of the preliminary inquiry is to establish the following:- a) The reported incident qualifies to be an inland vessel casualty within the meaning of the Act. b) the details of the voyage leading to the casualty c) The events that led to the casualty d) The extent to which loss of life or loss of property or damage to environment has occurred due to the shipping casualty. e) The causes that led to the casualty including acts of incompetency, negligence or misconduct of the person / persons concerned. 5.2.2 The preliminary inquiry which is held under Section 5.2.1 above is a departmental inquiry and the proceedings of such enquiries are not released to the public.	***Appointment of Court of Investigation***

5.2.3 In conducting the preliminary inquiry, the inquiry officer has the following responsibilities:

a) To inform the State Government of the details of the shipping causalities occurring within their jurisdiction.
b) To go on board the inland vessel and inspect the same including machinery and equipment but not unnecessarily detaining or delaying her from proceeding on any voyage.
c) to enter and inspect any premises to facilitate the completion of the preliminary inquiry
d) To summon persons he thinks fit to take statement to complete the preliminary inquiry.
e) To demand the production of all logbooks, documents or papers he considers necessary for the inquiry.
f) To submit a report to the state government.

5.2.4 Whenever on the basis of the preliminary inquiry, the State Government is satisfied that it is necessary or expedient to have a formal investigation into the facts of any case reported under section 5.1 of this chapter or otherwise brought to its notice, the State Government may-

a) appoint a special Court and direct the Court to make the investigation at such place as the State Government may fix in this behalf, or
b) direct any principal Court of ordinary criminal jurisdiction or the Court of any District Magistrate to make the investigation.

5.2.5 A special Court appointed under clause (a) of sub-section 5.2.4 shall consist of not less than two and more than four persons of whom one shall be a Magistrate, one shall be a person conversant with maritime affairs or with the navigation of inland mechanically propelled vessels, and the other or others (if any) shall be conversant with either maritime or mercantile affaires, or with the navigation of inland mechanically propelled vessels.

5.3 Power of Court of investigation to inquire into charges of incompetency or misconduct

Powers of Court of Investigation

5.3.1 Any Court making an investigation under section 5.2 of these rules may inquire into any charge of incompetency or misconduct arising in the course of the investigation against any master, engineer or engine-driver, or any person holding a certificate granted under Chapter III of the Act, as well as into any charge of a wrongful act or default on his part causing any wreck, abandonment, damage, casualty, or loss referred to in section 5.1 of these rules.

5.3.2 In every case in which any such charge arises against any master, engineer or engine-driver, or any person holding a certificate granted under Chapter III of the Act in the course of an investigation, the Court shall, before the commencement of the inquiry into the charge, cause to be furnished to him a copy of the report or of any statement of the case upon which the investigation has been directed.

5.4 Power for State Government to direct investigation to otherwise than of under section 5.1 5.4.1 If the State Government has reason to believe that there are grounds for charging any master, engineer or engine-driver, or any person holding a certificate granted under Chapter III of the Act, with incompetency or misconduct, otherwise than in the course of an investigation under section 5.1 of these rules, it may send a statement of the case to the principal Court of ordinary criminal jurisdiction, or the Court of the District Magistrate, at or nearest to the place at which it may be convenient for the parties and witnesses to attend, and may direct the court to make an investigation into the charge. 5.4.2 Before commencing an investigation under sub-section 5.4.1 above, the Court shall cause the person charged to be furnished with a copy of the statement of the case sent by the State Government.	***Powers of State Government to Direct Investigation***
5.5 Person charged to be heard For the purpose of an investigation under this Chapter into any charges against a master, engineer or engine-driver, or any person holding a certificate granted under Chapter III of the Act, the Court may summon him to appear, and shall give him full opportunity of making a defence, either in the personal or otherwise.	***Persons charged to be heard***
5.6. Assessors 5.6.1 When, in the opinion of the Court making an investigation under this Chapter, the investigation involves, or appears likely to involve, any question as to the cancelling or suspension of the certificate of a master, engineer or engine-driver, or any person holding a certificate granted under Chapter III of the Act, the Court shall appoint as its assessors, for the purposes of the investigation, two persons having experience in the merchant service or in the navigation of inland mechanically propelled vessel. 5.6.2 In every other investigation the Court may, if it thinks fit, appoint as its assessor, for the purposes of the investigation, any person conversant with maritime affairs or the navigation of inland mechanically propelled vessel and willing to act as assessor. 5.6.3 Every person appointed as an assessor under this section shall attend during the investigation and deliver his opinion in writing to be recorded on the proceedings,	***Assessors***

5.7 Powers of Court as to evidence and regulation of proceedings 5.7.1 For the purpose of any investigation under this Chapter, the court making the investigation shall, so far as relates to compelling the attendance and examination of witnesses, and the production of documents and the regulation of the proceedings, have- a) if the court is a special Court - the same powers as are exercisable by the principal Court of ordinary Criminal jurisdiction for the place at which the investigation is made; or b) if the Court is a principal court of ordinary criminal jurisdiction or the Court of the District Magistrate – the same powers as are exercisable respectively by either Court in the exercise of its criminal jurisdiction.	***Powers of Court as to Evidence Regulation***
5.8 Power of Court to effect arrest of witnesses by entry and detention of vessels 5.8.1 If any court making an investigation under this Chapter issues a warrant of arrest to compel the attendance of any person whose evidence is in its opinion necessary, it may, for the purpose of effecting the arrest, but subject to any general or special instructions issued by the State Government in this behalf authorize any officer to enter any vessel. 5.8.2 An officer so authorized to enter any vessel; may, for the purpose of enforcing the entry, call to his aid any officers of Police or Customs, or any other persons, and may seize and detain the vessel for such time as is reasonably necessary to effect the arrest; and every such officer or other person shall be deemed to be a public servant within the meaning of the Indian Penal Code. 5.8.3 No person shall be detained under this section for more than forty-eight hours.	***Powers of Court to Arrest***
5.9 Power of Court to commit for trial and to bind over witnesses Whenever, in the course of an investigation under this Chapter, it appears to the Court making the investigation may that any person has committed, within the territories to which the Act extends, an offence punishable under any law in force in such territories, the Court making the investigation (subject to such rules consistent with the Act as the High Court may, from time to time, make in this behalf)- a) cause such person to be arrested; b) commit him or hold him to bail to take his trial before the proper Court; c) bind over any other person to give evidence at such trial; and d) exercise, for the purposes of this section, all the powers of a Magistrate of the first-class or of a Presidency Magistrate.	***Powers of Court to Commit Trial***

5.10 Deposition of absent witnesses 5.10.1 Whenever, in the course of a trial referred to in section 5.9, the evidence of any witness is required in relation to the subject matter, any deposition previously made by him in relation to the same subject-matter before any Court making an investigation under this Chapter shall, if authenticated by the signature of the Magistrate or presiding Judge of such Court, be admissible in evidence on proof- a) that the witness cannot be found within the jurisdiction of the Court before which the trial is held; and b) that the deposition was made in the presence of the person accused, and that he had an opportunity of cross-examining the witness. 5.10.2 A certificate signed by such Magistrate or presiding Judge that the deposition was made in the presence of the accused, and that he had an opportunity of cross-examining the witness shall, unless the contrary be proved, be sufficient evidence that it was so made and that the accused had such opportunity.	***Deposition of Absent Witnesses***
5.11 Report by Court to State Government The Court shall, in the case of every investigation under this Chapter, transmit to the State Government a full report of the conclusions at which it has arrived, together with the evidence recorded and the written opinion of any assessor.	***Report by Court to State Government***
5.12 Court to exercise its power independently of the assessor Notwithstanding the appointment under section 5.6 of an assessor or assessors by a Court making an investigation under this Chapter, the exercise of all powers conferred on such Court by this chapter and the Act shall rest with the Court alone.	***Court to Exercise Power Independent of Assessor***
5.13 Power for State Government to direct investigations into causes of explosions on mechanically propelled vessels 5.13.1 Whenever any explosion occurs on board any inland mechanically propelled vessel, the State Government may direct that an investigation into the cause of the explosion be made by such person or persons as it may appoint in this behalf. 5.13.2 The person or persons so appointed may, for the purpose of the investigation, enter into and upon the mechanically propelled vessel, with all necessary workmen and labourers, and remove any portion of the mechanically propelled vessel or of the machinery thereof, and shall report to the State Government what, in his or their opinion, was the cause of the explosion. 5.13.3 Every person making an investigation under this section shall be deemed to be a public servant within the meaning of the Indian Penal Code.	***Investigation into Causes of Explosion***

CHAPTER 6

PROTECTION OF, AND CARRIAGE OF PASSENGERS IN INLAND MECHANICALLY PROPELLED VESSELS

PART-A

Part – A

CARRIAGE OF DANGEROUS GOODS

Carriage of Dangerous Goods

6A.1 CARRIAGE OF DANGEROUS OR HAZARDOUS GOODS

6A.1.1 No person shall-

i. take with him on board an inland mechanically propelled vessel any dangerous goods without giving notice of their nature to the owner or master of the mechanically propelled vessel, or

ii. Deliver or tender for carriage on such mechanically propelled vessel any dangerous goods without giving such notice and without distinctly marking their nature on the outside of the package containing the goods.

6A.1.2 If the owner or master of an inland mechanically propelled vessel suspects, or has reason to believe, that any luggage or parcel taken, delivered or tendered for carriage on the mechanically propelled vessel contains dangerous goods he may-

i) Refuse to carry it upon the mechanically propelled vessel; or
ii) Require it to be opened to ascertain the nature of its contents; or
iii) if it has been received for carriage, stop its transit until he is satisfied as to the nature of its contents.

6A.2 DEFINITION AND CLASSIFICATION OF DANGEROUS GOODS

Definition & Classification of Dangerous Goods

6A.2.1 Dangerous or hazardous goods are solids, liquids, or gases that can harm people, other living organisms, property, or the environment.

6A.2.2 For the purpose of this Chapter, all Goods in the Dangerous Goods List of International Maritime Dangerous Goods (IMDG) Code shall be considered to be Dangerous Goods.

6A.2.3 The classification of Dangerous Goods shall be made by the shipper / consignor or the appropriate competent authority into classes or divisions as listed below:

Class 1: Explosives

Class 1

Class 1.1: substances and articles which have a mass explosion hazard
Class 1.2: substances and articles which have a projection hazard but not a mass explosion hazard

Class 1.3: substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard Class 1.4: substances and articles which present no significant hazard Class 1.5: very insensitive substances which have a mass explosion hazard Class 1.6: extremely insensitive articles which do not have a mass explosion hazard	
Class 2: Gases Class 2.1: flammable gases Class 2.2: non-flammable, non-toxic gases Class 2.3: toxic gases	***Class 2***
Class 3: Flammable liquids	***Class 3***
Class 4: Flammable solids; substances liable to spontaneous combustion; substances which, in contact with water, emit flammable gases Class 4.1: flammable solids, self-reactive substances and desensitized explosives Class 4.2: substances liable to spontaneous combustion Class 4.3: substances which, in contact with water, emit flammable gases	***Class 4***
Class 5: Oxidizing substances and organic peroxides Class 5.1: oxidizing substances Class 5.2: organic peroxides	***Class 5***
Class 6: Toxic and infectious substances Class 6.1: toxic substances Class 6.2: infectious substances	***Class 6***
Class 7: Radioactive material	***Class 7***
Class 8: Corrosive substances	***Class 8***
Class 9: Miscellaneous dangerous substances and articles	***Class 9***
The numerical order of the classes and divisions is not that of the degree of danger.	
6A.3 DISPLAY OF CLASS LABELS ON DANGEROUS GOOD PACKAGES: 6A.3.1 every package containing dangerous or hazardous goods shall display the distinct class labels appropriate to the type of dangerous or hazardous goods. 6A.3.2 In the case of packages containing goods which represent more than one hazard, such packages shall display distinct labels to indicate the hazards. 6A.3.3 the size of the class label shall not be of less than 25 cm square which may be divided into two portions, the upper half portion being reserved for the pictorial symbol and the lower half for the test.	***Display of Class Labels***

6A.4 RESPONSIBILITY OF THE CONSIGNOR OF DANGEROUS GOODS: The Consignor shall ensure that the owner or the master of the mechanically propelled inland vessel has been provided full and adequate information in writing about the dangerous or hazardous goods being transported as to enable such owner or the master of the mechanically propelled inland vessel to: i) make aware of the safety rules for transportation of hazardous material ii) to make aware of the risks created by such goods to health or safety of any person involved in handling or carriage of dangerous goods	***Responsibility Of Consignor***
6A.5 RESPONSIBILITY OF OWNER OR MASTER OF THE MECHANICALLY PROPELLED INLAND VESSEL ENGAGED IN CARRIAGE OF DANGEROUS GOODS 6A.5.1 The crew of the mechanically propelled inland vessel is trained in handling the dangers posed during transport of such goods. 6A.5.2 The mechanically propelled inland vessel is suitable and is safe for the transportation of the said goods. 6A.5.3 The mechanically propelled inland vessel is equipped with necessary First-Aid, Safety equipment, tool box and antidotes as may be necessary to contain any accident. 6A.5.4 Satisfy himself that the information given by the consignor is full and accurate. 6A.5.5 Ensure that the crew is trained to handle and transport such hazardous materials. 6A.5.6 The crew should have successfully passed a course connected with the transport of hazardous goods conducted at any institute recognised by the State Government. 6A.5.7 The master of the mechanically propelled inland vessel shall keep all information provided to him in writing i.e., in the form TREM CARD (Transport Emergency Card). This is to be kept in the navigating bridge and is available at all times while hazardous material related to it is being transported. 6A.5.8 Every mechanically propelled inland vessel carrying dangerous or hazardous goods shall hoist flag "B" of International code of signals and at night display an all-round "RED" light. 6A.5.9 Every mechanically propelled inland vessel carrying goods of dangerous or hazardous nature shall be fitted with a spark arrester in all the ventilators and air pipes of the compartments carrying dangerous goods.	***Responsibility of Owner or Master***
6A.6 EMERGENCY INFORMATION PANEL 6A.6.1 Every mechanically propelled inland vessel engaged in carriage of dangerous goods shall display an Emergency Information Panel.	***Emergency Information Panel***

6A.6.2 Emergency information panel should be legibly and conspicuously displayed on each side of the Upper Deck. Such panel shall contain the following information: i. The correct technical name of the dangerous or hazardous goods in letters not less than 50mm high. ii. The United Nations class number for the dangerous goods in letters not less than 100mm high. iii. The class label of the dangerous or hazardous goods in the size of not less than 250mm square. iv. The name and telephone number of the emergency services to be contacted in the event of fire or any other accident in letters and numerals that are not less than 50mm high v. the name and telephone number of the consignor of the dangerous or hazardous goods or of some other person from whom expert information and advice can be obtained concerning the measures that should be taken in the event of emergency.	
6A.7 MASTER TO REPORT TO THE POLICE STATION ABOUT ACCIDENT: The master of the mechanically propelled inland vessel engaged in carriage of dangerous or hazardous goods shall, on the occurrence of an accident involving any dangerous or hazardous goods transported by his mechanically propelled inland vessel, report forthwith to the nearest police station, notify and report to the Administration and also inform the owner of the goods carriage or the transporter regarding the accident.	***Accident Reporting***
6A.8 POWER OF OWNER OR MASTER OF MECHANICALLY PROPELLED VESSEL TO THROW OVERBOARD DANGEROUS GOODS 6A.8.1 Where any dangerous goods have been taken or delivered on-board any inland Mechanically propelled vessel in contravention of section 50 of the Act or section 6A.1 of these regulations, the owner or master of the mechanically propelled vessel may, if he thinks fit, cause the goods to be thrown overboard together with any package or receptacle in which they are contained, and neither the owner nor the master shall, in respect of his having so caused the goods to be thrown overboard , be subject to any liability, civil or criminal ,in any Court. 6A.8.2 Report the action taken under section 6A.8.1 above to the nearest Police Station.	***Powers of Master or Owner***
PART-B	***Part – B***
CARRIAGE OF PASSENGERS IN INLAND MECHANICALLY PROPELLED VESSELS	***Carriage of Passengers***
6B.1 Right of Refusal to carry certain Passengers 6B.1.1 The master or any employee authorized in this behalf by the owner or master of any inland vessel, may refuse to admit any person on the Inland Vessel as a passenger,-	***Right of Refusal to certain passengers***

a) if he has not paid his fare; or
b) if he is insane; or
c) if he is suffering from an infectious or contagious disease; or
d) if he is drunk and incapable of taking care of himself; or
e) if he is disorderly, or if he is otherwise in such a state or is conducting himself in such a manner, as to cause or likely to cause annoyance to other passengers; or
f) when the Inland vessel, or the part thereof to which such person seeks admission, already contains the maximum number of passengers which may lawfully be carried therein.

6B.1.2 The Master of the inland vessel performing voyages/trips for carriage of passengers shall maintain a record of such cases in which right of refusal under section 6B.1.1 is exercised by the master of an inland vessel.

6B.2 Duties of the Passengers

Duties of Passengers

6B.2.1 No passenger shall,-

a) travel, or attempt to travel in an inland vessel without having previously paid his fare; or
b) travel, or attempt to travel in accommodation of a higher class than that for which his fare has been paid.
c) travel beyond the place to which his fare has been paid without previously paying the additional fare in respect of the additional distance; or
d) use, or attempt to use ticket on any day for which such ticket is not available; or
e) take, or attempt to take luggage with him without having previously paid the freight, if any; payable in respect thereof.

6B.2.2 Every passenger of an inland vessel shall, when required by the master or any person authorized in this behalf by the master or owner-

i. pay his fare, if not already paid,
ii. present his ticket for examination,
iii. deliver such ticket at or near the end of the journey.

6B.2.3 No passenger shall alter or deface his ticket so as to render illegible the date or number or any other material portion thereof.

6B.2.4 No passenger shall take with him or keep on board an inland vessel:

a) any decayed meat, fish or vegetable, or any such other offensive article.
b) Any dangerous and explosive material.
c) Any fire arms.

6B.2.5 No passenger on an inland vessel shall,-

a) obstruct or impede the master or any other officer of the Inland vessel in the discharge of his duties;
b) in any way obstruct or interfere with the loading or unloading of luggage or cargo; obstruct passages/alleyways by goods / baggage / belongings

c) damage, or attempt to damage the Inland vessel or any article on board thereof;
d) enter or leave to attempt to enter or leave, any inland vessel when such Inland vessel is in motion;
e) without lawful reason, enter a compartment or place reserved for the use of another passenger or refuse to leave it when required to do so by the master or any other officer of the Inland vessel;
f) smoke or be in possession of a fire or light, in any part of the Inland vessel where smoking or the possession of a fire or light is not permitted by the master thereof;
g) be drunk and disorderly, or drunk and incapable of taking care of himself;
h) commit any nuisance or act of indecency or use obscene or abusive language;
i) without lawful excuse, molest or interfere with the comfort of any other passenger.

6B.2.5 No male passenger on an inland vessel, knowing that a compartment or place has been reserved for the exclusive use of females, shall enter such compartment or place without lawful reasons, or having entered it, shall remain therein after being required by the master, or any other officer of the Inland vessel to leave it.

6B.3 Master's Authority to Evict Passengers

6B.3.1 The master or owner or any employee authorized in this behalf by the owner or master, of any inland vessel may make the following passengers leave the Inland vessel, namely:-

Master's Authority to Evict Passengers

a) insane passengers, and their attendants (if any), if they have embarked without the special permission of the master, or of the authorized employee;
b) passengers suffering from an infectious or contagious disease, when they have embarked without the special permission of the master or owner or of the authorized employee;
c) passengers who are drunk and incapable of taking care of themselves;
d) passengers who are disorderly, or are otherwise in such a state, or are conducting themselves in such a manner, as to cause or likely to cause annoyance to other passengers;
e) passengers carrying fire arms or any weapon without the special permission of the master or of the authorized employee.
f) any passengers who have embarked in excess of the maximum number of passengers which may lawfully be carried in the Inland vessel or in the part of the inland vessel thereof in which they propose to travel; and
g) passengers who have not paid their fare.

6B.3.2A person who has been refused permission to an inland vessel under rule 6B.1 shall not embark thereon; and a person who is required under rule 6B.3.1 to leave an inland vessel shall leave at such convenient time and place as the master/ owner or authorized employee may direct.

6B.3.3 Provided that any person who is refused admission under clause (f) of rule 6.3.1 to leave shall be entitled to have his fare returned to him.

6B.4 Rights of the Passengers

Master/Owner/Manager of the passenger vessels shall take appropriate steps to ensure that rights of the passengers including but not limited to the following are assured:

Rights of the Passengers

1. **The Right to Safety and Security**
    a) Good, safe and certified inland vessels shall be deployed for passenger carriage.
    b) Over all hygiene of inland vessels, toilets, hotels, shops etc
    c) Protection from Crew-made casualties like unsafe working practices in handling/managing of passengers and operation of vessels.
    d) Security of life and assets

2. **The Right against cancellations or delays due to man-made causes**
    a) Controlling actions which block the passenger movements such as Bandh, harthals, strikes, processions etc.
    b) Protection from cancellation of journey (full/part) for the benefit of service provider
    c) Controlling Overall man-made delays
    d) Optimized journey time

3. **The Right for courteous service and comfort**
    a) Crew behavior and supportive staff behavior
    b) Comfort on vessel and in waiting area at jetty.
    c) Ease of boarding and alighting

4. **The Right to be informed**
    a) Proper information on arrival time, departure time, running time, fare etc
    b) Route and stops/halts information on the inland vessel
    c) Facts to make an informed choice like insurance/compensation against injury/loss of life
    d) Protection against misleading information

5. **The Right to be heard**
    a) Considering passenger views in policy making
    b) Development of passenger service industry based on passenger needs and wants

6. **The Right to redress**
    a) Fair settlement of complaints
    b) Setting up of Grievance Redressal Mechanism and control room

6B.5 Case of Epidemic Disease onboard

Epidemic Disease Onboard

6B.5.1 Whenever any case of plague, cholera or other dangerous epidemic disease occurs on board an Inland Vessel, the Master or Person in-charge, shall immediately:-

a) remove the patient, together with his bedding, drinking utensils and food, to a part of the deck at the extreme stern of the Inland Vessel or to a suitable place/cabin allocated for isolation of such patients. In the case of plague, the clothing, bedding, and if considered necessary the baggage of the patient shall be disinfected immediately;
b) cause all excreta, vomit and urine which may have been discharged on to the dock/vessel by the patient, to be cleaned away with a solution of cyllin : and
c) report the case to the Sub-divisional or District Magistrate within whose jurisdiction the nearest facility of berthing/mooring lies, and also to the Chief Medical Officer of the district.
d) Where such place of berthing/mooring is not at the headquarters of a sub-division or district, the report mentioned in sub-clause (c) of this Sub-section shall be sent by the Master or Officer In-charge, as the case may be, by the most expeditious means available, to the next headquarters of a sub-division or district which the Inland vessel will touch.

6B.5.2 If, when the case occurs, the Inland Vessel is lying at berth/mooring at the headquarters of a sub-division or district, or otherwise, when the Inland Vessel has reached the nearest berth/mooring facility which is at such headquarters, the Master or Officer In-charge shall not move the Inland Vessel there from until permission has been given by the District Magistrate or Sub-divisional Magistrate as the case may be.

6B.5.3 On receipt of the report mentioned in sub-rule 6B.5.1 the Magistrate shall at once depute a Medical Officer to inspect and disinfect the Inland Vessel.

6B.5.4 Such Medical Officer shall visit the Inland Vessel and if a suitable hospital is available, or if other satisfactory arrangements can be made for the patients' treatment and segregation, shall bring the patient to land.

6B.5.5 Where no such hospital is available, and no such arrangement can be made, the patient shall not be allowed to land, but the Medical Officer deputed under sub-rule 6B.5.3 shall take steps to ensure the proper segregation of the patient on the Inland Vessel, and to satisfy himself that every possible precaution has been taken to prevent the spread of the disease.

6B.5.6 The Medical Officer deputed under sub-rule 6B.5.3 shall, in all cases, cause the deck, cabins, latrines and any other part of the Inland Vessel, while the patient has been, to be thoroughly disinfected.

6B.5.7 In case of death of a passenger, the body of the patient shall be wrapped in cloth soaked in a strong solution of cyllin or suitable disinfectant, and handed over to his relatives, friends, or where he is without relatives/ friends, to the police, who shall arrange for its disposal. 6B.5.8 If not already disinfected in accordance with the provisions of clause 6B.5.3 the clothes of the deceased (except those in the baggage), his bedding and all food in his possession shall be burnt, unless orders to the contrary are passed by the Medical Officer. 6B.5.9 When the orders contained in these rules have been complied with, and The Medical Officer deputed under sub-rule 6B.5.3 is satisfied that there is no reason further to detain the inland vessel, he may give permission to the vessel to proceed on the journey. 6B.5.10 The owner of every inland vessel shall be bound to keep on board each inland vessel, five liters of cyllin or suitable disinfectant. 6B.5.11 The patient may be permitted to land on the expiry of a period to be fixed by the Medical Officer deputed under sub-rule 6B.5.3.	
6B.6 Cargo Loading in Passenger cum cargo vessels 6B.6.1 A passenger cum cargo inland vessel carrying both passengers and cargo, all cargo carried on deck shall be efficiently stowed to prevent it from shifting. 6B.6.2 A space of at least 75 centimetres wide on each side of the cargo, and within the bulwarks, shall be kept clear as fore and aft passage way.	***Cargo Loading in Passenger cum Cargo Vessels***
6B.7 Power to Arrest 6B.7.1 The master or any other officer of an inland mechanically propelled vessels, and any person called by him to his assistance, may arrest any person who has committed a breach of any rule made under this section, even if the name and address of such person are unknown to the master or such other officer. 6B.7.2 The procedure prescribed by section 43 of the Code of Criminal Procedure, 1973 in the case of arrest by private persons shall apply to every arrest made under this section.	***Powers to Arrest***
6B.8 Passenger Accommodation 6B.8.1 Area of each part of passenger space and the length of seats therein shall be measured and the lesser of the numbers given by area and by seating shall be the allowable number during fair season provided that in open vessels the allowable number of passengers is not to exceed two per 0.3 metre of length of the vessel and in no case to exceed 100.	***Passenger Accommodation***

6B.8.2 Total number of passengers permitted to be carried during the foul season shall not exceed two third the total number allowed for fair season provided that vessels operating in sheltered waters such as creeks may be permitted to carry same number of passengers throughout the year. 6B.8.3 In passenger ferries plying by day and night, number of passengers permitted by night shall be three fourth of that by day. 6B.8.4 Passenger ferries plying with seating and standing passengers on single deck vessels on short cross/along sheltered water voyage by day and by night up to 2200 hours shall have the number of standing passengers calculated at not less than 0.21 sq m per person after deducting the deck area required for the number of seating passengers and area for ventilators, skylights, windlass, safety appliances and vessel utility area etc. 6B.8.5 Open Launches: a) The forward extremity of the space available for the passenger accommodation is to be determined by the Surveyor, with due regard to the proper stowage of the anchor and cable and to any other necessary equipment in the bow of the vessel, and the length shall be measured from this point to the foreside of the bulkhead separating the machinery space from the passenger space. b) If the machinery is placed amidships, and additional space is available for passengers between the after bulkhead of the machinery space and a position near the stern of the vessels, to be determined by the Surveyor as suitable having due regard to the steering arrangements and fuel tank space. The breadths are to be measured at suitable intervals to the back of the side benches or to the inside of gunwale or to the inside of the half deck (where fitted) whichever measurement is least. c) The space abreast of the machinery space may be included in the passenger measurements if the engine is enclosed by a casting of longitudinal bulkheads and if the distance between the sides of the casing or bulkheads and the back seats is at least 0.9m d) The number of passenger allowable by area shall be found by dividing by 0.36 the area in square meters of the clear space measured as above. Allowance shall be made for the crew and baggage in the area measurements (15%). The number allowable by seating shall be found by dividing the length in meter of each continuous fixed seat by 0.45. e) Seating on buoyant apparatus shall be computed separately. 6B.8.6 Decked Launches a) The forward extremity of the space available of the space for the passenger accommodation shall be determined as above for open launches, and the clear area of this space is to be obtained by deducting all encumbrances such as skylights, companions, machinery casings, navigating spaces, life boats and ventilator.	

b) The maximum number of passengers that may be allowed shall be ascertained by using the divisor 0.56 for the area of deck in square meter of the saloon or cabin floor below deck. Only one saloon below deck shall be included in passenger measurement, except that where the vessel has an appropriate standard

6B.8.7 In all vessels the seating must be so arranged that there will be no serious obstacle to prevent a person from passing forward and aft quickly in case of emergency.

6B.8.8 No space within 0.5m of entrance to any ladder way, wash place or lavatory shall be included in the space measured for passengers.

6B.8.9 Vessels engaged in carrying large number of passengers shall have a strong barrier constructed on each deck.

6B.9 Notwithstanding anything contained in these rules, the Government, by a general or a specific order, may direct the vessel owners, vessel builders or persons / passengers involved in any manner with vessel operation to add/ delete/amend certain technical specifications of vessels or of its operational aspects in order to enhance safety of vessel, monitoring of movement, passengers comfort and general regulation of the Inland Transport Sector.

PART-C

Part – C

FIRE APPLIANCES TO BE CARRIED IN INLAND MECHANICALLY PROPELLED VESSELS

Fire Appliances

6C.1 Application

Applications

This rule shall apply to all vessels excepting the following for the reasons stated against each-

a) Vessels above 500 tons gross. These vessels shall be required to comply with requirements of Merchant Shipping (Fire Appliances) rule 1969 as applicable to ships on coastal voyages.
b) Hovercrafts: Requirements in respect of hovercrafts shall be specially considered by the competent officer.
c) Provided that these rules do not apply to the existing vessels for a period of 6 months from the date of publication of these rules or till their next annual survey whichever is early.

6C.2 Fire Control and Fire Fighting Appliances Plan

Fire Control & Appliances Plan

All inland vessels shall carry on board a copy of approved plan showing the detailed location of all the Fire Control and Fire Fighting Appliances fitted/carried on board.

6C.3 Safety Equipment Plan

Fire Safety Plan

In lieu of separate plans described in 6C.2 and 6D.2, an inland vessel may carry a combined Fire Fighting and Life Saving Appliances plan called as Safety Equipment Plan.

6C.4 Fire Fighting Appliances to be carried on-board

Fire Fighting Appliances

All inland vessels shall be fitted with the following type of fire fighting appliances-

a) Power Driven Fire Pump: In every decked vessel and above 150 tons gross in other vessels at least one.
b) Hand Operated Fire Pump: In every vessel exceeding 21 meters in length at least one.
c) Water services pipes, Hydrants, Fire houses: In every vessel required to carry a fire pump with water services pipe hydrants and fire hoses so arranged that at-least one powerful jet of water may be directed to any part of the vessel. Hoses shall not be less than 32mm in dia.
d) Nozzles: One jet cum spray nozzle for every fire hose carried in accordance with these rules.
e) Fire Axe: At least one in every vessel exceeding 15 meters in length
f) Fire Buckets: At least one for each number of the crew with the minimum of two. Fifty percent of those buckets are to be fitted with lanyards. No vessels need carry more than 20 buckets.
g) Sand Box with scoop: In every vessel at least one in machinery and boiler spaces. Quantity of sand shall not be less than 0.075 cubic meters.
h) Non Portable Foam Type Fire extinguishers. In case of motor vessels exceeding 30 meter length at least one. Capacity of such extinguishers shall not be less than 45 litres.
i) Portable fire extinguishers shall be provided on board vessels as follows:

Length	Extinguisher Type
Less than10m	1x4 litre chemical foam
10m to less than12.5m	1x4 litre chemical foam 2x5 kg dry powder
12.5m to less than15m	2x9 litre chemical foam 2 x 5 kg dry powder
15m and above	2x9 litre chemical foam 3x 5 kg dry powder

Passenger vessels and cargo-passenger vessels 12.5m and above in length shall carry twice the number of extinguishers required by above table for vessels of their length.

j) Smothering Arrangement: All fixed installation in vessels of over 24m length having areas containing fuel oil installations shall be covered by smothering arrangements of fixed CO2 type or fixed water sprinkler type. The capacity of the smothering system shall be adequate and to the satisfaction of the competent authority.

6C.5Fire Fighting Drills

Fire Fighting Drills

6C.5.1 The master of every inland vessel shall ensure that mock fire drills are carried out at-least once every month in as realistic manner as practicable.

6C.5.2 A record of drills carried out as per 6C.5.1 above shall be recorded in the official log book.

6C.6 Arrangements for Emergency Escape Minimum two widely separated escape openings/ladders/stairs need to be provided for totally enclosed accommodations and under deck crew accommodations (if any) and under deck spaces including machinery space for human occupancy.	***Emergency Escape***
6C.7 Penalty Any breach of provisions in these rules shall be punishable with Imprisonment for a term which may extend to 6 months or fine which may extent to 500 rupees or both.	***Penalty***
PART-D	***Part – D***
LIFE SAVING APPLIANCES TO BE CARRIED IN INLAND MECHANICALLY PROPELLED VESSELS	***Life Saving Appliances***
6D. 1 Classification of vessels For the purposes of this part the inland vessels shall be classified as namely: a) Class I – Passenger vessels and Ferry launches boats b) Class II – Cargo vessels and vessels other than those falling under Class I, Class III, and IV. c) Class III - Non-propelled vessels (Barges) d) Class IV – Pleasure crafts adventure vessels	***Classification of Vessels for LSA***
6D.2 Life Saving Appliances Plan All inland vessels shall carry on board a copy of approved plan showing the detailed location of all the Life Saving Appliances fitted/carried on board.	***Life Saving Appliances Plan***
6D.3 Safety Equipment Plan In lieu of separate plans described in 6C.2 and 6D.2, an inland vessel may carry an approved combined Fire Fighting and Life Saving Appliances plan called as Safety Equipment Plan.	***Safety Equipment Plan***
6D.3 Life Saving Appliances to be carried on-board 6D.3.1 An inland vessel of class I shall carry a) Sufficient number of life rafts or buoyant apparatus to accommodate at least 100% number of passengers and crew on board. b) One life jacket each for 100% of passengers and crew on board. c) Life jacket for child, for 10% of total number of persons certified to carry. For the purpose of this section, child means person below 30kgs.	***Life Saving Appliances***

d) At least four lifebuoys for vessels up to 25 meter length, six life buoys for vessel 25-45 meter length and 8 life buoys more than 45 meter length. At least two of the life buoys shall be with self-igniting light and buoyant line of 30m in length. e) Every vessels of Class I passenger capacity 150 shall have at least one life boat with minimum passenger capacity of ten persons. The boat shall be provided with necessary equipment for launching. Boats are to be stowed on either side of the vessels if more than one boat provided. f) Life boats plus Life rafts together to accommodate 100% of the passengers and crew on-board. g) All crew of should possess sufficient training in rescue and first aid. h) All boats shall have headlights, search lights, hand torches and emergency lanterns. 6D.3.2 An inland vessel of class II shall carry – a) At least one life raft to accommodate all crew for vessel over 10 meters. b) One life jacket for each crew or person on board. c) At least two life buoys for vessels up to 25 meter length and four life buoys for above 25 meter of which one shall be equipped with self-igniting light and buoyant line of 30m in length. 6D.3.3 A manned inland vessel of class III shall carry – a) One life jacket for every crew on board. b) At least two life buoys, one of which shall be equipped with self-switching light and buoyant line of 30m in length. 6D.3.4 A manned inland vessel of class IV shall carry – a) Every vessel of class IV up to 10 meter in length shall carry life jacket for each person. b) Vessel of 10 meters or more in length shall in addition to life jacket for each person carry sufficient life raft for all persons on board. c) In vessels falling under sub-section 6D3.4 (b) above, if the life rafts could not be accommodated, sufficient number of lifebuoys providing 100% buoyancy shall be provided. d) However all vessels of class IV shall carry at least 2 life buoys of which one shall be fitted with self-igniting light and buoyant line of 30m in length.	
6D.4 Technical Requirements Every lifesaving appliances provided as per provisions of these rules shall be meeting the Technical requirements contained in the International Life Saving Appliances Code and type approved by MMD or Competent Authority of the State. All life-saving appliances shall be properly stowed as per the approved plan and maintained/serviced as per the requirements of International Life Saving Appliances Code.	***LSA Technical Requirements***
6D.5 Operational readiness, maintenance and inspection 6D.5.1 Before vessels leave port and at all times during the voyage, all life-saving appliances on board shall be in working order and ready for immediate use.	***Maintenance & Inspection of LSA***

6D.5.2 Instructions for on-board maintenance of life-saving appliances shall be easily understood and illustrated where possible.

6D.5.3 The general emergency alarm system shall be tested weekly.

6D.5.4 Inflatable life-rafts shall be serviced at intervals of not more than 12 months at an approved servicing station. However, in cases where the service of a vessel and the location of approved service station make it impossible to comply with this requirement, the Competent Authority may allow this period to be extended but in no case shall this period be greater than 18 months.

6D.5.4 A report of the inspection shall be entered in the official log book.

PART-E

LIGHTS, SOUND SIGNALS AND PREVENTION OF COLLISION

Part – E

Lights, Sound Signals and Prevention of Collision

Steering & Sailing Rules

6E.1 STEERING AND SAILING RULES

Look-Out

6E.1.1 Look-Out

Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate to the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.

Every vessel shall make use of searchlights to locate luminous marks used for channel marking.

6E.1.2 Safe Speed

Safe Speed

(1) Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and grounding, and be stopped within a distance appropriate to the prevailing circumstances and conditions.

(2) In determining a safe speed the following factors shall be among those taken into account.

(a) The state of visibility:
(b) The traffic density including concentrations of fishing vessel or other vessels.

(c) The manoeuvrability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions.
(d) The state of the river, wind, current / river stream and the proximity of navigational hazards;
(e) State and availability of shore navigational aids and channel marking by day and night;
(f) Speed restrictions imposed by the waterway authority;
(g) The draught of the vessel in relation to available depth of water; and
(h) At nights, the presence of background light such as from the shore lights or from the back scatter other own lights.

6E.1.3 Risk of collision

Risk of Collision

(1) Every vessel shall use all available means appropriate to the prevailing circumstance and conditions to determine if risk of collision exists. If there is any doubt, such risk shall be deemed to exist.

(2) In determining if risk of collision exists the following consideration shall be among those taken into account:-

(a) Such risk shall be deemed to exist if a compass bearing of an approaching vessel does not appreciably change and apparent distance from own vessel decreases;
(b) Such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large vessel or a tow or when approaching a vessel at close range; and
(c) For vessel not fitted with a compass, if the relative position remains unchanged.

6E.1.4 Action to avoid collision

Action to Avoid Collision

(1) Any action taken to avoid collision shall, if the circumstances of the case admit be positive, made in ample time and with due regard to the observance of good seamanship.
(2) Any alteration of course or speed to avoid collision shall, if the circumstances of the case admit be large enough to be readily apparent to another vessel. A succession of small alterations of course and / or speed should be avoided.
(3) If there is sufficient room, alteration of course alone may be the most effective action to avoid a close quarters situation provided that it is made in good time, is substantial and does not result in another close quarters situation.
(4) Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance the effectiveness of the action

shall be carefully checked until the other vessel is finally passed and clear.

(5) If necessary to avoid collision or allow more time to assess the situation, a vessel shall slacken her speed or take the way off by stopping or reversing her means of propulsion.

6E.1.5 Narrow channels

Narrow Channels

(1) A vessel proceeding along the course of a narrow channel shall keep as near to the outer limit of the channel which lies on her starboard side as is safe and practicable. A vessel of less than 10 meters in length or a sailing vessel shall not impede the passage of a vessel which can safely navigate only within the marked channel.

(2) A vessel engaged in fishing shall not impede the passage of any other vessel in the navigable channel;

(3) A vessel shall not cross a navigable channel if such crossing impedes the passage of vessel proceeding upstream or downstream along the navigable channel;

(4) A vessel nearing a bend or an area of a narrow channel where other vessels may be obscured by an intervening obstruction shall navigate with particular alertness and caution and shall sound the appropriate signal;

(5) Every vessel shall, if the circumstances of the case admit, avoid anchoring in a narrow channel.

(6) When single lane traffic is in force, vessels shall join the lane only when the traffic signal permits to do so. While in the lane, the vessels shall proceed with maximum permissible speed and clear the channels as quickly as possible. Vessels shall not stop or anchor in a traffic lane and shall exercise caution while joining or leaving the single lane to avoid collision with waiting vessels at anchor.

6E. 2Conduct of vessels in sight of one another

Conduct of Vessels in Sight of one another

6E.2.1 Sailing vessels

Sailing Vessels

When two sailing vessels are in sight of one another or approaching one another so as to involve risk of collision, one of them shall keep out of the way of the other as follows:-

(1) In a non-tidal river when one vessel is proceeding upstream and the other vessel proceeding downstream the vessel proceeding upstream shall keep out of the way of the other;

(2) When both are proceeding, upstream or downstream and in a tidal lagoon the vessel which is to windward shall keep out of the way of the vessel which is to leeward;

(3) A vessel which is running free shall keep out of the way of a vessel which is close-hauled; and

(4) A vessel which is close-hauled on the port tack shall keep out of the way of a vessel which is close-hauled on the starboard tack.

(5) For the purpose of these rules, "upstream" shall be deemed to be the direction against current and downstream the direction with the current. "Wind ward" side shall be deemed to be the side opposite to that of which the main sail or the largest fore and after sail is carried.

6E.2.2 Overtaking

Overtaking

(1) Notwithstanding anything contained in these rules any vessel overtaking any other shall keep out of the way of the vessel being overtaken;

(2) A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5 degrees abaft her beam. That is, in such a position with reference to the vessel she is overtaking, that at night she would be able to see only the stern light / towing light of that vessel but neither of her sidelights; and

(3) Any subsequent alteration or bearing between two vessels shall not make the overtaking vessel a crossing vessel within the meaning of these rules or relieve her duty of keeping clear of the overtaken vessel until she is finally passed and cleared.

6E.2.3 Head-on situation

Head-on Situation

When two mechanically propelled vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.

6E.2.4 Crossing situation

Crossing Situation

When two mechanically propelled vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit avoid crossing ahead of the vessel.

6E.2.5 Action by give-way vessel

Action by Give Way Vessel

6E.2.5.1 Where by any of the rules of Part E of this chapter, one of the two vessels is required to keep out of the way of the other vessel, the vessel required to keep out of the way of the other vessel is called as Give Way Vessel.

6E.2.5.2 Every vessel which is directed by these rules to keep out of the way of another vessel shall, so far as possible take early and substantial action to keep well clear.

6E.2.6 Action by stand-on vessel

Action by Stand on Vessel

6E.2.6.1 Whereby any of the rules of Part E of this chapter, one of the two vessels is required to keep out of the way of the other vessel, the other vessel is called as Stand on Vessel.

6E.2.6.2 A Stand on Vessel shall keep her course and speed. 6E.2.6.3 The Stand on Vessel may however take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action as required by these rules. 6E.2.6.4 When from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessels alone, she shall take such action as will best aid to avoid collision; 6E.2.6.5 A vessel which takes action in a crossing situation in accordance with sub paragraph 6E.2.6.3 of this rule to avoid collision with another vessel, shall if the circumstances of the case admit, not alter course to port for a vessel on her own port side; and 6E.2.6.6 These rules do not relieve the give-way vessel of her obligation to keep out of the way.	
6E.2.7 Responsibilities of (between) vessels 6E.2.7.1 A mechanically propelled vessel underway shall keep out of the way of; a) a vessel is not under command; b) a vessel restricted in her ability to manoeuvre; c) a vessel engaged in fishing; d) a sailing vessel, vessel under oars or country boat; and e) a vessel proceeding downstream by a vessel proceeding upstream, if the prevailing circumstances permit. 6E.2.7.2 A sailing vessel under way shall keep out of the way of:- a) a vessel not under command; b) a vessel restricted in her ability to manoeuvre; and c) a vessel engaged in fishing. 6E.2.7.3 A vessel engaged in fishing when underway shall, so far as possible, keep out of the way of : a) a vessel not under command; and b) a vessel restricted in her ability to manoeuvre.	***Responsibilities Between Vessels***
6E.3 Conduct of vessels in restricted visibility 6E.3.1 This rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility; 6E.3.2 Every vessel shall make appropriate sound signals in accordance with these Rules and exhibit lights while navigating in restricted visibility.	***Conduct of Vessels in Restricted Visibility***

6E.3.3 Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A mechanically propelled vessel shall have her engines ready for immediate manoeuvre. 6E.3.4 Every vessel shall have due regards to the prevailing circumstances and conditions of restricted visibility when complying with the rule of this part. 6E.3.5 Except where it has been determined that risk of collision does not exist every vessel which hears apparently forward her beam the fog signal of another vessel or which cannot avoid a close-quarters situation with another vessel forward of her beam, shall reduce her speed, she shall if necessary take all her way off and in any event navigate with extreme caution until danger of collision is over. **6E.4 Lights & Shapes** **6E.4.1 Application** a) Provisions in this Rule shall be complied with in all weathers. b) The rules concerning lights shall be complied with from sunset to sunrise, and during such times no other lights shall be exhibited, except such, lights as cannot be mistaken for the lights specified in these rules, do not impair their visibility or distinctive character, or interfere with the keeping of a proper look- out c) The lights prescribed by these rules shall, if carried, also be exhibited from sunrise to sunset in restricted visibility and may be exhibited in all other circumstances when it is deemed necessary. d) The rule concerning shapes shall be complied with by day. e) The lights and shapes unless otherwise specified in these rules shall comply with the positioning and technical details as per the provisions of Annex-1 to International Regulations for prevention of collision at sea (1972). **6E.4.2 Different Lights used in vessels** a) "Masthead Light" a white light placed over the fore and aft centreline of the vessel showing an unbroken light over an arc of the horizon of 225 degree and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on either side of the vessel. This light shall be placed as far as practicable at height above the hull of not less than 3 meters for vessels of 20 meters or more in length and 2 meters for vessels of less than 20 meters in length. b) "Sidelights" a green light on the starboard side and a red light on the port side each showing an unbroken light over an arc of the horizon of 112.5 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on its respective side. In a vessel of less than 20 meters in length the sidelights may be combined in one lantern carried the fore and aft centreline of the vessel. Side lights shall be placed not less than 1 meter below the mast head light.	***Lights & Shapes*** ***Application*** ***Different Lights***

c) “Stern light” a white light placed as nearly as practicable at the stern showing an unbroken light over an arc of the horizon of 135 degree and so fixed as to show the light 67.5 degrees from right aft on each side of the vessel.

d) “Towing light” a yellow light having the same characters as “Stern light’ mentioned in sub section (c) of this rule.

e) “All-round light” a light showing an unbroken light over an arc of the horizon of 360 degrees.

f) “Flashing light” a light flashing at regular intervals.

6E.4.3 Visibility of Lights

Visibility of Lights

The lights prescribed in these rules shall be visible at the following minimum ranges:-

a) In a vessel of 20 meters or more in length, Masthead light 3 miles, Side lights 2 miles, Stern light 2 miles, Towing light 2 miles, All-Round light 1mile.

b) In a vessel less than 20 meters in length, Masthead light 2 miles, Side light 1 mile, Stern light 1 mile, All-Round light 1 mile.

6E.4.4 Lights to be exhibited by mechanically propelled vessel under- way

Under-way Vessel Lights

6E.4.4.1 A mechanically propelled vessel under-way shall exhibit:-

a) a masthead light forward. A vessel of 50 metres or more in length shall exhibit an additional masthead light at a suitable place and higher than masthead light forward.

b) side lights.

c) a stern light.

6E.4.4.2 A mechanically propelled vessel of less than 10 meters in length in-lieu of the lights prescribed in paragraph (1) may exhibit an all-round white light, and shall if practicable also exhibit side lights or a combined lantern.

6E.4.5 Lights to be exhibited by towing & pushing vessels

Pushing & Towing Vessel Lights

6E.4.5.1 A mechanically propelled vessel when towing or pushing shall exhibit:-

a) two masthead lights forward in a vertical line. When the length of the tow exceeds 200 meters three such lights in a vertical line. These lights will be in-lieu of light prescribed in sub-rule 6E.4.4.1 (a). The lights shall be placed not less than 1 meter apart and the lowest light placed at a height not less than two meters above the hull.

b) side lights.

c) a stern light.

d) A towing light in a vertical line above the stern light.

6E.4.5.2 When a pushing vessel and a vessel being pushed ahead are connected in a composite unit, they shall be regarded as a mechanically propelled vessel and exhibit the lights prescribed in sub-rule 6E.4.4.

6E.4.5.3 A vessel or object being towed shall exhibit: - a) side lights b) a stern light. 6E.4.5.4 Provided that any number of vessels being towed or pushed in a group shall be lighted as one vessel. 6E.4.5.5 A vessel being pushed ahead, not being part of a composite unit, shall exhibit at the forward end, side lights. 6E.4.5.6 A vessel being towed alongside exhibit a stern light and at the forward end side lights. 6E.4.5.7 Where from any sufficient cause, it is impracticable for vessel or object being towed to exhibit the lights prescribed in this rule, all possible measures shall be taken to light the vessel or the object towed at least to indicate the presence of unlighted vessel or object.	
6E.4.6 Lights to be exhibited by sailing vessel and vessels under oars 6E.4.6.1 A sailing vessel shall exhibit:- a) side lights. b) a stern light. 6E.4.6.2 In a sailing vessel of less than 20 meters in length the lights prescribed in paragraph 6E.4.6.1 may be combined in one lantern carried at or near the top of the mast where it can be seen. 6E.4.6.3 A sailing vessel underway may in addition to the lights prescribed in paragraph 6E.4.6.1 of this rule, exhibit at or near the top of the mast where they can best be seen two all-round lights in a vertical line, the upper being red and lower be green. 6E.4.6.4 A sailing vessel less than 10 meters in length and a vessel under oars may exhibit lights prescribed in this rule, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing white light which shall be exhibited in sufficient time to prevent collision.	***Sailing Vessel & Vessel under Oars Light***
6E.4.7 Lights to be exhibited by fishing vessels 6E.4.7.1 A vessel engaged in fishing shall exhibit:- a) two all-round lights in a vertical line the upper being red and the lower white and during the day a shape consisting of two cones with their apexes together in a vertical line or a basket. b) when making way through the water in addition to the lights prescribed in sub rule (a) above, side lights, and a stern light.	***Fishing Vessel Lights***

6E.4.7.2 A fishing vessel less than 10m in length, a vessel under oars may exhibit lantern and shall have ready at hand an electric torch which shall be exhibited in sufficient time to prevent collision.	
6E.4.8 Lights to be exhibited by vessels not under command or restricted in their ability to manoeuvre 6E.4.8.1 A vessel not under command shall exhibit:- a) two all-round red lights in a vertical line where they can best be seen by night. b) two balls or similar shapes in a vertical line by day. c) When making way through the water; side lights and a stem light addition to the lights prescribed in (a). 6E.4.8.2 A vessel restricted in her ability to manoeuvre shall exhibit; a) three all- round lights in a vertical line, the highest and lowest of these shall be red and the middle light shall be white. b) Three shapes in a vertical line, the highest and lowest shapes shall be balls and the middle one a diamond. c) when making way through the water, masthead lights, side lights and stern light in addition to the lights prescribed in (a) d) when at anchor, in addition to the lights and shapes prescribed in (a) and (b) above, lights and shapes prescribed in rule 6E.4.11 for anchored vessels shall also be exhibited.	***NUC & RAM Vessels Lights***
6E.4.9 Lights to be exhibited by vessels engaged in dredging A vessel engaged in dredging, in addition to the lights in Rule 6E.4.8.2 shall exhibit by two all – round red lights or by day two balls in a vertical line to indicate the side on which obstruction exists.	***Lights to be exhibited by vessels engaged in dredging***
6E.4.10 Lights to be exhibited by pilot vessels A vessel engaged on pilotage duty shall exhibit:- a) at or near the mast head two all – round lights in vertical line, the upper one white and the lower one red. b) when under way, in addition side lights and stern light.	***Pilot Vessel Lights***
6E.4.11 Lights to be exhibited by anchored vessels and vessels aground 6E.4.11.1 A vessel at an anchor shall exhibit:- a) In the fore part an all-round white light or one ball by day. b) At or near the stern and at a lower level than the light in (a), an all-round white light. 6E.4.11.2 A vessel of less than 20 m in length may exhibit one all-round white light where it can best be seen.	***Anchored & Aground Vessel Lights***

6E.4.11.3 A vessel aground shall exhibit in addition to the lights prescribed in para 6E.4.11.1 and 6E.4.11.2, where they can best be seen. a) two all-round red lights in a vertical line, b) three balls in a vertical line by day. 6E.4.11.3 In lieu of lights prescribed in this section, a vessel less than 10m in length, a vessel under oars may exhibit lantern and shall have ready at hand an electric torch which shall be exhibited in sufficient time to prevent collision.	
6E.4.12 Lights to be exhibited by hydrofoils & mechanized country crafts Where it is impracticable for a mechanized country craft or a hydrofoil to exhibit lights and shapes of the characteristics or in positions prescribed in the Rules she shall exhibit lights and shapes as closely similar in characteristics and position as is possible.	***Hydrofoil & Country Craft Lights***
6E.5 Sound Signals 6E.5.1 The sound signal appliances unless otherwise specified in the Rules shall comply with the technical requirements as per the provisions of Annexure-III of the International Regulations for prevention of collision at sea (1972).	***Sound Signals***
6E.5.2Equipment for sound signals A vessel of 20 meters or more in length shall be provided with a whistle and a bell and a vessel of 100 meters or more in length, in addition shall be provided with a gong.	***Sound Signaling Equipment***
6E.5.2 Manoeuvring and warning signals 6E.5.2.1 when vessels are in-sight of one another, a mechanically propelled vessel underway, when manoeuvring as authorized or required by these regulations, shall indicate her intentions by the following signals on her whistle. a) One short blast (a blast of about 1 second duration) to indicate - "I am altering my course to starboard" b) Two short blasts to indicate. "I am altering course to port" c) Three short blasts to indicate "I am operating stern propulsion." 6E.5.2.2 An Overtaking vessel and vessel being overtaken shall indicate their intention by sounding following signal: a) Two prolonged blasts (blast of about 4 to 6 seconds duration each) followed by one short blast to indicate "I intend to over take you on your starboard side." b) Two prolonged blasts followed by two short blasts to indicate "I intend to over take you on your port side." c) A vessel being overtaken shall indicate her agreement by the following signals on her whistle; one prolonged, one short, one prolonged, one short blast, in that order. If in doubt she may sound signals prescribed in paragraph 6E.5.2.3 below.	***Manoeuvring & Warning Signals***

d) When in doubt – When vessels in sight of one another are approaching each other and from any cause either vessel fails to understand the intentions or actions of the other or is in doubt whether sufficient action is being taken by the other to avoid collision, the vessel in doubt shall immediately indicate such doubt by giving at least 5 short and rapid blasts on the whistle, the signal may be supplemented by a light signal of at least 5 short and rapid flashes..
e) At bends – A vessel nearing bend or an area of a channel where other vessels may be obscured, shall sound one prolonged blast, such signal shall be answered with a prolonged blast by any approaching vessel.

6E.5.3 Sound signals in restricted visibility

Sound Signals in Restricted Visibility

In or near an area of restricted visibility, where by day or night, signals prescribed in this rules shall be used as follows:-

a) A mechanically propelled vessel making way through the water shall sound at intervals of not more than 2 minutes one prolonged blast.
b) A mechanically propelled vessel underway but stopped and making no way through the water shall sound at intervals of not more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them.
c) A vessel not under command, a vessel restricted in her ability to manoeuvre, a vessel constrained by her draught, vessel engaged in towing, fishing or pushing another vessel, shall at intervals of not more than 2 minutes three blasts in succession namely one prolonged followed by two short blasts.
d) A vessel at anchor shall at intervals of not more than one minute ring the bell rapidly for about 5 seconds. A vessel at anchor may in addition sound three blasts in succession namely one short, one prolonged and one short blast to give warning on her position, and possibility of collision to any approaching vessels. A vessel aground shall give three separate and distinct strokes on the bell immediately before and after the rapid ringing of the bell.
e) A vessel of less than 10 meters in length shall not be obliged to give the above mentioned signals but shall make some other effective sound signal at intervals of not more than 2 minutes.

6E.6 Distress signals

Distress Signals

When a vessel is in distress and requires assistance from other vessels or from shore, the following shall be the signals to be used or displayed by her either together or separately.

a) a continuous sounding of any sound signal apparatus.
b) A flag or a light waved in a circle to draw attention.
c) Flares on the deck.
d) “May day” transmitted by radio telephony.
e) International code of signal N.C. hoisted on the vessel.

6E.7 Exemptions

Exemptions

Any vessel (or class of vessels) whose keel is laid or which is at corresponding stage of construction before the entry into force of these rules may be exempted from compliance therewith of the following provisions until two years after the date of entry into force of these rules.

a) The installation of lights with colour specifications and intensity as prescribed in these rules.
b) Repositioning of masthead lights and side lights on vessels resulting from application of these rules.
c) The installation of lights with ranges prescribed in these rules.

6E.8 Application of the provision of Port Rules and National Waterway regulations

Port & National Waterway Rules Application

Notwithstanding anything mentioned above, the provision of the Port Rules and Prevention of Collision Regulations, 2002 for National Waterways shall also apply mutatis mutandis, to the mechanically propelled vessels while making voyages within the port limits and National waterways.

PART-F

Part F

RADIO COMMUNICATION AND SAFETY OF NAVIGATION

Radio Communication and safety of navigation

For the purpose of this section, categorization of vessels is as per section 2.2 of these rules. Vessels shall carry the radio and navigational equipments as per the below table:

Equipment	Category A	Category B
VHF radio installation capable of transmitting DSC on channel 70, and radiotelephony on channels 16, 13 and 6	1	1
NAVTEX receiver	1	1
SART	1	0
Class B Automatic Identification System (AIS)	1	1
Radar operating on 9 GHz	1	0
Echo Sounder	1	1
Magnetic Compass - for steering and bearing	1	1
Gyro Compass with repeaters for steering and bearing	1	0
Rudder Angle Indicator	1	1
Global Positioning System (GPS)	1	1
Binocular	1	1
Aldis Lamp or Searchlight	1	1
Passage Charts	Yes	No
Area Tide Tables	Yes	No
Aneroid Barometer	1	1

CHAPTER 7

INSURANCE OF MECHANICALLY PROPELLED VESSELS AGAINST THIRD PARTY RISKS

7.1 Requirements of Chapter VI A of the Act As per clause 54C of the "Chapter VI A" of the Act the provisions of section 134, Chapters X, XI and XII of the Motor Vehicles Act, 1988 shall, as far as may be apply, in relation to the mechanically propelled vessels as they apply in relation to motor vehicles, subject to certain modifications listed therein. The provisions of section 134, Chapters X, XI and XII of the Motor Vehicles Act, 1988 with modifications specified in section 54C of the Act are as in the clauses listed below in this chapter.	***Requirements of Chapter VI A Of the Act***
7.2 Duty of Master of an Inland Vessel in case of accident and injury to a person. When any person is injured or any property of a third party is damaged, as a result of an accident in which an Inland Vessel is involved, the Master of the Inland Vessel or any other person in charge of the Inland Vessel shall – (a) unless it is not practicable to do so on account of mob fury or any other reason beyond his control, take all reasonable steps to secure medical attention for the injured person, by conveying him to the nearest medical practitioner or hospital, and it shall be the duty of every registered medical practitioner or the doctor on duty in the hospital immediately to attend to the injured person and render medical aid or treatment without waiting for any procedural formalities, unless the injured person or his guardian, in case he is a minor, desired otherwise; (b) give on demand by a police officer any information required by him or, if no police officer is present, report the circumstances of the occurrence, including the circumstances, if any, or not taking reasonable steps to secure medical attention as required under clause (a), at the nearest police station as soon as possible, and in any case within twenty-four hours of the occurrence; (c) give the following information in writing to the insurer, who has issued the certificates of insurance, about the occurrence of the accident, namely :- i. insurance policy number and period of its validity; ii. date, time and place of accident; iii. particulars of the persons injured or killed in the accident; iv. name of the Master of the Vessel and the particulars of his certificate granted under Chapter III of the Inland Vessels Act 1917. *Explanation* – For the purposes of this section, the expression "Master of a Vessel" includes the owner of the Inland Vessel.	***Duties of Master in case of Accident and Injury to a person***

Objects and Reasons – Clause 7.2 sets out the duties of the Master of a Vessel involved in accident, such as reporting the accident to the Police Station, rendering medical aid to the injured, etc.

7.3 LIABILITY WITHOUT FAULT IN CERTAIN CASES

7.3.1 Liability to pay compensation in certain cases on the principle of no fault

Liability without fault in certain cases

1) Where death or permanent disablement of any person has resulted from an accident arising out of the use of an Inland Vessel, the owner of the Inland Vessel shall, or, as the case may be, the owners of the Inland Vessel shall, jointly and severally, be liable to pay compensation in respect of such death or disablement in accordance with the provisions of this section.
2) The amount of compensation which shall be payable under subsection in respect of the death of any person shall be a fixed sum of fifty thousand rupees and the amount of compensation payable under that sub-section in respect of the permanent disablement of any person shall be a fixed sum of twenty – five thousand rupees.
3) In any claim for compensation under sub-section (1), the claimant shall not be required to plead and establish that the death or permanent disablement in respect of which the claim has been made was due to any wrongful act, neglect or default of the owner or owners of the Inland Vessel concerned or of any other person.
4) A claim for compensation under sub-section (1) shall not be defeated by reason of any wrongful act, neglect or default of the person in respect of whose death or permanent disablement the claim has been made nor shall the quantum of compensation recoverable in respect of such death or permanent disablement be reduced on the basis of the share of such person in the responsibility for such death or permanent disablement.
5) Notwithstanding anything contained in sub-section (2) regarding death or bodily injury to any person, for which the owner of the Inland Vessel is liable to give compensation for relief, he is also liable to pay compensation under any other law for the time being in force :

Provided that the amount of such compensation to be given under any other law shall be reduced from the amount of compensation payable under this section or under section 7.4.19A.

Objects and Reasons – Clause 7.3.1 provides for liability to pay compensation in certain cases on the principle of no fault.

7.3.2 Provisions as to other right to claim compensation for death or permanent disablement

Right to claim compensation for death or permanent disablement

1) The right to claim compensation under section 7.3.1 in respect of death or permanent disablement of any person shall be in addition to any other right, except the right to claim under the scheme referred to in section 7.4.19A (such other right hereafter in this section referred to as the right on the

principle of fault) to claim compensation in respect thereof under any other provision of this Act or of any other law for the time being in force.

2) A claim for compensation under section 7.3.1 in respect of death or permanent disablement of any person shall be disposed of as expeditiously as possible and where compensation is claimed in respect of such death or permanent disablement under section 7.3.1 and also in pursuance of any right on the principle of fault, the claim for compensation under section 7.3.1 shall be disposed of as aforesaid in the first place.
3) Notwithstanding anything contained in sub-section (1), where in respect of the death or permanent disablement of any person, the person liable to pay compensation under section 7.3.1 is also liable to pay compensation in accordance with the right on the principle of fault, the person so liable shall pay the first-mentioned compensation and -
    a) if the amount of the first-mentioned compensation is less than the amount of the second-mentioned compensation, he shall be liable to pay (in addition to the first-mentioned compensation) only so much of the second-mentioned compensation as is equal to the amount by which it exceeds the first-mentioned compensation;
    b) if the amount of the first-mentioned compensation is equal to or more than the amount of the second-mentioned compensation, he shall not be liable to pay the second-mentioned compensation.

Objects and Reasons – Clause 7.3.2 makes provision to claim compensation for death or permanent disablement besides the claim for compensation for no fault liability.

7.3.3 Permanent disablement – For the purposes of this Chapter, permanent disablement of a person shall be deemed to have resulted from an accident of the nature referred to in sub-section (1) of section7.3.1 if such person has suffered by reason of the accident, any injury or injuries involving :-

Permanent Disablement

a) permanent privation of the sight of either eye or the hearing of either ear, or privation of any member or joint; or
b) destruction or permanent impairing of the powers of any members or joint; or
c) permanent disfiguration of the head or face.

Objects and Reasons – Clause 7.3.3 seeks to classify injuries which are considered as permanent disablement for the purpose of Motor Vehicles Act, 1988.

7.3.4 Applicability of Chapter to certain claims under Act 8 of 1923 The provisions of this Chapter shall also apply in relation to any claim for compensation in respect of death or permanent disablement of any person under the Workmen's Compensation Act, 1923 (8 of 1923) resulting from an accident of the nature referred to in sub-section (1) of section 7.3.1and for this purpose, the said provisions shall, with necessary modifications, be deemed to form part of that Act.

Applicability of chapter to certain claims under Act 8 of 1923

Objects and Reasons – Clause 7.3.4 lays down that the provision of this Chapter shall also apply in relation to any claims under Workmen's Compensation Act. **7.3.5 Overriding effect** – The provisions of this Chapter shall have effect notwithstanding anything contained in any other provision of Motor Vehicles Act, 1988 or of any other law for the time being in force. ***Objects and Reasons*** – Clause 7.3.5 provides for overriding effect of this Chapter over any other provisions of this Act or any law for the time being in force. **7.4 INSURANCE OF AN INLAND VESSEL AGAINST THIRD PARTY RISKS** **7.4.1Definitions.** – In this Chapter, - a) "authorized insurer" means an insurer for the time being carrying on general insurance business in India under the General Insurance Business (Nationalization) Act, 1972, and any Government insurance fund authorized to do general insurance business under that Act, aa) "goods service vessel" means any mechanically propelled vessel used or adapted to be used for carriage of cargo for hire or reward; b) "certificate of insurance" means a certificate issued by an authorized insurer in pursuance of sub-section (3) of section 7.4.3 and includes a cover note complying with such requirements as may be prescribed, and where more than one certificate has been issued in connection with a policy, or where a copy of a certificate has been issued, all those certificates or that copy, as the case may be; c) "liability", wherever used in relation to the death of or bodily injury to any person, includes liability in respect thereof under section 7.3.1; d) "policy of insurance" includes "certificate of insurance"; da) "public service vessel" means any mechanically propelled vessel used or adapted to be used for the carriage of passengers for hire or reward; e) "property" includes goods carried in the inland vessel, bridges, landing facilities, navigation marks and infrastructure; f) "reciprocating country" means any such country as may on the basis of reciprocity be notified by the Central Government in the Official Gazette to be a reciprocating country for the purposes of this Chapter; fa) "route" means a line of travel which specifies the waterway which may be traversed by a mechanically propelled vessel between one terminal and another; g) "third party" includes the Government. ***Objects and Reasons –*** Clause 7.4.1 seeks to define certain words and expressions appearing in clause 7.4 of this Chapter.	***Insurance of an Inland Vessel against Third Party Risks*** ***Definitions***

7.4.2 Necessity for insurance against third party risk

Necessity of Insurance against third party risk

1) No person shall use, except as a passenger, or cause or allow any other person to use, an Inland Vessel in an Inland Waterway, unless there is in force in relation to the use of the Inland Vessel by that person or that other person, as the case may be, a policy of insurance complying with the requirements of this Chapter. Provided that in the case of an Inland Vessel carrying, or meant to carry, dangerous or hazardous goods, there shall also be a policy of insurance under the Public Liability Insurance Act, 1991 (6 of 1991).

Explanation – The Master or person in-charge of an Inland Vessel working merely as a paid employee, while there is in force in relation to the use of the Inland Vessel no such policy as is required by this sub-section, shall not be deemed to act in contravention of the sub-section unless he knows or has reason to believe that there is no such policy in force.

2) Sub-section (1) shall not apply to any Inland Vessel owned by the Central Government or a State Government and used for Government purposes unconnected with any commercial enterprise.
3) The appropriate Government may, by order, exempt from the operation of sub-section (1) on any Inland Vessel owned by any of the following authorities, namely :-
    a) the Central Government or a State Government, if the Inland Vessel is used for Government purposes connected with any commercial enterprise;
    b) any local authority;
    c) any State Water Transport undertaking :

Provided that no such order shall be made in relation to any such authority unless a fund has been established and is maintained by that authority in accordance with the rules made in that behalf under Motor Vehicles Act, 1988 for meeting any liability arising out of the use of any Inland Vessel of that authority which that authority or any person in its employment may incur to third parties.

Explanation – For the purposes of this sub-section, "appropriate Government" means the Central Government or a State Government, as the case may be, and –

i. in relation to any corporation or company owned by the Central Government or any State Government, means the Central Government or that State Government;
ii. in relation to any corporation or company owned by the Central Government & one or more State Governments, means the Central Government;
iii. in relation to any other State Water Transport undertaking or any local authority, means that Government which has control over that undertaking or authority.

Objects and Reasons – Clause 7.4.2 speaks of the necessity for insurance against third party risk.

7.4.3 Requirement of policies and limits of liability

Requirement of Policies and limits of liability

1) In order to comply with the requirements of this Chapter, a policy of insurance must be a policy which -
    a) is issued by a person who is an authorized insurer; and
    b) insures the person or classes of persons specified in the policy to the extent specified in sub – section (2) –
        i. against any liability which may be incurred by him in respect of the death of or bodily injury to any person, including owner of the goods or his authorized representative carried in the Inland Vessel or damage to any property of a third party caused by or arising out of the use of the Inland Vessel in an Inland Waterway ;
        ii. against the death of or bodily injury to any passenger of a public service vessel caused by or arising out of the use of the Inland Vessel in an Inland Water;

Provided that a policy shall not be required –

i. to cover liability in respect of the death, arising out of and the course of this employment, of the employee of a person insured by the policy or in respect of bodily injury sustained by such an employee arising out of and in the course of his employment other than a liability arising under the Workmen's Compensation Act, 1923 (8 of 1923), in respect of the death of, or bodily injury to, any such employee -
    a) engaged as Master or person in-charge of the Inland Vessel, or
    b) if it is a goods carriage, being carried in the Inland Vessel, or

ii. to cover any contractual liability.

Explanation – For the removal of doubts, it is hereby declared that the death of or bodily injury to any person or damage to any property of a third party shall be deemed to have been caused by or to have arisen out of, the use of an Inland Vessel in Inland Water notwithstanding that the person who is dead or injured or the property which is damaged was not in a Inland Water at the time of the accident, if the act or omission which led to the accident occurred in Inland Water.

2) Subject to the proviso to sub-section (1), a policy of insurance referred to in sub-section (1), shall cover any liability incurred in respect of any accident, up to the following limits, namely :-
    a) save as provided in clause (b), the amount of liability incurred.
    b) in respect of damage to any property of a third party, a limit of rupees six thousand :

3) A policy shall be of no effect for the purposes of this Chapter unless and until it is issued by the insurer in favour of the person by whom the policy is effected a certificate of insurance in the prescribed form and containing the prescribed particulars of any condition subject to which the policy is issued and of any other prescribed matters; and different forms, particulars and matters may be prescribed in different cases.

4) where a cover note issued by the insurer under the provisions of this Chapter or the rules made thereunder is not followed by a policy of insurance within the prescribed time, the insurer shall, within seven days of the expiry of the period of the validity of the cover note, notify the fact to the registering authority in whose records the Inland Vessel to which the cover note relates has been registered or to such other authority as the State Government may prescribe.
5) Notwithstanding anything contained in any law for the time being in force, an insurer issuing a policy of insurance under this section shall be liable to indemnify the person or classes of persons specified in the policy in respect of any liability which the policy purports to cover in the case of that person or those classes of persons.

Objects and Reasons – Clause 7.4.3 lays down the requirements of the policies and the limit of liability in respect of passengers and persons other than passengers in relation to passenger vessels and goods carriages.

7.4.4 Validity of polices of insurance issued in reciprocating countries

Validity of Policies of Insurance in Reciprocating Countries

Where, in pursuance of an arrangement between India and any reciprocating country, the Inland Vessel registered in the reciprocating country operates on any route or within any area common to the two countries and there is in force in relation to the use of the Inland Vessel in the reciprocating country, a policy of insurance complying with the requirements of the law of insurance in force in that country, then, notwithstanding anything contained in section 7.4.3 but subject to any rules which may be made under section 7.4.20, such policy of insurance shall be effective throughout the route or area in respect of which, the arrangement has been made, as if the policy of insurance had complied with the requirements of this Chapter.

Objects and Reasons – Clause 7.4.4 provides for the validity of policies of insurance issued in a reciprocating country in respect of Inland Vessels of the reciprocating country operating on any route common to the two countries.

7.4.5 Duty of insurers to satisfy judgments and awards against persons insured in respect of third party risks

Duties of Insurer to satisfy judgments and awards

1) if, after a certificate of insurance has been issued under sub-section (3) of section 7.4.3 in favour of the person by whom a policy has been effected, judgement or award in respect of any such liability as is requirement to be covered by a policy under clause (b) of sub-section (1) of section 7.4.3 (being a liability covered by the terms of the policy) or under the provisions of section 7.4.19A is obtained against any person insured by the policy, then, notwithstanding that the insurer may be entitled to avoid or cancel or may have avoided or cancelled the policy, the insurer shall, subject to the provisions of this section, pay to the person entitled to the benefit of the decree any sum not exceeding the sum assured payable thereunder, as if he were the judgement debtor, in respect of the liability, together with any amount payable in respect of costs and any sum payable in respect of

interest on that sum by virtue of any enactment relating to interest on judgments.

2) No sum shall be payable by an insurer under sub-section (1) in respect of any judgement or award unless, before the commencement of the proceedings in which the judgement or award is given the insurer had notice through the Court or, as the case may be, the Claims Tribunal of the bringing of the proceedings, or in respect of such judgement or award so long as execution is stayed thereon pending an appeal; and an insurer to whom notice of the bringing of any such proceedings is so given shall be entitled to be made a party thereto and to defend the action on any of the following grounds, namely :-
   a) that there has been a breach of a specified condition of the policy, being one of the following conditions, namely :-
      i. a condition excluding the use of the Inland Vessel-
         a) for hire or reward, where the Inland Vessel is on the date of the contract of insurance an Inland Vessel not covered by a certificate of registration granted under section 19F of the Inland Vessels Act 1917 to ply for hire or reward, or
         b) for organized racing and speed testing, or
         c) for a purpose not allowed by the a certificate of registration granted under section 19F of the Inland Vessels Act 1917 under which the Inland Vessel is used, where the Inland Vessel is a "public service vessel or goods service vessel".
      ii. a condition excluding manning by a named person or persons or by any person who is "not holding a certificate granted under Chapter III of the Inland Vessels Act, 1917", or by any person who has been disqualified for holding or obtaining a certificate granted under Chapter III of the Inland Vessels Act 1917 during the period of disqualification; or
      iii. a condition excluding liability for injury caused or contributed to by conditions of war, civil war, riot or civil commotion; or
   b) that the policy is void on the ground that it was obtained by the non-disclosure of a material fact or by a representation of fact which was false in some material particular.

3) Where any such judgement as is referred to in sub-section (1) is obtained from a Court in a reciprocating country and in the case of a foreign judgement is, by virtue of the provisions of section 13 of the Code of Civil Procedure, 1908 (5 of 1908) conclusive as to any matter adjudicated upon by it, the insurer (being an insurer registered under the Insurance Act, 1938 (4 of 1938) and whether or not he is registered under the corresponding law of the reciprocating country) shall be liable to the person entitled to the benefit of the decree in the manner and to the extent specified in sub-section (1), as if the judgement were given by a Court in India :

Provided that no sum shall be payable by the insurer in respect of any such judgement unless, before the commencement of the proceedings in which the judgement is given, the insurer had notice through the Court concerned of the bringing of the proceedings and the insurer to whom notice is so given is entitled under the corresponding law of the reciprocating country, to be made a party to the proceedings and to defend the action on grounds similar to those specified in sub-section (2).

4) Where a certificate of insurance has been issued under sub-section (3) of section 7.4.3to the person by whom a policy has been effected, so much of the policy as purports to restrict the insurance of the persons insured thereby by reference to any conditions other than those in clause (b) of subsection (2) shall, as respects such liabilities as are required to be covered by a policy under clause (b) of sub-section (1) of section 7.4.3, be of no effect :

Provided that any sum paid by the insurer in or towards the discharge of any liability of any person which is covered by the policy by virtue only of this sub-section shall be recoverable by the insurer from that person.

5) If the amount which an insurer becomes liable under this section to pay in respect of a liability incurred by a person insured by a policy exceeds the amount for which the insurer would apart from the provisions of this section be liable under the policy in respect of that liability, the insurer shall be entitled to recover the excess from that person.
6) In this section the expression "material fact" and "material particular" means, respectively, a fact or particular of such a nature as to influence the judgement of a prudent insurer in determining whether he will take the risk and, if so, at what premium and on what conditions, and the expression "liability covered by the terms of the policy" means liability which is covered by the policy or which would be so covered but for the fact that the insurer is entitled to avoid or cancel or has avoided or cancelled the policy.
7) No insurer to whom the notice referred to in sub-section (2) or sub-section (3) has been given shall be entitled to avoid his liability to any person entitled to the benefit of any such judgement or award as is referred to in sub-section (1) or in such judgement as is referred to in sub-section (3) otherwise than in the manner provided for in sub-section (2) or in the corresponding law of the reciprocating country, as the case may be.

Explanation – For the purposes of this section, "Claims Tribunal" means a Claims Tribunal constituted under section 7.5.1 and "award" means an award made by that Tribunal under section 7.5.4.

Objects and Reasons – Clause 7.4.5 lays down that it is the duty of the insurers to satisfy judgements against persons insured in respect of third party risk.

7.4.6 Rights of third parties against insurers on insolvency of the insured

Rights of Third Parties against insurers on insolvency of the Insured

1) Where under any contract of insurance effected in accordance with the provisions of this Chapter, a person is insured against liabilities which he may incur to third parties, then -
   a) in the event of the person becoming insolvent or making a composition or arrangement with his creditors, or

b) where the insured person is a company, in the event of a winding-up order being made or a resolution for a voluntary winding-up being passed with respect to the company or of a receiver or manager of the company's business or undertaking being duly appointed, or of possession being taken by or on behalf of the holders of any debentures secured by a floating charge of any property comprised in or subject to the charge, if, either before or after that event, any such liability is incurred by the insured person, his rights against the insurer under the contract in respect of the liability shall, notwithstanding anything to the contrary in any provision of law, be transferred to and vest in the third party to whom the liability was so incurred.

2) Where an order for the administration of the estate of a deceased debtor is made according to the law of insolvency, then, if any debt provable in insolvency is owing by the deceased in respect of a liability to a third party against which he was insured under a contract of insurance in accordance with the provisions of this Chapter, the deceased debtor's rights against the insurer in respect of that liability shall, notwithstanding anything to the contrary is any provision of law, be transferred to and vest in the person to whom the debt is owing.
3) Any condition in a policy issued for the purposes of this Chapter purporting either directly or indirectly to avoid the policy or to alter the rights of the parties thereunder upon the happening to the insured person of any of the events specified in clause (a) or clause (b) of sub-section (1) or upon the making of an order for the administration of the estate of a deceased debtor according to the law of insolvency shall be of no effect.
4) Upon a transfer under sub-section (1) or sub-section (2), the insurer shall be under the same liability to the third party as he would have been to the insured person, but –
    a) if the liability of the insurer to the insured person exceeds the liability of the insured person to the third party, nothing in this Chapter shall affect the rights of the insured person against the insurer in respect of the excess, and
    b) if the liability of the insurer to the insured person is less than the liability of the insured person to the third party, nothing in this Chapter shall affect the rights of the third party against the insured person in respect of the balance.

Objects and Reasons – Clause 7.4.6 provides that in the event of the insured becoming insolvent any liability incurred by the insured person and his rights against the insurer will be transferred to and vest in the third party to whom the liability was so incurred.

7.4.7 Duty to give information as to insurance

Duties to give information as to insurance

1) No person against whom a claim is made in respect of any liability referred to in clause (b) of sub-section (1) of section 7.4.3 shall on demand by or on behalf of the person making the claim refuse to state whether or not he was insured in respect of that liability by any policy issued under the provisions of this Chapter, or would have been so insured if the insurer had not avoided

or cancelled the policy, nor shall he refuse, if he was or would have been so insured, to give such particulars with respect to that policy as were specified in the certificate of insurance issued in respect hereof.

2) In the event of any person becoming insolvent or making a composition or arrangement with his creditors or in the event of an order being made for the administration of the estate of a deceased person according to the law of insolvency, or in the event of a winding-up order being made or a resolution for a voluntary winding-up being passed with respect to any company or of a receiver or manager of the company's business or undertaking being duly appointed or of possession being taken by or on behalf of the holders of any debentures secured by a floating charge on any property comprised in or subject to the charge, it shall be the duty of the insolvent debtor, personal representative of the deceased debtor or company, as the case may be, or the official assignee or receiver in insolvency, trustee, liquidator, receiver or manager, or person in possession of the property to give at the request of any person claiming that the insolvent debtor, deceased debtor or company is under such liability to him as is covered by the provision of this Chapter, such information as may reasonably be required by him for the purpose of ascertaining whether any rights have been transferred to and vested in him by section 7.4.6, and for the purpose of enforcing such rights, if any; and any such contract of insurance as purports whether directly or indirectly to avoid the contract or to alter the rights of the parties thereunder upon the giving of such information in the events aforesaid, or otherwise to prohibit or prevent the giving thereof in the said events, shall be of no effect.

3) If, from the information given to any person in pursuance of subsection (2) or otherwise, he has reasonable ground for supporting that there have or may have been transferred to him under this Chapter rights against any particular insurer, that insurer shall be subject to the same duty as is imposed by the said sub-section on the persons therein mentioned.

4) The duty to give the information imposed by this section shall include a duty to allow all contracts of insurance, receipts for premiums, and other relevant documents in the possession or power of the person on whom the duty so imposed to be inspected and copies thereof to be taken.

Objects and Reasons – Clause 7.4.7 prescribes that it is the duty of the insured to give information relating to the insurance on demand by or on behalf of the person making the claim for compensation.

7.4.8 Settlement between insurers and insured persons

Settlement between insurers and insured persons

1) No settlement made by an insurer in respect of any claim which might be made by a third party in respect of any liability of the nature referred to in clause (b) of sub-section (1) of section 7.4.3 shall be valid unless such third party is a party to the settlement.

2) Where a person who is insured under a policy issued for the purpose of this Chapter has become insolvent, or where, if such insured person is a company, a winding-up order has been made or a resolution for a voluntary winding-up has been passed with respect to the company, no agreement

made between the insurer and the insured person after the liability has been incurred to a third party and after the commencement of the insolvency or winding-up, as the case may be, nor any waiver, assignment or other disposition made by or payment made to the insured person after the commencement aforesaid shall be effective to defeat the rights transferred to the third party under this Chapter, but those rights shall be the same as if no such agreement, waiver, assignment or disposition or payment has been made.

Objects and Reasons – Clause 7.4.8 lays down that any settlement made by the insurer in respect of any claim which may be made by the third party will not be valid unless the third party is a party to the claim.

7.4.9 Saving in respect of section 7.4.6, 7.4.7 and 7.4.8

Saving in respect of section 7.4.6, 7.4.7 and 7.4.8

1) For the purposes of section 7.4.6, 7.4.7 and 7.4.8 a reference to "liabilities to third parties" in relation to a person insured under any policy of insurance shall not include a reference to any liability of that person in the capacity of insurer under some other policy of insurance.
2) The provisions of section 7.4.6, 7.4.7 and 7.4.8 shall not apply where a company is wound-up voluntarily merely for the purposes of reconstruction or of an amalgamation with another company.

Objects and Reasons – Clause 7.4.9 lays down that the liability of the insurer will be only in respect of that particular policy alone and not in respect of any other policy of insurance.

7.4.10 Insolvency of insured persons not to affect liability of insured or claims by third parties

Insolvency of insured persons not to affect liability of insured or claims by third parties

Where a certificate of insurance has been issued to the person by whom a policy has been effected, the happening in relation to any person insured by the policy of any such event as is mentioned in sub-section (1) or sub-section (2) of section 7.4.6 shall, notwithstanding anything contained in this Chapter, not affect any liability of that person of the nature referred to in clause (b) of sub-section (1) of section 7.4.3; but nothing in this section shall affect any rights against the insurer conferred under the provisions of section 7.4.6, 7.4.7 and 7.4.8 on the person to whom the liability was incurred.

Objects and Reasons – Clause 7.4.10 provides that the insolvency of the insured will not affect the liability of the insured or affect the claims of third parties or the rights against the insurer.

7.4.11 Effect of death on certain causes of action

Effect of death on certain causes of action

Notwithstanding anything contained in section 306 of the Indian Succession Act, 1925 (39 of 1925) of the death of a person in whose favour a certificate of insurance had been issued, if it occurs after the happening of an event which has given rise to a claim under the provisions of this Chapter, shall not be a bar to the survival of any cause of action arising out of the said event against his estate or against the insurer.

Objects and Reasons – Clause 7.4.11 makes it clear that in the event of the death of the insured after the happening of an accident in which his Inland Vessel was involved, the right of third parties will not be barred against the insured or his excise.

7.4.12 Effect of certificate of insurance

Effect of Certificate of Insurance

When an insurer has issued a certificate of insurance in respect of a contract of insurance between the insurer and the insured person, then -

a) if and so long as the policy described in the certificate has not been issued by the insurer to the insured, the insurer shall, as between himself and any other person except the insured, be deemed to have issued to the insured person a policy of insurance conforming in all respects with the description and particulars stated in such certificate; and
b) if the insurer has issued to the insured the policy described in the certificate, but the actual terms of the policy are less favourable to persons claiming under or by virtue of the policy against the insurer either directly or through the insured than the particulars of the policy as stated in the certificate, the policy shall, as between the insurer and any other person except the insured, be deemed to be in terms conforming in all respects with the particulars stated in the said certificate.

Objects and Reasons – Clause 7.4.12 provides that where the insurer has issued a certificate of insurance, and the policy of insurance has not been issued, then the policy to be issued be deemed to be in terms conforming in all respects to the particulars mentioned in the certificate of insurance.

7.4.13 Transfer of certificate of insurance

Transfer of Certificate of Insurance

1) Where a person in whose favour the certificate of insurance has been issued in accordance with the provisions of this Chapter transfer to another person the ownership of the Inland Vessel in respect of which such insurance was taken together with the policy of insurance relating thereto, the certificate of insurance and the policy described in the certificate shall be deemed to have been transferred in favour of the person to whom the Inland Vessel is transferred with effect from the date of its transfer.

Explanation. – For the removal of doubts, it is hereby declared that such deemed transfer shall include transfer of rights and liabilities of the said certificate of insurance and policy of insurance.]

2) The transferee shall apply within fourteen days from the date of transfer in the prescribed form to the insurer for making necessary changes in regard to the fact of transfer in the certificate of insurance and the policy described in the certificate in his favour and the insurer shall make the necessary

changes in the certificate and the policy of insurance in regard to the transfer of insurance.

Objects and Reasons – Clause 7.4.13 lays down that when the certificate of registration is transferred from one person to another, then the policy of insurance in respect of that Inland Vessel is also deemed to have been transferred to that other person from the date on which the ownership of the Inland Vessel stands transferred.

7.4.14 Production of certain certificates, licence, and a certificate of registration granted under section 19F of the Inland Vessels Act 1917 in certain cases

Production of certain certificates

1) The Master or person in-charge of an Inland Vessel shall, on being so required by a police officer in uniform authorized in this behalf by the State Government, produce -
   a) the certificate of insurance;
   b) the certificate of registration;
   c) the certificate granted under Chapter III of the Inland Vessels Act 1917; and
   d) the certificate of survey granted under section 9 of the Inland Vessels Act, 1917
2) If, where owing to the presence of an Inland Vessel in an Inland Water an accident occurs involving death or bodily injury to another person, the Master of the Inland Vessel does not at the time produce the certificate, a certificate granted under Chapter III of the Inland Vessels Act 1917 and a certificate of registration granted under section 19F of the Inland Vessels Act 1917 referred to in sub-section (1) to a police officer, he shall produce the said certificates, licence and a certificate of registration granted under section 19F of the Inland Vessels Act 1917 at the police station at which he makes the report required by section 7.2.
3) No person shall be liable to conviction under sub-section (1) or sub-section (2) by reason only of the failure to produce the certificate of insurance if, within seven days from the date on which its production was required under sub-section (1), or as the case may be, from the date of occurrence of the accident, he produces the certificate at such police station as may have been specified by him to the police officer who required its production or, as the case may be, to the police officer at the site of the accident or to the officer-in-charge of the police station at which he reported the accident :

Provided that except to such extent and with such modifications as may be prescribed, the provisions of this sub-section shall not apply to the Master of the "public service vessel or goods service vessel".

4) The owner of an Inland Vessel shall give such information as he may be required by or on behalf of a police officer empowered in this behalf by the State Government to give for the purpose of determining whether the Inland Vessel was or was not being manned in contravention of section

7.4.2 and on any occasion when the Master of the Vessel was required under this section to produce his certificate of insurance.

5) In this section, the expression “produce his certificate of insurance” means produce for examination the relevant certificate of insurance or such other evidence as may be prescribed that the Inland Vessel was not being manned in contravention of section 7.4.2.
6) As soon as any information regarding any accident involving death or bodily injury to any person is recorded or report under this section is completed by a police officer, the officer-in-charge of the police station shall forward a copy of the same within thirty days from the date of recording of information or, as the case may be, on completion of such report to the Claims Tribunal having jurisdiction and a copy thereof to the concerned insurer, and where a copy is made available to the owner, he shall also within thirty days of receipt of such report, forward the same to such Claims Tribunal and insurer.

Objects and Reasons – Clause 7.4.14 makes it compulsory on the part of the Master of an Inland Vessel involved in accident, to produce the certificate of registration and insurance, the certificate of survey granted under section 9 of the Inland Vessels Act, 1917 and a certificate of registration granted under section 19F of the Inland Vessels Act 1917 and a certificate granted under Chapter III of the Inland Vessels Act 1917 without delay. It also provides that the police officer who makes a report of accident shall send a copy of the report to the Accident Claims Tribunal.

7.4.15 Production of certificate of insurance on application for authority to use Inland Vessel

Production of certificate of insurance on application for authority to use inland vessel

A State Government may make rules requiring the owner of any Inland Vessel when applying whether by payment of a tax or otherwise for authority to use the Inland Vessel in an Inland Waterway to produce such evidence as may be prescribed by those rules to the effect that either -

a) on the date when the authority to use the Inland Vessel comes into operation there will be in force the necessary policy of insurance in relation to the use of the Inland Vessel by the applicant or by other persons on his order or with his permission, or
b) the Inland Vessel is an Inland Vessel to which section 7.4.2 does not apply.

Objects and Reasons – Clause 7.4.15 empowers the State Government to make rules to require production of certificate of insurance of an Inland Vessel at the time of payment of taxes and to have a valid certificate of insurance before the Inland Vessel prior obtaining a certificate of registration granted under section 19F of the Inland Vessels Act 1917.

7.4.16 Duty to furnish particulars of Inland Vessel involved in accident

Duty to furnish particulars of Inland Vessels involved in accident

A registering authority or the officer-in-charge of a police station shall, if so required by a person who alleges that he is entitled to claim compensation in respect of an accident arising out of the use of an Inland Vessel, or if so required by an insurer against whom a claim has been made in respect of any Inland Vessel, furnish to that person or to that insurer, as the case may be, on payment of the prescribed fee any information at the disposal of the said authority or the said police officer relating to the identification marks and other particulars of the Inland Vessel and the name and address of the person who was using the Inland Vessel at the time of the accident or was injured by it and the property, if any, damaged in such form and within such time as the State/Central Government may prescribe.

Objects and Reasons- Clause 7.4.16 lays down that it is the duty of the police officer registering accident case and the registering authority to furnish to the person who alleges that he is entitled to claim compensation all such particulars in such form and within such time as the State/Central Government may prescribe.

7.14.17 Special provisions as to compensation in case of hit and run Inland Vessel accident

Special provisions as to compensation in case of hit and run inland vessel accident

1) For the purposes of this section, section 7.4.18 and section 7.4.19 -
   a) "grievous hurt" shall have the same meaning as in the Indian Penal Code, 1860 (45 of 1860);
   b) "hit and run Inland Vessel accident" means an accident arising out of the use of a Inland Vessel the identity whereof cannot be ascertained in spite of reasonable efforts for the purpose;
   c) "scheme" means the scheme framed under section 7.4.19.
2) Notwithstanding anything contained in the General Insurance Business (Nationalization) Act, 1972 (57 of 1972) or any other law for the time being in force or any instrument having the force of law, the General Insurance Corporation of India formed under section 9 of the said Act and the insurance companies for the time being carrying on general insurance business in India shall provide for paying in accordance with the provisions of this Act and the scheme, compensation in respect of the death of, or grievous hurt to, persons resulting from hit and run Inland Vessel accidents.
3) Subject to the provisions of Motor Vehicles Act, 1988 and the scheme, there shall be paid as compensation–
   a) in respect of the death of any person resulting from a hit and run Inland Vessel accident, a fixed sum of fifty thousand rupees;
   b) in respect of grievous hurt to any person resulting from a hit and run Inland Vessel accident, a fixed sum of twenty-five thousand rupees.
4) The provisions of sub-section (1) of section 7.5.2 shall apply for the purpose of making applications for compensation under this section as they apply for the purpose of making applications for compensation referred to in that sub-section.

Objects and Reasons – Clause 7.4.17 provides for framing of a scheme by the Central Government for the payment of compensation in "hit and run" cases. It also lays down the amount of compensation in respect of the death and also in respect of grievous hurt.

7.4.18 Refund in certain cases of compensation paid under section 7.4.17 1) The payment of compensation in respect of the death of, or grievous hurt to, any person under section 7.4.17 shall be subject to the condition that if any compensation (hereafter in this sub-section referred to as the other compensation) or other amount in lieu of or by way of satisfaction of a claim for compensation is awarded or paid in respect of such death or grievous hurt under any other provision of this Act or any other law or otherwise so much of the other compensation or other amount aforesaid as is equal to the compensation paid under section 7.4.17 shall be refunded to the insurer. 2) Before awarding compensation in respect of an accident involving the death of, or bodily injury to, any person arising out of the use of a Inland Vessel under any provision of Motor Vehicles Act, 1988 (other than section 7.4.17 1 above) or any other law, the Tribunal Court or other authority awarding such compensation shall verify as to whether in respect of such death or bodily injury compensation has already been paid under section 7.4.17 or an application for payment of compensation is pending under that section, and such Tribunal, Court or other authority shall, - a) if compensation has already been paid under section 7.4.17, direct the person liable to pay the compensation awarded by it to refund to the insurer, so much thereof as is required to be refunded in accordance with the provisions of sub-section (1); b) if an application for payment of compensation is pending under section 7.4.17 forward the particulars as to the compensation awarded by it to the insurer. *Explanation* – For the purpose of this sub-section, an application for compensation under section 7.4.17 shall be deemed to be pending – i. if such application has been rejected, till the date of the rejection of the application, and ii. in any other case, till the date of payment of compensation in pursuance of the application. ***Objects and Reasons*** – Clause 7.4.18 seeks to provide that when compensation is awarded in a case where compensation under clause 7.4.17 has already been paid then so much of the compensation paid as per clause 7.4.17 shall be refunded to the insurer.	***Refund in certain cases of compensation paid under section 7.4.17***
7.4.19 Scheme for payment of compensation in case of hit and run Inland Vessel accidents 1) The Central Government may, by notification in the Official Gazette, make a scheme specifying, the manner in which the scheme shall be administered by the General Insurance Corporation, the form, manner and the time within which applications for compensation may be made, the officers or authorities to whom such applications may be made, the procedure to be followed by such officers or authorities for considering and passing orders on such applications, and all other matters connected	***Scheme for payment of compensation in case of hit and run inland vessel accidents***

with, or incidental to, the administration of the scheme and the payment of compensation.

2) A scheme made under sub-section (1) may provide that –
   a) a contravention of any provision thereof shall be punishable with imprisonment for such term as may be specified but in no case exceeding three months, or with fine which may extend to such amount as may be specified but in no case exceeding five hundred rupees or with both;
   b) the powers, functions or duties conferred or imposed on any officer or authority by such scheme may be delegated with the prior approval in writing of the Central Government, by such officer or authority to any other officer or authority;

Objects and Reasons – Clause 7.4.19 empowers the Central Government to makes scheme for payment of compensation in "hit and run" accident cases detailing the procedure for making claim, the authorities to whom the claim should be made, etc.

7.4.19A Special provisions as to payment of compensation on structured formula basis

Special provisions as to payment of compensation on structured formula basis

1) Notwithstanding anything contained in Motor Vehicles Act, 1988 or in any other law for the time being in force or instrument having the force of law, the owner of the Inland Vessel or the authorized insurer shall be liable to pay in the case of death or permanent disablement due to accident arising out of the use of Inland Vessel compensation, as indicated in the Schedule VII, to the legal heirs or the victim, as the case may be.

Explanation – For the purposes of this sub-section, "permanent disability" shall have the same meaning and extent as in the Workmen's Compensation Act, 1923.

2) In any claim for compensation under sub-section (1), the claimant shall not be required to plead or establish that the death or permanent disablement in respect of which the claim has been made was due to any wrongful act or neglect or default of the owner of the Inland Vessel or any other person.
3) The Central Government may, keeping in view the cost of living by notification in the Official Gazette, from time to time amend the Schedule VII.

7.4.19B Option to file claim in certain cases

Option to file claim in certain cases

Where a person is entitled to claim compensation under section 7.3.1and section 7.4.19A, he shall file the claim under either of the said sections and not under both

7.4.20 Power of Central Government to make rules

Power of Central Government to make rules

1) The Central Government may make rules for the purpose of carrying into effect the provisions of this Chapter, other than the matters specified in section 7.4.15.
2) Without prejudice to the generality of the foregoing power, such rules may provide for –
   a) the forms to be used for the purposes of this Chapter;

b) the making of applications for and the issue of certificates of insurance;
c) the issue of duplicates to replace certificates of insurance lost, destroyed or mutilated;
d) the custody, production, cancellation and surrender of certificates of insurance;
e) the records to be maintained by insurers of policies of insurance issued under this Chapter;
f) the identification by certificates or otherwise of persons or Inland Vessels exempted from the provisions of this Chapter;
g) the furnishing of information respecting policies of insurance by insurers;
h) adopting the provisions of this Chapter to Inland Vessels brought into India by persons making only a temporary stay therein or to Inland Vessels registered in a reciprocating country and operating on any route or within any area in India by applying those provisions with prescribed modifications;
i) the form in which and the time limit within which the particulars referred to in section 7.4.16 may be furnished; and
j) any other matter which is to be, or may be, prescribed.

7.5 CLAIMS TRIBUNALS

Claim Tribunals

7.5.1 Claims Tribunals

1) A State Government may, by notification in the Official Gazette, constitute one or more "Inland Vessel Accidents Claims Tribunals" (hereafter in this Chapter referred to as Claim Tribunal) for such area as may be specified in the notification for the purpose of adjudicating upon claims for compensation in respect of accidents involving the death of, or bodily injury to, persons arising out of the use of Inland Vessels, or damages to any property of a third party so arising, or both.

Explanation – For the removal of doubts, it is hereby declared that the expression "claims for compensation in respect of accidents involving the death of or bodily injury to persons arising out of the use of Inland Vessels" includes claims for compensation under section 7.3.1and section 7.4.19A.

2) A Claims Tribunal shall consist of such number of members as the State Government may think fit to appoint and where it consists of two or more members, one of them shall be appointed as the Chairman thereof.
3) A person shall not be qualified for appointment as a member of a Claims Tribunal unless he –
    a) is, or has been, a Judge of a High Court, or
    b) is, or has been, a District Judge, or
    c) is qualified for appointment as a High Court Judge or as a District Judge.
4) Where two or more Claims Tribunals are constituted for any area, the State Government, may by general or special order, regulate the distribution of business among them.

Objects and Reasons – Clause 7.5.1 empowers the State Government to constitute Claims Tribunals to adjudicate upon claims for compensation arising out of Inland Vessel accidents, resulting in death or bodily injury to persons or damages to any property of third parties.

7.5.2 Application for compensation

Application for Compensation

1) An application for compensation arising out of an accident of the nature specified in sub-section (1) of section7.5.1 may be made –
   a) by the person who has sustained the injury; or
   b) by the owner of the property; or
   c) where death has resulted from the accident, by all or any of the legal representatives of the deceased; or
   d) by any agent duly authorized by the person injured or all or any of the legal representatives of the deceased, as the case may be :

Provided that where all the legal representatives of the deceased have not joined in any such application for compensation, the application shall be made on behalf of or for the benefit of all the legal representatives of the deceased and the legal representatives who have not so joined, shall be impleaded as respondents to the application.

2) Every application under sub - section (1) shall be made, at the option of the claimant, either to the Claims Tribunal having jurisdiction over the area in which the accident occurred or to the Claims Tribunal within the local limits of whose jurisdiction the claimant resides, or carries on business or within the local limits of whose jurisdiction the defendant resides and shall be in such form and contain such particulars as may be prescribed :

Provided that where no claim for compensation under section 7.3.1is made in such application, the application shall contain a separate statement to that effect immediately before the signature of the applicant.

The Claims Tribunal shall treat any report of accidents forwarded to it under sub-section (6) of section 7.4.14 as an application for compensation under Motor Vehicles Act, 1988.

Objects and Reasons – Clause 7.5.2 provides for the form of application for compensation, the person who may claim compensation, the time within which the application should be filed, etc. It also provides that if the Claims Tribunal, think so, may treat the accident report filed by the Police Officer as per clause 7.4.14 as an application under Motor Vehicles Act, 1988.

7.5.3 Option regarding claims for compensation in certain cases

Option regarding claims for compensation in certain cases

Notwithstanding anything contained in the Workmen's Compensation Act, 1923 (8 of 1923) where the death of, or bodily injury to, any person gives rise to a claim for compensation under this Act and also under the Workmen's Compensation Act, 1923, the person entitled to compensation may without prejudice to the provisions of section 7.3 claim such compensation under either of those Acts but not under both.

Objects and Reasons – Clause 7.5.3lays down that when claim arises under Motor Vehicles Act, 1988 and under the Workmen's Compensation Act, the person entitled to claim compensation may claim compensation only under either of these Acts and not under both the Act.

7.5.4 Award of the Claims Tribunal

Award of the Claim Tribunal

1) On receipt of an application for compensation made under section 7.5.2, the Claims Tribunal shall, after giving notice of the application to the insurer and after giving the parties (including the insurer) an opportunity of being heard, hold an inquiry into the claim or, as the case may be, each of the claims and, subject to the provisions of section 7.4.18 may make an award determining the amount of compensation which appears to it to be just and specifying the person or persons to whom compensation shall be paid and in making the award the Claims Tribunal shall specify the amount which shall be paid by the insurer or owner or Master of an Inland Vessel involved in the accident or by all or any of them, as the case may be :

Provided that where such application makes a claim for compensation under section 7.3.1 in respect of the death or permanent disablement of any person, such claim and any other claim (whether made in such application or otherwise) for compensation in respect of such death or permanent disablement shall be disposed of in accordance with the provisions of section 7.3.

2) The Claim Tribunal shall arrange to deliver copies of the award to the parties concerned expeditiously and in any case within a period of fifteen days from the date of the award.
3) When an award is made under this section, the person who is required to pay any amount in terms of such award shall, within thirty days of the date of announcing the award by the Claims Tribunal, deposit the entire amount awarded in such manner as the Claims Tribunal may direct.

Objects and Reasons – Clause 7.5.4 provides that the Claims Tribunal shall deliver the copies of the award to the parties within fifteen days of the award and that the person against whom the award is made shall deposit the amount awarded within thirty days of announcement of the award.

7.5.5 Procedure and powers of Claims Tribunals

Procedure and powers of claim tribunal

1) In holding any inquiry under section 7.5.4, the Claims Tribunal may, subject to any rules that may be made in this behalf, follow such summary procedures as it thinks fit.
2) The Claims Tribunal shall have all the powers of a Civil Court for the purpose of taking evidence on oath and of enforcing the attendance of witnesses and of compelling the discovery and production of documents and material objects and for such other purposes as may be prescribed; and the Claims Tribunal shall be deemed to be a Civil Court for all the purposes of section 195 and Chapter XXVI of the Code of Criminal Procedure, 1973.
3) Subject to any rules that may be made in this behalf, the Claims Tribunal may, for the purpose of adjudicating upon any claim for compensation,

choose one or more persons possessing special knowledge of any matter relevant to the inquiry to assist it in holding the inquiry.

Objects and Reasons – Clause 7.5.5 lays down the procedure to be followed by the Claims Tribunal in setting claims compensation and the powers of the Claim Tribunals.

7.5.6 Impleading insurer in certain cases

Impleading insurer in certain cases

Where in the course of any inquiry, the Claims Tribunal is satisfied that -

a) there is collusion between the person making the claim and the person against whom the claim is made, or
b) the persons against whom the claim is made has failed to contest the claim, it may, for reasons to be recorded in writing, direct that the insurer who may be liable in respect of such claim, shall be impleaded as a party to the proceeding and the insurer so impleaded shall thereupon have, without prejudice to the provisions contained in sub-section (2) of section 7.4.5, the right to contest the claim on all or any of the grounds that are available to the person against whom the claim has been made.

7.5.7 Award of interest where any claim is allowed

Award of interest where any claim is allowed

Where any Claims Tribunal allows a claim for compensation made under Motor Vehicles Act, 1988, such Tribunal may direct that in addition to the amount of compensation simple interest shall also be paid at such rate and from such date not earlier than the date of making the claim as it may specify in this behalf.

Objects and Reasons – Clause 7.5.6 empowers the Claims Tribunal to order that simple interest at such rates as it thinks fit shall also be paid alongwith the award of compensation.

7.5.8 Award of compensatory costs in certain cases

Award of compensatory costs in certain cases

1) Any Claims Tribunal adjudicating upon any claim for compensation under Motor Vehicles Act, 1988, may in any case where it is satisfied for reasons to be recorded by it in writing that -
   a) the policy of insurance is void on the ground that it was obtained by representation of fact which was false in any material particular, or
   b) any party or insurer has put forward a false or vexatious claim or defence such Tribunal may make an order for the payment, by the party who is guilty of misrepresentation or by whom such claim or defence has been put forward of special costs by way of compensation to the insurer or, as the case may be, to the party against whom such claim or defence has been put forward.
2) No Claims Tribunal Shall pass an order for special costs under subsection (1) for any amount exceeding one thousand rupees.
3) No person or insurer against whom an order has been made under this section shall, by reason thereof be exempted from any criminal liability in respect of such mis-representation, claim or defence as is referred to in sub-section (1).

4) Any amount awarded by way of compensation under this section in respect of any mis-representation, claim or defence, shall be taken into account in any subsequent suit for damages for compensation in respect of such mis-representation, claim or defence. ***Objects and Reasons*** – Clause 7.5.7 seeks to empower the Claims Tribunals to award special compensatory costs where in certain cases it is found that there has been mis-representation of case or vexatious to claims or defence. **7.5.9 Appeals** 1) Subject to the provisions of sub-section (2), any person aggrieved by an award of a Claims Tribunal may, within ninety days from the date of the award, prefer an appeal to the High Court : Provided that no appeal by the person who is required to pay any amount in terms of such award shall be entertained by the High Court, unless he has deposited with it twenty-five thousand rupees or fifty per cent, of the amount so awarded, whichever is less, in the manner directed by the High Court : Provided further that the High Court may entertain the appeal after the expiry of the said period of ninety days, if it is satisfied that the appellant was prevented by sufficient cause from preferring the appeal in time. 2) No appeal shall lie against any award of a Claims Tribunal if the amount in dispute in the appeal is less than ten thousand rupees. ***Objects and Reasons*** – Clause 7.5.8 makes provision for appeal to High Court by the aggrieved against the orders of Claim Tribunal and where the person aggrieved is the person who has to pay the compensation such person shall deposit 50 percent of the amount awarded as directed by the High Court.	***Appeals***
7.5.10 Recovery of money from insurer as arrear of land revenue Where any amount is due from any person under an award, the Claim Tribunal may, on an application made to it by the person entitled to the amount, issue a certificate for the amount to the Collector and the Collector shall proceed to recover the same in the same manner as an arrear of land revenue. ***Objects and Reasons*** – Clause 7.5.9 lays down that any money due from any person under an award by the Claim Tribunal may be recovered by the Collector as arrears of land revenue.	***Recovery of money from insurer as arrear of land revenue***
7.5.11 Bar on jurisdiction of Civil Courts Where any Claims Tribunal has been constituted for any area, no Civil Court shall have jurisdiction to entertain any question relating to any claim for compensation which may be adjudicated upon by the Claim Tribunal for that area, and no injunction in respect of any action taken or to be taken by or before the Claims Tribunal in respect of the claim for compensation shall be granted by the Civil Court.	***Bar on jurisdiction of civil courts***

Objects and Reasons – Clause 7.4.10 bars the jurisdiction of Civil Courts where any Claims Tribunal has been constituted.

Powers of State Government to make rules

7.5.12 Power of State Government to make rules

A State Government may make rules for the purpose of carrying into effect the provisions of sections 7.5.1 to 7.5.10, and in particular, such rules may provide for all or any of the following matters, namely :-

a) the form of application for claims for compensation and the particulars it may contain, and the fees, if any, to be paid in respect of such applications;
b) the procedure to be followed by a Claims Tribunal in holding an inquiry under section 7.5;
c) the powers vested in a Civil Court which may be exercised by a Claims Tribunal;
d) the form and the manner in which and the fees (if any) on payment of which an appeal may be preferred against an award of a Claims Tribunal; and

Objects and Reasons – Clause 7.5.12 confers upon the State Government to make rules for carrying into effect provisions of clauses 7.5.1 to 7.5.10.

CHAPTER 8

REMOVAL OF OBSTRUCTIONS AND SIMILAR HAZARDS IN NAVIGATION

8.1 Raising of or removal of wreck impeding navigation etc

Raising/ Removal of Wreck impeding Navigation

8.1.1 If any mechanically propelled vessel or other vessel is wrecked, stranded or sunk in any inland water is or is likely to become obstruction, impediment or danger to the safe and convenient navigation or use of inland water or the landing place or embankment or part thereof, any officer empowered by the State Government by notification in the Official Gazette in this behalf (hereinafter in the Chapter referred to as competent officer) shall cause the vessel to be raised, removed, blown up or otherwise destroyed as the circumstances may warrant.

8.1.2 If any property recovered by a competent officer acting under sub-section 8.1.1 is unclaimed or the person claiming it fails to pay reasonable expenses incurred by the competent officer under that sub-section and a further sum of twenty-five percent, of the amount of such expense, the competent officer may sell the property by public auction, if the property is of a perishable nature, forthwith, and if it is not of a perishable nature, at any time not less than two months after the recovery thereof.

8.1.3 The expense and further sum aforesaid shall be payable to the competent officer out of the sale proceeds of the property and the balance shall be paid to the person entitled to the property recovered, or if no such person appears and claims the balance, shall be held in deposit for payment, without interest, to the person thereafter establishing his right thereto;

Provided that the person makes his claim within three years from the date of sale.

8.1.4 Where the sale proceeds of the property are not sufficient to meet the expenses and further sum aforesaid, the owner of the vessel at the time the vessel was wrecked, stranded or sunk shall be liable to pay the deficiency to the competent officer on demand, and if the deficiency be not paid within the one month of such demand, the competent officer may recover the deficiency from such owner as if it were and arrear of land revenue.

8.2 Removal of obstruction in inland water

Removal of Obstruction in Inland Water

8.2.1 The competent officer may remove, or cause to be removed any timber, raft or other thing, floating or being in any part of the inland water, which in his opinion, obstructs or impedes the free navigation thereof or the lawful use of any landing place or embankment or part thereof.

8.2.2 The owner of any such timber, raft or other thing shall be liable to pay the reasonable expenses of the removal thereof, and if such owner or any other person has without lawful excuse caused any such obstruction or impediment, or causes any public nuisance affecting or likely to affect such free navigation or lawful use, he shall also be punishable with fine which may extend to one hundred rupees. 8.2.3 The Competent Officer or any magistrate having jurisdiction over the offences may cause any such nuisance to be abated. **8.3 Recovery of expenses of removal** If the owner of any such timber, raft or other thing, or the person who has caused any such obstruction, impediment or public nuisance, neglects to pay the reasonable expenses incurred in the removal thereof, within one week after demand of within fourteen days after such removal has been notified in the Official Gazette or in such other manner as the State Government may, by general or special order direct, the competent officer may cause such timber, raft or other thing or the materials of any public nuisance so removed, or so much thereof as may be necessary, to be sold by public auction and may retain all the expenses of such removal and sale out of the proceeds of the sale, and shall pay the surplus of such proceeds or deliver so much of the thing or materials as may remain unsold , to the person entitled to receive the same and if no such person appears, shall cause the same to be kept and deposited in such manner as the State Government directs, and may, if necessary, from time to time, realize the expenses of keeping the same, together with the expenses of sale, or further sale of so much of the thing or materials as may remain unsold.	***Recovery of Expenses of Removal***
8.4 Removal of lawful obstruction 8.4.1 If any obstruction or impediment to the navigation of any inland water has been lawfully made or has become lawful by reason of the long continuance of such obstruction or impediment or otherwise, the competent officer shall report the same for the information of the State Government and shall, with the sanction of the State Government, cause the same to be removed or altered, making reasonable compensation to the person suffering damage by such removal or alteration. 8.4.2 Any dispute arising out of or concerning such compensation shall be determined according to the law relating to like disputes in the case of land required for public purpose.	***Removal of Lawful Obstruction***
8.5 Fouling of Government moorings 8.5.1 If any mechanically propelled vessel hooks or gets fouled in any of the buoys or moorings laid down by or by the authority of the State Government in any part of inland water, the master of such vessel shall not, nor shall any other person,	***Fouling of Government Moorings***

except in the case of emergency, lift the buoy or mooring for the purpose of unhooking or getting clear from the same without the assistance of the competent officer. 8.5.2 The Competent Officer immediately on receiving information of such accident shall assist and superintend the clearing of such vessel and the master of the vessel shall, on demand, pay such reasonable expenses as may be incurred in clearing the same. 8.5.3 Any master or other person offending against the provisions of the section shall, for every offence, be punishable with fine which may extend to one hundred rupees.	

CHAPTER 9

PENALTIES AND LEGAL PROCEEDINGS

9.1 Penalty for making voyage without certificate of survey 9.1.1 If any inland mechanically propelled vessel proceeds on a voyage in contravention of section 3 or section 19A of the Act, the owner and the master of the mechanically propelled vessel shall each be punishable with fine, which may extend to one thousand rupees. 9.1.2 If the master or any other officer on board an inland mechanically propelled vessel which proceeds on a voyage in contravention of section 3 or section 19 of the Act is a licensed pilot, he shall be liable to have his licence as a pilot suspended or cancelled, for any period by the State Government.	***Penalty for making voyage without certificate of survey***
9.2 Penalty for neglect to affix certificate of survey in inland mechanically propelled vessel If the certificate of survey is not kept affixed in an inland mechanically propelled vessel as required by section 10, or if the registration mark is not displayed as required by section 19H of the Act, the owner and the master of the mechanically propelled vessel shall each be punishable with fine which may extend to one hundred rupees.	***Penalty for neglect to affix certificate of survey in inland mechanically propelled vessel***
9.3 Penalty for neglect or refusal to deliver up or surrender certificates of survey or registration If the owner or master of an inland mechanically propelled vessel without reasonable cause neglects or refuses- a) to deliver up a certificate of survey when required under section 14 of the Act so to do; or b) to deliver up a certificate of registration when required under section 19N of the Act so to do; or c) to surrender a certificate of registration as required by section 19O of the Act ; he shall be punishable with fine, which may extend to one hundred rupees	***Penalty for neglect or refusal to deliver up or surrender certificates of survey or registration***
9.4 Penalty for carrying excessive number of passenger on board If an inland mechanically propelled vessel has on board or in any part thereof a number of passengers which is greater than the number set forth in the certificate of survey as the number of passengers which the vessel or the part thereof is, in the judgment of the surveyor, fit to carry, the owner and the master shall each be punishable with fine which may extend to one hundred rupees for every passenger over and above that number.	***Penalty for carrying excessive number of passenger on board***

9.5 Penalty for carrying excessive quantity of cargo on board If an inland mechanically propelled vessel has on board or in any part thereof cargo which is in excess of the cargo set forth in the certificate of survey as the quantity of cargo which the vessel or the part thereof is, in the judgment of the surveyor, fit to carry, the owner and the master shall, each, in addition to the penalty to which he may be liable under the provisions of section 58 of the Act, be punishable with fine which may extend- (a) in the case of first offence, to five hundred rupees; (b) in the case of any second or subsequent offence, to one thousand rupees.	***Penalty for carrying excessive quantity of cargo on board***
9.6 Penalty for serving or engaging a person to serve as master or engineer, without certificate If any person- a) proceeds on any voyage in an inland mechanically propelled vessel as the master or engineer of such vessel without being at the time entitled to and possessed of, a master's or serang's or an engineer's or engine-driver's certificate or a master's or engine-driver's licence as the case may be, as required under the Act, or b) employ as the master or engineer of an inland mechanically propelled vessel any person without ascertaining that he is at the time entitled to, and processed of, such certificate or licence He shall be punishable with line which may extend to five hundred rupees.	***Penalty for serving or engaging a person to serve as master or engineer, without certificate***
9.7 Penalty for master failing to give notice of wreck or casualty If any master wilfully fails to give notice, as required by section 32 of the Act of any wreck, abandonment, damage, causality, or loss, he shall be punishable with fine which may extend to five hundred rupees, and in default of payment of such fine, with simple imprisonment for a term which may extend to three months.	***Penalty for master failing to give notice of wreck or casualty***
9.8 Penalty for failing to deliver up suspended or cancelled certificate If any person, whose certificate is suspended or cancelled under the Act, fails to deliver up the certificate as required by section 46, he shall be punishable with fine, which may extend to five hundred rupees.	***Penalty for failing to deliver up suspended or cancelled certificate***
9.9 Penalty for taking or delivering or tendering for carriage dangerous goods on board inland mechanically propelled vessel without notice If any person, in contravention of section 50 of the Act, takes with him on board any inland mechanically propelled vessel any dangerous goods, or delivers or tenders any such goods for carriage on any inland mechanically propelled vessel, he shall be punishable with fine which may extend to two hundred rupees and the goods shall be forfeited to Government.	***Penalty for taking/delivering/tendering for carriage dangerous goods without notice***

9.10 Punishment for offences relating to accident If the master or the driver or other person in charge of the inland mechanically propelled vessel fails to report an accident in which his vessel is involved as required under Chapter VIA of the Act, he shall be punishable with imprisonment for a term which may extend to three months, or with fine which may extend to five hundred rupees, or with both, or, if having been previously convicted of an offence under this section, he is again convicted of an offence under this section, with imprisonment for a term which may extend to six months, or with fine which may extend to one thousand rupees, or with both. **9.11 Penalty for using uninsured mechanically propelled vessel** If, any person uses a mechanically propelled vessel or causes or allows a mechanically propelled vessel to be used without a policy, of insurance complying with the requirements of Chapter VIA of the Act, he shall be punishable with fine which may extend to one thousand rupees. **9.12 Penalty for neglect or refusal to give information as to insurance or to produce certificate of insurance** If, any person without reasonable cause neglects or refuses to give information as to insurance or to produce the certificate of insurance under the provisions contained in Chapter VIA of the Act, he shall be punishable with fine which may be extend to one hundred rupees. **9.13 Punishment of offences relating to pollution** Whoever contravenes any provision of Chapter VIAB of the Act or any rule made thereunder, shall be punishable with imprisonment which may extend to one year, or with fine which may extend to fifty thousand rupees, or with both. **9.14 Offences by companies** 9.14.1 Where an offence under Chapter VIAB of the Act has been committed by a company, every person who, at the time the offence was committed, was in charge of, and was responsible to, the company for the conduct of the business of the company, as well as the company shall be deemed to be guilty of the contravention and shall be liable to the proceeded against and punished accordingly. Provided that nothing in this sub-section shall render any such person liable to any punishment provided in this Act, if he proves that the offences was committed without his knowledge or that he exercised all due diligence to prevent the commission of such offence. 9.14.2 Notwithstanding anything contained in sub-section 9.14.1, where an offence under Chapter VIAB of the Act has been committed by a company, and it is proved that the offence was committed with the consent or connivance of, or is attributable to any neglect on the part of, any director, manager, secretary	***Punishment for offences relating to accident*** ***Penalty for using uninsured mechanically propelled vessel*** ***Penalty for neglect or refusal to give information as to insurance or to produce certificate of insurance*** ***Punishment of offences relating to pollution*** ***Offences by companies***

or other officer of the company, such director, manager, secretary or other officer shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly. 9.14.3 For the purposes of this section- a) "company" means anybody corporate and includes a firm or other association of individuals; and b) "director" in relation to a firm, means a partner in the firm' **9.15 Penalty for misconduct or neglect endangering inland mechanically propelled vessel or life or limb** If any person employed or engaged in any capacity on bard an inland mechanically propelled vessel, by wilful breach or by neglect of duty, or by reason of drunkenness- a) does any act tending immediately to wreck, destroy or materially damage the vessel, or to endanger the life or limb of any person on board, or belonging to the vessel, or b) refuses or omits to do any lawful act proper and requisite to be done by him for preserving the vessel from immediate wreck, destruction or material damage, or for preserving any such person from immediate danger to life or limb, He shall be punishable with fine which may extend to one thousand rupees, or with imprisonment for a term which may be extend to two years, or with both. **9.16 Desertion and absence without leave** If, any person employed or engaged in any capacity on board a mechanically propelled vessel commits any of the following offences, he shall be liable to be punished summarily as follows :- a) if he deserts from his mechanically propelled vessel, he shall be guilty of the offence of desertion and be liable to forfeit all or any of the property he leaves on board of the vessel and of wages he has then earned and also to imprisonment which may extend to three months; b) if he neglects or refuses, without reasonable cause, to join his mechanically propelled vessel or to proceed on any voyage in his vessel or is absent without leave at any time within twenty-four hours of the vessel sailing from a port or ghat either at the commencement or during the progress of a voyage or is absent at any time without leave and without sufficient reason from his vessel or from his duty, he shall, if offence does not amount to desertion or is not treated as such by the master, be guilty of the offence of absence without leave and be liable to forfeit out of his wages a sum not exceeding two days' pay and in addition for every twenty-four hours of absence either a sum not exceeding two day' pay and six days pay or any expenses properly incurred in hiring a substitute and also to imprisonment which may extend to two months.	***Penalty for misconduct or neglect endangering inland mechanically propelled vessel or life or limb*** ***Desertion and absence without leave***

9.17 General offences against discipline If any person employed or engaged in any capacity on board a mechanically propelled vessel commits any of the following offences, he shall be guilty of an offence against discipline and he shall be liable to be punished summarily as follows;- a) if he quits the mechanically propelled vessel without leave after her arrival at the port or ghat or port or ghat of delivery, he shall be liable to forfeit out of his wages a sum not exceeding one month's pay; b) if he is guilty of wilful disobedience to any lawful command or neglect of duty, he shall be liable to forfeit out of his wages a sum not exceeding two days' pay; c) if he is guilty of continued wilful disobedience to lawful command or continued wilful neglect of duty, he shall be liable to imprisonment which may extend to one month and also to forfeit over every twenty-four hours continuance of disobedience or neglect either a sum not exceeding six days' pay or any expenses properly incurred in hiring a substitute; d) if he assaults the master or any other officer of the vessel, he shall be liable to imprisonment for a term which may extend to three months or with fine which may extent to five hundred rupees, or with both; e) if he combines with any of the officers to disobey to lawful commands or to neglect duty or to impede the navigation of the vessel or retard the progress of the voyage, he shall be liable to imprisonment for a term which may extend to three months or with fine which may extend to five hundred rupees or both; f) If he wilfully damages his mechanically propelled vessel or commits criminal misappropriation or breach of trust in respect of or wilful damages to any of her stores or cargo, he shall be liable to forfeit out of his wages a sum equal to the loss sustained and also imprisonment which may extend to three months. **9.18 Entry of offence in official log books** If any offence within the meaning of this Act of desertion or absence without leave or against discipline is committed or if any act of misconduct is committed for which the offender's agreement imposes fine and it is intended to enforced the fine – a) an entry of the offences or acts shall be made in the official log-book and signed by the master and one of the persons employed or engaged in any capacity on board of the mechanically propelled vessel; b) the offender shall be furnished with a copy of the entry and have the same read over distinctly and audibly to him and may thereupon make such reply thereto as he thinks fit; c) a statement to a copy of the entry having been so furnished and entry having been so read over and the reply, if any made by the offender shall likewise be entered and signed in the manner aforesaid; d) in any subsequent legal proceedings the entries by this section required shall, if practicable, be produced or proved, and in default of such production or proof, the court hearing the case may	***General offences against discipline*** ***Entry of offence in official log books***

in its discretion refuse to receive evidence of the offence or act of misconduct.	
9.19 General provision for punishment of offences not otherwise provided for If any person contravenes any of the provision of this Act for which no other penalty is provided in the Act, he shall be punishable with fine which may extend to two hundred rupees.	***General provision for punishment of offences not otherwise provided for***
9.20 Levy of fine by distress of inland mechanically propelled vessel Where the owner or master of an inland mechanically propelled vessel is convicted of an offence under the Act or any rule made there under committed on board, or in relation to, that mechanically propelled vessel, and is sentenced to pay a fine, the Magistrate who passes the sentence may direct the amount of the fine to be levied by distress and sale of the mechanically propelled vessel and the tackle, apparel and furniture thereof, or so much thereof as is necessary.	***Levy of fine by distress of inland mechanically propelled vessel***
9.21 Jurisdiction of Magistrate Except in the case of an offence against any rule made under section 3 of the Act, no Magistrate shall try an offence under the Act, or any rule made there-under, unless he is a Presidency Magistrate, or a Magistrate whose powers are not less than those of a Magistrate of the first-class.	***Jurisdiction of Magistrate***
9.22 Place of trial If any person commits an offence against the Act or any rule made there-under, he shall be tried for the offence in any place in which he may be found or which the State Government, by notification in the Official Gazette, appoints in this behalf, or in any other place in which he might be tried under any other enactment for the time being in force.	***Place of trial***

ANNEXURE- 1

SCHEDULES

Schedule I

(Section 2.4.1)

Places of Survey

Following places in the State have been designated as Places of Survey as required under section 4(1)(a) of the Act.

S. No.	Place	District	Pin Code

Schedule II

(Section 2.6)

Fees for Survey

(The State government may by notification change the fees specified in the Schedule)

S. No.	Gross Tonnage of Inland Vessels and other descriptions	Fees payable (in Rupees)
1	Preliminary General Survey Required Fees	
	a) up to 10 tons	
	b) Exceeding 10 tons but does not exceed 25 tons	
	c) Exceeding 25 tons but does not exceed 50 tons	
	d) Exceeding 50 tons but does not exceed 75 tons	
	e) Exceeding 75 tons but does not exceed 100 tons	
	f) Exceeding 100 tons but does not exceed 300 tons	
	g) Exceeding 300 tons but does not exceed 600 tons	
	h) Exceeding 600 tons for every 300 tons or part their of	
2	Fee payable for intermediate survey and during validity of survey certificate or extra survey/inspection- as per tonnage in item no. 1 above	
3	Fee payable for survey on Sunday and other holidays in additional to ordinary fee chargeable.	
4	An extra fee chargeable if survey is called upon to undertake survey after 5.30 p.m. but before 9.00.a.m.	
5	For change of name of the owner or master or engine driver for the vessel on the certificate of survey or license certificate or Authorization of any person.	
6	For extension of survey validity -As per item no.1	
7	For registration or enlistment of Builder or repairer	
8	Issue of second copy of certificate or certified copy of certificate	
9	An appeal against the survey certificate or order or determination of the surveyor.	
10	Fee for dry dock survey - As per tonnage in item No.-1 above	
11	The time of the enforcement of survey fees	
12	For approval of drawing/ plans during alterations/ repair- 0.05 % of estimated cost minimum Rs. 1000.00	
13	For examination and consideration of design plans/drawing/ layout as requested- 0.05 % of tender cost amount. minimum Rs. 2000.00	
14	For witnessing tests of fire extinguishers, life buys, chains and anchors etc. as requested per visit.	

Schedule III
(Section 3.2)

Places of Registry

(The State government may by notification change the places specified in the Schedule)

Following places in the State have been designated as Places of Registry as required under section 19B (1) (a) of the Act.

S. No.	Place with PIN code	Jurisdiction Limits

Schedule IV
(Section 3.6)

Fees for Registration

(The State government may by notification change the fees specified in the Schedule)

S. No.	Gross Tonnage of Inland Vessels and other descriptions	Fees payable (in Rupees)
1	Preliminary General Survey Required Fees	
	a) up to 10 tons	
	b) Exceeding 10 tons but does not exceed 25 tons	
	c) Exceeding 25 tons but does not exceed 50 tons	
	d) Exceeding 50 tons but does not exceed 75 tons	
	e) Exceeding 75 tons but does not exceed 100 tons	
	f) Exceeding 100 tons but does not exceed 300 tons	
	g) Exceeding 300 tons but does not exceed 600 tons	
	h) Exceeding 600 tons for every 300 tons or part their of	
2	Fee payable for intermediate survey and during validity of survey certificate or extra survey/inspection- as per tonnage in item no. 1 above	
3	Fee payable for survey on Sunday and other holidays in additional to ordinary fee chargeable.	
4	An extra fee chargeable if survey is called upon to undertake survey after 5.30 p.m. but before 9.00.a.m.	
5	For change of name of the owner or master or engine driver for the vessel on the certificate of survey or license certificate or Authorization of any person.	
6	For extension of survey validity -As per item no.1	
7	For registration or enlistment of Builder or repairer	
8	Issue of second copy of certificate or certified copy of certificate	
9	An appeal against the survey certificate or order or determination of the surveyor.	
10	Fee for dry dock survey - As per tonnage in item No.-1 above	
11	The time of the enforcement of survey fees	
12	For approval of drawing/ plans during alterations/ repair- 0.05 % of estimated cost minimum Rs. 1000.00	
13	For examination and consideration of design plans/drawing/ layout as requested- 0.05 % of tender cost amount. minimum Rs. 2000.00	
14	For witnessing tests of fire extinguishers, life buys, chains and anchors etc. as requested per visit.	

Schedule V
(Section 4.2.3)

Examination Centres

(The State government may by notification change the places specified in the Schedule)

Following places in the State have been designated as Examination Centres.

S. No.	Place	District	Pin Code

Schedule VI

CONSTRUCTION RULES FOR INLAND VESSELS

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Chapter 1

General, Definitions, Documentation

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Section 1

General

1.1 Scope

1.1.1 The Rules in this part apply to all-welded, single hull steel vessels of normal form proportions and speed for operation in inland waterways.

1.1.2 For additional class notations relating to various vessel types, requirements as per Pt. 5 are to be complied with.

1.1.3 Vessels of unconventional forms and proportions or intended for carriage of cargoes not covered by the Rules or to be engaged in special service will receive individual consideration based on the general principles of the rules. In these cases, however additional calculations and/or model testing may be required to be carried out and submitted for approval.

1.1.4 Proposals for use of alternative materials e.g. aluminum, wood, etc. for some parts of the vessel shall receive special consideration.

1.2 Equivalence

1.2.1 Alternative arrangements, scantlings and equipment may be accepted provided they can be shown to be equivalent to the overall safety and strength standard of the Rules. Direct calculations for the derivation of the scantlings as an alternative to those derived by the Rule formulae, may be accepted on special consideration. The calculation procedure and the assumptions made are to be submitted for approval.

1.3 National regulations

1.3.1 While the Rules cover requirements for the classification of vessels, the attention of all concerned is drawn to requirements of various local or national Regulations, Codes and Recommendations which the vessel may also have to comply with.

1.4 Loadline and stability

1.4.1 All vessels will be assigned class only after it has been demonstrated that their intact/damage stability and loadline requirements (where applicable) are in compliance with the standards laid down by the local or National statutory authority.

1.5 Assumptions

1.5.1 It is assumed that significant dynamic excitation of major orders from propellers and machinery do not fall close to any natural frequency of the hull.

1.5.2 It is assumed that the vessels will be competently handled and loaded as per the approved loading manuals.

Section 2

Definitions

2.1 Principal particulars

2.1.1 The forward perpendicular, F.P., is the perpendicular drawn at the intersection of the maximum load waterline with the fore side of the stem.

In vessels with unusual bow arrangement the position of the F.P. will be specially considered.

2.1.2 The after perpendicular, A.P., is the perpendicular drawn at the intersection of the maximum load waterline with the after side of the rudder post or the centrerline of the rudder stock if there is no rudder post.

In vessels with unusual stern arrangement the position of the A.P. will be specially considered.

2.1.3 Rule length, L, is the distance, [m], between the forward and after perpendiculars. However L is to be not less than 96 per cent, and need not be greater than 97 per cent of the extreme length on the maximum load waterline.

In vessels with unusual bow and/or stern arrangement the Rule length, L, will be specially considered.

2.1.4 “Amidship” is at 0.5L aft of the F.P.

2.1.5 Breadth, B, is the greatest moulded breadth [m].

2.1.6 Depth, D, is the moulded depth [m], measured amidships from top of the keel to the moulded deck line of the uppermost continuous deck at side. When a uppermost continuous deck at side. When a rounded gunwale is arranged the depth is to be measured to the continuation of the moulded deck line.

2.1.7 Draught, T, is the moulded draught amidships corresponding to the maximum load waterline, [m].

2.1.8 The block co-efficient, C_b, is the moulded block co-efficient calculated as follows :-

$$C_b = \frac{\text{moulded displacement } [m^3] \text{ at draught T}}{\text{LBT}}$$

2.1.9 Speed, V, is the maximum service speed in knots on draught T.

2.2 Structural terms

2.2.1 The general terms used in the Rules for various structural parts of the vessels are defined as under:

- *Strength Deck*: In general the uppermost continuous deck. Where a superstructure deck has within 0.4L amidships, a continuous length equal to or greater than (1.5B + 3H), it is to be regarded as the strength deck instead of the covered part of the uppermost continuous deck. (H is the height of the superstructure, [m]).
- *Superstructure* : A decked structure on freeboard deck extending from side to side of the vessel or with the side plating not inboard of shell plating by more than 4 per cent of the breadth B.
- *Deckhouse*: a decked structure above the freeboard deck with the side plating being inboard of the shell plating by more than 4 per cent of the breadth B.
- *Bottom Structure* : Shell plating with stiffeners and girders below the upper turn of bilge and all other elements below and including the inner bottom plating in case of the double bottom. Sloping hopper tank top is to be regarded as a bulkhead.
- *Side Structure* : Shell plating with stiffeners and girders between the upper turn of bilge and the uppermost continuous deck at side. A rounded gunwale is included in the side structure.
- *Deck Structure* : Deck plating with stiffeners, girders, and supporting pillars.
- *Girder* : A collective term for the primary supporting members, other terms include :

    - Transverses – transverse girders under the deck.
    - web frames – side vertical girders.
    - Hatch end beams – transverse deck girders at the ends of the hatch.
    - Stringers – horizontal girders.
    - Cross-ties – girders connecting two vertical girders in a deep tank.
    - Floor – bottom transverse girders.
- *Stiffener* : A collective term for secondary supporting members; other terms being :
    - Frames.
    - Bottom, inner bottom, side or deck longitudinal.
    - Reverse frame – transverse stiffener on the inner bottom.
    - Horizontal or vertical bulkhead stiffeners.
    - Other terms are defined in the appropriate Chapters.

2.3 Material factor

2.3.1 Material factor, k, a factor depending on material strength is defined in Ch. 2.

Section 3
Documentation

3.1 General

3.1.1 Documentation is to be submitted as per the following paragraphs. In case of certain vessel types additional documentation may be required as per Pt. 5.

3.1.2 The documents should be submitted in triplicate, one copy of which shall be returned.

3.2 Plans for information

3.2.1 The following supporting plans and calculations are to be submitted for information:
- General arrangement.
- Tank plan.
- Capacity plan.
- Lines plan and Hydrostatic curves or tables.
- Docking plan.

3.3 Additional information

3.3.1 The following additional information is to be submitted as necessary for strength calculations:

- Maximum values of still water bending moments and shear forces.
- Lightvessel weight and its longitudinal distribution.
- Bonjeans data.
- Stowage factor and angle of repose of bulk cargoes to be carried.
- Masses and unbalanced moments of heavy machinery components e.g. engines, cranes, winches etc.

3.4 Plans for approval

3.4.1 Plans as relevant are to be submitted for approval as indicated in Table 3.4.1. These should as far as practicable be complete in all necessary details.

3.5 Plans to be kept on board

3.5.1 A copy of the final approved loading manual and suitable scantlings plans including details of corrosion control system; if any, are to be placed on board the vessel.

3.5.2 To facilitate the ordering of materials for repairs, plans showing the disposition and extent of high tensile steel and steel of grades other than Grade A, along with the information relating to their physical and mechanical properties, recommended working, treatment and welding procedures etc. are to be placed on board.

Table 3.4.1 : Plans for approval

Plan	Including Information On
Loading manual[1)]	details of loading in all contemplated loading conditions and resulting SWBM, SF & Torsional Moments (TM) Design values of SWBM, SF & TM
Midship section Other transverse sections Longitudinal sections & decks Shell expansion & framing plan	main particulars (L,B,D,T,C_b,V) equipment specification complete class notation applied for spacing of stiffeners deck Loads, if other than those specified in the Rules opening on the deck opening on the shell material grades
Double bottom	indication of access height and location of overflows loading on Inner bottom
Waterlight subdivision bulkheads & Watertight tunnels	openings and their closing appliances
Aft-end structure	propeller outline

Sternframe or sternpost Propeller shaft brackets Aft peak tank	propeller thrust structural details in way of rudder and propeller bearings height and location of overflows
Engine room structure Engine and thrust block seatings	type, power and r.p.m. of propulsion machinery weight of machinery, boilers, etc.
For-end construction Fore peak tank	openings on non-watertight bulkheads and diaphragm plates height and location of overflows
Oil tight/water tight and partition bulkheads in cargo tanks, ballast tanks and deep tanks	intended tank contents & their densities height and location of overflow/air pipes tanks intended to be partially filled corrosion protection: if any
Superstructures, deckhouses and Machinery casings	height of sills from deck and closing appliances for companion ways
Hatchways Hatch covers	position and type loads if different from those specified in the rules sealing and securing arrangement, spacing of bolts or wedges
Rudder, stock and tiller Steering gear arrangement	speed of the vessel (ahead & astern) material of bearing, coupling bolts, stock and the locking device rudder carrier.
Masts & derrick posts Support structure for masts, derrick posts & cranes	derrick length and loading dimensions and positions of stays and shrouds quality of material
Testing plan of tanks & bulkheads	
Welding details	
Notes: 1) See Chapter 5, Section 6. 2) One drawing may contain more than one of the items from each group	

End of the Chapter

Chapter 2

Material of Construction

Contents

Section

Section 1

General

1.1 Scope

1.1.1. The Rules relate, in general, to the construction of steel Vessels. Consideration will however be given to the use of other materials also.

1.1.2. The materials used in the construction of the vessel are to be manufactured and tasted in accordance with the requirements of Pt. 2. 'Materials' of the Rules and Regulations for the Construction and Classification of Steel Vessels (Main Rules). Materials for which provision is not made may be accepted, provided that they comply with an approved specification and such tests as may be considered necessary.

1.2 Steel

1.2.1 Ordinary hull structural steel is a hull structural steel with a minimum yield stress of 235 [N/mm^2] and a tensile strength generally in the range of 400-490 [N/mm^2].

For ordinary hull structural steel the material factor 'k' is to be taken as 1.0.

1.2.2 Steels having a yield stress of 265 [N/mm^2] and higher, are regarded as higher tensile steels. Where higher tensile steel is used, the hull girder section modulus and the local scantlings may be reduced in accordance with the relevant requirement of the Rules. For this purpose, a material factor 'K', is to be taken as follows:

K= 0.78 for steel with a minimum yield stress of 315 [N/mm^2]
K = 0.72 for steel with minimum yield stress of 355 [N/mm^2]

1.2.3 Where steel castings or forgings are used for sternframes, rudderframes, rudder stocks, propeller shaft brackets and other major structural items, they are to comply with Pt. 2 'Materials' of Main Rulers as appropriate.

1.3 Grades of a steel

1.3.1 The vessels covered by these Rules are generally to be constructed of Grade 'A' steel. However, for materials of over 20 [mm] in thickness used in highly stressed areas, grades of steel with higher levels of notch toughness (Grades 'B', 'D' or 'E') may be required dependent on the stress pattern associated with its location.

1.4 Aluminium

1.4.1 Where seawater resisting aluminium alloys manufactured and tested in accordance with the requirements of Pt. 2 of the main rules are used for superstructures, deckhouses, hatch covers or other structural components, scantlings equivalent to steel are to be derived as follows:

plating thickness, $t_a = t_s \sqrt{K_a}$

Section modulus of stiffeners, $Z_a = Z_s \cdot k_a$ where,

t_a, t_s = plating thickness of aluminium and mild steel respectively.

Z_a, Z_s = section modulus of aluminium and mild steel stiffeners respectively.

$K_a = \frac{235}{\sigma_a}$

σ_a = 0.2% proof stress or 70% of the ultimate strength of the aluminum material, whichever is lesser [N/mm^2].

1.4.2 The smaller modulus of elasticity of aluminium is to be taken into account, when determining the buckling strength of structural elements subjected to compression and the deflections, where relevant.

Section 2

Corrosion Protection

2.1 General

2.1.1 All steelwork, except inside tanks intended for the carriage of oil or bitumen, is to be protected against corrosion by application of suitable coasting.

For protection required in salt water ballast spaces, See 2.5.

For protection required in holds of dry bulk cargo carriers, see Pt. 5., Ch. 1.

For the protection required in tanks carrying chemicals or other special cargoes, see Pt,. 5, Ch. 3.

2.1.2 Where bimetallic connections are made, measures are to be incorporated to preclude galvanic corrosion.

2.2 Surface preparation, prefabrication primers, and paints or coatings

2.2.1 Steelwork is to be cleared of millscale and suitably cleaned before the application of surface paints and coatings. It is recommended that blast cleaning or other equally effective means be employed for this purpose.

2.2.2 Where a primer is used to coat steel after surface preparation and prior to fabrication, the composition of the coasting is to be such that it will have no significant deleterious effect on subsequent welding work and that it is compatible with the paints or other coatings subsequently applied. Unless the primer used is type approved by IRS for this purpose, tests as detailed in Pt. 3, Ch. 2, Sec. 3 of the Main Rules are to be made to determine the influence of the primer coating on the characteristics of the weld.

2.2.3 Paints other coatings are to be suitable for the intended purpose in the locations where they are to be used. Unless previously agreed, at least two coats are to be applied.

2.2.4 The paints or coating is to be compatible with any previously applied primer, See 2.2.2.

2.2.5 Paints, varnishes and similar preparations having a nitrocellulose or other highly flammable base, are not to be used in accommodation or machinery spaces.

2.2.6 In vessels intended for the carriage of oil cargoes having a flash point below 60^{o}C (Closed cup test), paint containing aluminium should not in general be used in cargo tanks, adjacent ballast tanks, cofferdams, pump rooms as well as on deck above the mentioned spaces, nor in any other areas where cargo vapours may accumulate, unless it has been shown by appropriate tests that the paint to be used does not increase the incendive sparking hazard.

2.3 Internal cathodic protection

2.3.1 Impressed current cathodic protection systems are not permitted in any tank.

When a cathodic protection system is to be fitted in tanks for the carriage of liquid cargo with flash point not exceeding 60^{o}C, a plan showing details of the locations and attachment of anodes is to be submitted. The arrangements will be considered for safety against fire and explosion aspects only.

2.3.2 Particular attention is to be given to the locations of anodes in relation to the structural arrangements and openings of the tank.

2.3.3 Anodes are to be of approved design and sufficiently rigid to avoid resonance in the anode support. Weldable steel cores are to be fitted, and these are to be so designed as to retain the anode even when the anode is wasted.

2.3.4 Anodes are to be attached to the structure in such a way that they remain secure both initially and during service. The following methods of attachment would be acceptable:

a) Steel core connected to the structure by continuous welding of adequate section.

b) Steel core bolted to separate supports, provided that a minimum of two bolts with lock nuts are used at each support. The separate supports are to be connected to the structure by continuous welding of adequate section.

c) Approved means of mechanical clamping.

2.3.5 Anodes are to be attached to stiffeners, or may be aligned in way of stiffeners on plane bulkhead plating, but they are not to be attached to the shell. The two ends are not to be attached to separate members which are capable of relative movement.

2.3.6 Where cores or supports are welded to the main structure, they are to be kept clear of the toes of brackets and similar stress raisers. Where they are welded to asymmetrical stiffeners, they are to be connected to the web with the welding kept at least 25 [mm] away from the edge of the web. In the case of stiffeners or girders with symmetrical face plates, the connection may be made to the web or to the centreline of the face plate but well clear of the free edges. However, it is recommended that anodes are not fitted to face plates of high tensile steel longitudinals.

2.4 Aluminium and magnesium anodes

2.4.1 Aluminium and aluminium alloy anodes are permitted in tanks used for the carriage of oil, but only at locations where the potential energy does not exceed 275 [J] (i.e. 28 [kgf m]). The weight of the anode is to be taken as the weight at the time of fitting, including any inserts and fitting devices.

2.4.2 The height of the anode is, in general, to be measured from the bottom of the tank to the centre of the anode. Where the anode is located on or closely above a horizontal surface (such as a bulkhead girder) not less than 1 [m] wide, provided with an upstanding flange or face plate projecting not less than 75 [mm] above the horizontal surface, the height of the anode may be measured above that surface.

2.4.3 Aluminium anodes are not to be located under tank hatches or tank cleaning openings unless protected by adjacent structure.

2.4.4 Magnesium or magnesium alloy anodes are permitted only in tanks intended solely for water ballast.

2.5 Corrosion protection coatings for salt water ballast spaces

2.5.1 In case of vessels which normally carry salt water for ballast purposes, all ballast spaces, having boundaries formed by the hull envelope, are to have a suitable corrosion protection coating applied in accordance with the manufacture's requirements.

Section 3
Deck Covering

3.1 General

3.1.1 Where plated decks are sheathed with wood or an approved composition, reductions in plate thickness may be allowed.

3.1.2 The steel deck is to be coated with a suitable material in order to prevent corrosive action, and the sheathing or composition is to be effectively secured to the deck.

3.1.3 Deck coverings in the following positions are to be of a type which will not readily ignite where used on decks:

a) forming the crown of machinery or cargo spaces within accommodation spaces of cargo vessels
b) within accommodation spaces, control stations, stairways and corridors of passenger vessels.

End of Chapter

Chapter 3

Principles for Scantlings and Structural Details

Contents

Section

Section 1

General

1.1 Application

1.1.1 Scantlings of various platings, stiffeners and girders to meet the local strength requirements are to be determined in accordance with the general principles given in this Chapter.

The design values of loads are given in chapters relevant to the structures under consideration.

1.1.2 Scantlings of hull members contributing to the longitudinal strength are also to comply with the requirements of Ch.4.

1.1.3 Scantlings of hull members subjected to compressive stresses are also to comply with the requirements of Sec.6.

1.2 Symbols

P = design pressure [kN/m^2] as given in the relevant chapters calculated at the loadpoint as given below:

Loadpoint for plates:

- midpoint of horizontally stiffened plate field

- half the stiffener spacing above the lower support of vertically stiffened plate field, or at the lower edge of plate when the thickness is changed within the plate field.

Load point for stiffeners:

- midpoint of span.

Loadpoint for girders

- midpoint of load are supported by the girder.

s = stiffener spacing, [mm], measured along the plating.

I = span of the stiffener, [m], in accordance with 4.1.1.

r = radius of curvature [mm].

S = span of the girder [m], in accordance with 4.1.2.

b = mean breadth [m], of the load area supported by the girder.

h_w = height of web, [mm].

b_f = width of flange, [mm].

σ = allowable bending stress, [N/mm^2] as given in the relevant chapters.

σ_y = minimum yield stress of material, [N/mm^2] may be taken as 235 [N/mm^2] for normal strength steel.

k = material factor as defined in Ch.2, Sec. 1.2.

E = modulus of elasticity, 2.06 x 105 [N/mm^2] for steel.

1.3 Frame spacing

1.3.1 The normal frame spacing between aftpeak and 0.2L from FP may be taken as:

450 + 2L [mm] for transverse framing

550 + 2L [mm] for longitudinal framing.

1.3.2 In aft peak and fore peak the frame spacing is not to exceed 600 [mm] or that given in 1.3.1 whichever is less.

1.3.3 Where the actual frame spacing is higher than that mentioned above, the minimum thicknesses of various structural members as given in the Rules may require to be increased.

Section 2
Corrosion Additions

2.1 General

2.1.1 The thickness of plates, stiffeners and girders in tanks for water ballast and/or cargo oil and in holds of dry bulk cargo carriers is to be increased by a corrosion addition 't_c' as given in Table 2.1.1.

2.1.2 The required corrosion addition 'Z_c' to the section modulus of stiffeners and girders due to the thickness addition 't_c' mentioned above may be approximated as:

$Z_c = \frac{t_c\, h_w\, (b_f + 0.3 h_w)}{1000}$ [cm^3]

Table 2.1.1 : Corrosion addition t_c [mm]		
Item	**Space Category**	**t_c**
Internal members within and plate boundary between spaces of the given category	Ballast tank	1.5 [1)]
	Cargo oil tank	1.5
	Hold of dry bulk cargo carriers	2
	Ballast tank/Cargo oil tank	1.5 [1)]
Plate boundary between the two Given space categories	Ballast tank/Hold of dry bulk Cargo carrier	2
	Ballast tank/Other category space	1.0
	Cargo Oil Tank/other Category Space	1.0
	Hold of dry bulk cargo cargo Carrier/Other category space	1.0

Notes:

1) Where the relevant ballast or liquid cargo tanks extend upto the exposed weather deck the minimum corrosion addition in the region extending upto 1.5 [m] below the weather deck corrosion addition is to be increased by 0.5 [mm].
2) Hold of dry bulk cargo carriers refers to the cargo holds of vessels with class notation **Bulk Carrier** and **Ore Carrier**.
3) Other category space denotes the hull exterior and all spaces other than water ballast and cargo oil tanks and holds of dry bulk cargo carriers.

Section 3

Plating

3.1 General

3.1.1 Minimum requirements of thickness of various platings are given in relevant chapters.

3.1.2 The thickness 't' of plating subjected to lateral pressure is not to be less than

$t = \frac{15.8s\sqrt{p}}{\sqrt{\sigma}} \times 10^{-3} + t_c$ [mm]

3.1.3 Any tapering of thickness of platings contributing to the longitudinal strength is to be based upon linear variation of stress s allowed at specified regions.

Section 4

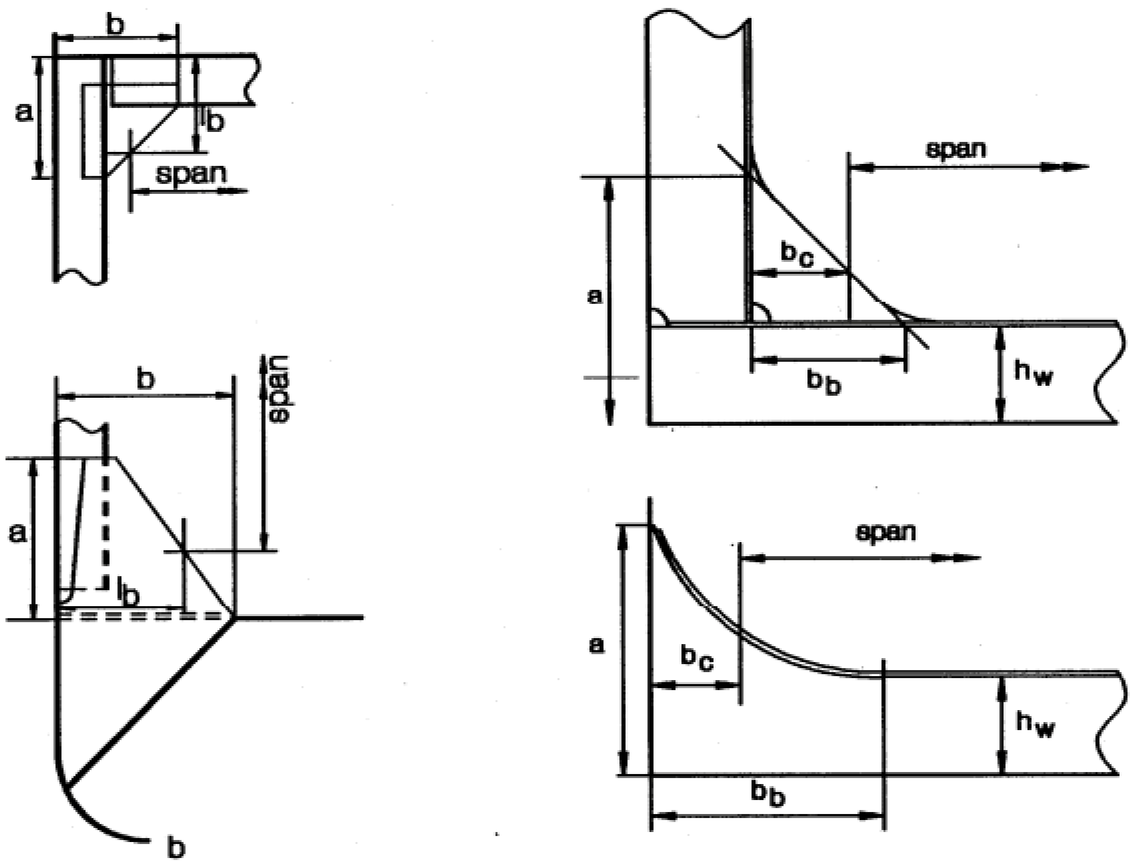
Stiffeners and Girders

4.1 Determination of span

4.1.1 For stiffeners, the span 'l' [m] is to be taken as the length of the stiffener between the two supporting members less the depth of stiffener on crossing panel if any. Where brackets larger than those required in 5.1.2 are fitted, the span may be determined as shown in Fig.4.1.1.

For curved stiffeners, 'l' may be based on the chord length.

4.1.2 For girders, the span 'S' [m] is to be taken as the length of the girder between the two supporting members less the web height of in-plane girder if any, and the correction for bracket 'b_c', as shown in Fig. 4.1.2.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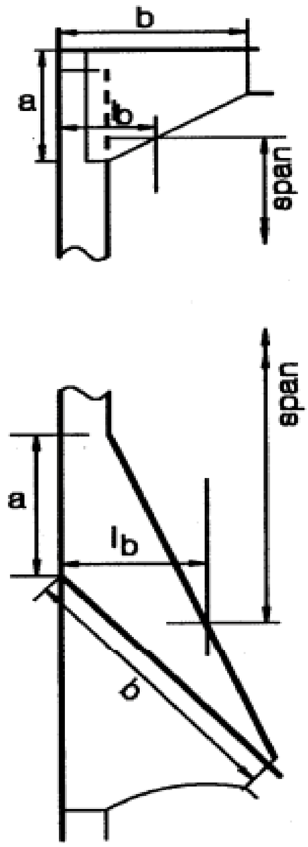


Fig.4.1.1

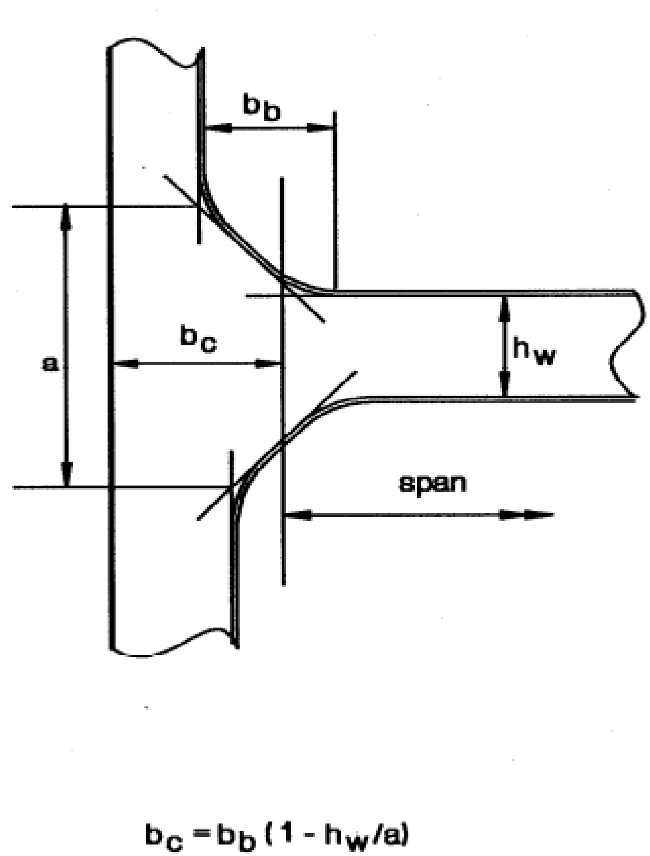


Fig.4.1.2

4.2 Effective Width of attached plating

4.2.1 The area of the attached plating, to be used in the calculation of sectional properties of the stiffeners and girders, is to be taken as the cross-sectional area within the effective width of the attached plating.

4.2.2 The effective width of plating attached to a stiffener may be taken as the mean of spacings on either side of the stiffener.

4.2.3 The effective width of plating attached to a girder, 'be' is to be taken as per the following:

$$b_e = c \,.\, b.$$

where,

$c = c_1$, for girders with uniformly distributed loads or with six or more evenly spaced point loads

$= c_2$, for girders with three or less evenly spaced point loads.

Table 4.2.3 : Values of "c"							
a/b	0.5	1.0	2.0	3.0	4.0	5.0	6.0	$\geq$ 7.0
c_1	0.19	0.38	0.67	0.84	0.93	0.97	0.99	1.00
c_2	0.11	0.22	0.40	0.52	0.65	0.73	0.78	0.80

For intermediate values of a/b and number of point loads, values of 'c' may be obtained by interpolation.

a = span of the girder, for simply supported girders, [m].

= 60 per cent of span of the girder, for girders fixed at both ends, [m]

4.2.4 In case of girders on corrugated bulkheads which run across the corrugations, the effective width of attached plating is to be taken as 10% of that obtained from 4.2.3.

4.2.5 The effective cross sectional area of the attached plating is not to be less than that of the face plate.

4.3 Scantlings of stiffeners

4.3.1 The section modulus 'Z' of stiffeners subjected to lateral pressure is not to be less than:

$Z = \frac{s.p.l^2}{m\sigma} + Z_c$ [cm^3] Where,

m = bending moment factor depending on the arrangement at the supports and variation of lateral pressure as given in the relevant chapters. Where not stated, the 'm' value may generally be taken as:

= 12 for continuous longitudinal stiffeners

= 10 for transverse, vertical and non-continuous longitudinal stiffeners fixed at both ends.

= 8 for stiffeners simply supported at both ends.

4.3.2 Where stiffeners are not perpendicular to the plating, the section modulus as obtained from 4.3.1 is to be increased by the factor ($1/\cos\propto$), $\propto$ being the angle between the stiffener web and the plane perpendicular to the plating.

4.4. Scantlings of girders

4.4.1 The scantlings of simple girders subjected to lateral pressure which can be considered as conforming to the general beam theory are to satisfy the requirement given in 4.4.2.

4.4.2. The section modulus 'Z' of girders subjected to lateral pressure is not to be less than.

$Z = \frac{b.p.S^2.\ 10^3}{m\sigma} + Z_c$ [cm^3]   Where,

m = bending moment factor depending upon the arrangement at supports and variation of lateral pressure as given in the relevant chapters. Where not stated, the 'm' value may generally be taken as 12 for continuous longitudinal girders and 10 for all other girders.

4.4.3 Where opening are cut in the girder web, they are to be away from the girder ends and scallops for stiffeners; with their centre located as near to the neutral axis of the girder as practicable. Openings of depth exceeding 25% of the girder depth or 300 [mm] and, of length exceeding the depth of the girder or 60% of the secondary stiffener spacing, are to be reinforced all around at the edge; or alternatively by providing horizontal and vertical stiffeners.

4.4.4 Girders are to be provided with adequate lateral stability by tripping brackets fitted generally at every fourth stiffener. Tripping brackets are also to be fitted at the toes of end brackets and in way of concentrated loads such as heels of pillars or cross ties.

Section 5
End Attachments

5.1 End attachments of stiffeners

5.1.1 Continuity of al stiffeners participating in longitudinal strength is to be maintained over transverse members within 0.5L amidships. Longitudinals abutting at transverse members may be accepted provided the brackets connecting the ends of the longitudinal are of adequate size and are either continuous or properly aligned.

5.1.2 Scantlings of brackets fitted on stiffeners not participating in the longitudinal strength are not to be less than the following:

- The arm lengths, 'a and b' (See Fig. 4.1.1) are to be such that:

i) a, b $\geq$ 0.8 L_B

and

ii) a + b $\geq$ 2.0 l_b,

where,

$l_b = 24\sqrt{Z} + 75$ [mm]

- Thickness of unflanged bracket is to be not less than:

$t = (4.0 + 0.3\sqrt{Z}) + t_c$ [mm]

- Thickness of flanged bracket is to be not less than:

$t = (3.0 + 0.25\sqrt{Z}) + t_c$ [mm]

- Width of flange, $w \geq 40 + Z/25$ [mm], but not to be less than 50 [mm].

where ,

Z is the section modulus [cm^3], of the smaller stiffener, being connected.

5.2 End attachments of girders

5.2.1 The end attachments and supporting structure of the girders are to provide adequate resistance against rotation and displacement of the joint and effective distribution of load from the member. Supporting members to which the girder are being connected, may require additional strengthening to provide adequate stiffness to resist rotation of the joint.

Where the end attachment provides only a low degree of restraint against rotation, the girder is generally to be extended beyond the point of support by at least two frame spaces before being gradually tapered.

Connections between girders forming a ring system are to be such as to minimize stress concentrations at the junctions. Integral brackets are generally to be radiused or well rounded at the toes.

Where the face plate of the girder is not continuous over the bracket, the free edge of the bracket is to be stiffened and the face plate of the girder is to be extended well beyond the toe of the bracket.

5.2.2 The thickness 't' of brackets on girder is not to be less than that of the girder web.

The arm length 'a' including the depth of girder is not to be less than:

$a = 83\sqrt{\frac{Z}{t}}$ [mm];

where,

Z = the section modulus [cm^3], of the girder to which the bracket is connected.

The cross sectional area 'A' of the face plate on the girder bracket is not to be less than:

$A_f = 0.001\, l_f\, t$ [cm^2]

Where, l_f is the length [mm], of the free edge of the bracket.

Additional stiffeners parallel to the bracket face plate are to be fitted on webs of large brackets. The arm length of an unstiffened triangular end panel of bracket is generally not to exceed 100 t [mm].

Section 6

Buckling

6.1 General

6.1.1 The critical buckling stress 'σ_{cr}' of plate panels and other members subjected to compressive loads is to be such that:

$\sigma_{cr} \geq \frac{\sigma_c}{\eta}$

Where,

σ_c = compressive stress to be considered as per Sec.6.3

η = 1.0 for deck, longitudinally stiffened side shell and single bottom plating

= 0.9 for bottom, inner bottom plating in double bottom and transversely stiffened side shell plating

$= \frac{0.7}{l + l_m/i}$ (need not be taken smaller than 0.3);

- For axially loaded members such as pillars, cross-ties, panting beams etc., in general – to be reduced by 15 per cent where the loads are primarily dynamic in nature.
- For 'l_m' and 'i' See 6.2.2.

6.1.2 The critical compressive buckling stress 'σ_{cr}' determined as follows is not to be less than the maximum compressive stress developed in the members under consideration.

$\sigma_{cr} = \sigma_E$ when $\sigma_E \leq 0.5\, \sigma_y$

$= \sigma_y \left(1 - \frac{\sigma_y}{4\sigma_E}\right)$ when $\sigma_E > 0.5\sigma_y$

Where,

σ_E = ideal elastic buckling stress as per Sec.6.2.

6.2 Ideal elastic buckling stress

6.2.1 The σ_E value for plating may be taken as:

$\sigma_E = 0.9\, K\, E[(t - t_c)/s]^2$ [N/mm^2]

Where,

$K = \frac{8.4}{\psi + 1.1}$

- for plating with stiffeners in the direction of the compressive stress

$$=C\left[1+\left(\frac{s}{1001}\right)^2\right]^2\left(\frac{2.1}{\psi+1.1}\right)$$

- for platings with stiffeners in the direction perpendicular to the compressive stress

ψ = ratio between the smaller and the larger values of the compressive stress assuming a linear variation (See Fig.6.2.1)

C = 1.30 when plating is stiffened by floors or deep girders

= 1.21 when stiffeners are angles or T sections

= 1.10 when stiffeners are bulb flats

= 1.05 when stiffeners are flat bars

s= shorter side of plate panel, [mm]

I = longer side of plate panel, [m]

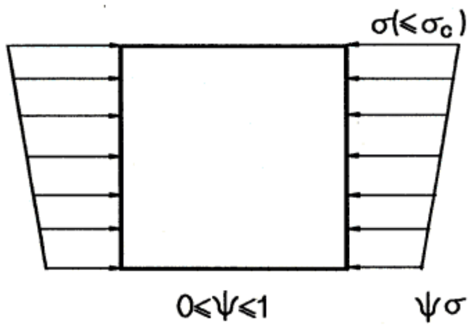


Fig. 6.2.1

6.2.2 The value of axially loaded members may be taken as:

$\sigma_E = 0.001\ C\ E\ (i/l_m)^2$ [N/mm^2]

C = 1.0 for both ends hinged; = 2.0 for one end fixed; = 4.0 for both ends fixed

i = radius of gyration of the member, [cm].

= $(I/a)^{1/2}$

I = moment of inertia of the member, [cm^4], about the axis perpendicular to the direction of buckling being considered

a = cross sectional area of the member, [cm^2]

l_m = length of the member, [m].

Where end connections of a member are different with respect to the two principal axes, σ_E is to be found out for both cases using appropriate values of 'C' and 'I'.

End of Chapter

Chapter 4

Longitudinal Strength

Contents

Section

Section 1

General

1.1 Application

1.1.1 Scantlings of hull members contributing to longitudinal strength are to comply with the requirements given in this Chapter. These members are also to comply with the requirements of buckling strength given in Ch. 3, Sec.6 and of local strength given in relevant chapters of Pt.3.

1.1.2 Still water bending moments are to be calculated for all vessels with unusual or non uniform weight or cargo distribution and for other vessels of L $\geq$ 60 m.

Such vessels are to be provided with an approved loading manual which describes the loading conditions on which the design is based and also gives the values of still water bending moments and permissible limits.

1.2 Symbols

L, B, T, k as defined in Ch. 1 Sec. 2.

I_n = moments of inertia of hull girder, [cm4], about the transverse neutral axis at the section under consideration.

Z_n = vertical distance [m] of the horizontal neutral axis above base line.

M_s = design still water bending moment [KN-m] as given in 2.1.2.

M_w = rule wave bending moment [kN-m] as given in 2.2.1.

Section 2

Vertical Bending Moments

2.1 Still water bending moment

2.1.1 Still water bending moments are to be calculated for the following loading conditions as a minimum:

a) Fully loaded condition with design cargo distribution(S)

b) Light condition with full consumables, stores, crew and ballast, if any.

In addition other loading conditions which may be more onerous, e.g. intermediate conditions of special loading or discharging sequences, are to be investigated.

2.1.2 The design value of still water bending moment Ms at 0.4L amidships is to be taken as the greater of the following:

a) The maximum of sagging or hogging still water bending moments obtained for the loading conditions specified in Sec. 2.1.1. and

b) 0.375 L^2B [KN - m]

At locations outside 0.4L amidships the design value of still water bending moment Ms may be linerally reduced to zero at perpendiculars.

2.2 Wave load conditions

2.2.1 The rule vertical wave bending moment M_w for 0.4L amidships is to be taken as

$M_w = CL^2B$ [kN – m]

Where,

C = coefficient as per Table 2.2.1.

Table 2.2.1	
Zone	**Coefficient C**
1	0.30 for $L \leq 20$ m 0.3 + 0.05 (L-20) for 20 < L < 60 0.5 for $L \geq 60$ m
2	0.3
3	0.15

At locations outside 0.4L amidships, the value of rule wave bending moment Mw is to be linerally reduced to zero perpendiculars.

Section 3

Hull Section Modulus and Moment of Inertia

3.1 Calculation of section properties

3.1.1 When calculating the moment of inertia and section moduli, the net sectional area (after deduction for openings) of all continuous longitudinal strength members is to be taken into account. Small isolated lightening holes in girders need not be deducted.

Superstructures not forming strength deck (See Ch. 1, Sec. 2.2), deckhouses, bulwarks and non-continuous longitudinal hatch coamings are not to be included in the above calculations.

In case of vessels with continuous trunks or longitudinal hatch coamings, their net sectional area may be included in the calculations provided they are effectively supported by longitudinal bulkheads or deep girders. The section modulus at deck however, is then to be calculated as given in 3.1.3.

3.1.2 The main strength members included in the calculation of hull moment of inertia and section modulus are to extend continuously through the cargo region and sufficiently far towards the ends of the vessel. Longitudinal bulkheads are to terminate at effective transverse bulkheads and large transition brackets are to be fitted in line with the longitudinal bulkheads.

3.1.3 The midship section modulus 'Z' at deck or bottom about the transverse neutral axis is to be obtained as follows:

$Z = I_n / (100.z)$ [cm^3]

Where,

z = the vertical distance [m] from the horizontal neutral axis upto the strength deck at side or the base line, as relevant.

However, in case of vessels where continuous trunks or longitudinal hatch coamings are to be included in the section modulus calculation as per Sec. 3.1.1. the distance z for calculation of modulus at deck is to be taken as the greater of the following:

z = z as above

$z = z_n [0.9 + 0.2\ y/B]$

where,

Z_n = the vertical distance from the horizontal neutral axis to top of continuous strength member.

y = athwartship distance from the centerline of the vessel to the side of the strength member.

z_n and y are to measured to the point giving the largest value of z.

3.2 Extent of high tensile steel

3.2.1 Where high tensile steels are used in the main hull structure in order to reduce the section modulus requirement, the vertical and longitudinal extent of its use is to be such that adjacent structure made of ordinary hull structural steel is not stressed beyond the stress level permissible for ordinary steel.

3.3 Section modulus requirement

3.3.1 At any transverse section, the hull section modulus Z, about the transverse neutral axis for the still water bending moments M_s given in 2.1 and wave bending moments M_w given in 2.2, is not to be less than:

$Z = \left(\frac{M_s + M_W}{\sigma_L}\right) \times 10^3$ [cm^3]

Where,

σ_L = 175/k [N/mm^2] within 0.4L amidships

= 125/k [N/mm^2] within 0.1L from AP. And F.P.

Between the specified regions σ_L is to be obtained by linear interpolation.

3.3.2 Scantlings of all continuous longitudinal members of hull girder based on the section modulus requirement in 3.3.1 are to be maintained within 0.4L amidships.

In the region outside 0.4L amidships, the scantlings are to be gradually tapered to the local requirements at ends.

3.4 Moment of inertia requirement

3.4.1 The moment of inertia In of the hull section about the transverse neutral axis, at midship, is not to be less than:

$I_n = 3\ L\ .\ Z$ [cm^4]   Where,

Z = Hull section modulus amidships as required by 3.3.1.

Section 4
Openings in Longitudinal Strength Members

4.1 Locations

4.1.1 As far as practicable, openings are to be avoided in the keel plate and in the bilge plate within 0.6L amidships.

4.1.2 Openings in the strength deck within 0.6L amidships are as far as practicable to be located inside the line of large hatch openings.

Necessary openings outside this line are to be kept well clear of the vessel's side and hatch corners.

4.1.3 Small openings are generally to be kept well clear of other openings in the longitudinal strength members.

4.2 Reinforcements

4.2.1 All openings are to be adequately framed and arrangements in way of corners and openings are to be such as to maintain structural continuity and minimize the creation of stress concentrations.

Corners of hatchways are to be reinforced as given in Ch. 8, Sec. 2. Smaller openings in the strength deck and outer bottom within 0.6L amidships are to be reinforced as given in 4.2.2 to 4.2.5 below. The area of these reinforcements is not to be included in the sectional areas used in the section modulus calculation.

4.2.2 Circular openings with diameter equal to or greater than 0.325 [m] are to have edge reinforcement having sectional area A not to be less than:

$A = 2.5$ b.t. [cm^2]

Where,

b = diameter of the opening [m]

t = thickness of the plating [mm].

4.2.3 Elliptical openings are to have their major axis in the fore and aft direction. Where the ratio of the major axis to minor axis is less than 2, the openings are to be reinforced as given in 4.2.2 taking b as the breadth of the opening (minor axis).

4.2.4 Rectangular openings are to have their corners well rounded. Where corners are of circular shape the radius is not to be less than 20 per cent of the breadth of the opening and the edges are to be reinforced as given in 4.2.2 taking b as the breadth of the opening.

Where corners are to elliptical shape as given in 4.2.3 or of streamlined shape as given in 4.3, the reinforcement will generally not be required provided that the transverse extension of the curvature, a, shown in Fig. 4.3.2 is not less than:

$a = 0.15b$ [m]

4.2.5 Openings in side shell subjected to large shear stresses are to be of circular shape and are to be reinforced as given in 4.2.2 irrespective of the size of opening.

4.3 Hatchway corners

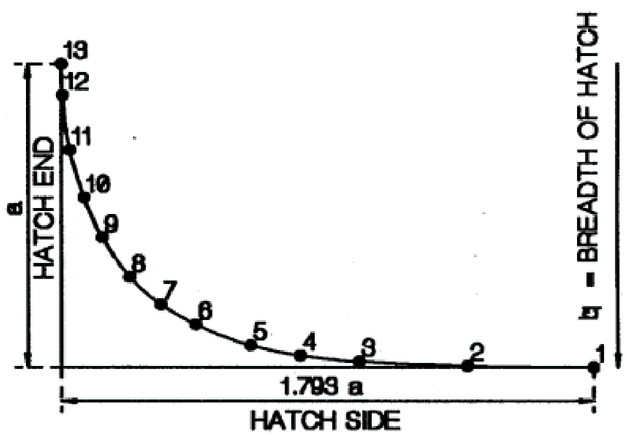
4.3.1 Where corners are of circular shape, the radius r within 0.6L amidships is not to be less than

$r = 0.05$ b [m], minimum 0.3 [m]; where,

b = breadth of the hatchway [m]

4.3.2 Where corners are of streamlined shape, as given by Fig. 4.3.2, the transverse extension of the curvature, a, is not to be less than

a = 0.05 b [m], minimum 0.3 [m]



Ordinates of steamlined corner		
Point	**Abscissa, x**	**Ordinate, y**
1	1.793a	0.0
2	1.381a	0.002a
3	0.987a	0.021a
4	0.802a	0.044a
5	0.631a	0.079a
6	0.467a	0.131a
7	0.339a	0.201a
8	0.224a	0.293a
9	0.132a	0.408a
10	0.065a	0.548a
11	0.022a	0.712a
12	0.002a	0.899a
13	0.0	1.000a

Fig.4.3.2: Streamlined deck corner

End of Chapter

Chapter 5

Bar Keel, Stem and Sternframes

Content

Section

Section 1

General

1.1 Scope

1.1.1 This chapter provides requirements for bar keel, bar stem, stern frames and shaft brackets.

1.2 Material

1.2.1 All steel plates and sections, castings and forgings used in the constructions are to be tested and approved in accordance with the requirements of Ch. 3, Ch. 4 and Ch. 5 of Pt. 2 'Materials' of the Rules & Regulations for the Construction and Classification of Steel Vessels (Main Rules), respectively. Material grades for plates and sections are to be selected as per Pt. 3, Ch.2.

1.2.2 Bar keels and stems may either be steel castings or forgings or rolled plates or bars.

1.2.3 Sternframes, rudder horns and shaft brackets may be constructed of cast or forged steel or may be fabricated from plates.

1.3 Symbols

1.3.1 L, T as defined in Ch. 1, Sec.2.

Section 2

Bar Keel

2.1 Scantlings

2.1.1 The scantlings of bar keel are not to be less than:

Depth = 75 + 0.75 L [mm]

Thickness = 10 + 0.4 L [mm]

Minor deviations from the above values may be accepted provided the required sectional area is maintained.

Section 3

Stem

3.1 Bar stem

3.1.1 The cross sectional area 'A' of a bar stem, below the summer load waterline, is not to be less than

A = 0.6L [cm^2]; or 12 [cm^2]

- whichever is greater.

3.2 Plate stem

3.2.1 The thickness 't' of the plate stem below the summer load waterline is not to be less than:

t = (0.08 L + 5.0) [mm]

3.2.2 The thickness of the plate stem may be gradually reduced to that of the side shell at the stem head.

3.2.3 The plate stems are to be supported by horizontal diaphragms spaced not more than 1.0 [m] apart. Where the stem plate radius is large, a centerline stiffener or web is to be provided.

Section 4

Stern Frames

4.1 General

4.1.1 Sternframes, shaft brackets etc. are to be designed such that they are effectively integrated into the vessel's structure.

4.1.2 In castings, sudden changes of section or possible constrictions to the flow of metal during castings are to be avoided. All fillets are to have adequate radii, which in general should not be less than 50 to 75 [mm], depending on the size of the casting.

4.1.3 Fabricated and cast steel sternframes are to be strengthened at intervals by webs spaced not more than 700 [mm] apart. In way of the upper part of the sternframe arch, these webs are to line up with the floors.

4.1.4 Rudder posts and propeller posts are to be connected to floors of increased thickness.

4.1.5 It is recommended that the after body of the vessel be so shaped as to ensure adequate flow of water to the propeller so as to prevent uneven formation of eddies, as far as possible.

4.2 Sternframes

4.2.1 The scantlings of the propeller posts are not to be less than the following:

Forged propeller posts (see Fig. 4.2.1 (a))

$A = (8 + 0.4L)\,T$ [cm^2] for $L < 60$ [m]

$= 32\,T$ [cm^2] for $L > 60$ [m]

Fabricated propeller posts (see Fig. 4.2.1 (b))

$l = 150\sqrt{T}$ [mm]

$w = 100\sqrt{T}$ [mm]

$r = 18\sqrt{T}$ [mm]

$t_1 = 11\sqrt{T}$ [mm]

$t_w = 5\sqrt{T}$ [mm]

Cast steel propeller posts (see Fig. 4.2.1 (c))

$l = 125\sqrt{T}$ [mm]

$w = 85\sqrt{T}$ [mm]

$r = 20\sqrt{T}$ [mm]

$t_1 = 12\sqrt{T}$ [mm]

$t_2 = 14\sqrt{T}$ [mm]

$t_w = 7\sqrt{T}$ [mm].

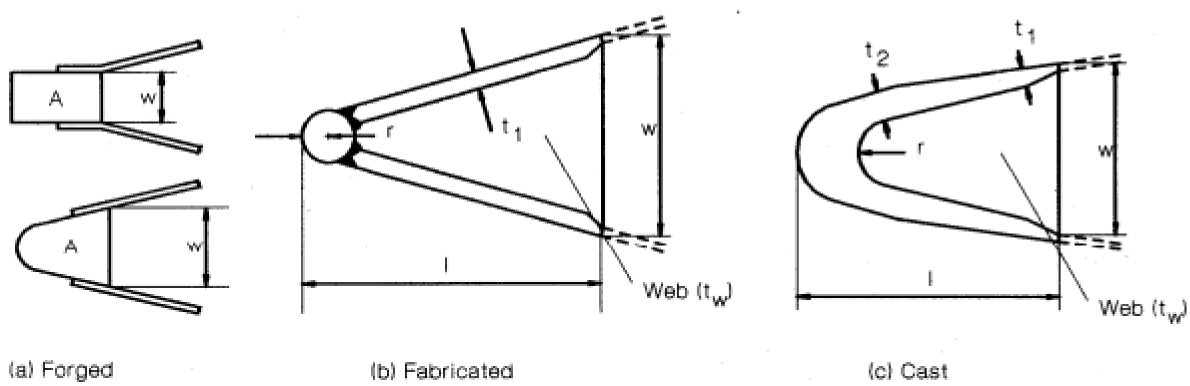


Fig.4.2.1 : Types of propeller posts

Where the sections adopted differ from the above, the section modulus about the longitudinal axis is to be equivalent to that with the Rule scantlings.

On sternframes without solepieces, the modulus of the propeller post, about the longitudinal axis, may be gradually reduced by 15 per cent below the propeller boss, provided the thicknesses are maintained as above.

4.2.2 The wall thickness of the boss 't_b' in the propeller post is not to be less than:

$t_b = 0.25\ d_{ts} + 12$ [mm]

where,

d_{ts} = Rule diameter of tail shaft, [mm]

In fabricated stern frames the connection of the propeller post to the boss is to be by full penetration welds.

4.3 Sole piece

4.3.1 The section modulus 'ZT' of the sole piece against transverse bending is not to be less than

$Z_T = \frac{1}{90}\frac{c\,F_r\,x}{b}$ [cm^3] Where,

F_r = Rudder force [N] as defined in Pt. 3, Ch. 12, Sec. 3

x = distance of the cross section under consideration from the centre line of rudder stock, [m]. 'x' is not to be taken as less than a/2.

a, b, c = shown in Figures 4.3.1 (a) and (b) [m].

The above requirement of Z_T is to be increased by 15 per cent for cast steel solepieces.

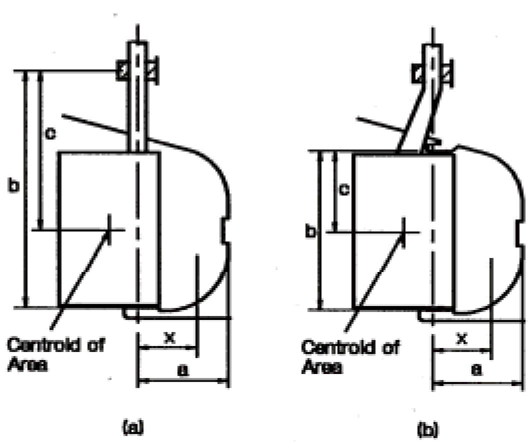


Fig.4.3.1 : Open stern frame

4.3.2 The section modulus 'Z_V' of the sole piece against vertical bending is not to be less than:

$$Z_V = \frac{Z_T}{2} \text{ [cm}^3\text{]}$$

4.3.3 The sectional area of sole piece is not to be less than:

$$A_s = \frac{1}{5400} \cdot \frac{c\, F_r}{b} \text{ [cm}^2\text{]}$$

4.3.4 The sole piece is to extend at least two frame spaces forward of the forward edge of the propeller boss and beyond this, the cross section of the extension is to be gradually reduced to that necessary for an efficient connection to the keel plate. Fabricated sole pieces are to have adequate internal stiffening.

4.4 Shaft brackets

4.4.1 Where the propeller shafting is exposed to the sea for some distance clear of the main hull, it is generally to be supported adjacent to the propeller by independent brackets having two arms. It is recommended that the angle included between the arms differs from the angle included between the propeller blades. In very small vessels the use of single arm brackets will be considered.

4.4.2 Fabricated brackets are to be designed to avoid or reduce the effect of hard spots and ensure a satisfactory connection to the hull structure. The connection of the arms of the bearing boss is to be by full penetration welding.

4.4.3 Generally, bracket arms are to be carried through the shell plating and attached to floors or girders of increased thickness. The shell plating in way of shaft brackets is to be increased in thickness to a minimum of 1.5 times the Rule bottom shell plating thickness amidships. In way of the bracket arms an insert plate is to be provided of thickness not less than:

$t = 1.6\sqrt{d_{ts}}$ where d_{ts} is the tailshaft diameter.

The connection of the bracket arms to the shell plating is to be by full penetration welding.

4.4.4 The scantlings of solid or built-up shaft brackets are to comply with the following:

$t = 0.4\, d_{ts}$ [mm]

$A = 4.5\, d_{ts}^2 \cdot 10^{-3}$ [cm^2]

$Z_T = 30\, d_{ts}^3 \cdot 10\text{-}6$ [cm^3]

Where,

t = thickness of the bracket arms

A = cross sectional areas of the bracket arms

Z_T = Section modulus of the bracket arms against transverse bending

End of Chapter

Chapter 6

Bottom Structure Contents

Contents

Section

Section 1

General

1.1 Scope

1.1.1 The scantlings and arrangement of bottom structure as defined in Ch. 1, Sec.2 are to comply with the requirements given in this chapter.

1.2 Symbols

L, B, T, C_b, k as defined in Ch. 1, Sec. 2.

s = spacing of stiffeners, [mm]

l = span of stiffeners, [m]

b = spacing of girders, [m]

S = span of girders, [m]

t_c, Z_c are corrosion additions to the thickness and section modulus respectively, as given in Ch.3, Sec.2.1.

$$f_B = \frac{Z_R}{Z_B}$$ where,

Z_R = Rule midship section modulus [cm^3] as required by Ch. 4.

Z_B = Actual midship section modulus [cm^3] provided at bottom.

Section 2

Structural Arrangement and Details

2.1 General

2.1.1 Depth of wells constructed in the double bottom, in connection with the drainage arrangement of holds, is to be kept in the minimum.

2.1.2 The continuity of the bottom, bilge and inner bottom longitudinal is to be maintained in accordance with Ch. 3, Sec. 5.1.1.

2.1.3 The bilge keel and the ground bar to which it is attached are to be gradually tapered at ends and arranged to finish in way of suitable internal stiffening, Butt welds in the bilge keel and the ground bar are to be well clear of each other and those in the shell plating.

2.1.4 The weld connections are to comply with the requirements of Ch. 16.

2.2 Access, ventilation and drainage

2.2.1 Adequate access is to be provided to all parts of the double bottom, Where the vertical dimension of the lightening hole exceeds 50 percent of the web height adequate reinforcements are to be provided. The diameter reinforcement are to be provided. The diameter of lightening holes in the bracket floors is not to exceed 1/3 of the breadth of the brackets.

Lightening holes or manholes are normally not to be cut in floors or girders towards their ends and under large pillars supporting structures. Manholes in inner bottom are to have reinforcement rings, and the man hole covers in the inner bottom plating in cargo holds are to be effectively protected. The edges of all holes are to be smooth.

2.2.2 To ensure the free passage of air and water from all parts of the tanks of air pipes and suctions, air and drain holes are to be provided in all non-watertight members. The air holes are to be placed as near to the inner bottom as possible and their total area is to be greater than the area of the fitting pipes. The drain holes are to be placed as near to the bottom as possible.

2.2.3 The access opening to pipe tunnel is to be visible above the floor plates and is to be fitted with a rigid watertight closing device. A notice board stating that the access opening to the pipe tunnel is to be kept closed, is to be fitted near the opening. The opening is to be regarded as an opening in watertight bulkhead.

Section 3

Design Loads

3.1 Bottom shell

3.1.1.The design pressure ‘p’ [kN/m^2] on outer bottom is to be taken as

p = 10 T_1 [kN/m^2]

Table 3.1.1 : Values of T_1	
Zone	**T_1**
1	T + 1.0 [m] for L > 60 [m] T + 0.6 [m]for L < 20 [m]
2	T + 0.6 [m]
3	T + 0.3 [m]
For intermediate values of L in Zone 1, T_1 to be linearly interpolated	

In way of tanks, the design pressure is not to be taken less than internal pressure ‘p’ given in 3.2.1.

3.2 Watertight floors and girders

3.2.1 The design pressure ‘p’ on watertight floors and girders in double bottom tanks is to be taken as the greater of:

p = 6.7 h_p [kN/m^2]

p = 10 (h_s + 1) [kN/m^2] where,

h_p = vertical distance [m], from the load point to the top of air pipe.

h_s = vertical distance [m], from the load point to top of the tank.

3.3 Inner bottom

3.3.1 The design pressure ‘p’ on the inner bottom is to be taken as the greater of that given in 3.2.1 and the following :

In way of cargo hold, the design pressure ‘p’ is not to be taken as less than:

P = 12.5 ρH [kN/m^2]

where,

ρ= cargo density [t/m^3] normally not to be taken as less than 0.7 [t/m^3]

H = height [m], to deck or top of hatchway coaming.

Section 4

Bottom and Inner Bottom Plating

4.1 Keel plate

4.1.1 The width of the plate keel is not to be less than (400 + 10L) [mm]. The thickness is to be 1 [mm] greater than that required for the adjacent bottom plating.

4.2 Bottom, bilge and inner bottom plating

4.2.1 The thickness of the bottom and inner bottom plating is to be not less than:

- for bottom plating

$t = (t_o + 0.04L) \sqrt{k} + t_c$ [mm]

for inner bottom plating.

$t = (t_o + 0.03L) \sqrt{k} + t_c$ [mm] but not less than 6.0 [mm]

where,

t_o = 4.0 [mm], in general.

= 6.0 [mm], for Inner bottom plating where ceiling is not fitted.

= 4.0 [mm] for inner bottom plating where wooden ceiling of 50 [mm] thickness is fitted.

4.2.2 The bottom, bilge and inner bottom plating is also to comply with the requirements of buckling strength given in Ch.3, Sec.6.

4.2.3 For vessels discharged by grabs and where no ceiling is fitted, the plating thickness 't' of the inner bottom and exposed parts of sloping bulkheads is not to be less than:

$t = 0.0085\ (s+800) \sqrt{k} + t_c$ [mm]

4.2.4 Where the inner bottom is subjected to wheel loads from cargo handling vehicles, the scantlings are also to comply with the requirements given in Ch.8, Sec.6.

Section 5

Single Bottom

5.1 Transverse framing

5.1.1 Plate floors of following scantlings are to be fitted at every frame

Depth at centerline d = 40B [mm] in general thickness of web, t = d/100 + 2.5 [mm]

Section modulus

$Z = 0.006\ s.l_f^2\ .\ T1$ [cm^3] in cargo holds

$= 0.0072\ s.l_f^2\ .\ T1\ [cm^3]$ in machinery and other spaces

Where,

l_f = span of floor, measured on the top of floor plate from side to side

= longitudinal bulkheads are provided the span, l_f not to be taken less than 0.4B

T_1 is as defined in 3.1.1.

The thickness of face plate is not to be less than 1/15 of the face width.

The top of floors, in general, is to be level from side to side. However, in vessels having considerable rise of floor, the depth of web at 10 per cent of the span from ends, is not to be less than half the depth at centerline.

If the height of floors between engine girders is reduced in way of crankcase, the face plate area is to be suitably increased, however the reduced height is normally not to be less than 2/3 of 'd' as given above.

5.1.2 On all vessels one centre girder is to be fitted and in addition side girders are to be fitted such that spacing of girders does not exceed 3.0 [m]. The girders are to extend as far forward and aft as practicable and where they are cut at transverse bulkheads the longitudinal continuity is to be maintained. Where the bottom structure changes into a double bottom structure, the bottom girders are to extend at least 3 frame spaces into double bottom structures.

The scantlings of the centre girders and side girders are to be not less than that of the floors. The thickness of face plates is not to be less than 1/15 of the face width.

5.1.3 In the after peak of single screw vessels, the height of the floors is to be increased such that their upper edge is well above the stern tube.

5.1.4 Where single bottom in the cargo region is stiffened by transverse frames supported by longitudinal girders, the scantlings of the frames and longitudinal girders are to be determined in accordance with 6.2.3 and 5.2.3, 5.2.4 respectively.

5.2 Longitudinal framing

5.2.1 The spacing of bottom transverses is normally not to exceed 3.0 [m]. The bottom transverses are to be supported by primary girders or longitudinal bulkheads. Where the design does not incorporate a centerline bulkhead, at least a docking girder is to be provided. The scantlings of simple girders and transverses are to be obtained in accordance with 5.2.3. The scantlings of a complex girder system are to be based on a direct stress analysis.

5.2.2 The section modulus ‘Z’ of the bottom longitudinal is not to be less than:

$Z = \frac{spl^2}{12\sigma} + Z_c$ [cm^3]

where,

P = application design pressure [kN/m^2], as given in 3.1.1.

σ = (215 - 140 f_B)/k, max. 160/k [N/mm^2]

Within 0.4L amidships

= 160/k [N/mm^2] within 0.1L from ends.

Elsewhere σ may be obtained by linear interpolation.

5.2.3 The section modulus ‘Z’ of bottom girders is not to be less than:

$Z = \frac{10^3\ b\ p\ S^2}{m\sigma} + Z_c$ [cm^3]

Where,

m = 10 in general

p = applicable design pressure [kN/m^2], as given in 3.1.1.

σ = (190 - 130 f_B)/k, max160/k [N/mm^2] for continuous longitudinal girders within 0.4L amidships.

= 160/k [N/mm^2]

For longitudinal girder within 0.1L from ends and for transverse girders in general.’

Elsewhere σ may be obtained by linear interpolation.

5.2.4 Tripping brackets are to be fitted in accordance with the requirements given in Ch.3, Sec.4.4.4.

Section 6
Double Bottom

6.1 General

6.1.1 Where double bottom spaces are used as tanks, the centre girder is to be watertight unless the double bottom is divided by watertight side girders or the tanks are narrow.

The depth ‘d’ of the centre girder is not to be less than:

d = 250 + 20B + 50T [mm],

with a minimum of 650 [mm].

In case of vessels with considerable rise of floors the depth ‘d’ may have to be increased.

6.1.2 The thickness ‘t’ of the bottom girders and floors is not to be less than
t = (0.007d + 3) $\sqrt{k}$ [mm].

6.1.3 The section modulus ‘Z’ of the stiffeners on girders and floors forming boundaries of double bottom tanks is not to be less than:

$Z = \frac{spl^2}{10\sigma} + Z_c$ [cm^3] Where,

p = design pressure [kN/m^2], as given in 3.2.1;

σ = (210 -130 f_B)/k, max. 160/k [N/mm^2] for longitudinal stiffeners within 0.4L amidships

= 160/k [N/mm^2]

for longitudinal stiffeners within 0.1L from ends and for transverse or vertical stiffeners in general. Between the regions specified above σ for longitudinal stiffeners may be obtained by linear interpolation.

Longitudinal stiffeners are to have end connections, other stiffeners may be sniped at ends provided the section modulus Z increased by 40 per cent.

6.1.4 The longitudinal girders are to be satisfactorily stiffened against buckling in accordance with the requirements given in Ch.3, Sec.6.

6.2 Transverse framing

6.2.1 The side girders are normally to be fitted at a spacing not exceeding 4.0 [m] and are to be extended as far forward and aft as practicable. The girders are to be stiffened at every bracket floor by a vertical stiffener of depth same as that of reverse frame and thickness that of the girder.

6.2.2 Plate floors are to be fitted under bulkheads, pillars, thrust seating, boiler bearers and in way of change of depth of double bottom. In engine room plate floors are to be fitted at every frame, Elsewhere plate floors are to be fitted at least every fifth frame, the spacing not exceeding 3.0 [m].

6.2.3 Where bracket floors are fitted the section modulus ‘Z’ of the bottom frames and reverse frames is not to be less than:

$Z = \frac{spl^2k}{1.6} + 10^{-3} + Z_c$ [cm^3] where,

p = applicable design pressure [kN/m^2], as given in 3.1.1 and 3.3.1 for bottom frames and reverse frames respectively.

I = span of frames [m] measured between girder or brackets.

Where vertical struts according to 6.2.4 are fitted, the section modulus of bottom and reverse frames may be reduced by 35 per cent.

6.2.4 The cross sectional area 'A' of the struts is not to be less than

A = c . k. I . s . T . [cm^2] where,

c = $7x10^{-4}$ in way of ballast tanks

= $6x10^{-4}$ elsewhere

I = actual span [m], without considering the strut.

The moment of inertia I of the struts is not to be less than:

I = 2.5 A . d^2 x 10-6 [cm^4] where,

d = depth of double bottom, [mm].

6.2.5 The bottom frames and reverse frames are to be attached to the centre girder and margin plate by means of brackets of same thickness as that of the plate floors. The breadth of the brackets is not to be less than 0.75 times the depth of the centre girder and the brackets are to be flanged 75 [mm] at their free edges.

6.3 Longitudinal framing

6.3.1 The side girders are normally to be fitted at a spacing not exceeding 5.0 [m] and are to be extended as far forward and aft as practicable.

6.3.2 The plate floors are to be fitted under bulkheads, pillars, thrust seating and boiler bearers. In engine room, plate floors are to be fitted at every second side frames. Additionally, under the main engine seatings, floors extending to the first side girder outside the engine seating, are to be fitted at intermediate frames. The spacing of floors is normally not exceed 3.0 [m]

6.3.3 The plate floors are to be stiffened at every longitudinal by a vertical stiffener of depth same as that of the inner bottom longitudinal and thickness as that of the floor. Between plate floors, transverse brackets are to be fitted at every frame at the margin plate and at a spacing not exceeding 1.25 [m] on either side of the centre girder. The thickness of brackets is to be same as that of the plate floors. The brackets are to extend upto the adjacent longitudinal and are to be flanged 75 [mm] at their free edges.

6.3.4 The section modulus 'Z' of the bottom and inner bottom longitudinal is not to be less than:

$Z = = \frac{spl^2}{12\sigma} + Z_c$ [cm^3]   Where,

p = applicable design pressure [kN/m^2], as given in 3.1.1 and 3.3.1 for bottom longitudinal and inner bottom longitudinal respectively:

I = span of longitudinal [m], measured between the plate floors

σ = (210 - 140 f_B)/K [N/mm^2], maximum 160/k [N/mm^2] for bottom longitudinal within 0.4L amidships

= (210 - 100 f_B)/K [N/mm^2], maximum 160/k [N/mm^2] for inner bottom longitudinal within 0.4L amidships

σ = 160/k [N/mm^2] within 0.1L from ends.

Between the regions specified above, σ may be obtained by linear interpolation.

Where vertical struts according to 6.2.4 are fitted, the section modulus of the bottom and inner bottom longitudinal may be reduced by 35 per cent.

Section 7
Engine Seatings

7.1 General

7.1.1 It is recommended that the depth of the floors or double bottom in way of engine foundations be increased.

7.1.2 Sufficient fore and aft girders are to be arranged in way of the main machinery to effectively distribute its weight and to ensure adequate rigidity of the structure. The girders are generally to extend over the full length of the engine room and are to be suitably scarphed into the bottom structure beyond.

7.1.3 The scantlings of engine seatings are to be adequate to resist gravitational, thrust, torque, dynamic and vibratory forces which may be imposed on them. The recommendations given by the engine manufacturer are also to be taken into account.

7.1.4 Where the top plate of the engine seating is situated above the floors or the inner bottom, adequate transverse strength by means of brackets in line with the floors is to be ensured. In way of the recess for crankcase, brackets as large as practicable are to be fitted.

7.1.5 Lightening holes in engine foundations are to be kept as small as practicable and the edges are to be suitably reinforced.

7.2 Recommended scantlings

7.2.1 For engines of power less than 1500 kW and RPM greater than 1200, the scantlings of engine girder face plate, web and floors in way of engine seatings may be calculated as given below. Scantlings for other engines will be specially considered.

Top plate area; $A = 20 + 120 \left(\frac{P}{R}\right)$ [cm^2]

Thickness of top plate; $t_p = 0.1A + 14$ [mm]

Girder web thickness; $t_g = 0.043A + 7$ [mm]

Floor web thickness; $t_f = 0.02A + 6$ [mm]

Where,

P = maximum power of the engine [kW]

R = rpm of engine at maximum power

End of Chapter

Chapter 7

Side Structure

Contents

Section

Section 1

General

1.1 Scope

1.1.1 The scantlings and arrangement of side structure as defined in Ch. 1, Sec.2 and also those of sides of the superstructures are to comply with the requirements of this Chapter.

1.2 Symbols

L, B, T, C_b, k as defined in Ch. 1, Sec.2.

s = spacing of stiffeners, [mm].

l = span of stiffeners, [m].

b = spacing of girders, [m]

S = span of girders, [m].

t_c, Z_c = corrosion addition to thickness and section modulus respectively, as given in Ch. 3, Sec. 2.1

$f_D = \frac{Z_R}{Z_D}$

$f_B = \frac{Z_R}{Z_B}$

$f_s = f_D$ for side shell area above neutral axis

$= f_B$ for side shell area below neutral axis

where,

Z_R = Rule midship section modulus [cm^3] as required by Ch. 4.

Z_D, Z_B = Actual midship section moduli [cm^3] provided at deck and bottom respectively.

Section 2

Structural Arrangement and Details

2.1 General

2.1.1 The vessel's side shell may be stiffened longitudinally or vertically.

2.1.2 Where the side shell is stiffened longitudinally, the continuity of the side longitudinal within a distance of 0.15D from bottom or from strength deck is to be maintained in accordance with Ch. 3, Sec.5.1.1 The web frames are to be fitted in line with the bottom transverses or plate floors.

2.1.3 The position, shape and reinforcement of sea inlets or other openings in side shell are to be in accordance with the requirements of Ch. 4.

2.1.4 In the case of superstructures exceeding 0.15L in length and ending within 0.5L amidships, the side plating of the superstructures is to be increased by 25 per cent in way of the break.

2.1.5 The thickness of the shell plating is to be increased locally by 50 per cent in way of sternframe, propeller brackets and rudder horn, For reinforcements in way of anchor pockets, hawse pipes etc. refer to Ch. 13.

2.1.6 The weld connections are to comply with the requirements of Ch. 14.

2.2 Sheer strake

2.2.1 The thickness of sheer strake as obtained from 4.1.3 is to be increased by 30 per cent on each side of a superstructure end bulkhead located within 0.5L amidships if the superstructure deck is a partial strength deck.

2.2.2 Where a rounded sheer strake is adopted, the radius in general, is not to be less than 15 times the plate thickness.

2.2.3 Bulwarks are generally not to be welded to the top of the sheer strake within 0.6L amidships.

2.2.4 Where the sheer strake extends above the deck stringer plate, the top edge of the sheer strake is to be kept free from notches and drainage openings if any, are to have smooth transition in the longitudinal direction.

Section 3
Design Loads

3.1 External pressure

3.1.1 The design pressure ‘p’ on side shell is to be taken as per Table 3.1.1.

3.2 Internal tank pressure

3.2.1 Where the side shell forms a boundary of a tank, the design pressure ‘p’ is to be taken as the greater of external pressure given by 3.1.1 and the internal tank pressure ‘pi’ given by 3.2.2.

3.2.2 The internal tank pressure 'pi' is to be taken as the greater of:

pi = 10 (h_s + 1) [kN/m2]. or

= 6.7 hp [kN/m^2]

Table 3.1.1			
Zone		**Design pressure 'p' pkN/m^2]$^{a)}$**	
		For load points below the max. load waterline	**For load points above the max. load water line**
1	L $\geq$ 60 [m]	10 h_o + (15 – 5$\frac{h_o}{T}$)	15 - 10h_o
2	L $\leq$ 20 [m] $^{b)}$	10 h_o + (9 – 3$\frac{h_o}{T}$)	9 - 10 h_o
3		10 h_o + (5 – 2$\frac{h_o}{T}$)	5
a) 'p' is not to be taken as less than 5 (kN/m^2) b) For intermediate lengths (L) in Zone 1, the value of 'p' is to be linearly interpolated h_o = vertical distance [m], from the maximum load waterline to the loadpoint.			

Where,

h_s = The vertical distance [m] from the load point to the top of tank

h_p = vertical distance [m], from the load point to the top of air pipe.

For very large tanks which may be partially filled, sloshing pressures may have to be considered.

Section 4

Side Shell Plating and Stiffeners

4.1 Side shell plating

4.1.1 The thickness 't' of side shell is not to be less than:

t = (4 + 0.04L) $\sqrt{k}$ = t_c [mm]

4.1.2 The side shell plating is also to comply with the requirements of buckling strength given in Ch. 3, Sec. 6.

4.1.3 The breadth of the sheer strake is not to be less than 100 D [mm]

Where the thickness of the strength deck plating is greater than that required for side plating, the sheer strake thickness is not to be less than the mean of the two values.

4.2 Side shell longitudinal

4.2.1 The section modulus 'Z' of side longitudinal is not to be less than

Z = $\frac{spl^2}{12\sigma}$ + Z_c [cm^3] Where,

P = applicable design pressure at midpoint of the span [kN/m^2].

σ = (215 - 145 fs)/k, maximum 160/k [N/mm^2] for side longitudinal at deck/bottom level within 0.4L amdiship.

= 160/k [N/mm^2] at neutral axis within 0.4L amidship

= 160/k [N/mm^2] within 0.1L from ends and at the level of short superstructure decks.

Between the region specified above 'σ' may be obtained by linear interpolation.

4.3 Main frames

4.3.1 The section modulus 'Z' of the main frames bracketed at both ends as per 4.3.2 is not to be less than :

Z = $\frac{spl^2}{2400}$+ Z_c [cm^3] and

= 5.5 $\sqrt{(L.k)}$ [cm^3]

where,

p = applicable design pressure at midpoint of the span or mean of the pressures at two ends, whichever is greater, [kN/m^2].

4.3.2 Main frame brackets are to be as follows:

length of the bracket :

- for upper bracket : 70 I[mm]
- for lower bracket : 120 I[mm]

Section modulus at end (including bracket) :

- for upper bracket : 1.7 Z[cm^3]
- for lower bracket : 2.0 Z [cm^3]

where,

Z = section modulus of main frame as given in 4.3.1

Where the free edge of the bracket exceeds 40 times the bracket thickness, the brackets are to be flanged. The flange width is to be at least 1/15 of the length of the free edge.

4.3.3 Brackets at ends of the main frame may be omitted provided the frame is carried through life supporting members and the section modulus obtained as per 4.3.1 is increased by 75 per cent.

4.4 Superstructure frames

4.4.1 Superstructure frames located between the collision bulkhead and the after peak bulkhead are to have section modulus 'Z' not less than:

Z= 0.005 S l^2 K [cm^3]

4.4.2 The lower end of the superstructure frame is to be connected to the bracket or frame below or else it is to be bracketed above the deck. The upper end is to be bracketed to the deck beam or longitudinal.

4.5 Peak frames

4.5.1 Vertical peak frames forward of the collision bulkhead and aft of the after peak bulkhead are to have section modulus ‘Z’ not less than

Z = $\frac{spl^2}{1600}$ + Z_c [cm^3] and

= 5.5 $\sqrt{(L.k)}$ [cm^3] Where,

p = applicable design pressure [kN/m^2], as given in Sec.3.

4.5.2 Peak frames are to be bracketed at top and bottom and in way of side stringers, the connection is to provide adequate shear strength.

Section 5
Girders

5.1 General

5.1.1 Web frames are to be fitted in way of hatch end beams and deck transverses.

5.1.2 In the engine room, web frames are to be fitted at the forward and aft end of the engine and every 5th frame in general. The section modulus ‘Z’ of the web frames and side stringers is to be obtained as per 5.1.5 taking ‘b’ as the mean of the web frame or stringer spacing respectively, on either side. The depth of the webs and stringers are not to be less than 2.5 times the depth of the ordinary frames.

Adequate deep beams are to be provided in line with the web frames.

5.1.3 In peak spaces, side stringers supporting vertical peak frames are normally to be fitted at every 2.6 [m], The section modulus ‘Z’ of the stringers is to be obtained as per Sec. 5.1.5 The stringers are to be supported by web frames.

5.1.4 The scantlings of simple girders and web frames supporting frames and longitudinal are to be in accordance with 5.1.5.The scantlings of the complex girder system are to be based on a direct stress analysis. The buckling strength of cross ties where fitted, is to comply with the requirements given in Ch.3, Sec.6.

5.1.5 The section modulus ‘Z’ of simple girders and web frames is not to be less than :

Z = $\frac{b\,p\,S^2\,.10^3}{m\sigma}$ + Z_c [cm^3] where,

p = applicable design pressure [kN/m^2], as given in Sec 3.

m = 12 for continuous longitudinal girders with end attachments in accordance with Ch.3, Sec.5.

= 10 for other girders with end attachments in accordance with Ch. 3, Sec.5.

σ = (190 - 45 f_s)/k, max 160/k [N/mm^2], for continuous longitudinal girders within 0.4L amidships.

= 160/K [N/mm^2] for longitudinal girders within 0.1L from ends and for web frames in general.
Between the regions specified above, s may be obtained by linear interpolation.

5.1.6 The net cross sectional area 'A' of the girder web at ends is not to be less than
A = (0.06 Sbpk + 0.01 h t_c [cm^2] for stringers and upper ends of web frames
=0.08 Sbpk + 0.01 ht_c [cm^2] for lower ends of the web frames.
where,
h = girder height [mm].

5.1.7 Tripping brackets are to be fitted in accordance with the requirements given in Ch.3, Sec.4.4.4

End of Chapter

Chapter 8

Deck Structure

Contents

Section

Section 1
General

1.1 Scope

1.1.1 The scantlings and arrangement of deck structure as defined in Ch. 1, Sec.2 are to comply with the requirements given in this Chapter.

Symbols

L, B, T, C_b, k as defined in Ch. 1, Sec.2.

s = spacing of stiffeners, [mm].

I = span of stiffeners, [m]

b = spacing of girders, [m]

S = span of girders, [m].

T_c, Z_c = corrosion addition to thickness and section modulus respectively as given in Ch. 3, Sec.2.1.

$f_D = \frac{Z_R}{Z_D}$

where,

Z_R = Rule midship section modulus [cm^3], as required by Ch.4.

Z_D = actual midship section modulus [cm^3], provided at deck calculated as per Ch. 4.

Section 2
Structural Arrangement and Details

2.1 General

2.1.1 In tankers, the deck is normally to be stiffened longitudinally in the cargo tank region, however, where L does not exceed 75 [m], consideration may be given to transversely stiffened decks.

2.1.2 The continuity of the deck longitudinal is to be maintained in accordance with Ch.3, Sec.5.1.1

2.1.3 The deck within the line of hatchway openings is preferably to be stiffened transversely or alternatively the arrangements are to provide adequate transverse buckling strength. Where the deck outside the line of hatchway openings is framed longitudinally, the transverse beams or buckling stiffeners between the hatchways are to extend at least upto the second longitudinal from the hatch side or equivalent.

2.1.4 In vessels with large hatch openings, the effective cross-sectional area of the deck between the hatchways is to be sufficient to withstand the transverse load acting on the vessel's sides.

2.1.5 The weld connections are to comply with the requirements of Ch. 14.

2.1.6 Hatchway corners are to be of streamlined, elliptical or circular shape as given in Ch.4. Where shapes other than the streamlined shape or equivalent are adopted, insert plates are to be fitted at the hatch corners in strength deck. The insert plates are to be 25 per cent thicker than the deck platting outside the line of hatchways and are to extend as shown in Fig. 2.1.6. The butts of insert plates are to be well clear of those in coaming.

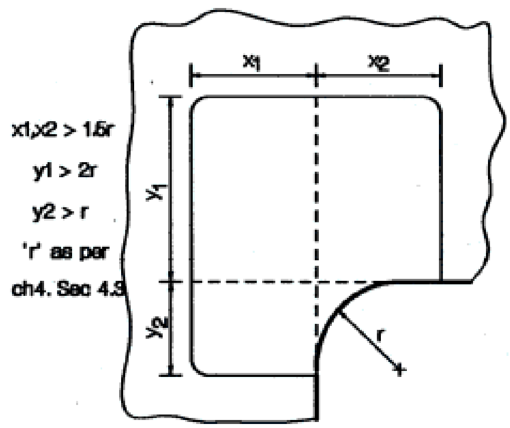


Fig.2.1.6 : Extent of insert plate

Section 3

Design Loads

3.1 Weather deck

3.1.1 The design pressure 'p' on exposed decks is to be taken as :

$p = H_1 - 10\ h_o$ [kN/m^2] minimum 5[kN/m^2] where,

h_o = vertical distance [m], from the maximum load waterline to the deck.

H_1 = as given in Table 3.1.1.

Table 3.1.	
Zone	**H_1**
1	9 for $L \leq 20$ [m] 9 + 0.15 [L-20]for 20 < L < 60 15 for $L \geq 60$ [m]
2	9
3	5

3.1.2 For decks subjected to cargo loading the design pressure is to be taken as:

$p = 12.5\ q$ [kN/m^2]

where 'q' is deck cargo loading [t/m^2]

3.1.3 For weather decks forming crowns of tanks, the design pressure ‘p’ is to be taken as the greater of that given by 3.1.1 and 3.3.1

3.2 Accommodation decks

3.2.1 The design pressure ‘p’ on accommodation decks is to be taken as :

$p = 4.5$ [kN/m^2]

3.2.2 For decks forming crowns of tanks the design pressure ‘p’ is to be taken as the greater of that given by 3.2.1 and 3.3.1.

3.3 Decks forming tank boundaries

3.3.1 The design pressure ‘p’ for decks forming the bottom or crown of a tank may be taken as the greater of the following:

$p = 6.7\ h_p$ [kN/m^2] or

$= 10\ (h_s + 1)$ (kN/m^2)

Where,

h_p = vertical distance [m], from the deck to the top of air pipe

h_s = vertical distance [m], from the deck to the top of the tank

Section 4

Deck platings and Stiffeners

4.1 Deck platings

4.1.1 The thickness of the strength deck plating outside the line of hatchway openings is to be adequate to give the necessary hull section modulus and moment of inertia required by Ch.4.

4.1.2 The thickness ‘t’ of deck platings is not to be less than:

$t = (t_o = 0.02L)\sqrt{k} + t_c$ [mm]   where,

$t_o = 5$ for strength decks and forecastle decks

$= 4.0$ for other decks.

4.1.3 The strength deck plating outside the line of hatchways is also to comply with the requirements of buckling strength given in Ch. 3, Sec.6.

4.1.4 In way of ends of bridges, poops and forecastles, the thickness of the strength deck stringer strake is to be increased by 20 per cent over four frame spaces fore and also aft of the end bulkheads.

4.2 Deck stiffeners

4.2.1 The section modulus ‘Z’ of deck longitudinal is not to be less than:

$Z = \frac{s\ p\ l^2}{12\sigma} + Z_c$ [cm^3]   where,

p = applicable design pressure [kN/m^2] as given in Sec.3.

σ = (215 - 145f_D.f_Z)k, max. 160/k [N/mm^2] for strength deck and decks of long superstructures/deckhouses within 0.4L amidships.

= (215 - 145f_D.f_Z)k, max. 160/k [N/mm^2] for continuous decks below strength deck within 0.4L amidships.

= 160/k [N/mm^2] within 0.1L from ends and for short decks.

Elsewhere, σ may be obtained by linear interpolation.

The longitudinal are also to comply with the requirements of buckling strength given in Ch. 3, Sec.6.

4.2.2 The section modulus 'Z' of transverse beams is not to be less than:

$Z = \frac{s\,p\,l^2}{1600} + Z_c$ [cm^3] where,

p = applicable design pressure [kN/m^2] as given in Sec.3.

Section 5

Deck Girders and Pillars

5.1 Girders

5.1.1 Deck girders and transverses are to be arranged in line with vertical members of scantlings sufficient to provide adequate support.

5.1.2 The scantlings of simple girders and transverses are to be accordance with 5.1.3. The scantlings of a complex girder system are to be based on a direct stress analysis.

5.1.3 The section modulus 'Z' of deck girders is not to be less than:

$Z = \frac{b\,p\,S^2.10^3}{m\sigma} + Z_c$ [cm^3] Where,

p = applicable design pressure [kN/m^2] as given in Sec.3.

m = 12 for continuous longitudinal girders with end attachments in accordance with Ch. 3.

= 10 for other girders with end attachments in accordance with Ch. 3.

σ= 190 - 145f_D.f_Z)k, max. 160/k [N/mm^2] for continuous longitudinal girders within 0.4L amidships

= 160/k [N/mm^2] for longitudinal girders within 0.1L from ends and for transverse girders in general.

Elsewhere, 'σ' may be obtained by linear interpolation.

5.1.4 The net cross sectional area 'A' of the girder web at ends
Is not to be less than:

A = 0.07 . S.b.p k + 0.01h t_c [cm^2] where,

h = girder height [mm].

5.1.5 The girders are to be satisfactorily stiffened against buckling in accordance with the requirements given in Ch.3, Sec.6. Tripping brackets are to be fitted in accordance with the requirements given in Ch. 3, Sec.4.4.4

5.2 Cantilevers

5.2.1 The scantlings of cantilever beams and supporting frames will be specially considered.

5.3 Pillars

5.3.1 The scantlings of the pillars are to be in accordance with the requirements of Ch.3, Sec.6. Axial load, if any, from pillars above is to be added to the load from deck girders.

The minimum wall thickness 't' [mm], of the tubular pillars is not to be less than:

$t = 4.5 + 0.015\ d$ for $d < 300$ [mm]

$= 0.03d$ for $d \geq 300$ [mm]

Where,

d = diameter of the pillar [mm].

5.3.2 Pillars are to be fitted in the same vertical line wherever possible, and arrangements are to be made to effectively distribute the load at the heads and heels. Where pillars support eccentric loads, they are to be strengthened for the additional bending moments imposed upon them. Doubling or insert plates are generally to be fitted at the head and heel of hollow pillars.

5.3.3 The pillars are to have a bearing fit and are to be attached to the head and heel plates by continuous welding.

5.3.4 Where the heels of hold pillars are not directly above the intersection of plate floors and girders, partial floors and intercostals girders are to be fitted as necessary to support the pillars. Lightening holes or manholes are not to be cut in the floors and girders below the heels of pillars.

5.3.5 Inside tanks, hollow pillars are not to be used and strengthening at the heads and heels of pillars is not to be obtained by means of doubling plates. Where hydrostatic pressure may give rise to tensile stresses in the pillars, their sectional area 'A' is not to be less than

$A = 0.07 \cdot A_L.p$ [cm^2]

where,

p = design pressure as given in Sec.3, causing the tensile stress in pillar

A_L= load area of deck [m^2], being supported by the pillar.

Section 6
Decks for Wheel Loading

6.1 General

6.1.1 Where it is proposed either to stow wheeled vehicles on the deck or to use wheeled vehicles for cargo handling, the requirements of this section are to be complied with in addition to those given in the preceding sections.

6.1.2 The requirements given below are based on the assumption that the considered element (Deck plating and/or stiffener) is subjected to one load area only, and that the element is continuous over several evenly spaced supports. The requirements for other loads and/or boundary conditions will be specially considered.

A “load area” is the tyre print area of individual wheels; for closely spaced wheels it may be taken as the enveloped area of the wheel group.

6.1.3 The details of wheel loadings are to be forwarded by the vesselbuilder. These details are to include the proposed arrangement and dimensions of tyre prints, axle and wheel spacing, maximum axie load and tyre pressure.

6.2 Wheel loads

6.2.1 The pressure ‘p’ from the wheels on deck is to be taken as:

$p = \frac{12.5W}{n.a.b} \times 10^6$ [kN/m^2]

- for stowed vehicles in sailing condition; and

$p = \frac{W}{n.a.b}\ (9.81 + \frac{3W}{\sqrt{W}})\ 10^6$ [kN/m^2]

- For cargo handling vehicles in harbor condition

where,

W = maximum axle load, [t]. For fork lift trucks, the total weight is to be taken as the axle load.

n = number of “load areas” per axle

a = extent [mm], of the load area parallel to the stiffener (see Fig. 6.2.1)

b = extent [mm], of the load area perpendicular to the stiffener (see Fig. 6.2.1)

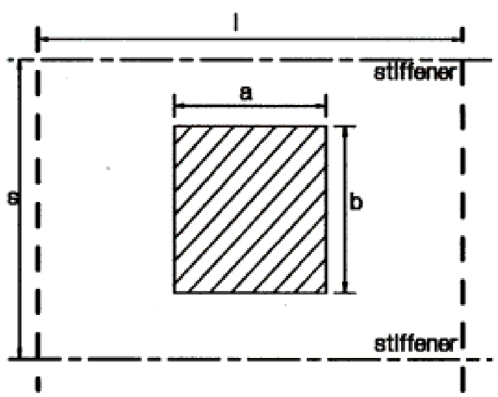


Fig.6.2.1 : Plate panel and load area dimensions

6.3 Deck plating

6.3.1 The thickness ‘t’ of deck plating subjected to wheel loading is not to be less than:

$t = C_1 f_a \sqrt{\frac{c_2 bspk.10^{-3}}{m}} + t_c$ [mm] where,

f_a = (1.1 0.25 s/l) for s $\leq$ 1, however need not be taken as greater than 1.0

a,b,s,l = deck panel dimensions [mm] [see Fig. 6.2.1]

c_1 = 0.137 in general for sailing conditions

= 0.127 in general for harbor conditions

= As per Table 6.3.1 for upper deck within 0.4L amidships.

Table 6.3.1 : c1 values for upper deck plating within 0.4L amidships		
Framing system	**Sailing conditions**	**Harbour conditions**
Longitudinal	0.145	0.130
Transverse	0.180	0.145

For upper deck plating between 0.4L amidships and 0.1L from ends, c_1 is to be varied linearly.

c2 = $1.3 - \frac{4.2}{(a/s + 1.8)^2}$,

however, need not be taken as greater than 1.0

m = $\frac{38}{(b/s)^2 - 4.7(b/s) + 6.5}$ for b $\leq$ s)

6.4 Deck stiffeners

6.4.1 The section modulus 'Z' of deck beams and longitudinal subject to wheel loadings is not to be less than:

Z = $\frac{c_3 . a . b . p \, l \, 10^{-6}}{m\sigma}$ + Z_c [cm^3]

Where,

c_3 = (1.15 – 0.25 b/s) for b $\leq$ s, however need not be taken as greater than 1.0

m = $\frac{r}{(a/l)^2 - 4.7(b/s) + 6.5}$

r = 29 for continuous stiffeners supported at girders

= 38 when the continuous stiffeners can be considered as rigidly supported at girders against rotation.

σ = 160/k [N/mm^2] in general, for sailing conditions

= 180/k [N/mm^2] in general, for harbour conditions

= As per Table 6.4.1 for deck longitudinal between 0.4L amidships and 0.1L from ends, σ is to be varied linearly.

Table 6.4.1 - σ Values longitudinal within 0.4L amidships	
Condition	**[N/mm^2]**
Sailing	(215 - 145f_D. f_Z)/k
Harbour	(225 - 90 f_D. f_Z)/k

6.5 Deck girders

6.5.1 The scantlings of girders will be specially considered based on the most severe condition of moving or stowed vehicles. Also see Sec.6.1.3.

End of Chapter

Chapter 9

Bulkheads

Contents

Section

Section 1

General

1.1 Scope

1.1.1 The requirements of this chapter cover the arrangement and scantlings of watertight and deep tank bulkheads.

1.1.2 The requirements also cover the non-watertight bulkheads and shaft tunnels.

1.2 Statutory requirements

1.2.1 Where applicable, the number and disposition of bulkheads are to be arranged to meet the requirements for subdivision, floodability and damage stability in accordance with the requirements of the local or National Statutory Authority of the country in which the vessel is registered.

1.3 Symbols

L, B, T, C_b, k as defined in Ch. 1, Sec.2.

s = spacing of stiffeners [mm]

I = span of stiffeners [m]

b = spacing of girders [m]

S = span of girders [m]

t_c, Z_c = corrosion additions to thickness and section modulus respectively as given in Ch.3, Sec.2.1.

$f_D = \frac{Z_R}{Z_D}$

$f_D = \frac{Z_R}{Z_D}$

where,

Z_R = Rule midship section modulus [cm^3] as required by Ch. 4.

Z_D, Z = Actual midship section moduli in [Cm^3] provided at deck and bottom respectively calculated as per Ch.4.

$f_S = f_D$ for side shell area above neutral axis

$f_S = f_B$ for side shell area below neutral axis.

Section 2
Subdivision and Arrangement

2.1 Number of bulkheads

2.1.1 The following transverse watertight bulk-heads are to be fitted in all vessels:

- A collision bulkhead;
- An aftpeak bulkhead;
- A bulkhead at each end of the machinery space.

In vessels with machinery aft, the aftpeak bulkhead may from the aft boundary of the machinery space.

Additional transverse watertight bulkheads are to be fitted to ensure adequate transverse strength.

2.1.2 The ordinary transverse watertight bulk-heads in the holds should be spaced at reasonably uniform intervals. Where non uniform spacing is unavoidable and the length of a hold is unusually large, the transverse strength of the vessel is to be maintained by providing additional web frames, increased framing etc.

2.2 Position and height of bulkheads

2.2.1 The collision bulkhead is to be fitted at a distance of 0.04L to 0.1L from the F.P. Any recesses or steps in collision bulkheads are to fall within the limits.

2.2.2 Consideration will however be given to proposals for the collision bulkhead positioned aft of the limits given in 2.2.1, provided that the application is accompanied by calculations showing that with the vessel fully loaded to maximum draught on even keel, flooding of space forward of the collision bulkhead will not result in any part of the main deck becoming submerged, nor result in any unacceptable loss of stability.

2.2.3 All vessels are to have an after peak bulkhead generally enclosing the sterntube and rudder trunk in a watertight compartment, In twin screw vessels where the bossing ends forward of the after peak bulkhead, the sterntubes are to be enclosed in suitable watertight spaces.

2.2.4 The watertight bulkheads are in general to extend to the uppermost continuous deck.

2.2.5 For passenger vessels the number and position of the bulkheads will normally be governed by the requirements of trim and stability in damaged condition given in Pt.5, Ch.4.

2.3 Openings in watertight bulkheads and closing appliances

2.3.1 Doors, manholes, permanent access openings or ventilation ducts are not to be cut in the collision bulkhead below the uppermost continuous deck.

2.3.2 Openings may be accepted in other watertight bulkheads provided the number and the size of openings is kept to a minimum compatible with the design and proper working of the vessel. Where penetrations of watertight bulkheads are necessary for access, piping, are to be made to maintain the watertight reinforcements are to be provided to ensure that the strength is at least equal to that of the unpierced bulkhead.

2.4 Cofferdams

2.4.1 Cofferdams are to be provided between the following spaces to separate them from each other:

- tanks for fuel oil or lubricating oil
- tanks for edible oil
- tanks for fresh water and feed water.

2.4.2 Tanks for lubricating oil are also to be separated by cofferdams from those carrying fuel oil. However, these cofferdams need not be fitted provided that the common boundaries have full penetration welds and the head of oil is generally not in excess of that in the adjacent lubricating oil tanks.

Section 3
Structural Arrangement and Details

3.1 General

3.1.1 Oil fuel or oil carried as cargo in the deep tanks is to have a flash point of 60^{o}C and above in closed cup test. Where tanks are intended for other liquid cargoes of a special nature the scantlings and arrangements will be considered in relation to the nature of the cargo.

3.1.2 The continuity of bulkhead longitudinals within a distance of 0.15D from the bottom or the strength deck is to be maintained in accordance with Ch.3, Sec.5.1.1

3.1.3 Carlings, girders or floors are to be fitted below the corrugated bulkhead at their supports. These supporting members are to be aligned to the face plate strips of the corrugations.

3.1.4 The weld connections are to comply with the requirements of Ch.16.

3.2 Wash bulkheads

3.2.1 A centreline was bulkhead is to be fitted in peak spaces used as tanks, where the breadth of the tank exceeds 0.5B and also in deep tanks used for fuel oil extending from side to side.

3.2.2 The area of perforations is generally to be between 5% to 10% of the total area of bulkhead. The plating is to be suitably stiffened in way of the openings.

3.3 Supporting bulkheads

3.3.1 Bulkheads or parts thereof supporting deck structure are also to be designed as pillars. The permissible axial loads and buckling strength are to be calculated in accordance with Ch.3, Sec.6. In calculating sectional properties the width of attached plating is not to be taken in excess of 40 times the plate thickness. Also see Ch.8, Sec. 5.1.1.

Section 4
Design Loads

4.1 Watertight bulkhead loads

4.1.1 The design pressure 'p', for ordinary watertight bulkheads is given by:

$p = 10\ h\ [kN/m^2]$

where,

h = the vertical distance [m] from the loadpoint to the uppermost continuous deck.

4.1.2 For bulkheads bounding cargo spaces intended to carry dry bulk cargoes, the design pressure 'p' is to be taken as the higher of that given in 4.1.1 and the pressure due to bulk cargo as given below:

$p = 12.5\ C\ \rho\ h_c\ [kN/m^2]$

where,

α = angle made by the panel under consideration with the horizontal plane [deg.]

δ = angle of repose of cargo [deg.] not to be taken greater than the following

- 20^o for high bulk cargo (e. g. coat, grain)
- 25^o for bulk cement cargo
- 35^o for heavy bulk cargo (e.g. ore)

h_c = vertical distance [m], from the loadpoint to the mean horizontal plane corresponding to actual volume of cargo being considered

ρ = vertical distance [m], from the loadpoint to the mean horizontal plane corresponding to actual volume of cargo being considered

ρ = density of cargo [t/m^3].

For vessels designed to carry heavy bulk cargoes which are also required to carry lighter cargoes, the pressure 'p' based on maximum mass of cargo to be carried in the hold and fitted up to the top of hatch coaming would also required to be considered.

4.2 Tank bulkhead loads

4.2.1 The design pressure ‘p’ for tank bulkheads are normally to be taken as the greater of

$p = 12.5\ h_s\ [kN/m^2]$

$= 6.7\ h_p\ [kN/m^2]$

$= 10\ (h_s + 1)\ [kN/m^2]$

where,

h_p = vertical distance [m] from the loadpoint to the top of the air pipe.

h_s = vertical distance [m] from the loadoint to the top of the tank or hatchway.

For very large tanks which may be partially filled, sloshing pressures may have to be considered.

4.2.2 The pressure ‘p’ on girder web panels in cargo tanks or ballast tanks is not to be taken as less than 20 $[kN/m^2]$

4.3 Wash bulkheads loads

4.3.1 The design pressure ‘p’ for wash bulkheads may be taken as 50% of that for boundary bulkhead in the same location.

Section 5

Plating and Stiffeners

5.1 Bulkhead plating

5.1.1 The thickness ‘t’ of the bulkhead plating is not to be less than the minimum thickness given in 5.1.2 nor less than

$t = 15.8s \sqrt{\frac{p}{\sigma}} \times 10^{-3} + t_c$ [mm]

where,

p = applicable design pressure as given in Sec.4.

σ = as per Table 5.1.1 for longitudinal bulkheads.

= 160/k for transverse tank bulkheads and collision bulkhead;

= 220/k for ordinary transverse watertight bulkheads.

= 190/k for transverse dry bulk cargo bulkheads

5.1.2 The minimum thickness requirement of the bulkhead plating is given by

$T = (4.0 + 0.01L) + t_c$ [mm]

5.1.3 The plate thickness of corrugated bulkhead is not to be less than that required according to 5.1.1 and 5.1.2. The spacing ‘s’ to be used in the calculation of the plating thickness is to be taken as the greater of ‘b’ or ‘c’ where ‘b’ and ‘c’ are indicated in Fig. 5.1.3.

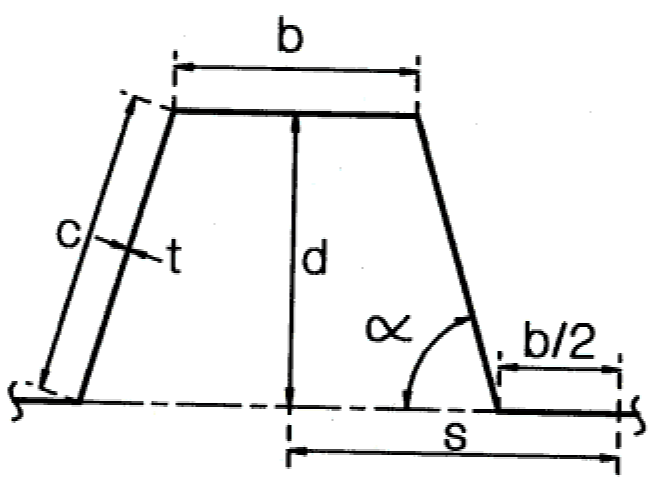


Fig.5.1.3 : Corrugated bulkhead

For built up corrugation bulkheads, where the thickness of the flange and web are different, the thickness of the wider plating is also not to be less than :

Table 5.1.1 : 'σ' values for longitudinal bulkhead plating				
Region	Framing system	At neutral axis	At strength deck or bottom	Between neutral axis and strength deck or bottom
0.4L amidships	Vertical	140/k	(175-130 fs)k max. 120/k	To be obtained by linear interpolation
	Longitudinal	160/k	(185-105 fs)k max. 120/k	To be obtained by linear interpolation
Within 0.1L from ends	160/k	160/k	160/k	
Elsewhere	to be obtained by linear interpolation between allowable values at regions specified above.			

t = $\sqrt{\frac{s^2 .p}{2\sigma} - (t_a - t_c)^2 + t_c}$ [mm]

where,

t_a = thickness of adjacent plating [mm] not to be taken greater than t.

5.1.4 The longitudinal bulkhead plating within 0.1D from bottom or strength deck is also to comply with the requirements of buckling strength given in Ch.3, Sec.6.

5.1.5 In way of stern tubes, doubling plate of same thickness as the corresponding strake is to be fitted, or the strake thickness is to be increased by at least 60 per cent.

5.2 Longitudinals

5.2.1 The section modulus of continuous longitudinal stiffeners and corrugations is not to be less than:

$Z = \frac{s\,p\,l^2}{m\sigma} + Z_c$ [cm^3]

Where,

p = applicable design pressure given in Sec.4.

m = 12

σ = (215 - 145 f_s)/k, max. 160/k [N/mm^2] at deck/bottom level within 0.4L amidships

= 160/k at neutral axis within 0.4L amidships

= 160/k for longitudinal within 0.1L from ends.

For longitudinal between the regions specified above σ may be obtained by linear interpolation.

5.2.2 The thickness of the web and flange is not to be less than the minimum plating thickness requirements stipulated in 5.1.2.

5.2.3 The rule section modulus of a corrugated bulkhead element is to be obtained according to 5.2.1 taking 's' as shown in Fig. 5.1.3.

5.2.4 The actual section modulus of a corrugated bulkhead element may be obtained in accordance with the following:

$Z_{actual} = \frac{t.d(b + c/3)}{2000}$ [cm^3]

where,

Where, t,d,b and c [mm], are as shown in Fig. 5.1.3.

5.3 Vertical and transverse stiffeners on tank bulkheads, collision bulkheads, dry bulk cargo bulkheads and wash bulkheads

5.3.1 The section modulus of bulkhead stiffeners is not to be less than:

$Z = \frac{spl^2}{m\sigma} + Z_c$ [cm^3] where,

p = applicable design pressure [kN/m2] given in Sec.4.

m = 10 for transverse stiffeners and vertical stiffeners which may be considered fixed at both ends

= 7.5 for vertical stiffeners simply supported at one of both ends

= 10 for horizontal corrugation fixed at ends

= 13 for fixed upper end of vertical corrugation

= 20 for non-fixed upper end of vertical corrugation

= 10 for lower end of vertical corrugation

σ = 160/k for tank bulkhead and collision bulkhead

= 210/k for dry bulk cargo bulkheads.

5.3.2 The thickness of web and flange is to be as required in 5.1.2.

5.3.3 Actual section modulus of corrugation is to be obtained as per 5.2.4.

5.3.4 Brackets are normally to be fitted at the ends of non-continuous stiffeners. Where stiffeners are sniped at the ends, the thickness of the plating supported by the stiffeners is not to be less than:

$t = 0.0395 \sqrt{[(1 - 0.0005s)\ s.p.k]} + t_c$ [mm]

5.4 Vertical and transverse stiffeners on ordinary watertight bulkheads

5.4.1 The section modulus of bulkhead stiffeners is not to be less than

$$Z = \frac{spl^2}{m\sigma}$$

where,

p = applicable design pressure given in Sec. 4.

m = 16 for stiffeners fixed at both ends

= 12 for stiffeners fixed at on end (lower end in case of vertical stiffeners) and simply supported at the other end.

= 8 for stiffeners simply supported at both ends.

σ = 220/k

5.4.2 The thickness of web and flange is to be as required in 5.1.2. For sniped ends, the thickness of bulkhead plating is to be as per 5.3.4.

5.4.3 Actual section modulus of corrugations is to be obtained as per 5.2.4.

Section 6

Girders

6.1 General

6.1.1 Bulkhead stringers and deep transverses are to be arranged in line with other primary supporting structure to the adjoining deck, side shell and bottom so as to facilitate the formation of continuous ring structures. Otherwise equivalent scarphing arrangement is to be provided.

6.1.2 The section modulus requirement 'Z' of simple girders is not to be less than:

$$Z = \frac{b.p.S^2 \times 10^2}{m\sigma} + Z_c\ [cm^3]$$

where,

m = 12 for continuous longitudinal girders with end attachments in accordance with Ch. 3, Sec.5.

= 10 for other girders with end attachments in accordance with Ch. 3, Sec.5.

σ = (190 - 45f_s),max 160/k [N/mm^2], for continuous longitudinal girders within 0.4L amidships.

= 160/k [N/mm^2] for continuous longitudinal girders within 0.1L from ends and for vertical or transverse girders on tank and collision bulkheads.

= 210/k for vertical and transverse girders, in general.

For continuous longitudinal girders between the regions specified above, 'σ' may be obtained by linear interpolation.

6.1.3 The depth of the girders should not be less than 2.5 times the depth of the cutout (if any) for the passage of continuous stiffeners. The net cross sectional area 'A' of the girder web at ends is not to be less than

A = CkSbp + 0.01 d_w t_c [cm^2]

Where,

C = 0.060 for tank collision bulkheads

C = 0.045 for other watertight bulkheads

d_w = depth of web [mm].

However, for lower end of vertical girders value of C to be taken as 0.08 and 0.06 respectively.

6.1.4 Tripping brackets are to be fitted in accordance with the requirements given in Ch. 3, Sec.4.

End of Chapter

Chapter 10

Superstructures, Deckhouses and Bulwarks

Contents

Section

Section 1

General

1.1 Scope

1.1.1 The scantlings of the bulwarks and of the exposed bulkheads of the superstructures and deckhouses are to comply with the requirements of this chapter. The scantlings of the decks of the superstructures and deckhouses are to be in accordance with the requirements of Ch. 8, and those of the sides of the superstructures are to be in accordance with the requirements of Ch. 7.

1.2 Definitions

1.2.1 For definitions of the terms ‘Superstructure’ and ‘Deckhouse’ refer to Ch. 1.

1.2.2 The lowest tier is normally the tier that is directly situated on the deck to which the rule depth ‘D’ is measured or on superstructures which are less than 1.8 [m] in height.

1.3 Symbols

1.3.1 L and k as defined in Ch. 1, Sec.2.

s = spacing of stiffeners [mm]

l = span of stiffener [m].

Section 2

Scantlings

2.1 End bulkheads and exposed sides of deckhouses

2.1.1 The thickness ‘t’ of steel plating of the fronts, sides and aft ends of deckhouses and the front and aft ends of superstructures is not to be less than:

$t = (0.004\ s + 2.5)\ \sqrt{k}$ – for lowest tier

$= (0.004\ s + 1.5)\ \sqrt{k}$ – for upper tiers

2.1.2 The section modulus Z of stiffeners on fronts, sides and aft ends of deck houses and the front and ends of superstructures is not to be less than:

$Z = 3.6\ sl^2 \times 10^{-3}\ .\ k\ [cm^3]$ – for uppermost tier

l is not to be taken less than 2.0 [m].

When a multiple tier erection is fitted, the section modulus of stiffeners on lower tiers is to be increased at the rate of 15% per tier fitted above the tier under consideration.

2.1.3 The upper end of stiffeners on all erections are to be bracketed to the deck beams or longitudinal and the lower end is to be welded to the deck below.

2.2 Protected machinery casings

2.2.1 The thickness of plating is not to be less than:

$t = (0.003\ S + 1.5) \sqrt{k}$ [mm]

2.2.2 The section modulus 'Z' of stiffeners is not to be less than:

$Z = 0.003\ sl^2 \sqrt{k}$ [cm^3]

Where, I is not to be taken less than 2.0 [m].

2.2.3 Casings supporting one or more decks above are to be adequately strengthened.

Section 3

Structural Arrangement and Details

3.1 Structural continuity

3.1.1 Adequate transverse strength is to be provided to the deckhouses and superstructures by means of transverse bulkheads, girders and web frames.

3.1.2 The front and the after end bulkheads of large superstructures and deckhouses are to be effectively supported below by a transverse bulkhead or by a combination of partial bulkheads, girders and pillars. Similarly, the exposed sides of various tiers of erections are to be supported by bulkheads, girders or carlings below.

3.1.3 All openings cut on the sides are to be substantially framed and have well rounded corners.

3.1.4 At the ends of superstructures, which have no set-in from the vessels' side, the side plating is to extend beyond the ends of the superstructure, and is to be gradually reduced in height down to the sheer strake. The extended plating is to be adequately stiffened, particularly at its upper edge.

Section 4

Bulwarks and Guard Rails

4.1 General requirements

4.1.1 Bulwarks or guard rails are to be provided on the exposed parts of the freeboard and superstructure decks and also on all upper deck spaces normally accessible to crew and passengers. The height of the bulwarks of guard rails measured above the sheathing, if any, should not be less than the following:

For all passenger vessels :

- For all Zones : 900 [mm]

For all other vessels :

- For Zone 1 : 900 [mm]
- For Zone 2 : 600 [mm]
- For Zone 3 : 300 [mm].

Consideration will be given to cases where this height would interfere with the normal operation of the vessel.

4.1.2 Bulwarks or guard rails as required by 4.1.1 may be dispensed with in way of hatch side coamings fitted with suitable handrails.

4.1.3 where bulwarks on weather portion of freeboard decks or superstructure decks form wells, provision is to be made for rapidly freeing the decks of water.

4.2 Bulwark construction

4.2.1 Bulwarks are to be stiffened at the upper edge by a strong rail section and supported by stays from the deck, spaced not more than 2.0 [m] apart. Where bulwarks are cut in way of a gangway or other openings, stays of increased strength are to be fitted at the ends of the openings.

Bulwark stays are to be supported by, or are to be in line with, suitable underdeck stiffening, which is to be connected by double continuous fillet welds in way of the bulwark stay connection.

Bulwarks are to be adequately strengthened in way of the eyeplates for cargo gear. In way of the mooring pipes, the plating is to be increased in thickness and also adequately stiffened.

4.2.2 Bulwarks are generally not to be welded to the top of the sheerstrake within 0.6L amidships and so arranged as to ensure their freedom from main structural stresses.

4.3 Bulwark scanttings

4.3.1 The thickness of the bulwark plating is not to be less than 4.0 [mm].

4.3.2 The section modulus 'Z' at the bottom of the bulwark stay is not to be less than:

$Z = (33 + 0.44\ L)\ h^2\ s\ [cm^3]$

where,

h = height of the bulwark [m]

s = spacing of bulwark stays [m]

In the calculation of section modulus 'Z'. only the material connected to the deck is to be included. The contribution from bulwark plating and/or stay flange may be considered depending upon the construction details.

4.4 Guard rails

4.4.1 The guard rails are to be support by stanchions fitted not more than 3.0 [m] apart;
At least every third stanchion is to be supported by a bracket or stay.

4.4.2 Lengths of chain may be accepted in lieu of guard rails if they are fitted between two fixed stanchions and/or bulwarks.

4.4.3 The clear opening below the lowest course of the guard rails is not to exceed 230 [mm].

End of Chapter

Chapter 11

Openings and Closing Appliances, Ventilators, Air Pipes and Discharges

Contents

Section

Section 1

General

1.1 Scope

1.1.1 This chapter applies to all vessel types in general. Additional requirements pertaining to special vessels types are given in Pt. 5.

1.1.2 The requirements of National or local authorities should also be applied, where relevant.

1.1.3 For the purpose of this section weather tightness of hatch covers means that closing appliances do not permit entry of water into the vessel which may prejudice the safety of the vessel under the navigational condition envisaged.

Section 2

Hatch Coamings

2.1 Coaming heights

2.1.1 The height of cargo hatchcoamings above deck is to be not less than 300 [mm] for Zones 1 and 2 and 200 [mm] for Zone 3.

In addition, the distance of coaming top above load water line is to be not less than given in Table 2.1.1.

2.2 Hatch coaming construction

2.2.1 Hatctchside coamings are to extend to the lower edge of the deck beams. Side coamings not forming a part of continuous girders, are to extend two frame spaces beyond the hatch ends below the deck.

Table 2.1.1 : Height of hatch coamings [mm]

	Zone 1	Zone 2	Zone 3
With weathertight hatch cover [1)]	1000	600	300

Without weathertight	1700	1000	500
Hatch cover			
Note 1) See 1.1.3			

2.2.2 Hatch end coamings when not in line with the deck transverses are to extend below the deck, at least three longitudinal frame spaces beyond the side coaming.

2.2.3 Continuous hatchway coamings or coamings forming an effective part of the deck girder system are to be made from steel of same tensile strength as that of the deck plating.

2.2.4 If the junction of hatch coamings forms a sharp comer, the side and end coamings are to be extended in the form of tapered brackets in longitudinal and transverse directions respectively.

2.2.5 Extension brackets or rails arranged approximately in line with the cargo hatch side coamings and intended for the stowage of steel hatch covers are not to be welded to deckhouse, masthouse or to each other unless they form a part of the longitudinal strength members.

2.3 Coamings scantlings

2.3.1 The scantlings of hatch coaming plating and stiffeners are to be not less than that required for the adjacent deck.

2.3.2 Hatchway coamings 300 [mm] and above are to be stiffened in their upper edge.

Coaming stays are to be fitted at spacing of not more than 3.0 [m]. The stays are to end on stiffened plating. The coamings are to be satisfactorily stiffened against buckling.

Section 3
Hatch Covers

3.1 General

3.1.1 Hatch covers, where fitted, may be of the types a) to e) as described below.

Hatch cover Types :

'a' : Steel plated cargo hatch covers stiffened by webs or stiffeners and secured by clamping devices. Weathertightness is to be ensured by means of gaskets. Hatch covers used for holds containing liquid cargoes are also included in this category.

'b' : Steel plated pontoon type cargo hatch covers with internal webs and stiffeners extending over the full width of the hatchway. Weather- tightness is to be achieved by tarpaulins.

'c' : Wood or steel hatch covers used in conjunction with the portable beams. Weathertightness to be obtained by tarpaulins.

'd' : Access hatch covers for cargo oil tanks and adjacent spaced. The hatch covers are to be of steel and gasketed.

'e' : Access hatch covers other than 'd'. The covers are to be of steel or wood and weathertight. Escape hatches are to be operable from both sides.

3.1.2 Materials for steel hatch covers are to satisfy the requirements of hull structural steel. Where other approved materials are used, equivalent strength and stiffness are to be provided.

3.2 Design loads

3.2.1 The design weather load on the weather deck hatchcovers is to be taken as:

$p = H_1 - 10\ h_o$ [kN/m^2], minimum 3 [kN/m^2]

where,

h_o = Vertical distance [m] from the maximum load waterline to the top of hatch covers.

H_1 = as given in Table 3.2.1.

Table 3.2.1

Zone 1	H_1
1	9 for $L \leq 20$ [m] 9 + 0.15 (L-20) for 20 < 1 < 60 15 for $L \geq 60$ m
2	0
3	5

3.2.2 For hatch covers subjected to cargo loading the design pressure is to be taken as:

$p = 12.5\ q$ [kN/m^2]

where,

q = specified cargo loading [t/m^2] on the hatch cover.

3.2.3 The design internal pressure on hatch covers above tanks are to be determined as per the design pressure on deck structure given in Ch.8.

3.3 Hatchcover plating

3.3.1 The thickness of steel hatch cover plating is not to be less than:

$t = 15.8s \sqrt{p/\sigma} \times 10^{-3} + t_c$ [mm], or

3 [mm] whichever is greater

where,

p = design pressure as per 3.2

= 160/k [N/mm^2].

Hatch covers of G.I. sheet and other material will be specially considered.

3.3.2 The plating of hatch covers acting as compression flanges for the hatch cover stiffeners and girders is to be effectively stiffened against buckling.

In the middle part of the simply support span the critical buckling stress s_c is to be such that:

$\sigma_c \geq 1.15\ \sigma_b$ [N/mm^2]

where,

σ_b = calculated bending stress in the compression flange corresponding to the design load as given in 3.2.

σ_c = the critical buckling stress as per Ch.3, Sec.6.

3.4 Stiffeners and girders

3.4.1 The section modulus of the stiffeners and girders is not to be less than the following:

$Z = \frac{6.25\ spl^2}{m}$ [cm^3]

Where,

l = the member span between effective supports [m]

s = the member spacing [m]

m = 8 for members simply supported at ends

= 12 for members which can be considered as fixed at both ends.

The moments of inertia of stiffeners and girders is not to be less than:

I = 2.1 Zl [cm^4]

For other materials the requirement will be specially considered.

3.4.2 For covers above cargo and ballast tanks, fillet welds on tank side are to be double continuous.

3.5 Hatch cover edges

3.5.1 The cover edges are to be adequately stiffened to withstand the forced imposed upon them during opening and closing of the hatches.

3.6 Wooden hatch covers

3.6.1 Wooden hatch cover planks are to have a finished thickness not less than 1/24th of the unsupported span, with a minimum of 20 [mm]. The planks of wood covers are to be connected at their underside by cross planks spaced not more than 1.5 [m].

3.6.2 The ends of all wooden hatch covers are to be protected by encircling with galvanized steel bands.

3.7 Portable hatch beams

3.7.1 The section modulus and the moment of inertia of the portable hatch beams stiffened at their upper and lower edges by continuous flat bars are to satisfy the requirements of 3.4.

3.7.2 Carriers or sockets, or other suitable arrangements are to be provided as means of the efficient fitting and securing of portable hatch beams.

3.7.3 Sliding hatch beams are to be provided with an efficient device for locking them in their correct fore and aft positions when the hatchway is closed.

3.8 Direct calculations

3.8.1 Hatchcovers of special construction and arrangement e.g. covers designed and constructed as a grillage, covers supported along more than two opposite edges and covers supporting other covers, may require submission of direct strength calculation taking into account the arranement of stiffeners and the supporting members.

3.9 Hatch cover securing arrangement

3.9.1 The gaskets and the securing arrangements are to be designed for the expected relative movement between cover and coaming or special devices are to be fitted to restrict such movement.

3.9.2 Securing arrangements together with suitable gasketting material are to ensure weathertightness of the covers to the satisfaction of the surveyors.

3.9.3 The gasket material is to be satisfactory air, seawater and if necessary oil resistant quality. It is to be effectively secured along the edges of the covers in a manner as to ensure that the forces from the hatch covers or cargo stowed on top of the hatchcovers are transferred to the coaming or to the deck by direct contact without the load coaming on the gaskets. The sealing is to be achieved by relatively soft packing. The hatch coaming or steel parts on the adjacent covers in contact with the packing are to be well rounded where necessary,

A metallic contact is to be kept between the hatchcover and the hull to effect electrical earthing.

3.9.4 Where tarpaulins are fitted to make hatch covers weathertight. They are to be free from jute, and are to be waterproof and of ample strength. At least two layers of tarpaulins are to be provided and these are to be secured by battens and wedges or equivalent arrangements.

Section 4

Miscellaneous Openings

4.1 Mannoles

4.1.1 Manholes on the weather decks are to be closed by substantial covers capable of closing them watertight.

4.2 Companionways, doors and accesses on weather decks

4.2.1 companionways on exposed decks are to be equivalent in strength and weathertightness to a deckhouse in the same portion. The height of the doorway sills above deck is not to be less than 100 [mm] for Zone 3 and 150 [mm] for Zone 1 & 2.

For doorways directly leading to engine room the sill height above deck is to be not less than 400 [mm].

In addition the sill heights above load waterline should not be less than the values mentioned below:

Zone 1	1000 [mm]
Zone 2	600 [mm]
Zone 3	300 [mm]

4.3 Openings on engine casing

4.3.1 Machinery space openings are to have efficient closing appliances. The openings and coamings for fiddley, funnel and machinery space ventilators in the casing in those positions are to be provided with strong covers of steel or other equivalent material permanently attached in their proper positions and capable of being secured weathertight.

4.3.2 Skylights are to be of substantial construction and secured firmly to the deck. For skylights the coaming height is not to be less than that required for the hatch coamings. Efficient means are to be provided for closing and securing the hinged scuttles, if any. The thickness of glasses in fixed or opening skylights is to be appropriate to their position and size as required for side scuttles. Glasses are to be protected against mechanical damage, and are to be fitted with deadlights or storm covers permanently attached.

4.3.3 Side scuttles in the engine casings are to be provided with fireproof glass.

4.4 Windows and side scuttles

4.4.1 Side scuttles and windows are to be made and tested according to standards. The glass thickness of side scuttles below main deck is to be not less than 8.0 [mm].

The glass thickness of windows above deck to not to be less than:

$t = \frac{w}{70}$ [mm], minimum 6.0 [mm]

where,

w = the height or the width of the window, whichever is smaller, [mm].

4.4.2 Side scuttles in the shell below main deck are to be non opening type with deadlights and the lower edge of glass is to be atleast 500 [mm] above the load water line in any condition of list or trim. Further, the scuttles are to be adequately protected against damage by direct contact.

4.4.3 Side scuttles and windows above deck may be fitted without deadlight/portable covers provided the height of lower edge of glass above waterline is not less than specified in Table 4.4.3.

Table 4.4.3 : Height of side scuttles [mm]	
Zone 1	**h_t [mm]**
1	1700
2	1000
3	50

Section 5
Ventilators

5.1 General

5.1.1 The scantlings of exposed ventilator coamings are to be equivalent to the scantlings of deckhouses in the same position. In cargo spaces and other areas where mechanical damage is likely, the ventilator trunks are to be well protected.

5.2 Coaming heights

5.2.1 Ventilators on exposed decks are to have the lower edge of openings at a height of not less than 300 [mm] above deck.

In addition the height of lower edge of openings above waterline are to be not less than specified in Table 5.2.1.

Table 5.2.1 : Ventilator coaming heights [mm]		
	With closing appliances	**Without closing appliances**
Zone 1	1000	1700
Zone 2	600	1000
Zone 3	300	500

5.3 Closing appliances

5.3.1 Ventilator openings are to be fitted with efficient weathertight closing appliances if applicable as specified in Table 5.2.1.

Section 6
Air and Sounding Pipes

6.1 General

6.1.1 Air and sounding pipes are to comply with the requirements of Pt. 4, Ch.2.

6.1.2 Striking plates of suitable thickness, or their equivalent, are to be fitted under all sounding pipes.

6.1.3 Air and sounding pipes leading through cargo containment areas or other spaces where mechanical damage is likely to occur, are to be well protected.

6.2 Height of air pipes

6.2.1 The height of air pipes from the upper surface of decks decks exposed to the weather, to the point from where water may have access below, is not normally to be less than 300 [mm].

The heights above load waterline of air pipes with and without closing appliances are not to be less than as specified in Table 5.2.1 for ventilators.

6.2.2 Lower heights may be approved in class where these are essential for the working of the vessel, providing closing appliances are of an approved automatic type.

6.3 Closing appliances

6.3.1 Permanently attached closing appliances to prevent free entry of water are to be fitted to all sounding pipes and for air pipes where required as per 6.2.1.

3.3.2 Where the closing appliances are not of an automatic type, provision is to be made for relieving vacuum when the tanks are being pumped out.

Section 7

Scuppers and Sanitary Discharges

7.1 General

7.1.1 Scuppers sufficient in number and size to provide effective drainage are to be fitted in all decks.

7.1.2 Scuppers draining weather decks and spaces within superstructures or deckhouses not fitted with efficient weathertight doors are to be led overboard.

7.1.3 Scuppers and discharges which drain spaces below the main deck, or spaces within intact superstructures or deckhouses on the main deck fitted with efficient weathertight doors, may be led to the bilges in the case of scuppers, or to suitable sanitary tanks in the case of sanitary discharges. Alternatively, they may be led overboard provided that the spaces drained are above the load waterline, and the pipes are fitted with efficient and accessible means of preventing water from passing inboard as required in 7.2.1.

7.1.4 Scuppers and discharge pipes should not normally pass through fuel oil or cargo oil tanks. Where scuppers and discharge pipes pass, unavoidably, through fuel oil or cargo oil tanks, and are led through the shell within the tanks, the thickness of the piping should be at least the same thickness as Rule shell plating in way, derived from the appropriate chapters.

Piping within tanks is to be tested in accordance with Pt. 4, Ch. 2 and Ch. 3.

7.1.5 All piping is to be adequately supported.

7.2 Closing appliances

7.2.1 Where the inboard end of scuppers and discharges are below main deck, normally a screw down non-return value in an accessible location is to be fitted to prevent water from passing inboard.

Where the inboard end is above the main deck, a non-return value is to be fitted at the shell, if the height of the inboard end above waterline is lower than the following:

Zone 1 – 1000 [mm]

Zone 2 – 600 [mm]

Zone 3 – 300 [mm].

7.3 Materials for valves, fittings and pipes

7.3.1 All shell fittings and valves required by 7.2 are to be of steel, bronze or other approved ductile materials; ordinary cast iron or similar materials is not acceptable.

7.3.2 All these items, if made of steel or other approved material with low corrosion resistance, are to be suitable protected against wastage.

7.3.3 The lengths of pipe attached to the shell fittings, elbow pieces or valves are to be of galvanized steel or other equivalent approved material.

END OF CHAPTER

Chapter 12

Rudders

Contents

Section

Section 1

General

1.1 Scope

The requirements of this Chapter apply to arrangement and scantlings of normal streamlined or plate rudders and their supporting structure. Rudder fitted with special features e.g. special profiles, fins, flaps, steering propellers etc. to increase the lift force will be specially considered.

1.2 Material

1.2.1 All materials used in the construction of the rudder are to be tested and approved in accordance with Pt.2. 'Materials' of the Rules and Regulations for the Construction and Classification Steel Vessels (Main Rules).

1.2.2 Material grades for plates and sections for the rudder blade are to be selected as per Pt. 3, Ch. 2, Sec. 1.3.

1.2.3 Bearing materials for bushings are to be stainless steel, bronze, white metal, synthetic material or lignum vitae. If stainless steel is proposed to be used for liners or bushes for the rudder stocks and pintles, the chemical composition is to be submitted for approval.

Hardness of the material of the bushing is to be at least 65 Brinell lower than that of the liner or the rudder stock or printle.

Synthetic bush materials are to be of approved type. Arrangement is to be provided for adequate supply of sea-water to these bearings.

1.3 Testing

1.3.1 Bodies of the rudders are to be tested in accordance with the requirements given in Ch. 15.

Section 2

Arrangement and Details

2.1 General

2.1.1 Various types rudder arrangement are shown in Fig. 2.1.1; other combinations of couplings and bearing may, however, be proposed.

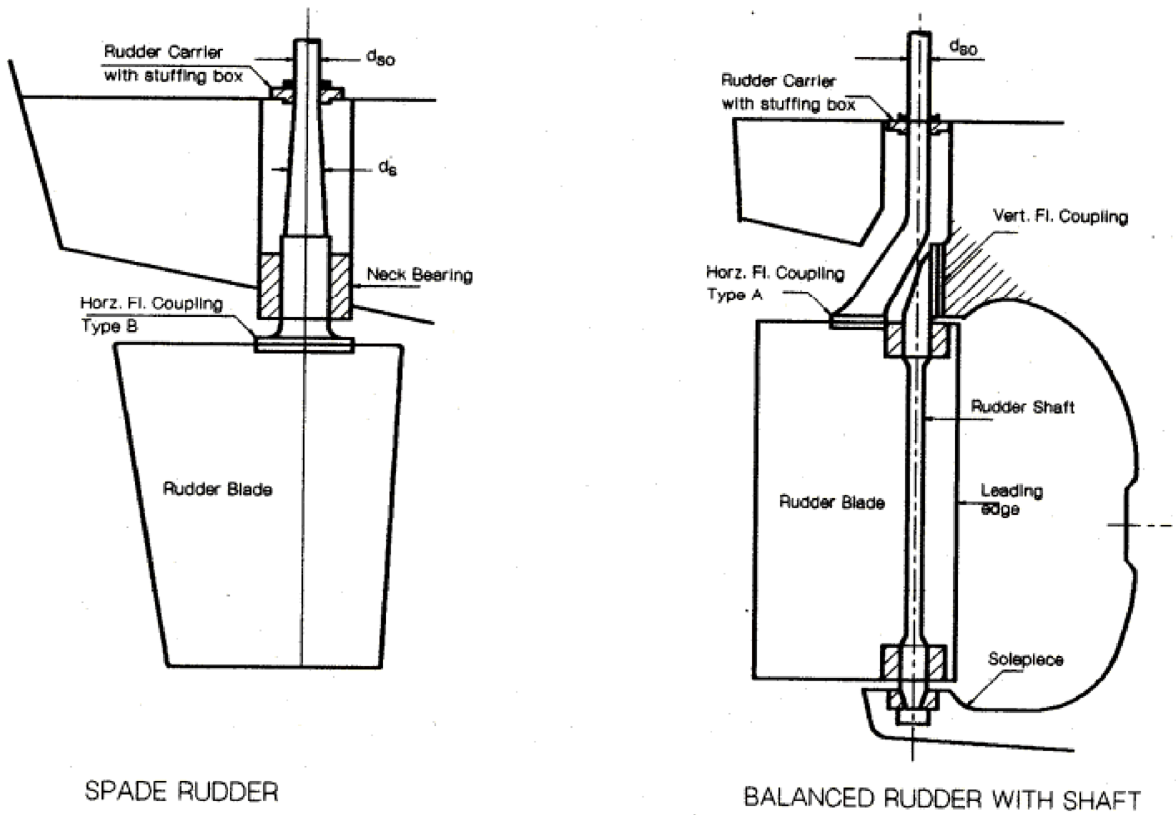


Fig.2.1.1 : Types of rudders

2.1.2 Effective means are to be provided for supporting the weight of the rudder. Where the support is provided by a carrier bearing attached to the rudder head, the structure in way of the bearing is to be adequately strengthened. The plating under all rudder head bearing or rudder carriers is to be increased in thickness.

2.1.3 All rudder bearings are to be accessible for measuring wear without lifting or unshipping the rudder.

2.1.4 Satisfactory arrangement is to be provided to prevent water from entering the steering gear compartment and lubricant from being washed away from the rudder carrier. A seal or stuffing box is to be fitted above the deepest load water line for this purpose unless the top of the rudder trunk (steering gear flat) is more than 300 [mm] above the deepest waterline in way trimmed condition. When the rudder carrier is fitted below the deepest load water line, two separate seals or stuffing boxes are to be provided.

2.1.5 Suitable arrangement is to be provided to prevent the rudder from lifting and accidental unshipping.

Section 3

Design Loads

3.1 Rudder force

3.1.1 The rudder force, upon which rudder scantlings are to be based, is to be determined from the following formula;

$F_r = 132 \,.\, K_1 \,.\, K_2 \,.\, K_3 \,.\, A \,.\, V^2$ [N] Where,

F1 = rudder force [N]

A = area of rudder blade [m^2]

V = maximum achievable vessel speed (knots) in the lightest operating condition in which the rudder is fully immersed. V is not to be taken as less than 6 knots.

For astern condition, the maximum astern speed is to be usded, but in no case less than:

$V_{astern} = 0.5V$

K1 = (λ + 2)/3; with λ not to be taken greater than 2.

$\lambda = b^2/ A_t$ where b is the mean height of the rudder area [m] and A_t, the sum of rudder blade area and area of rudder post or rudder horn, if any, within the height b [m^2]

Mean breadth C [m] and mean height b [m] of rudder are calculated according to the co-ordinate system in Fig. 3.1.1.

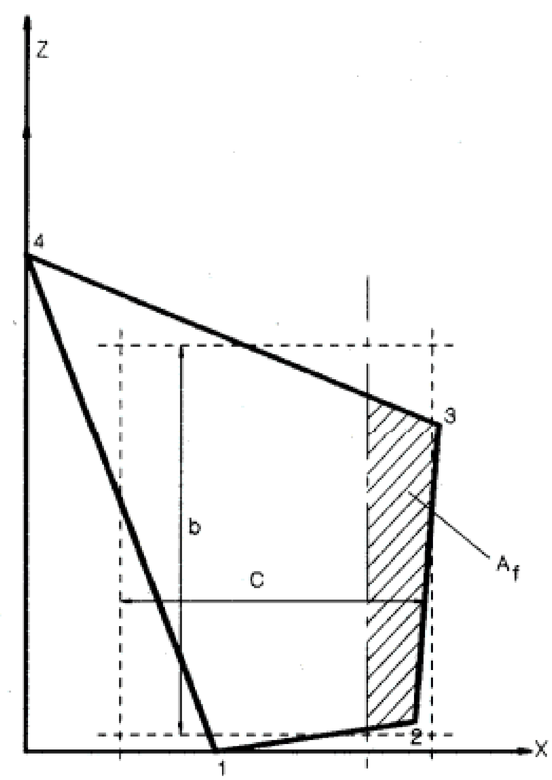


Fig.3.1.1 : Rudder dimensions

K_2 = Factor depending on the kind of rudder profile as per Table 3.1.1.

K3=0.80 for rudders outside the propeller jet

= 1.15 for rudders behind a fixed propeller nozzle.

= 1.0 otherwise.

Table 3.1.1		
Profile type	**K_2**	
	ahead	**astern**
NACA:00 Gottingen profiles	1.1	0.80
Hollow profiles	1.35	0.90
Flat side profiles	1.1	0.90

3.2 Rudder torque

3.2.1 The rudder torque on regular shaped rudders in both ahead and astern conditions of travel is to be calculated as follows:

$Q_t = F_t \cdot r$ [N-m];

Where,

$r = x_c - f$ [m]; but not to be taken less than 0.1C.

x_c = the distance of the point of application of the design force Fr from the leading edge

= 0.33 C in ahead condition

= 0.66 C in astern condition.

C = Mean breadth of rudder area [m] See Fig. 3.1.1.

f = C. A_f/A where A_f is the portion of the rudder blade area situated ahead of the centre line of the rudder stock.

3.2.2 In case of rudder blades with stepped contours the total rudder torque is to be obtained as follows:

$Q_f = \sum Q_n$ for i = 1,2,3,……

Where,

$Q_{ri} = F_{ri}.r_{i,}$ individual torque component from each part Ai of the total rudder area.

$F_{ri} = F_r.A_i/A$

$r_i = X_{ci}\ f_i$; but not to be taken less than 0.1 C_i.

$X_{ci}\ f_i$ and C_i are to be taken as X_c, f and C as in 3.2.1 for each discrete part except that for those rudder parts immediately aft of rudder horn X_{ci} is to be taken as $0.25C_i$ and $0.55C_i$ in ahead and astern conditions respectively.

3.3 Bending moments, shear forces and reactions

3.3.1 The bending moment (BM) and shear force (SF) distributions along the entire height of the rudder blade and rudder stock as well as the bearing reaction (R) may be obtained by direct calculation. The rudder is to be assumed as simply supported at the centres of the upper bearing and the neck bearing. In case of rudders supported by the sole piece or rudder horn the flexibility of the sole piece or rudder horn, and rudder and rudder stock is to be taken into consideration.

3.3.2 For common types of rudders, the following approximate values may be used:

- For balanced rudders with heel support:-

BM = $\frac{Fr.b}{8}$ $[\mathrm{N-m}]$

at mid-height of the rudder blade;

= = $\frac{Fr.b}{7}$ $[\mathrm{N-m}]$

at centre of neck bearing.

SF = 0.6 F_r [N]

at top and bottom ends of the rudder blade;

= 0.1 F_r [N]

at mid-height of the rudder blade.

R = 0.6 F_r [N]

at the heel pintle bearing;

= 0.7 F_r [N]

at the neck bearing/stern pintle;

= 0.1 F_r [N]

at the upper bearing.

- For spade rudders :-

BM = $\frac{F_r.A_1.b_1}{A}$ $[\mathrm{N-m}]$

at any cross section below and including the neck bearing.

SF = = $\frac{F_r.A_1}{A}$ $[\mathrm{N}]$

at any cross section upto the centre of the neck bearing.

R = $\frac{b_2+b_3}{b_3}$ $. F_r$ $[\mathrm{N-m}]$

at the neck bearing;

= $\frac{b_2}{b_3}$. F_r [N]

at upper bearing;

Where,

A_1 = rudder area below the cross section under consideration.

b1 = vertical distance from the centroid of A_1 to the cross section;

b2 = vertical distance from the centroid of rudder area A to the centre of the neck bearing, and

b3 = vertical distance between the centres of the upper and lower bearings.

3.3.3 At upper bearing the bending moments are to be taken as zero and between the upper bearing and the neck bearing the bending moments may be varied linearly.

Section 4
Rudder Blades

4.1 Construction details

4.1.1 Care is to be taken to avoid notch effects and to maintain continuity of strength around cut-outs and openings in the side plating. The plating thickness is to be increased suitably and corners are to be well rounded and ground smooth.

4.1.2 Side plating and vertical webs transmitting the torque are to be welded to the coupling flange by full penetration welds.

4.1.3 In general, welds between plates and heavy places are to be made as full penetration welds, Where back welding is not practicable, welding is to be performed against backing bar or equivalent.

4.1.4 Webs are to be connected to the side plating in accordance with Ch. 14. Where fillet welding is not practicable, side plating is to be connected by means of slot welding to flat bars welded to the webs. Normally slots of length 75 [mm], breadth at least twice the side plating thickness and spaced 200 [mm] centre to centre will be accepted. The ends of the slots are to be well rounded. In areas subjected to large bending stresses, horizontal slots may require to be replaced by continuous weld.

4.1.5 Arrangement is to be provided to drain the rudders completely. Drain plugs are to be provided with efficient packing.

4.1.6 Internal surfaces of rudders are to be efficiently coated for corrosion resistance after completion of fabrication and testing. Where it is intended to fill the rudder with plastic foam. Details of the foam material are to be submitted.

4.2 Double plated rudders

4.2.1 Thickness 't' of the rudder side, top and bottom plating is not to be less than:

$$t = 5.5\ s f_a \cdot \sqrt{\left(T + \frac{F_r}{A} . 10^{-4}\right)} . 10^{-3} + 2.5\ [mm]$$

where,

$$f_a = \sqrt{1.1 - 0.5\left(\frac{s}{1000} . l\right)^2}\ ;\ \text{max.}1.00$$

s = the smaller of the distance between the horizontal or the vertical web plates [mm].

l = the larger of the distance between the horizontal or the vertical web plates [m].

The thickness 't' is however not to be less than the minimum side shell thickness as per Pt.3, Ch.7.

For nose plates the thickness is to be increased to 1.25 t.

4.2.2 The thickness of the vertical and horizontal webs is not to be less than 70 per cent of the requirement given in 4.2.1 with a minimum of 7 [mm].

4.2.3 The thickness of side plating and vertical webs forming the main piece may have to be increased locally in way of the coupling and cutouts or openings, if any.

4.3 Single plated rudders

4.3.1 Rudder blade thickness is not to be less than:

$t = 1.5 \,.\, y.\, V \,.\, 10^{-3} + 2.5$ [mm]

where y is the spacing of horizontal arms [mm]; and V, the speed in knots as per 3.1.1.

4.3.2 Rudder blade is to be stiffened by horizontal arms spaced not more than 1000 [mm] apart. The arms are to be efficiently attached to the main piece. The thickness of the arms is not to be less than the blade thickness. The section modulus of the arms in way of main piece is not to be less than:

$Z = 0.5 \,.\, y \,.\, x^2 V^2 \,.\, 10^{-3}$ [cm^3]

where,

x is the distance from the centre line of the stock to the after end of the rudder [m].

4.3.3 The diameter of the mainpiece at top end is not to be less than that of the lower rudder stock, and it may be gradually reduced towards lower end.

Section 5

Rudder Stock and Pintles

5.1 Rudder stock

5.1.1 Diameter of the rudder stocks, when obtained by direct calculation, are normally to give an equivalent stress se not exceeding 138 [N/mm^2] i.e.

$$\sigma_e = \sqrt{\sigma^2 + 3\tau_t^{\,2}} \leq 138 \text{ [N/mm}^2\text{]}$$

where,

σ is the bending stress [N/mm^2].

τ_t is the torsional shear stress [N/mm^2].

This requirement is regardless of the liners; and both ahead and astern conditions are to be considered.

5.1.2 The diameter of the rudder stock at and above rudder carrier is given by

$d_u = 4.0 \sqrt[3]{(Q_r)}$ [mm]

5.1.3 The diameter of rudder stock at any other cross section is given by

$d_s = d_u \cdot \sqrt[6]{\left(1 + \frac{4}{3} \cdot \frac{BM^2}{Q_r^2}\right)}$[mm]

where BM is the bending moment at the cross section under consideration obtained as per 3.3.

5.1.4 The diameter of the rudder stock at neck bearing is to be maintained to a point as far as practicable above the top of the neck bearing and may subsequently be tapered to that required at the rudder carrier. The length of the taper is to be at least three times the reduction in diameter. Particular care is to be taken to avoid the formation of a notch at the upper end of the taper.

5.1.5 Sudden changes of section or sharp corners in way of the rudder coupling, jumping collars and shoulders for rudder carriers are to be avoided, Jumping collars are not to be welded to the rudder stock. Keyways in the rudder stock are to have rounded ends and the corners at the base of the keyway are to be adequately radiused.

5.2 Pintles and bearings

5.2.1 The diameter d_p of the pintles, measured on the inside of liners where fitted, is not to be less than:

$d_p = 0.35 \sqrt{R}$ [mm]

where,

R = Raction force [N] at the pintle bearing, obtained as per Sec.3.3.

5.2.2 Pintles are to have a conical attachment to the gudgeons and the taper on diameter is generally to range between 1:8 to 1:12. The slugging nut is to be efficiently secured. An effective sealing against sea water is to be provided at both ends of the cone.

5.2.3 The length of pintle housing in the gudgeon is not to be less than the pintle diameter d_p, The thickness of the pintle housing is not to be less than 0.25 d_p.

5.2.4 Where liners are fitted to pintles, they are to be shrunk on or otherwise efficiently secured. If linears are to be shrunk on, the shrinkage allowance is to be indicated on the plans. Where liners are formed by stainless steel weld deposit, the pintles are to be of weldable quality steel, and details of the procedure are to be submitted. Bushing is to be effectively secured against movement.

5.2.5 Pintle clearances are normally to be as given in Table 5.2.5.

Attention is to be paid to the manufacture’s recommendations particularly where brush material requires pre-soaking.

Table 5.2.5 : Pintle Clearances	
- For metal bearing material	$0.001\ d_p + 1.0$ [mm]
- For Synthetic Bearing material	To be specially determined considering the swelling and internal expansion Properties of the material, but not less than 1.5 [mm].

5.2.6 The bearing pressure ‘p’ due to reaction ‘R’ on projected bearing area is not to exceed the values given in Table 5.2.6. For the purpose of this calculation, the bearing length is not to be taken greater than 1.2 times the rudder stock or pintle diameter measured outside of liners, if fitted. Higher values than given in the table may be taken on verification by tests.

Table 5.2.6 : Bearing pressure	
Bearing Materials	**P [N/mm^2]**
Steel or bronze against lignum vitae	2.5
Steels against white metal, oil lubricated	4.5
Steel against synthetic material with hardness between 60 and 70 shore D[(1)]	5.5
Steel against stainless steel, bronze and hot prassed bronze-graphite materials	7.0
Note : (1) Indentation hardness test at 23^{o}C and with 50% moisture, according to a recognised standard, Synthetic bearing materials to be of approved type.	

Section 6
Rudder Couplings

6.1 Horizontal bolted couplings

6.1.1 The diameter of the coupling bolts is not to be less than:

$$d_b = 0.62\ [\frac{d_s^{\ 3}}{n.e_m}]^{1/2}\ [\text{mm}]$$

where,

d_s = Rule stock diameter [mm] in way of the coupling flange;

n = total number of bolts;

e_m = mean distance of the bolt axis from the centre of the bolt system [mm].

6.1.2 Coupling bolts are to be fitted bolts and a minimum of six (6) bolts are to be provided. Their nuts are to be effectively locked.

6.1.3 Mean distance e_m from the centre of the bolts to the centre of the bolt system is not to be less than 0.9 d_s [mm]. In addition, where the coupling is subjected to bending stress the mean athwartship distance from the centre of bolts to the longitudinal centerline of the coupling is not to be less than 0.6 d_s [mm].

6.1.4 The thickness of coupling flanges is not to be less than the diameter of the coupling bolts.

6.1.5 The width of material outside the bolt holes is not to be less than 0.67 d_b [mm].

6.2 Vertical flange couplings

6.2.1 The diameter of the coupling bolts is not to be less than:

$d_b = 0.81 \left[\frac{d_s^3}{n}\right]^{1/2}$ [mm]

where,

d_s = Rule stock diameter [mm] in way of the coupling flange

n = total number of bolts, not to be less than 8.

6.2.2 The first moments of area of the bolts about the centre the coupling to be not less than:

m = 0.00043 ds^3 [cm^3]

6.2.3 The thickness of the coupling flanges must be at least equal to the bolt diameter; and the width of the flange material outside the bolt holes must be greater than or equal to 0.67 d_b.

END OF CHAPTER

Chapter 13

Anchoring and Mooring Equipment

Contents

Section

Section 1

General

1.1 Introduction

1.1.1 To entitile a vessel to the letter 'L' in her character of classification, anchoring and mooring equipment is to be provided in accordance with the requirements of this Chapter.

These requirements are based on maximum current of 8 [km/hr], wind speed of 25 [m/sec], water depth of 5-7 [m] and good holding ground conditions. Where environmental conditions are more onerous, special consideration will be required.

1.1.2 Except in case of tugs, towlines are not subject of classification and the details given in the equipment table are for guidance purpose only. However, for tugs intended for towing other vessels, having onboard suitable lines for the same purpose, the requirement of towline may be waived with written concurrence from the Owners.

1.1.3 Attention is drawn to any relevant requirements of the local Authorities with which the vessel is to be registered.

1.2 Documentation

1.2.1 The arrangement of anchoring and mooring equipment and Equipment Number calculations are to be submitted for information.

1.2.2 Following details of the proposed equipment are to be submitted for approval :-

1) Number, weight, type and design of anchors.

2) Length, diameter, grade and type of chain cables.

3) Type and breaking load of steel and fibre ropes.

1.3 Symbols

1.3.1 L,B,T as defined in Ch. 1, Sec. 2.

Section 2

Structural Arrangement for Anchoring Equipment

2.1 General

2.1.1 The anchors are normally to be housed in hawse pipes and anchor pockets of adequate size, scantlings and suitable form to prevent movement of anchor and chain due to wave action.

The arrangements are to provide an easy lead of chain cable from windlass to the anchors. Upon release of the brake, the anchors are to immediately start falling by their own weight. Substantial chafing lips are to be provided at shell and deck. These are to have sufficiently large, radiused faces to minimize the probability of cable links being subjected to large bending stresses. Alternatively, roller fairleads of suitable design may be fitted.

Alternative arrangements for housing of anchors will be specially considered.

2.1.2 The shell plating and framing in way of the hawse pipes are to be reinforced as necessary.

2.1.3 The chain locker is to have adequate capacity and depth to provide an easy direct lead for the cable into the chain pipes, when the cable is fully stowed. The chain pipes are to be suitable size and provided with chafing lips. The port and starboard cables are to have separate spaces. The chain lockers boundaries are to be watertight. Provisions are to be made to minimize the ingress of water to the chain locker in bad weather. Adequate arrangement for drainage of chain lockers is to be provided.

Provisions are to be made for securing the inboard ends of the chains to the structure. The strength of this attachment should be between 15 per cent to 30 per cent of the breaking strength of the chain cable. It is recommended that suitable arrangements be provided so that in an emergency the chain can be readily made to slip from an accessible position outside the chain locker.

2.1.4 The windlass and chain stoppers are to be efficiently bedded and secured to deck. The thickness of deck plating is to be increased in way of the windlass and chain stoppers and adequate stiffening underneath is to be provided

Section 3

Equipment Specification

3.1 Equipment number

3.1.1 The equipment number, EN, on which the requirements of equipment are based is to be calculated as follows :-

$$EN = \Delta^{2/3} + 0.1A$$

Δ = moulded displacement, [t], corresponding to the maximum load water line.

A= area [m^2] in profile view of the hull above the maximum load waterline, including super structures, deck houses, trunks and hatch coamings, which are within the Rule length of the vessel. Houses of breadth less than B/4 may be disregarded.

In the calculation of A, sheer and trim are to be ignored.

Parts of windscreens or bulwarks which are more than 0.8 [m] in height are to be regarded as parts of houses when determining A.

3.2 Equipment

3.2.1 The anchors, chain cables, towlines and mooring lines for all vessels are to comply with Table 3.2.1, except where modified for particular vessel types as per 3.2.2 to 3.2.6 below.

3.2.2 For vessels without a sharp stem, a single anchor of twice the mass may be fitted in lieu of the two bower anchors required as per the table.

3.2.3 For all self-propelled vessels except tugs, operating on rivers where, in view of their length, they cannot safely turn for anchoring with the bow in an upstream direction, the mass of the stern anchor is to be twice that required as per the table.

3.2.4For tugs intended for pushing or side tow operations, two stern anchors are to be provided and the mass of each anchor is to be based on EN calculated considering the complete barge train; but not less than 300 [kg].

3.2.5 For tugs intended for towing operations only, stem anchors need not be provided; and for tugs intended for pushing operations only, bower anchors need not be provided.

3.2.6 For non-propelled vessels intended to be towed, two stern anchors of the tabular mass or one stern anchor of twice the mass are to be provided.

Table 3.2.1 : Equipment - Anchors, anchor cables, towlines and mooring lines				
EN	Stockless bower anchors, See Note 1 mass [kg]	Stockless stern anchors See Note 2 mass [kg]	Towline (Recommendation) See Note 3	Mooring lines See Note 4
			Minimum breaking strength [kN]	Minimum breaking strength [kN]
4 & ≤ 6	35	-	-	-
> 6 & ≤ 8	45	-	-	-
> 8 & ≤ 10	60	-	-	14
> 10 & ≤ 12	70	-	-	17
> 12 & ≤ 14	85	-	-	20
> 14 & ≤ 17	100	-	-	24
> 17 & ≤ 20	115	-	-	28
> 20 & ≤ 25	145	-	56	36
> 25 & ≤ 30	175	-	67	43

> 30 & ≤ 40	230	115	90	57
> 40 & ≤ 50	290	145	112	72
> 50 & ≤ 60	345	175	134	86
> 60 & ≤ 70	400	200	157	100
> 70 & ≤ 80	460	230	179	115
> 80 & ≤ 90	520	260	202	129
> 90 & ≤ 100	575	290	224	143
> 100 & ≤ 110	635	320	231	158
> 110 & ≤ 120	690	345	238	172
> 120 & ≤ 130	735	370	245	182
> 130 & ≤ 140	780	390	252	187
> 140 & ≤ 150	825	420	259	192
> 150 & ≤ 160	870	435	266	197
> 160 & ≤ 170	915	460	272	202
> 170 & ≤ 180	960	480	279	208
> 180 & ≤ 190	1000	500	286	213
> 190 & ≤ 200	1045	525	293	218
> 200 & ≤ 210	1090	550	300	223
> 210 & ≤ 220	1135	570	307	228
> 220 & ≤ 230	1180	590	314	233
> 230 & ≤ 240	1225	615	321	238
> 240 & ≤ 250	1270	635	328	244
> 250 & ≤ 260	1315	660	335	249
> 260 & ≤ 270	1360	680	342	254
> 270 & ≤ 280	1405	700	349	259
> 280 & ≤ 290	1450	725	355	264
> 290 & ≤ 300	1495	750	362	269

Notes :

1. Normally two stockless bower anchors are required but see 3.2.2.
2. i) For self propelled vessels, see 3.2.3.

   ii) For tugs, see 3.2.4 and 3.2.5.

   iii) For non-propelled vessels being towed, see 3.2.6.
3. The length of the towline is to be not less than given by the following formulae, as appropriate:

   a) L + 75 [m] for vessels
   for which 20 ≤ EN ≤ 160

   b) L + 100 [m] for vessels
   for which EN > 160.

For tugs intended for towing the breaking strength of the towline not to be less than twice the maximum bollard pull.

4. Two mooring lines are required for vessels for which EN is below 100 and three for vessels having larger values. The length of each wire in the mooring lines is to be not less than 2.5L, but need not be more than 100 [m].

5. The length of short or stud link chain cable for each bower anchor is to be not less than L+10 [m] with a minimum of 40 [m] and a maximum of 60 [m]. The minimum breaking strength of the chosen diameter and grade of short or stud link chain cable or wire is to be not less than 0.343 times the mass of anchor [kg] in case of ordinary anchor and 0.458 times the mass of anchor [kg] in case of HHP anchor.

6. The length of cable for each stern anchor, on vessels for which EN>30. is to be not less than 40[m].

Section 4
ANCHORS

4.1 General

4.1.1 Anchors are to be of an approved design and of a type suitable for the intended service.

4.1.2 The mass of each bower anchor as required in Sec. 3 is for anchors of equal mass. The masses of individual anchors may vary by ± 7 per cent of the tabular masses, provided that the total mass of the anchors is not less than would have been required for anchors of equal mass. Where the maximum current expected in service differs considerably from 8 [km/h], the anchor weight required by Table 3.2.1 is to be suitably modified.

4.1.3 The mass of the head, including pins and fittings, of an ordinary stockless anchor is not to be less than 60 per cent of the total mass of the anchor.

4.1.4 The mass 'ex stock' of stocked bower or steam anchors is not to be less than 80 per cent of the tabular mass of ordinary stockless bower anchors. The mass of the stock is to be 25 per cent of the total mass of the anchor including the shackle etc. but excluding the stock.

4.1.5 When anchors of a design approved for the designation 'High Holding Power' are used as bower anchors, the mass of each such anchor may be 75 per cent of the tabular mass of ordinary stockless bower anchors. For approval of HHP anchors, see Pt. 3, Ch. 15, CI.4.2 of *the Rules and Regulations for the Construction and Classification of Steel Vessels (Main Rules).*

4.1.6 Anchor shackles are to be of a design and material suitable to the service for which the anchor is intended.

4.2.1 Anchors and anchor shackles are to be manufactured and tested in accordance with the requirements of Pt. 2, Ch. 10 of *the Rules and Regulations for the Construction and Classification of Steel Vessels (Main Rules).*

Section 5

ANCHOR Chain Cables

5.1 General

5.1.1 Chain cables may be either short link or stud link and of mild steel or special quality steel meeting the requirements of breaking strength and the length as given in Table 3.2.1 The required chain diameter is to be obtained by using tables of chain breaking strength given in Pt. 2, Ch. 10 of *the Rules and Regulations for the Construction and Classification of Steel Vessels (Main Rules).*

5.1.2 In conjunction with HHP anchors, only Grade CC2 or ISO Grade 40 chain cable is to be used, however, for HHP anchors having a mass of 300 [kg] or less, Grade CC1 chain cable may be accepted provided the diameter of Grade CC1 cable required is increased by five per cent.

5.1.3 When desired by the Owners, steel wires may be used instead of chain cables. Steel wires are to have a breaking strength not less than that required for chain cables and their length is to be not less than 25 per cent in excess of the length required for chain cable as per Table 3.2.1.

In such cased it is recommended that a short length of chain or a swivel is fitted between the anchor and the wire rope.

5.2 Manufacture and testing

5.2.1 Chain cables, steel wire ropes and shackles are to be manufactured and tested in accordance with the requirements of Pt. 2, Pt. 2, Ch. 10 of *the Rules and Regulations for the Construction and Classification of Steel Vessels (Main Rules).*

Annexure - 1

Section 6

Towlines and Mooring Lines

6.1 General

6.1.1 Towlines and mooring lines may be of steel wire, natural fibre or synthetic fibre and are to be made by an approved manufacturer.

6.1.2 The number, length and breaking strength of towlines and mooring lins are to be as required by Sec. 3. Also see Sec. 1.1.2.

6.1.3 The lengths of individual mooring lines may be reduced by up to 10 per cent of the tabular length, provided that the total length of mooring lines is not less than would have resulted had all lines been of equal tabular length.

6.1.4 The diameter of a fibre rope is not to be less than 20 [mm].

6.2 Manufacture and testing

6.2.1 Steel wire ropes are to be manufactured and tested in accordance with the requirements of Pt. 2, Ch. 10 of *the Rules and Regulations for the Construction and Classification of Steel Vessels (Main Rules).*

6.3 Mooring arrangement

6.3.1 Means are to be provided to enable mooring lines to be efficiently secured on board vessel by an adequate number of suitably placed bollards on either side of the vessel.

6.3.2 Mooring winches should be fitted with drum brakes of sufficient strength to prevent unreeling of the mooring lines.

6.3.3 Adequate stiffening is to be provided in way of Bollards, Mooring winches etc.

Section 7

Windlass

7.1 General

7.1.1 The requirements of 7.1.2 to 7.1.5 apply equally to bow and stern anchor winches.

7.1.2 On vessels equipped with anchors having a mass of over 50 [kg], windlass(es) of sufficient power and suitable for the type and size of chain cable are to be fitted. Arrangements for anchor davits will be specially considered .

7.1.3 The windlasses may be hand or power operated. Hand operated windlasses are acceptable only if effort required at the handle does not exceed 15[kgf] for raising one anchor at a speed of not less than 2 [m/min] and making about 30 turns of the handle per minute.

7.1.4 A power operated windlass is to be capable of exerting, for a period not less than 30 minutes, a continuous duty pull of 28 d_c^2 [N] and to raise one anchor with chain cable at a mean speed of not less than 9 [m/min], d_c[mm] being the diameter required for Grade CC1 chain cable.

7.1.5 Winches suitable for operation by hand as well as by external power are to be so constructed that the power drive cannot activate the hand drive.

7.2 Testing

7.2.1 After installation on board, anchoring tests are to be carried out to demonstrate satisfactory working.

End of Chapter

Chapter 14
Welding

Contents

Section

Section 1
General

1.1 Scope

1.1.1 Welding in steel hull construction of all types of vessels is to comply with the requirements of this Chapter.

Welding in aluminum structures will be specially considered.

1.2 Documentation

1.2.1 Connection details of the welded structural members, including type and size of welds are to be clearly indicated on the plans submitted for approval. An explanation of all symbols or abbreviations used in detailing the weld connections should be included on the plans.

Details of proposed welding procedure is to be submitted indicating preheating temperature and any post welding heat treatment, if employed. Extent to which automatic welding, including deep penetration welding, is to be employed should also be indicated.

Section 2
Welding

2.1 Welders and supervision

2.1.1 Welders are to be proficient in the type of work on which they are to be engaged. The records of their tests and qualifications are to be kept by the builders and made available to the Surveyors. A sufficient number of skilled supervisors are to be employed to ensure effective control at all stages of assembly and welding operations.

2.2 Welding electrodes

2.2.1 Electrodes and welding consumables approved by IRS in accordance with the requirements of Pt 2. Ch. 11 and suitable for the type of joint and grade of steel, are to be used.

2.2.2 For the connection of two different grades of steel of the same tensile strength properties, electrodes suitable for the lower grade will be generally acceptable except at structural discontinuities or other points of stress connection.

2.2.3 For the connection of steel of different tensile strengths, the electrodes are to be suitable for the tensile strength of the component, on the basis of which the weld fillet size has been determined in Sect.3.

2.3 Preparation for welding

2.3.1 The parts to be welded are to be fitted in accordance with the approved joint detail. The edge preparation is to be accurate and uniform.

Means are to be provided for maintaining the parts to be welded, in correct position during the welding operations. Excessive force is not to be employed in aligning the parts before welding and the means employed in maintaining the alignment are to be so arranged as to allow for expansion and contraction during the welding operation. All methods employed in correcting improper alignment are to be to the satisfaction of the Surveyor.

2.3.2 All surfaces to be welded are to be clean, dry and free from rust, scale and grease. The surface and boundaries of each run of deposit are to be thoroughly cleaned and freed from slag before the next run is applied. Before a manual sealing run is applied to the back of a weld, the original root material is to be gouged out to sound metal.

2.3.3 Tack welding is to be kept to a minimum, and where used, should be equal in quality to that of the finished welds. Any defective tack weld is to be cut out before completing the finished welds. Care is to be taken in removing the tack welds to ensure that the structure is not damaged in doing so.

2.4 Welding procedure

2.4.1 Only approved welding procedures are to be used, See 2.5.

2.4.2 Structural arrangements are to be such as to allow adequate access for satisfactory completion of all welding operations. Welded joints are to be so arranged so as to facilitate downhand welding wherever possible.

2.4.3 The sequence of welding is to be so planned that any restraint during welding operations is reduced to a minimum. The ends of the frames and stiffeners should be left unattached to the plating at the subassembly stage until connecting welds are made, in the intersecting systems of plating, framing and stiffeners, at the erection stage.

Where a butt meets a seam, the welding of the seam should be interrupted well clear of the junction and not be continued until the butt is completed. Welding of the butt should continue past the open seam and the weld be chipped out for the seam to be welded straight through.

2.4.4 Adequate precautions are to be taken to ensure that the welding site is protected from the deleterious effects of high moisture, severe wind and extreme cold.

2.5 Approval of Procedures

2.5.1 Unless previously approved, welding procedures are to be established by the yard and forwarded to IRS for approval. The welding procedure specifications are to include detailed description of the base material, primer, plate thickness range, joint/groove design, welding consumable, welding position, welding techniques, welding parameters, preheating/interpass temperature and post heat treatment if any.

The welding for procedure qualification and subsequent testing, are to be witnessed by the IRS Surveyor.

2.6 Inspection of welds

2.6.1 Effective arrangements are to be provided for the inspection of finished welds to ensure that all welding has been satisfactorily completed.

2.6.2 All finished welds are to be visually inspected and are to be sound, uniform and substantially free from slag inclusions, porosity, undercutting or other defects. Welds and adjacent base metal are to be free from injurious arc strikes.

2.6.3 For the examination of important structural welds, visual inspection is to be supplemented by radiography or other acceptable non-destructive crack or flaw detection methods. The extent of such examination is to be to the Surveyors' satisfaction, but particular attention is to be given to the following locations:

a) Junction and crossing of seams and butts in strength deck, sheer strake, side and bottom shell within 0.4L amidships.
b) Butts of keel plating and rounded sheerstrake within 0.4L amidships.
c) Insert plates in way of hatch openings on the strength deck.
d) Butts of longitudinal framing and longitudinal bulkhead stiffeners with 0.4L amidships.

2.6.4 Defective sections of welds as found by visual or non-destructive examination or leakages under hydrostatic tests, are to be gouged out as necessary and carefully rewelded.

Section 3
Welded Connections

3.1 Butt welds

3.1.1 Plates of equal thickness may be manually butt welded as per Fig. 3.1.1. For automatic welding procedure will be specially considered.

3.1.2 For joints of plates with difference in thickness of more than 4 [mm], the thicker plate is to be tapered. The taper is not to exceed 1:3. Edge preparation after the tapering is to be as indicated in Sec. 3.1.1.

3.1.3 All manual butt welds are normally to be welded from both sides. Where a back ceiling run is not practicable or in certain cases when the stress level in the members is very low, welding on one side may be permitted provided the welding process is found satisfactory.

3.1.4 Where stiffening members, attached by continuous fillet welds, cross the finished butt or seam welds, these welds are to be made flush in way of the faying surface. Similarly for butt welds in webs of stiffening members, the butt weld is to be first completed and made flush with the stiffening member before the stiffener is connected to the plating by filled weld. The ends of the flush portion are to run out smoothly without notches or any sudden change of section. Where such conditions can not be complied with, a scallop is to be arranged in the web of the stiffening member. Scallops are to be of such size and in such a position, that a satisfactory weld can be made.

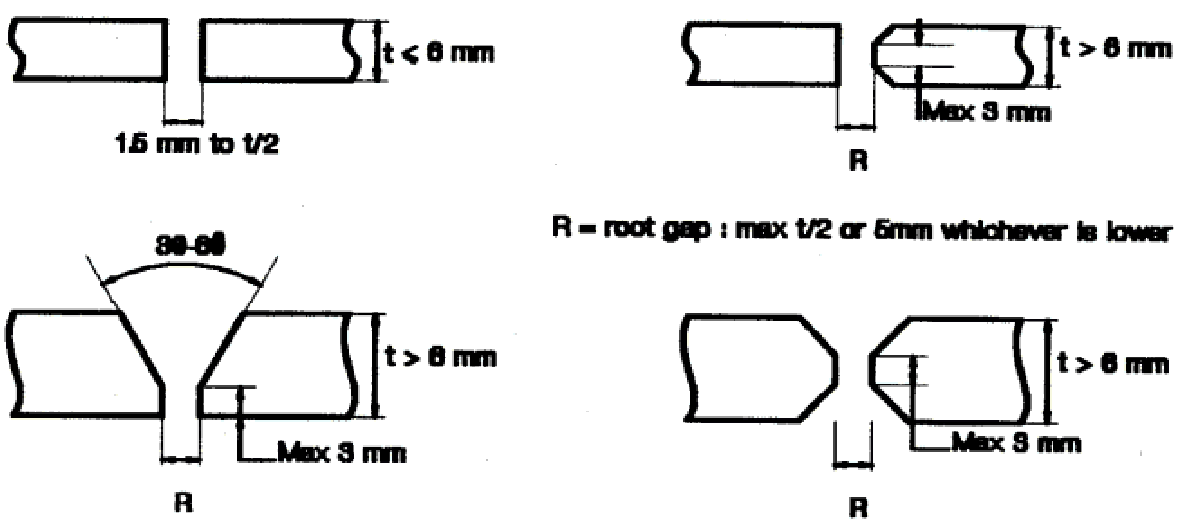


Fig.3.1.1 : Manually welded butt joints

3.2 'T' Connections

3.2.1 The throat thickness (See Fig. 3.2.1) of the fillet welds is given by:

throat thickness = t_p. weld factor. d/s

where,

t_p= thickness [mm] of the thinner of the two parts being connected.

d= distance [mm], between the successive weld fillets.

s= length [mm], of the correctly proportioned weld fillets, clear of end craters is not to be less than 75 [mm].

The weld factors for various connections are generally to be as given in Table - 3.2.1.

Where an approved automatic deep penetration procedure is used, the weld factors may be reduced by 15 per cent.

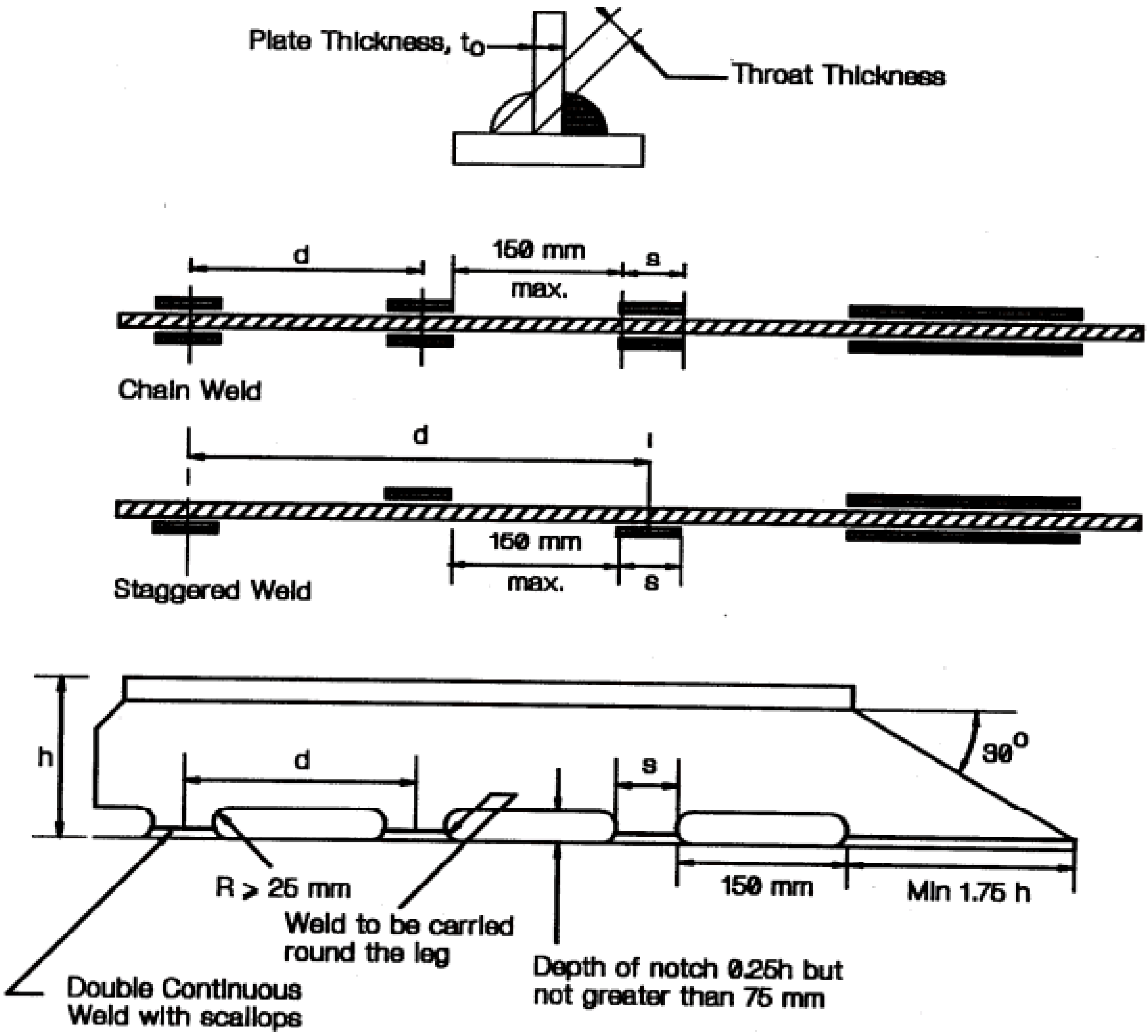


Fig.3.2.1 : Fillet welds

3.2.2 The throat thickness is not to be less than 3.0 [mm] and generally not to be greater than 0.44 t_p for double continuous welds and the greater of 0.44 t_p or 4.5 [mm] for intermittent welds.

Table 3.2.1 : Weld factors for fillet welds

	Structural items	Weld Factors	d.c.	Int. weld	Remarks
Single Bottom					
Centre girder	to keel plate or bar keel	0.3	*		
	to face plate	0.15		*	
Side girder	to bottom shell	0.15		*	
	to face plate	0.13		*	
	to floors	0.20		*	
Floors	to keel plate	0.15	*		
	to shell plating	0.15		*	
	to centre girder	0.35	*		

	to longitudinal bullheads	0.35	*		
	to face plate	0.15		*	
	sterntube covering	0.15	*		
Bottom longitudinal	to shell plating	0.13		*	
Double Bottom See Note 1					
Centre girder or duct keel	to keel plate	0.3	*		
	to inner bottom	0.25		*	
Side girder	to bottom shell	0.15		*	
	to inner bottom	0.15		*	
	to floors	0.15		*	
Floors	to shell plating	0.15		*	
	to inner bottom/margin plate	0.15		*	
	to centre girder/keel plate	0.20		*	
Margin plate	to shell plating	0.4	*		
	to inner bottom	0.4	*		
Inner bottom	to side shell	0.4	*		
Tank side brackets	to shell plating	0.3			
	to margin plate	0.3			
Bracket floor	to inner bottom/bottom shell	0.15			
	to centre girder	0.25			
	to side shell/margin plate	0.25			
Bottom frames	to shell plating	0.13			
Reverse frames	to inner bottom	0.13			
Longitudinal	to shell plating	0.13			
	to inner bottom	0.13			
Tank boundaries and bilge wells		0.40	*		
Stiffeners	to floors and girders	0.13		*	

	Structural items	**Weld Factors**	**d.c.**	**Int. weld**	**Remarks**
Structure in Machinery Space					
Floors and girders	to shell & inner bottom	0.3	*		
	to face plate	0.2		*	
Transverse & longitudinal frames	to shell plating	0.15		*	

Floors	to centre girder in way of engine, thrust blocks & boiler seatings				
	- in single bottom	0.50	*		
	- in double bottom	0.30	*		
Main engine foundation girders	to top plate	0.5	*		See note 2
	to hull structure	0.4	*		
Floors	to engine girder	0.4	*		
Brackets etc	to engine girders	0.3	*		
Side Structure					
Transverse frames	To side shell				
	- in tanks	0.13			
	- elsewhere	0.11			
Side longitudinal	To shell plating	0.13			
Web frames & side stringers	To shell plating				
	- within 0.2 x span from ends	0.35	*		
	- elsewhere	0.20		*	
	To face plate and tripping bracket	0.15		*	
Web frames	To side stringers	0.3	*		
Bilge keel	To ground bars	0.2	*		
Bilge keel ground bar	To side shell	0.35	*		Single cont.
Deck Structure					
Strength deck	to shell	F.P.			See Note 3
Other decks	To shell and bulkheads	0.3	-		Generally
Deck beams	To deck plating				
	- in tanks	0.13		*	
	- elsewhere	0.11		*	
Deck longitudinals	to decks	0.13		*	
Deck girders	to deck plating				
	- within 0.2 x span from ends	0.35	*		
	- elsewhere	0.20		*	
	to face plating and tripping brackets	0.15		*	
Cantilever webs	to shell, decks, face plates and longitudinal girders at ends	0.35	*		
Pillars	to deck, inner bottom and pillar brackets	0.40	*		

	Structural items	Weld Factors	d.c.	Int. weld	Remarks
Construction in 0.25 L from F.P					
Floors and girders	to shell & inner bottom	0.25	*		
	to face plate	0.25		*	
Bottom longitudinals	to shell plating	0.15		*	
Shell	to transverse & longitudinal side framing	0.15		*	
Panting stringers	To shell & frames	0.30	*		
All internal structure	In fore peak (unless a higher factor is specified)	0.13		*	
Aft Peak Construction					
All internal structure	On bottom, side shell & aft peak bulkhead	0.3	*		See 3.2.5
Bulkheads and Partitions					
Boundaries of	Watertight, oiltight and wash bulkheads and shaft tunnels	0.4	*		To be specially considered for chemical cargo tanks
Stiffeners	On tank & wash bulkheads	0.13		*	
	On pillar bulkheads	0.13		*	
	On ordinary bulkheads	0.11		*	
Vertical & horizontal girders in tanks & wash bulkheads	To bulkhead plating				
	- within 0.2 x span from ends	0.40	*		
	- elsewhere	0.40		*	
	- to faceplate	0.30		*	
	- to tripping brackets	0.30		*	
Vertical & horizontal girders elsewhere	to bulkhead plating	0.15			
	- within 0.2 x span from ends	0.35	*		
	- elsewhere	0.20		*	
	to faceplate & tripping brackets	0.15		*	
Primary Structures in Cargo Tanks					
Webs	To shell deck & bulkheads				
	- within 0.2 x span from ends	0.4	*		
	- elsewhere	0.3	*	*	
Webs	To face plates	0.3	*		
Webs	- to webs of other primary members	0.3	*		
Boundaries	- to tripping brackets	0.15		*	
Superstructures & deckhouses					

External bulkheads	to deck				
	- on 1st and 2nd tiers	0.40	*		
	- elsewhere	0.25	*		
Internal bulkheads	boundaries	0.13		*	
Stiffeners	to external bulkheads	0.10		*	

	Structural items	Weld Factors	d.c.	Int. weld	Remarks
Hatchways and closing appliances					
Hatch coaming	To deck all corners	0.5	*		
	To deck elsewhere	0.4	*		
	To face plate	0.4	*		
	To hatch cover rest bar	0.16	*		
Hatch cover	To stiffeners	0.12		*	
Rudders & Nozzles					
Rudders					See note 4
Main piece members	To coupling flange	F.P.	*		
	To each other	0.44	*		
Rudder plating	To rudder webs, elsewhere	0.20	*		
Nozzles	Generally as for rudders				
Miscellaneous fitting & equipment					
Framing ring for manhole type covers	To deck & bulkhead	0.4	*		
Framing around ports and W.T./oultight door	Plating	0.4	*		
Sea-chest boundary welds	To plating	0.4	*		
	elsewhere	0.4	*		
Ventilators, air pipes etc.	To deck	0.4	*		
Bulwark stays	To deck	0.4	*		
	To bulwark plating	0.2		*	
Fabricated anchors		F.P.			
Masts, derrick posts, crane pedestals, deck machinery & mooring equipment seating - to deck etc.		To be considered in each individual case			

d.c double continuous

F.P. Full penetration

Note 1 For tank boundaries see 3.2.5

Note 2 Preferably to be deep penetration or full penetration weld depending on the thinckness of the engine girders.

Note 3 Generally full penetration, but alternative proposals may be considered

Note 4 See Chapter 12, Section 4.1.

3.2.3 The leg length is not be less than 2 times the specified throat thickness.

3.2.4 Where the connection is highly stressed, deep penetration or full penetration welding may be required. Where full penetration weldings required, the abutting plate may require to be beveled.

3.2.5 Continuous welding is to be adopted in the following locations and in any other region of high dynamic loading :-

a) Boundaries of weathertight decks and erections, including hatch coamings, companionways and other openings.
b) Boundaries of tanks and watertight compartments.
c) All structures in the afterpeak and the afterpeak bulkhead stiffeners.
d) All framing within holds of bulk carriers intended for carriage of coal.
e) All welding inside tanks intended for chemicals or edible liquid cargoes.
f) All lap welds in tanks.
g) Primary and secondary members to plating in way of end connections and end brackets to plating in the case of lap connection.
h) Other connections as given in Table 3.2.1.

3.2.6 Where intermittent welding is used, the welding is to be made continuous around the ends of brackets, lugs, scallops and at other orthogonal connections with other members. In tanks for water ballast, cargo oil or fresh water, only scalloped welding is to be used.

3.2.7 where structural members pass through the boundary of a tank, and leakage into the adjacent space could be hazardous or undesirable, full penetration welding is to be adopted for the members for at least 150 [mm] on each side of the boundary. Alternatively, a small scallop of suitable shape may be cut in the member close to the boundary outside the compartment, and carefully welded all round.

3.3 Lap Connections

3.3.1 Overlaps are not to be used to connect plates which may be subjected to high tensile or compressive loading. However, where they are adopted, the width of overlap is to be adequate to ensure a good weld, the surfaces are to be in close contact and the joints should be closed all round by continuous fillet weld.

3.4 Slot Weld

3.4.1 For the connection of plating to internal webs, where access for welding is not practicable, the closing plating is to be attached by continuous full penetration or slot welds to flat bars fitted to the webs. Slots are to be well rounded at ends, to have a minimum length of 75 [mm] and in general, minimum width of twice the plating thickness. The distance between the slots is not to exceed 150 [mm]. Complete filling of the slots is normally not permitted.

3.5 End connection

3.5.1 In way of the end connections of girders double continuous welding is to be used all around. The weld area is not to be less than the cross-sectional area of the member, and the throat thickness not less than that given by Table 3.2.1 for girder ends.

3.5.2 Where stiffeners have bracketed end connections, bracket arms are to be welded all around and the throat thickness is not to be less than 0.35 times the thickness of bracket.

3.5.3 Where stiffeners are continuous at girder, they are to be connected to the webs, either directly and/or by means of lugs. The weld area is to be such that the shear stress does not exceed 80/k [N/mm^2]. Where the shear forces are high, a double sided connection to the web and/or a web stiffener welded on top of the continuous stiffener may be required.

End of chapter

Chapter 15

Hull Inspection, Workmanship and Testing

Contents

Section

Section 1

Hull Inspection

1.1 Approval of works

1.1.1 The builders, intending to class vessels to be built at their yard with classification society, are to demonstrate their capability to carry out the fabrication to acceptable quality standards before the commencement of the fabrication. Similar approval procedure shall apply to subcontractor's works also. Previous experience in the building and repair of relevant structures and equipment can be considered favourably in this regard.

1.2 Inspection facilities

1.2.1 Adequate facilities are to be provided to enable the Surveyor to carry out a satisfactory inspection of all components during each stage of prefabrication and construction.

Section 2

Workmanship

2.1 General

2.1.1 All workmanship is to be of good quality and in accordance with good shipbuilding practice. Any defect is to be rectified to the satisfaction of the Surveyor before being covered with paint, cement or other composition.

2.1.2 The assembly sequence and welding sequence are to be agreed prior to construction and are to be to the satisfaction of the Surveyor.

2.2 Plate edges and cut-outs

2.2.1 Openings, holes and other cut-outs in the main structural components are to be rounded off by adequately large radii. The free edges of cut-outs, hatch corners etc. are to be properly prepared and are to be free from notches. All edges should be faired.

2.3 Cold forming

2.3.1 Flanging and bending of plates while cold forming are not to have an average bending radius less than three times the plating thickness. The minimum radius is not to be less than twice the plating thickness.

2.3.2 During joggling of plates and profiles, the depth of joggle is not to be less than four times and the bending radius not less than twice the web thickness.

2.4 Hammering, bending and straightening

2.4.1 Steel being worked on when hot, is not to be overheated, and it is to be hammered and bent in the appropriate heat condition. Steel which is burnt, is not to be used.

2.4.2 Flame heating may be employed to straighten buckled plating when the buckling is not severe.

Section 3
Testing

3.1 Definitions

3.1.1 *Shop primer* is a thin coating applied after surface preparation and prior to fabrication as a protection against corrosion during fabrication.

Protective coating is a final coating protecting the structure from corrosion.

3.1.2 *Structural testing* is a hydrostatic test carried out to demonstrate the tightness of the tanks and the structural adequacy of the design. Where practical limitations prevail and hydrostatic testing is not feasible (for example when it is difficult, in practice, to apply the required head at the top of the tank), hydro-pneumatic testing may be carried out instead. When a hydro-pneumatic testing is performed, the conditions should simulate, as far as practicable, the actual loading of the tank.

3.1.3 *Hydro-pneumatic testing* is a combination of hydrostatic and air testing, consisting of filling the tank with water up to its top and applying an additional air pressure. The value of the additional air pressure is to be at least as defined in Sec.3.4.

3.1.4 *Leak testing* is an air or other medium test carried out to demonstrate the tightness of the structure.

3.1.5 *Hose testing* is carried out to demonstrate the tightness of structural items not subjected to hydrostatic or leak testing and to other components which contribute to the watertight or weathertight integrity of the hull.

3.2 Application

The requirements of this Section apply to:

- tanks, including independent tanks
- watertight or weathertight structures.

The purpose of these tests is to check the tightness and/or the strength of structural elements.

Tests are to be carried out in the presence of the Surveyor at a stage sufficiently close to completion so that any subsequent work would not impair the strength and tightness of the structure.

For the general testing requirements, See Sec.3.8 and Sec.3.9.

3.3 Structural testing

3.3.1 Structural testing as required in Table 3.3.1 may be carried out before or after launching.

Shop primer may be applied before carrying out the structural testing.

3.3.2 Structural testing may be carried out after the protective coating has been applied, provided that one of the following two conditions is satisfied:

a) all the welds are completed and carefully inspected visually to the satisfaction of the Surveyor, prior to the application of the protective coating,

b) leak testing is carried out prior to the application of the protective coating.

However, when leak testing is not carried out, protective coating in way of the following welds should be applied only after the structural testing has been satisfactorily completed:

- all erection welds, both manual and automatic
- all manual fillet weld connections on tank boundaries and manual penetration welds.

3.4 Leak testing

3.4.1 Where leak testing is carried out in accordance with Table 3.3.1, air pressure as indicated in Table 3.4.1 is to be applied during the test.

Prior to inspection, it is recommended that the air pressure in the tank is raised as indicated in Table 3.4.1 and kept at this level for about 1 hour to reach a stabilized state, with a minimum number of personnel in the vicinity of the tank, and then lowered to the test pressure.

3.4.2 Welds are to be coated with an efficient indicating liquid.

3.4.3 A U-tube filled with water up to a height corresponding to the test pressure is to be fitted to avoid overpressure of the compartment tested and to verify the test pressure. The U-tube should have a cross section larger than that of the pipe supplying air.

In addition, the test pressure is also to be verified by means of one master pressure gauge. Alternative means which are considered to be equally reliable, may be accepted.

3.4.4 Where leak testing is carried out it should be prior to the application of a protective coating, on all fillet weld connections on tank boundaries, penetrations and erection welds on tank boundaries excepting welds made by automatic processes. Selected locations of automatic erection welds and pre-erection manual or automatic welds may require to be similarly tested at the discretion of the Surveyor, taking account of the quality control procedures operating in the shipyard. For other welds, leak testing may be carried out after the protective coating has been applied, provided that these welds were carefully inspected visually to the satisfaction of the Surveyor.

Any other recognized method may be accepted to the satisfaction of the Surveyor.

3.5 Hose testing

When hose testing is required to verify the tightness of the structures, as defined in Table 3.3.1, a minimum pressure in the hose of at least 0.2 [N/m^2] is to be applied at a maximum distance of 1.5 [m]. The nozzle diameter is not to be less than 12 [mm].

3.6 Hydropneumatic testing

When hydropneumatic testing is performed, the same safety precautions as for leak testing (See Sec.3.4) are to be adopted.

3.7 Other testing methods

Other testing methods may be accepted, at the discretion of IRS, based upon equivalency considerations.

3.8 General testing requirements

General requirements for testing are given in Table 3.3.1.

3.9 Additional requirements for special type vessels/tanks

In addition to the requirements of Table 3.3.1, particular requirements for testing of certain spaces within the cargo area of following types of vessels are given in Table 3.9.1.

- edible liquid carriers
- chemical carriers

These requirements intend generally to verify the adequacy of the structural design of the tank, based on the loading conditions on which the scantlings of the tank structure were determined.

Table 3.3.1 : General testing requirements				
Item nuber	**Structure to be tested**	**Type of testing**	**Structural test pressure**	**Remarks**
1	Double bottom tanks	Structural testing [a]	The greater of the following: - head of water upto the top of overflow - head of water upto the uppermost continuous deck	Tank boundaries tested from at least one side
2	Double side tanks	Structural testing [a]	The greater of the following: - head of water upto the top of overflow - 1.0 [m] head of water above highest point of tank	Tank boundaries tested from at least one side
3	Tank bulkheads, deep tanks	Structural testing [a]	The greater of the following: - head of water upto the top of overflow - 1.0 [m] head of water above highest point of tank - setting pressure of the safety relief valves, where relevant	Tank boundaries tested from at least one side
	Fuel oil bunkers	Structural testing [a]		
4	Fore peak and after peak used as tank	Structural testing	The greater of the following: - head of water upto the top of overflow - 1.0 [m] head of water above highest point of tank	Test of the after peak carried out after the stern tube has been fitted
	Fore peak not used as tank	Structural testing	- head of water upto the uppermost continuous deck for cargo vessels and bulkhead deck for passenger vessels	
	After peak not used as tank	Leak testing		
5	Watertight bulkheads	Hose testing [c]		Thorough inspection of bulkhead to be

				carried out
6	Watertight doors below freeboard or bulkhead deck	Structural testing [e]	- water pressure head upto the uppermost continuous deck for cargo vessels and bulkhead deck for passenger vessels	
7	Double plate rudders	Leak testing		
8	Shaft tunnel clear of deep tanks	Hose testing		
9	Shell doors	Hose testing		
10	Weathertight hatch covers and closing appliances	Hose testing		
11	Chain locker (if aft of collision bulkhead)	Structural testing	Head of water upto the top	
12	Independent tanks	Structural testing	Head of water upto the top of overflow, but not less than 0.9 [m],	
13	Ballast ducts	Structural testing	Ballast pump maximum pressure	

[a] Leak or hydropneumatic testing may be accepted under the conditions specified in 3.4, provided that at least one tank for each type is structurally tested. This however, does not apply to cargo space boundaries in tankers and tanks for segregated cargoes or pollutants. If the structural test reveals weakness or severe faults not detected by the leak test, all tanks are to be structurally tested.

[b] Where applicable, the highest point of tank is to be measured to the deck and excluding hatches.

[c] When hose test cannot be performed without damaging possible outfitting (machinery, cables, switchboards, insulation, etc.) already installed, it may be replaced, at the discretion of IRS by a careful visual inspection of all the crossings and welded joints; where necessary, dye penetrant test or ultrasonic leak test may be required.

[d] The test may be made before or after the door is fitted. In case test is done before, hose testing is to be carried out in place after the door is fitted.

Table 3.9.1 : Additional testing requirements for spaces within the cargo area of certain types of ships					
Item No.	**Types of vessels**	**Structure to be tested**	**Testing requirements**	**Structural test pressure**	**Remarks**
1	Edible liquid carriers	Independent tanks	Structural testing	Head of water upto the top of overflow without being less than 0.9 [m]	
2.	Chemical carriers	Integral or independent tanks	Structural testing of cargo tanks boundaries from at least one side	The greater of the following: - 1.0 [m] head of water above highest point of tank - setting pressure of the safety relief valves, where relevant	

End of Chapter

PART B
STABILITY
REQUIREMENTS

Intact Stability Requirements for Vessels operating in Inland Waters

Chapter 1

Regulation 1

GENERAL

1. The purpose of this Annexure on Intact Stability is to recommend stability criteria and other measures for ensuring the safe operation of all vessels to minimize the risk to such vessels, to the personnel on board and to the environment.

2. Application

2.1 This Code contains intact stability criteria for the following types of vessels

- Cargo vessels
- Cargo vessels carrying timber deck cargo
- Cargo vessels carrying grain in bulk
- Passenger vessels
- Pontoons
- Cargo vessels carrying containers on deck and container vessels

2.2 The requirements for vessels of novel design or vessels not otherwise covered shall be specially considered.

3. Definitions

For the purpose of this Annexure the definition given hereunder apply. For terms used, but not defined herein, the definitions as given Chap. 1 apply.

.01 An air-cushion vehicle is a craft such that the whole or a significant part of its weight can be supported, whether at rest or in motion, by a continuously generated cushion of air dependent for its effectiveness on the proximity of the surface over which the craft operates.

.02 A hydrofoil boat is a craft which is supported above the water surface in normal operating conditions by hydrodynamic forces generated on foils.

.03 A side wall craft is an air-cushion vehicle whose wall extending along the sides are permanently immersed hard structures.

.04 A container vessel means a vessel which is used primarily for the transport of marine containers.

CHAPTER 2

Regulation 1

Stability booklet

1. Stability data and associated plans should be drawn up in the working language of the vessels and any other language the Administration may require. All translations of the stability booklet should be approved.

2. Each vessels should be provided with a stability booklet, approved by the Administration, which contains sufficient information to enable the master to operate the vessel in compliance with the applicable requirements contained in this Annexure. The Administration may have additional requirements. The stability booklet may include information on longitudinal strength, where required. This Annexure addresses only the stability-related contents of the booklet.

3. The format of the stability booklet and the information included will vary dependent on the vessel type and operation. In developing the stability booklet, consideration should be given to including the following information :

   .01 a general description of the vessel;

   .02 Instructions on the use of the booklet;

   .03 General arrangement plans showing watertight compartments, closures, vents, downflooding angles, permanent ballast, allowable deck loadings and free board diagrams;

   .04 Hydrostatic curves or tables and cross curves of stability calculated on a free-trimming basis, for the ranges of displacement and trim anticipated in normal operating conditions;

   .05 Capacity plan or tables showing capacities and centres of gravity for each cargo stowage space;

   .06. Tank sounding tables showing capacities, centres of gravity, and free surface data for each tank;

   .07. Information on loading restrictions, such as maximum KG or minimum GM curve or table that can be used to determine compliance with the applicable stability criteria;

   .08. Standard operating conditions and examples for developing other acceptable loading conditions using the information contained in the stability booklet;

   .09. A brief description of the stability calculations done including assumptions;

   .10. General precautions for preventing unintentional flooding;

   .11. Information concerning the use of any special cross-flooding fittings with descriptions of damage conditions which may require cross-flooding;

.12. Any other necessary guidance for the safe operation of the vessel under normal and emergency conditions;

.13. A table of contents and index for each booklet;

.14 Inclining test report for the vessel, or:

.01 Where the stability data is based on a sister vessel, the inclining test report of that sister vessel along with the lightship measurement report for the vessel in question; or

.02 Where lightship particulars are determined by other methods than from inclining of the vessel or its sister, a summary of the method used to determine those particulars;

.15 Recommendation for determination of vessel's stability by means of an in-service inclining test.

.16 If permanent ballast is used, its location and weight should be noted in the vessel's stability booklet, it should be located such that it does not shift during the normal operation of the vessel. Permanent ballast should not be removed from the vessel or relocated within the vessel without the approval of the Administration.

4 As an alternative to the stability booklet mentioned in 3.6.1, a simplified booklet in an approved form containing sufficient information to enable the master to operate the vessel incompliance with the applicable provisions of the Code as may be provided at the discretion of the Administration concerned.

Regulations 2

General precautions against capsizing

1. Compliance with the stability criteria does not ensure immunity against capsizing, regardless of the circumstances, or absolve the master from his responsibilities. Masters should therefore exercise prudence and good seamanship having regard to the season of the year, weather forecasts and the navigational zone and should take the appropriate action as to speed and course warranted by the prevailing circumstances.
2. Care should be taken that the cargo allocated to the vessel is capable of being stowed so that compliance with the criteria can be achieved. If necessary, the amount should be limited to the extent that ballast weight may be required.
3. Before a voyage commences, care should be taken to ensure that the cargo, sizeable pieces of equipment have been properly stowed or lashed so as to minimize the possibility of both longitudinal and lateral shifting, while at sea, under the effect of acceleration caused by rolling and pitching.
4. A vessel, when engaged in towing operations, should possess an adequate reserve of stability to withstand the anticipated heeling moment arising from the tow line without end angering

the towing vessel. Deck cargo on board the towing vessel should be so positioned as not to endanger the safe working of the crew on deck or impede the proper functioning of the towing equipment and be properly secured. Towline arrangements should include towing springs and a method of quick release of the tow.

5. The number of partially filled or slack tanks should be kept to a minimum because of their adverse effect on stability.
6. The stability criteria contained in chapter 3 set minimum values, but no maximum values are recommended. It is advisable to avoid excessive values of metacentric height, since these might lead to acceleration forces which could be prejudicial to the vessel, its complement, its equipment and to safe carriage of the cargo. Slack tanks may, in exceptional cases, be used as a means of reducing excessive values of metacentric height. In such cases, due consideration should be given to sloshing effects.
7. Regard should be paid to the possible adverse effects on stability where certain bulk cargoes are carried.

Regulations 3

Operational precautions in heavy weather

1. All doorways and other openings, through which water can enter into the hull or deckhouses, forecastle, etc., should be suitably closed in adverse weather conditions and accordingly all appliances for this purpose should be maintained on board and in good condition.
2. Weathertight and watertight hatches, doors, etc., should be kept closed during navigation, except when necessarily opened for the working of the vessel and should always be ready for immediate closure and be clearly marked to indicate that these fittings are to be kept closed except for access. Hatch covers and flush deck scuttles in fishing vessels should be kept properly secured when not in use during fishing operations. All portable deadlights should be maintained in good condition and securely closed in bad weather.
3. Any closing devices provided for vent pipes to fuel tanks should be secured in bad weather
4. In all conditions of loading necessary care should be taken to maintain the minimum freeboard.

Chapter 3

General Intact Stability Criteria for All Vessels

1. The following general criteria are recommended for passenger and cargo vessels.
   - The metacentric height GM should not be less than 0.15 m, for all the vessels.
   - Passenger vessels, with 2/3 rd of passengers crowded on one side on the upper most deck, the angle of heel should not exceed 10^{o} and the vessel should have a positive metacentric height.

For the purpose of this Rule the weight of the passenger is to be taken as 65 kgs.

- The freeboard in case of passenger vessels, should not be less than 760 mm in all conditions of loading.
- The maximum angle of heel of all self propelled vessels during tuning at service speed fully loaded on account of turning shall not exceed 10^{o}.

2. Provisions should be made for a safe margin of stability at all stages of the voyage, regard being given to additions of weight, such as those due to absorption of water and to losses of weight such as those due to consumption of fuel and stores.
3. For vessels carrying oil-based pollutants in bulk, the Administration should be satisfied that the criteria given in 3.1 is maintained during all loading and ballasting operations.

Chapter 4

Severe wind and rolling criterion (weather criterion)

1. This criterion supplements the stability criteria given in Chapter 3.
2. Weather criterion:

a) The ability of a vessel to withstand the combined effects of beam wind and rolling should be demonstrated for each standard condition of loading, with reference to the figure as follows:

.01 The vessel is subjected to a steady wind pressure acting per perpendicular to the vessels's centreline which results in a steady wind heeling lever (1w1).

.02 From the resultant angle of equilibrium (θo), the vessel is assumed to roll owing to wave action to an angle of roll ($\theta 1$) to windward. Attention should be paid to the effect of steady wind so that excessive resultant angles of heel are avoided;

.03 The vessel is then subjected to a gust wind pressure which results in a gust wind heeling lever (1w2);

.04 Under these circumstances, area "b" should be equal to or greater than area “a”;

.05 Free surface effects should be accounted for in the standard conditions of loading

The angles in the above figure are defined as follows:

θo = angle of heel under action of steady wind

θ1 = angle of roll to windward due to wave action

θ2 = angle of downflooding (qf) or 50° or qc, whichever is less,

Where:

θf = angle of heel at which openings in the hull,· superstructures or deckhouses which cannot be closed weathertight immerse. In applying this criterion, small openings through which progressive flooding cannot take place need not be considered as open.

θc = angle of second intercept between wind heeling lever Iw2 and GZ curves.

b) The wind heeling levers Iw1 and Iw2 referred above are constant values at all angles of inclination and should be calculated as follows:

lw1=(P.A.Z /1000gD) (m) and

lw2=1.5 lw1 (m)

Where:

P = wind pressure of 504 Pa. the value of P used for vessels in restricted services may be reduced subjected to the approval of the administration;

A = Projected lateral area of the portion of the vessel and deck cargo above the waterline (m^2)

Z = vertical distance from the centre of A to the centre of the underwater lateral area or approximately to a point at one half the- mean draught (m);

D = displacement (t)

g = gravitational acceleration of 9.81 m/s2

c) The angle of roll (q1) referred to should be calculated as follows:

q1=109k.X1.X2(r.s)1/2 (degrees)

Where:

X1 = factor as shown in table 1

X2 = factor as shown in table 2

k = factor as follows:

k = 1.0 for round-bilged vessel having no bilge or bar keels

k = 0.7 for a vessel having sharp bilges

k = as shown in table 3 for a vessel having bilge keels, a bar keel or both

r = 0.73+0.60G/d

with:

OG = distance between the centre of gravity and the waterline (rn) (+ if centre of gravity is above the waterline, if it is below)

D = mean moulded draught of the vessel (m)

S = factor as shown in table 4.

Table 1

Values of factor X1

B/d	**X1**
2.4	1.00
2.5	0.98
2.6	0.96
2.7	0.95
2.8	0.93
2.9	0.91
3.0	0.90
3.1	0.88
3.2	0.86
3.3	0.84
3.4	0.82
3.5	0.80

Table 2

Values of factor X2

CB	X2
<0.45	0.75
0.50	0.82
0.55	0.89
0.60	0.95
0.65	0.97
>0.70	1.00

Table 3

Values of factor k

(Ak.100/LB)	K
0	1.0
1.0	0.98
1.5	0.95
2.0	0.88
2.5	0.79
3.0	0.74
3.5	0.72
4.0	0.70

Table 4

Values of factor s

T	S
6	0.100
7	0.098
8	0.093
12	0.065
14	0.053
16	0.044
18	0.038
20	0.035

(Intermediate values in table 1-4 should be obtained by linear interpolation.)

Roiling period 1=(2C B / (GM)l/2) (seconds)

where:

C = 0.373 +0.023(B/d)-0.043(L/ 100).

The symbols in the above tables and formula for the rolling period are defined as follows:

L = length of the vessel at waterline (m)

B = moulded breadth of the vessel (m)

d = mean moulded draught of the vessel (m)

CB = block coefficient

Ak = total overall area of bilge keels, or area of the lateral projection of the bar keel, or sum of these areas (m2)

GM = metacentric height corrected for free surface effect (m).

Regulation 2

Standard loading conditions to be examined

1. Loading conditions: The standard loading conditions referred to in the text are as follows:

.01 For a passenger vessel:

.01 Vessel in the fully loaded departure condition with full stores and fuel and with the full number of passengers with their luggage;

.02 Vessel in the fully loaded arrival condition, with full number of passengers and their luggage but with only 10% stores and fuel remaining;

.03 Vessel without cargo, but with full stores and fuel and the full number of passengers and their luggage;

.04 Vessel in the same condition as at .03 above with only 10% stores and fuel remaining.

.02 For a cargo vessel:

.01 Vessel in the fully loaded departure condition, with cargo homogeneously distributed throughout all cargo spaces and with full stores and fuel;

.02 Vessel in the fully loaded arrival condition, with cargo homogeneously distributed throughout all cargo spaces and with 10% stores and fuel remaining;

.03 Vessel in ballast in the departure condition, without cargo but with full stores and fuel;

.04 Vessel in ballast in the arrival condition, without cargo and with 100% stores and fuel remaining.

.03 For a cargo vessel intended to carry deck cargoes:

.01 Vessel in the fully loaded departure condition with cargo homogeneously distributed in the holds and with cargo specified in extension and mass on deck, with full stores and fuel;

.02 Vessel in the fully loaded arrival condition with cargo homogeneously distributed in holds and with a cargo specified in extension and mass on deck, with 10% stores and fuel.

2. A mass of 65.kg should be assumed for each passenger except that this value may be reduced to not less than 60 kg where this can be justified. In addition, the mass and distribution of the luggage should be determined by the Administration.

3. The height the of the centre of gravity for passengers should be assumed equal to:

- 1.0m above deck level for passengers standing upright. Account may be taken, if necessary, of camber and sheer of deck;
- 0.30 m above the seat in respect of seated passengers.

4. Passengers and luggage should be considered to be in the spaces normally at their disposal.

5. Passengers without luggage should be considered as distributed to produce the most unfavorable combination of passenger heeling moment and/or initial metacentric height, which may be obtain in practice, when assessing compliance with the criteria given in Chapter 3. In this connection, it is anticipated that a value higher than four persons per square-metre will not be necessary.

Chapter 5
Sub Division and Number of bulkheads

1. The requirements of the bulkheads are as follows:

a) **Cargo Vessels:** The number and location of bulkheads are to be as per Annexure 1.

b) **Passenger Vessels:** The number of Bulkheads are to be as follows

Length	Machinery Aft	Machinery elsewhere
15<L<30	3	3
L>30	3	4

Location of collision bulkhead is to within the limits specified in Annexure 1.

c) Pontoons: Minimum number of bulkheads is to be based on the damaged stability calculations to the satisfaction of the Administration.

Determination of Lightship, Displacement and Centre of Gravity and Guidance information for conducting inclining Experiment

Chapter 1
Regulation 1
Application

1. Every vessel, passenger or cargo should he inclined upon its completion and the elements of its stability determined.

2. Where any alterations are made to a vessel so as to materially affect the stability, the vessel should be re-inclined.

3. At periodic interval not exceeding five years, a lightweight surveys should be carried out on all passenger vessels to verify any changes in lightship displacement and longitudinal centre of gravity. The vessel should re-inclined whenever, in comparison with the approved stability information, a deviation from the lightship displacement exceeding 2% or a deviation of the longitudinal centre of gravity exceeding 1% of L is found, or anticipated.

4. The administration may allow the inclining test of an individual vessel to be dispensed with provided basic stability data are available from the. Including test of a sister vessel and it is shown to the satisfaction of the Administration that reliable stability information for the exempted vessel can be obtained from such basic data.

5. The Administration may allow the inclining test of an individual vessel or class of vessels especially designed for the carriage of liquids or ore in bulk to be dispensed with when reference to existing data for similar vessels clearly indicates that due to the vessel's proportions and arrangements more than sufficient metacentric height will be available in all possible loading conditions.

Chapter 2
Definitions

For the purpose of this Annexure, unless expressly provided otherwise:

1. Certification of the test weights is the verification of the weight marked on a test weight. Test weight should be certified using a certified scale. The weight should be performed close enough in time to the inclining test to ensure the measured weight is accurate.

2. Draught is the vertical distance from the moulded baseline to the waterline.

3. The inclining test involves moving a series of known weights, normally in the transverse direction, and then measuring the resulting change in the equilibrium heel angle of the vessel. By using this information and applying basic naval architecture principles, the vessel's vertical centre of gravity (VCG) is determined.

4. Lightship condition is a vessel complete in ail' respects, but without consumables, stores, cargo, crew and effects, and without any liquids on board except that machinery and piping fluids, such as lubricants and hydraulics, are at operating levels.

5. A Lightweight survey involves taking an audit of all items which should be added, deducted or relocated on the vessel at the time of the inclining test so that the observed condition of the vessel can be adjusted to the lightship condition. The weight, longitudinal, transverse and vertical location of each item should be accurately determined and recorded. Using this *information, the* static waterline of the vessel at the time of the inclining test as determined from measuring the freeboard or verified draught marks of the vessel, the-vessels hydrostatic data, and the sea water density, the lightship displacement and longitudinal centre of gravity (LCG) can be obtained. The transverse centre of gravity (TCG) may also be determined for vessels which are asymmetrical about the centreline or whose internal arrangement or outfitting is such that an inherent list may develop from off-centre weight.

Chapter 3
Regulation 1
Preparation for the Inclining Test

1. Notification of the Administration

Written notification of the inclining test should be sent to the Administration as it requires or in due time before the test. An Administration representative should be present to witness the inclining test and the test results are submitted for review.

The responsibility for making preparations, conducting the inclining test and lightweight survey, recording the data, and calculating the results rests with the shipyard, owner or naval architect.. While compliance with the procedures outlined herein will facilitate an expeditious and accurate inclining test, it is recognized that alternative procedures or arrangements may be equally efficient. However, to minimize risk of delay, it is recommended that all such variances be submitted to the Administration for review prior to the inclining test.

.01 Details of notification

Written notification, should provide the following information as the Administration may require:

.1 identification of the vessel by name and shipyard hull number, if applicable;
.2 date, time, and Location of the test;
.3 inclining weight data:
  .1 type;
  .2 amount (number of units and weight of each);
  .3 certification;
  .4 method of handling (i.e sliding rail or crane);
  .5 anticipated maximum angle of heel to each side;

.4 measuring devices;
  .1 pendulums- approximate location and length;
  .2 U-tubes-approximate location and distance between legs;
  .3 inclinometers-location and details of approvals and calibrations.

.5 approximate trim;
.6 condition of tanks;
.7 estimated weights to deduct, to complete, and to relocate in order to place the vessel in its true lightship condition;
.8 detailed description of any computer software to be used to aid in calculation during the inclining test;
.9 name and phone number of the person responsible for conducting the inclining test.

Regulation 2

General condition of the vessels

1. A vessel should be as complete as possible at the time of the inclining test. The test should be scheduled to minimize the disruption in the vessel's delivery date or its operational commitments.

2. The amount and type of work left to be complete (weights to be added) affect the accuracy of the lightship characteristics, so good judgment should be used. If the weight or centre of gravity of an item to be added cannot be determined with confidence, it is best to conduct the inclining test after the item is added.

3. Temporary material, tool boxes, staging, sand, debris, etc., on board should be reduced to

absolute minimum before the inclining test. Excess crew or personnel not directly involved in the inclining test should be removed from on board the vessel before the test.-

4. Decks should be free of water. Water trapped on deck may shift and pocket in a fashion similar to liquids in a tank. Any rain, snow or ice accumulated on the vessel should be removed prior to the test.

5. The anticipated liquid loading for the test should be included in the planning for the test. Preferably, all tanks should be empty and clean, or completely full. The number of slack tanks should be kept to an absolute minimum. The viscosity of the fluid, the depth of the fluid and the shape-of the tank-should be such that the free surface effect can be accurately determined.

6. The vessel should be moored in a quiet, sheltered area free from extraneous forces such as propeller wash from passing vessels, or sudden discharges from shore side pumps. The tide conditions and the trim of the vessel during the test should be considered. Prior to the test, the depth of water should be measured and recorded in as many locations as are necessary to ensure that the vessel will not contact the bottom. The specific gravity of water should be accurately recorded. The vessel should be moored in a manner to allow unrestricted heeling. The access ramps should be removed. Power lines, hoses, etc., connected to shore should be at a minimum, and kept slack at all times.

7. The vessel should be as upright as-possible and have sufficient draught so that any abrupt changes in the water plane will be avoided as the vessel is inclined from side to side. A deviation from design trim of up to 10 of L is normally acceptable when using hydrostatic data calculated at design trim. Otherwise, the hydrostatic data should be calculated for the actual trim. Caution should be exercised when applying the "1% rule of thumb" to ensure that excessive error, as would result from a significant change- in the water plane area during heeling, is not introduced into the stability calculations. With inclining weights in the initial position, up to one-half degree of list is acceptable.

8. The total weight used should be sufficient to provide a minimum inclination of one degree and a maximum of four degrees of heel to each side. The Administration may, however, accept a smaller inclination angle for large vessels. Test weights should be compact and of such a configuration that the vertical centre of gravity of the weights can be accurately determined. Each weight should be marked with an identification number and its weight. Re-certification of the test weights should be carried out prior to the inclining. A crane of sufficient capacity and reach, or some other means, should be available during the inclining test to shift weight on the deck-in an expeditious and safe manner, water ballast transfer may be carried out, when it is impractical, to incline using solid weights, if acceptable to the Administrator.

9. Two pendulums (minimum) should be used to allow identification of bad readings at any one pendulum station. They should each be located in an area protected from the wind. The

pendulums should be long enough to give a measured deflection, to each side of upright, of at least 5 cm. To ensure recordings from individual instruments are kept separate, it is suggested that the pendulums be physically located as far apart as practical. One or more pendulums may be substituted by other measuring devices (U-tubes or inclinometers) at the discretion of the Administration.

10. Efficient two-way communications should, be provided between central control and the weight handlers and between centre control and each pendulum station. One person at a central control station should have complete control over all personnel involved in the test.

Regulation 3
Plans required

1. The person in charge of the inclining test should have available a copy of the following plans at the time of the inclining test:
   .01 lines plan;
   .02 hydrostatic curves or hydrostatic data;
   .03 general arrangement plan of decks, holds, inner bottoms, etc.;
   .04 capacity plan showing capacities *and* vertical and longitudinal centres of gravity of cargo spaces tanks, etc. When ballast water is used as inclining weights, the transverse and vertical centres of gravity for the applicable tanks, for each angle of inclination, must be available;
   .05 tank sounding tables;
   .06 draught mark locations; and
   .07 docking drawing with keel profile and draught mark corrections (if available)

Regulation 4
Test procedure

1. Procedures followed in conducting the inclining test and lightweight survey should be in accordance with the recommendations laid out in Chapter.
   .1 Freeboard/draught readings should be taken to establish the position of the waterline in order to determine the displacement of the vessel at the time of the inclining test. It is recommended that at least five freeboard readings, approximately equally spaced, be taken on each side of the vessel or that all draught marks (forward, midship and aft) be read on each side of the vessel.
   .2 The standard test employs eight distinct weight movements. Movement No. 8, a recheck of the zero point, may be omitted if a straight line plot is achieved after Movement No. 7. If a straight line plot is achieved after the initial zero and six weight movement, movements, the inclining test is complete and the second check at zero may be omitted. If a straight line plot is not achieved, those weight movements that did not yield acceptable plotted points should be repeated or explained.

2. A copy of the inclining data should be forwarded to the Administration along with the calculated results of the inclining test in an acceptable report format, if required.

3. All calculations performed during the inclining test and in preparation of an inclining test report may be carried out by a suitable computer program. Output generated by such a program may be used for presentation of all or partial data and calculations included in the test report if it is clear, concise, Well documented, and generally consistent in form and content with Administration requirements.

Regulations 5

Stability test for pontoons

1. An inclining experiment is not normally required for a pontoon, provided a conservative value of the lightship vertical centre of gravity (KG) is assumed for the stability calculations. The KG can be assumed at the level of the main deck although it is recognized that a lesser value could be acceptable if fully documented. The lightship displacement and longitudinal centre of gravity should be determined by calculation based on draught and density readings.

Chapter 4

DETAILED GUILDELINES FOR CONDUCT OF INCLINING TEST

Regulation 1

INTRODUCTION

1. This Chapter contains important detailed procedures for conducting an inclining test in order to ensure that valid results are obtained with maximum precision at a minimal cost to owners, shipyards and the Administration .A complete understanding of the correct procedures used to perform an inclining test is imperative in order to ensure that the test is conducted properly and so that results can be examined for accuracy as the inclining experiment is conducted.

2 Free surface and tankage

.01 If there are liquids on board the vessel when it is inclined, whether in the bilges or in the tanks, they will shift to the Iow side when the vessel heels. This shift of liquids will exaggerate the heel of the vessel. Unless the exact weight and distance of liquid shifted can be precisely calculated , the metacentric height (GM) calculated from the inclining test wilI be in error. Free surface should be minimized by emptying the tanks completely and making sure ail bilges are dry; or by completely filling the tanks so that no shift of liquid is possible. The latter method is not the optimum because air pockets are difficult to remove from between structural members of a tank, and the weight and centre of the liquid in a full tank should be accurately determined in order to adjust the lightship values accordingly. When tanks must be left slack, it is desirable that the sides of the tanks be parallel vertical planes and the tanks be regular in shape, (i.e. rectangular, trapezoidal, etc.) when viewed from above, so that the free surface moment of the liquid can be accurately determined.

Free surface correction is independent of the height of the tank in the vessel, location of the tank, and direction of heel. As the width of the tank increases, the value of free surface moment increases by the third power. The distance available for the liquid to shift is the predominant factor. This is why even the smallest amount of liquid in the bottom of a wide tank or bilge is normally unacceptable and should be removed prior to the inclining experiment. Insignificant amounts of liquids in V-shaped tanks or voids (e.g. a chain locker in the bow), where the potential shift is negligible, may remain if removal of the liquid would be difficult or would cause extensive delays.

When ballast water is used as inclining weight, the actual transverse and vertical movements of the liquid should be calculated taking into account the change of heel of the vessel. Free surface corrections as defined in this paragraph should not apply to the inclining tanks.

.02 Pressed up tanks - "Pressed up" means completely full with no voids caused by trim or inadequate venting. Anything less than 100% full, for example the 98% condition regarded as full for operational purposes, is not acceptable. Preferably, the vessel should be roiled from side to side to eliminate entrapped air before taking the final sounding. Special care should be taken when pressing fuel oil tanks to prevent accidental pollution.

.03 Empty tanks - It is generally not sufficient to simply pump tanks until suction is lost. Enter the tank after pumping to determine if final stripping with portable pumps or by hand is necessary.

The exceptions are very narrow tanks or tanks where there is a sharp deadrise, since free surface would be negligible. Since all empty tanks should be inspected, all manholes should be open and the tanks well ventilated and certified as safe for entry. A safe testing device should be on hand to test for sufficient oxygen and minimum toxic levels. A certified marine chemist's certificate certifying that all fuel oil and chemical tanks are safe for human entry should be available, if necessary.

2 Mooring arrangements

The importance of good mooring arrangements cannot be over-emphasized. The arrangement selections will be dependent upon many factors. Among the most important are depth of water, wind and current effects. Whenever possible, the vessel should be moored in a quiet, sheltered area free from extraneous forces such as propeller wash from passing vessels or sudden discharges from shore side pumps. The depth of water under the hull should be sufficient to ensure that the hull will be entirely free of the bottom. The tide conditions and the trim of the vessel during the test should be considered. Prior to the test, the depth of water should be measured and recorded-in as many locations to ensure the vessel will not contact the bottom. If marginal, the test should be conducted during high tide or the vessel moved to deeper water.

.01 The mooring arrangement should ensure that the vessel will be free to list without restraint for a sufficient period of time to allow a satisfactory reading of the heeling angle, due to each weight shift, to be recorded.

.02 The vessel should be held by lines at the bow and the stem, attached to bollards and/or cleats on the deck .If suitable restraint of the vessel cannot be achieved using deck fittings, then temporary padeyes should be attached as close as possible to the centreline of the vessel-and as near the waterline as practical. Where the vessel can be moored to one side only, it is good practice to supplement the bow and stern lines with two spring lines in order to maintain positive control of the vessel .The leads of the spring lines should be as long as practicable. Cylindrical camels should be provided between the vessel and the dock. All lines should be slack, with the vessel free of the pier and camels, when taking readings.

.01 If the vessel is held off the pier by the combined effect of the wind and current, a superimposed heeling moment will act on the vessel through the test. For steady conditions this will not affect the results. Gusty wind or uniformly varying wind and/or current will cause these superimposed heeling moments to change, which may require additional test points to obtain a valid test. The need for additional test points can be determined by plotting test points as they are obtained.

.02 If the vessel is pressed against the fenders by wind and/or current, all lines should be slack. The cylindrical camels will prevent binding but there will be an additional superimposed heeling moment due to the vessel bearing against the camels. This condition should be avoided where possible but, when used, consideration should be given to pulling the vessel free of the dock and camels and letting the vessel drift as readings are taken.

.03 Another acceptable arrangement is where the combined wind and current are such that the vessel may be controlled by only one line at either the bow or the stern. In this case, the control line should be led from on or near the centre line of the vessel with all lines but the control line slack, the vessel is free to veer with the wind and/or current as readings are taken. This can sometimes be troublesome because varying wind and/or current can cause distortion of the plot.

.03 The mooring arrangement should be submitted to the approval authority for review prior to the test.

.04 If a floating crane is used for handling inclining weights, it should not be moored to the vessel.

3. Test weights:

.01 Weights, such as porous concrete, that can absorb significant amounts of moisture, should only be used if they are weighed just prior to the inclining test or if recent weight certificates are presented. Each weight should be marked with an identification number and its weight. For small vessels, drums completely filled with water may be used. Drums should normally be full and capped to allow accurate weight control. In such cases, the weight of the drums should be verified in the presence of the Administration representative using a recently calibrated scale.

.02 Precautions should be taken to ensure that the decks are not overloaded during weight movements. If deck strength is questionable then a structural analysis should be performed to determine. If existing framing can support the weight.

.03 Generally the test weights should be positioned as far outboard as possible on the upper deck. The test weights should be on board and in place prior to the scheduled time of the inclining test.

4 Pendulums

.01 The pendulum should be long enough to give a measured deflection, to each side of upright, of at least 5 centimeters. Generally, this will require a pendulum length of at least 3 meters. It is recommended that pendulum lengths of 4-6 meters be used. Usually, the longer the pendulum the greater the accuracy of the test; however, if excessively long pendulums are used on a tender vessel the pendulums may not settle down and the accuracy of the pendulums would then be questionable. On large vessels with high GM, pendulum lengths in excess of the length recommended above may be required to obtain the minimum deflection. In such cases should be filled with high viscosity oil. If the pendulums are of different lengths, possibility of collusion between station recorders is avoided.

.02 On smaller vessels, where there is insufficient headroom to hang long pendulums, the 5 centimeters deflection should be obtained by increasing the test weight so as to increase the heel. On most vessels the typical inclination is between one and four degrees.

.03 The pendulum wire should be piano wire or other monofilament material. The top connection Of the pendulum should afford unrestricted rotation of the pivot point. An example is that of a washer with the pendulum wire attached suspended from a nail.

.04 A bough filled with a liquid should be provided to dampen oscillations of the pendulum after each weight movement.]t should be deep enough to prevent the-pendulum weight from touching the bottom. The use of a winged plumb bob at the end of the pendulum wire can also help to dampen the pendulum oscillations in the liquid.

.05 The battens should be smooth, light-coloured wood, 1 to 2 centimeters thick, and should be securely, fixed in position so that an inadvertent contact will not cause them to shift. The batten should be aligned close to the pendulum wire but not in contact with it.

.06 The pendulums may he placed in any location on the vessel, longitudinally and transversely. The pendulums should be in place prior to the scheduled time of the inclining test.

.07 It is recommended that inclinometers or other measuring devices only be used in conjunction with at least one pendulum. The Administration may approve an alternative arrangement when this is found impractical.

Regulation 2
EQUIPMENT REQUIRED

1 Besides the physical equipment necessary such as the inclining weights, pendulums, small boat, etc., the following are necessary and should be provided by or made available to the person in charge of the inclining:

.1 Engineering scales for measuring pendulum deflections (rules should be subdivided sufficiently to achieve the desired accuracy);

.2 Sharp pencils for marking pendulum deflections;

.3 Chalk for marking the various positions of the inclining weights;

.4 A sufficiently long measuring tape for measuring the movement of the weights and locating different items on board;

.5 A sufficiently long sounding tape for sounding tanks and taking freeboard readings;

.6 One or more well maintained specific gravity hydrometers with range sufficient to cover 0.999 to 1.030, to measure the specific gravity of the water in which the vessel is floating (a hydrometer for measuring specific gravity of less than 1.000 may be needed in some locations);

.7 Other hydrometers as necessary to measure the specific gravity of any liquids on board;

.8 Graph paper to plot inclining moments versus tangents;

.9 A straight edge to draw the measured waterline on the lines drawing;

.10 A pad of paper to record data;

.11 An explosion proof testing device to check for sufficient oxygen and absence of lethal gases in tanks and other closed spaces such as voids and cofferdams;

.12 A thermometer; and

.13 Draught tubes (if necessary).

Regulation 3

TEST PROCEDURE

1 The inclining experiment, the freeboard/draught readings and the survey may be conducted in any order and still achieve the same results. If the person conducting the inclining test is confident that the survey will show that the vessel is in an acceptable condition and there is the possibility of the weather becoming unfavorable, then it is suggested that the inclining be performed first and the survey last. If the person conducting the test is doubtful that the vessel is complete enough for the test, it is recommended that the survey be performed first since this could invalidate the entire test, regardless of the weather conditions. It is very important that all weights, the number of people on board, etc., remain constant throughout the test.

2 Initial walk through and survey

The person responsible for conducting the inclining test should arrive on board the vessel well in advance of the scheduled time of the test to ensure that the vessel is properly prepared for the test. If the vessel to be inclined is large, a preliminary walk through may need to be done the day preceding the actual incline. To ensure the safety of personnel conducting the walk through, and to improve the documentation of surveyed weights and deficiencies, at least two persons, should make the initial walk through. Things to check include: all compartments are open, dean, and dry, tanks are well ventilated and gas free, movable or suspended items are secured and their position documented, pendulums are in place, weights are on board and in place, a crane or other method for moving weights is available, and the necessary plans and equipment are available. Before beginning the inclining test, the person conducting the test should:

.01 Consider the weather conditions. The combined adverse effect of wind and current may result in difficulties or even an invalid test due to the following:

.1.1 Inability to accurately record freeboards and draughts;
.1.2 Excessive or irregular oscillations of the pendulums;
.1.3 Variation in unavoidable superimposed heeling moments.

In some instances, unless conditions can be sufficiently improved by moving the vessel to a better location, it may be necessary to delay or postpone the test. Any significant quantities of rain water should be removed from the vessel before the test.

.02 Make a quick overall survey of the vessel to make sure the vessel is complete enough to conduct the test and to ensure that all equipment is in place. An estimate of items which will be outstanding at the time of the inclining test should be included as part of any test procedure submitted to the Administration. This is required so that the Administration representative can advised the shipyard/naval architect if in their opinion the vessel will not be sufficiently complete to conduct the incline and that it should be rescheduled. If the condition of the vessel is not accurately depicted in the test procedure and at the time of the inclining test the Administration representative considers that the vessel is in such condition that an accurate incline cannot be conducted, the representative may refuse to accept the incline and require that the incline be conducted at a later date;

.03 Enter all empty tanks after it is determined that they are well ventilated and gas free to ensure that they are dry and free of debris. Ensure that any pressed up tanks are indeed full and free of air pockets. The anticipated liquid loading for the incline should be included in the procedure required to be submitted to the Administration;

.04 Survey the entire vessel to identify all items which need to be added to the vessel, removed from the vessel, or relocated on the vessel to bring the vessel to the lightship condition. Each item should be clearly identified by weight and vertical and longitudinal location. If necessary, the transverse location should also be recorded. The inclining weights, the pendulums, any temporary equipment, dunnage and the people on board during the inclining test are all among the weights to be removed to obtain the lightship condition. The person calculating the lightship characteristics from the data gathered during the incline and survey and/or the person reviewing the inclining test may not have been present during the test and should be able to determine the exact location of the items from the data recorded and the vessel's drawings. Any tanks containing liquids should be accurately sounded and the soundings recorded;

4.1 It is recognized that the weight of some items on board, or that are to be added, may have to be estimated. If this is necessary, it is in the best interest of safety to be on the safe side when estimating, so the following rules of thumb should be followed:

4.1.1 When estimating weights to be added:

- Estimate high for items to be added high in the vessel.
- Estimate low for items to be added low in the vessel.

4.1.2 When estimating weights to be removed:

- Estimate low for items to be removed from high in the vessel.
- Estimate high for items to be removed from low in the vessel.

4.1.3 When estimating weights to be relocated:

- Estimate high for items to be relocated to a higher point in the vessel.
- Estimate low for items to be relocated to a lower point in the vessel.

3 Freeboard/draught readings

1 Freeboard/draught readings should be taken to establish the position of the waterline in order to determine the displacement of the vessel at the time of the inclining test. It is recommended that at least five freeboard readings, approximately equally spaced, be taken on each side of the vessel or that all draught marks (forward, midship, and aft) be read on each side of the vessel. Draught mark readings should be taken to assist in determining the waterline defined by freeboard readings, or to verify the vertical location of draught marks on vessels where their location has not been. Confirmed .The locations for each freeboard reading should be dearly marked. The longitudinal location along the vessel should be accurately determined and recorded since the (moulded) depth at each point will be obtained from the vessel's lines. All freeboard measurements should include a reference note clarifying the inclusion of the coating in the measurement and the coaming height.

2 Draught and freeboard readings should be read immediately before or immediately after the inclining test. Weights should be on board and in place and all personnel who will be on board during the test including those who will be stationed to read the pendulums, should be on board and in location during these readings. This is particularly important on small vessels. If readings are made after the test, the vessel--should-be maintained in the same condition as during the test. For small vessels, it may be necessary to counterbalance the list and trim effects of the freeboard measuring party. When possible, readings should be taken from a small boat.

3 A small boat should be available to aid in the taking of freeboard and draught mark

readings. It should have low freeboard to permit accurate observation of the readings.

4 The specific gravity of the flotation water should be determined at this time. Samples should be taken from a sufficient depth of the water to ensure a true representation of the flotation water and not merely surface water, which could contain fresh water from run off of rain. A hydrometer should be placed in a water sample and the specific gravity read and recorded.

5 A draught mark reading may be substituted for a given freeboard reading at that longitudinal location if the height and location of the mark has been verified to be accurate by a keel survey while the was in dry dock.

6 The dimensions given on a vessel’s lines drawing are normally moulded dimensions. In the case of depth, this means the distance from the inside of the bottom shell to the inside of the deck plate. In order to plot the vessel's waterline on the lines drawing, the freeboard readings should be converted to moulded draughts. Similarly, the draught mark readings should be corrected from extreme (bottom of keel) to moulded (top of keel) before plotting, Any discrepancy between the freeboard/draught readings should be resolved.

7 The mean draught (average of port and starboard reading) should be calculated for each of the locations where freeboard/draught readings are taken and plotted the vessel's lines drawing or Outboard profile to ensure that all readings are consistent and together define the correct waterline. The resulting plot should yield either a straight line or a waterline which is either hogged or sagged. If inconsistent readings are obtained, the freeboards/draughts should be retaken.

4 The incline

1 Prior to any weight movements the following should be checked:

.01 The mooring arrangement should be checked to ensure that the vessel is floating freely.(This should be done just prior to each reading of the pendulums).

.02 The pendulums should be measured and their lengths recorded. The pendulums should be aligned so that when the vessel heels, the wire will be close enough to the batten to ensure an accurate reading but will not come into contact with the batten.

.03 The initial position of the weights is marked on the deck. This can be done by tracing the outline of the weights on the deck.

.04 The communications arrangement is adequate.

.05 All personnel are in place.

2 A plot should be run during the test to ensure that acceptable data is being obtained. Typically, the abscissa of the plot will be heeling moment (weight times distance) and the ordinate will be the tangent of the heel angle (deflection of the pendulum divided by the length of the pendulum). This plotted line does not necessarily pass through the origin or any other particular point for no single point is more significant than any other point. A linear regression analysis is often used to fit the straight line. The weight movements give a good spread of points on the test plot.

3 Plotting all of the readings for each of the pendulums during the inclining experiment aids in the discovery of bad readings, Since (W)(x)/tan q should be constant, the plotted line should be straight. Deviations from a straight line are an indication that there were other moments acting on the vessel during the inclining. These other moments should be identified, the cause corrected, and the weight movements repeated until a straight line is achieved. -Figures A- D illustrate examples of how to detect some of these other moments during the inclining, and a recommended solution for each case. For simplicity, only the average of the readings is shown on the inclining plots.

4 Once everything and everyone is in place, the zero position should be obtained and the remainder of the experiment conducted as quickly as possible, while maintaining accuracy and proper procedures, in order to minimize the possibility of a change in environmental conditions during the test.

5 Prior to each pendulum reading, each pendulum station should report to the control station when the pendulum has stopped swinging. Then, the control station will give a "standby" warning and then a “mark" command. When "mark" is given, the batten at each position should be marked at the location of the pendulum wire. If the wire was oscillating slightly, the centre of the oscillations should be taken as the mark. If any of the pendulum readers does not think the reading was a good one, the reader should advise the control station and the point should be retaken for all pendulum stations. Likewise, if the control station suspects the accuracy of a reading, it should be repeated for all the pendulum stations. Next to the mark on the batten should be written the number of the weight movement, such as zero for the initial-position and one through seven for the weight movements.

6 Each weight movement should be made in the same direction, normally transversely, so as not to change the trim of the vessel. Alter each weight movement, the distance the weight was moved (centre W centre) should be measured and the heeling moment calculated by multiplying the distance by the amount of weight, moved. The tangent is calculated for each pendulum by dividing the deflection by the length of the pendulum. The resultant tangents are plotted on the graph. Provided there is good agreement among the pendulums with regard to the tan q value, the average of the pendulum readings may be graphed instead of plotting each of the readings.

7 Inclining data sheets should be used so that no data is forgotten and so that the data is clear, concise, and consistent in form and format. Prior to departing the vessel, the person conducting the test and the Administration representative should initial each *data* sheet as an indication of their concurrence with the recorded data.

End of Chapter

PART C
MAIN AND AUXILLIARY MACHINERY REQUIREMENTS

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Section 1

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Chapter 1

General Requirements for the Design and Construction of Machinery

Contents

Section 1
General

1.1 Scope

1.1.1 The requirements of this Chapter and those given in Ch.2 to 10 apply to the construction and installation of main propulsion and auxiliary machinery systems, together with their associated equipment, boilers, pressure vessels and pumping and piping arrangements fitted in vessels intended to be classed with IRS.

1.2 Machinery to be constructed under survey

1 2.1 In vessels intended to be built under Special Survey, all important units of equipment are to be surveyed at the manufacturer's works. The workmanship is to be to the Surveyor's satisfaction and the Surveyor is to be satisfied that the components are suitable for the intended purpose and duty. Examples of such units are:

Main propulsion engines, including their associated gearing, flexible couplings, scavenge blowers and superchargers;

Boilers supplying steam for propulsion or for services essential for the safety or the operation of the vessel in the waterway including superheaters, economizers, desuperheaters, steam receivers. All other boilers having working pressures exceeding 3.5 bar, and having heating surfaces greater than 4.65 [m^2];

-Auxiliary engines of 110 [kW] (150 shp) and over which are the source of power for services essential for safely or for the operation of the vessel.

-Steering machinery;

-Athwartship thrust, units, their prime movers and control mechanisms;

-All pumps necessary for the safety of vessel, e.g. bilge, ballast, fire pumps, etc.;

-Air compressors, air receivers and other pressure vessels necessary for the operation of main propulsion and essential machinery.

-Alarm and control equipment as detailed in Ch.7; and

-Electrical equipment and electrical propelling machinery as detailed in Ch.8.

1.3 Extent of survey

1.3.1 The Surveyors are to examine and test the materials and workmanship from the commencement of work until the final test of the machinery under full power working conditions. Any defects, etc., are to be indicated as early as possible. On completion, the Surveyors will submit a report and, if this is found to be satisfactory by IRS, a certificate of class will be granted and an appropriate notation assigned in accordance with Pt. 1.

1.4 Departures from the rules

1.4.1 Where it is proposed to depart from the requirements of the Rules. classification society will be prepared to give due consideration to the circumstances of any special case.

1.5 Plans and particulars

1.5.1 Before the work is commenced, plans in triplicate of all machinery items, as detailed in the Ch.2 to 9 giving the requirements for individual systems, are to be submitted for approval. The particulars of the machinery, including power ratings and design calculations, where applicable necessary to verify the design, are also to be submitted. Any subsequent, modifications are subject to approval before being put in to operation.

1.5.2 The strength requirements for rotating parts of the machinery, as specified in Ch.4 to 8, are based upon strength consideration only and their application does not relieve the manufacturer from the responsibility for the presence of dangerous vibrations in the installation at speeds within the operating range.

1.6 Availability of machinery for operation

1.6.1 The design and arrangement is to be such that the machinery can be started and controlled on board vessel without external aid, so that operating conditions can be maintained under all circumstances.

1.7 Ambient reference conditions

1.7.1 The rating of the main and auxiliary machinery is to be suitable for the temperature conditions associated with the geographical limits of the restricted service.

1.7.2 Machinery installations are to be designed such as to ensure proper operations under the conditions as under:

- Permanent list of 10°
- Permanent trim of 5°

1.8 Power ratings

1.8.1 In the following Chapters, where the dimensions of any particular component are determined from shaft power, P in [kW] (H, in shp). and revolutions per minute, R. the values to be used are to be derived from the following:

-For main propelling machinery, the maximum shaft power and corresponding revolutions per minute giving the maximum torque for which the machinery is to be classed; and

-For auxiliary machinery, the maximum continuous shaft power and corresponding revolutions per minute which will be used in service.

1.9 Units

1.9.1 Units and formulae included in the Rules are shown in SI units followed by metric units in brackets where appropriate.-

1.9.2 Where the metric version of shaft power, i.e. (shp), appears in the Rules, 1 shp is equivalent to 75 [kgf metre/sec] or 0.735 [kW].

1.9.3 Pressure gauges may be calibrated in bar.

Where I bar = 0.1 [N/mm^2] = 1.02 [kgf/cm^2]

1.10 Power conditions for generator sets

1 10.1 Auxiliary engines coupled to electrical generators are to be capable under service conditions of developing continuously the power to drive the generators at full rated output and, if developing for a short period (15 minutes) an overload power of not less than 10 per cent.

1.10.2 Engine builders are to satisfy the Surveyors by tests on individual engines that the above requirements, as applicable, can be complied with, due account being taken of the deference between the temperature under test conditions and those specified in 1.7.1. Alternatively, where it is not practicable to test the engine/generator set as a unit, type tests (e.g. against a brake) representing a particular size and range of engines may be accepted. With oil engines any fuel stop fitted is to be set to permit the short period overload power of not less than 10 per cent above full, rated output being developed.

1.11 Fuel

1.11.1 The flash point (closed cup test) of oil fuel is to be not less than 55°C, unless specially approved.

1.11.2 Fuels with flash points lower than 55°C, but not less than 43°C, unless specially approved, may be used in vessels, intended for service restricted to certain geographical limits, where it can be ensured that the temperature of the machinery spaces will always be 10°C below the flash point of the fuel. In such cases, safety precautions and the arrangements for storage and pumping will be specially considered.

1.12 Astern power

1.12.1 Sufficient astern power is to be provided to maintain control of the vessel in all normal circumstances.

Section 2
Machinery Room Arrangements

2.1 General

2.1.1 The machinery is to be so designed installed and protected that risks of fire, explosions, accidental pollution, leakages and accidents thereof, and accidents to personnel working in machinery spaces will be minimised.

2.1.2 The design and arrangement of machinery foundations, shaft connections, piping and ducting is to take into account the effects of thermal expansion, vibrations, mis-alignment and hull interaction to ensure operation within safe limits. Bolts and nuts exposed to dynamic forces and vibrations are to be properly secured.

2.2 Accessibility

2.2.1 Accessibility for attendance and maintenance purposes, is to be provided for machinery plants.

2.3 Fire protection

2.3.1 All surfaces of machinery where the surface temperature may exceed 220°C and where impingement of flammable liquids may occur are to be effectively shielded to prevent ignition. Where insulation covering these surfaces is oil absorbing or may permit penetration of oil, the insulation is to be encased in steel or equivalent.

2.3.2 Flammable or oil absorbing materials are not to be used in floors, gratings, etc. in boiler and engine rooms, shaft tunnels or in compartments where settling tanks are installed.

2.4 Ventilation

2.4.1 All spaces, including engine and cargo pump spaces, where flammable or toxic gases or vapours may accumulate, are to be provided with adequate ventilation under all conditions.

2.5 Communications

2.5.1 At least one independent means of communication is to be provided between the bridge and engine room control station.

Section 3
Trials

3.1 General

3.1.1 Tests of components and trials of machinery, as detailed in the Chapters giving the requirementts for individual systems *are* to be carried out to the satisfaction of the Surveyors.

3.2 Trials

3.2.1 For all types of installations, the trials are to be of sufficient duration, and carried out under normal maneuvering conditions, to prove the, machinery under power. The trials *are* also to demonstrate that any vibration which may occur within the operating speed range is acceptable

3.2.2 The trials are to include demonstrations of the following:

-The adequacy of the starting arrangements to provide the required number of starts of the *main* engines:

-The ability of the machinery to reverse the direction of thrust of the propeller in sufficient time, under normal maneuvering conditions, and so bring the-vessel to rest from maximum ahead rated speeds.

3.2.3. Where controllable pitch propellers are fitted, *the* free route astern trial is to be carried out with the propeller blades set in full pitch astern position. Where emergency manual pitch setting facilities are provided, their operation is to be demonstrated to the satisfaction of the Surveyors.

3.2.4 All trials are to be to Surveyor's satisfaction.

Section 4

Certification of Machinery and Components based upon Quality Management Systems

4.1 General

4.1.1 This certification scheme is applicable to works where the employment of quality control procedures is well established. Classification society will have to be satisfied that the practices employed will ensure that the quality of finished products is to the standards which would be demanded when using traditional survey procedures.

4.1.2 Classification society will consider proposed designs for compliance with the Rules, or other appropriate requirements, and-the extent to which the manufacturing processes and control procedures ensure conformity of the product to the design. A comprehensive survey will be made by the Surveyors of the actual operation of the quality control programme and of the adequacy and competence of the staff to implement it.

4.1.3 Where classification society considers that the requirements of 4.1.2 can be satisfactorily compiled with, the manufacturers will, in general, be approved and authorized to inspect and certify their products.

4.1.4 The procedures and practices of manufacture which have been granted approval will be kept under continuous review.

4.1.5 Approval by another organization will not normally be acceptable as sufficient evidence that a manufacturer's arrangements comply with class requirements.

4.2 Requirements for approval

4.2.1 The manufacturer is required to have adequate equipment and facilities for those operations appropriate to the level of design, development and manufacture being undertaken.

4.2.2 The manufacturer shall demonstrate that the firm has experience consistent with technology and complexity of the product for which approval is sought and that firm's products have been of a consistently high standard.

4.2.3 The manufacturer should have implemented quality management systems generally in accordance with the ISO 9000 series of standards.

4.2.4 The manufacturer shall establish and maintain procedures and controls to ensure that class requirements for certification of materials and components at sub-contractor's works are complied with.

4.3 Information required for approval

4.3.1 Manufacturers applying for approval under this scheme are to submit the following information:

-Description of the products for which certification is required including, where applicable, model or type number;

-Applicable plans and details of materials used;

-An outline description of all important manufacturing plant and equipment;

-A summary of equipment used for measuring and testing during manufacturing and completion;

-The quality manual;

-The system used for identification and traceability;

-Number and qualification of personnel engaged in quality control and quality assurance and

-A list of suppliers of materials and components and proposed arrangements to ensure compliance with the requirements for certification.

4.4 Approval and maintenance of approval

4.4.1 After receipt and appraisal of the information required by 4.3, an assessment of the Works would be carried out by the Surveyors to ensure Compliance with the quality manual

4.4.2 If the initial assessment of the Works confirms that the implementation of the quality management systems is satisfactory, department will issue to the manufacturer a Quality Assurance Approval Certificate which will include details of the products for which approval, has been given.

4.4.3 An extension of approval in respect of product type may be given at the discretion of chief surveyor without any additional assessment.

4.4.4 The certificate will be valid for 3 years subject to surveillance assessments being carried out e very 6 months.

4.4.5 When significant faults or deficiencies are found during surveillance assessments or surveillance assessments are not carried out, the certificate of approval may be withdrawn/suspended at the discretion of chief surveyor.

End of Chapter

Chapter 2
Piping Design Requirements

Contents

Section

Section 1
General

1.1 Scope

1,1,1 The requirements of this Chapter apply to the design and construction of piping systems, including pipe fittings forming parts of such systems but excluding steam piping Systems and systems where the temperature exceeds 300°C.

1.1.2 For steam piping systems and systems having temperatures greater than 300°C, the Rules and Regulations for the Construction & Classification of Steel Vessels will be applicable.

1.1 Classes of pipes

1.2.1 For the purpose of testing, type of joints to be adopted heat treatment and welding procedure, piping systems are divided into three classes, as given in Table 1.2 1,

1.2-2 For Class I piping, the *Rules and Regulation s for the Construction & Classification of Steel Vessels* will be applicable,

1.2.3 In addition to the pressure piping systems in Table 1.2.1. Class lll pipes may be used for open ended piping, e.g. overflows, vents, boiler waste steam pipes, open ended drains etc.

1.3 Design pressure

1.3.1 The design pressure, P, is the maximum permissible working pressure and is to be not less than the highest set pressure of the safety valve or relief *valve.*

1.3.2 The design pressure of feed piping and other piping on the discharge from pumps is to be taken as the pump pressure at full rated speed against a shut valve. Where a safety valve or other protective device is fitted to restrict the pressure to a lower value than the shut valve load, the design pressure is to be the highest set pressure of the protective device.

Table 1.2.1 : Classes of piping systems			
Piping system	Class I	Class II	Class III
Fuel oil	P> 16 or T > 150	P -< 16 and T -< 150	P -< 7 and T -< 60
Other media	P > 49 or T > 300	P -< 40 and T -< 300	P -< 16 and T -< 200

1.4 Design temperature

1.4.1 The design temperature is to be taken as the maximum temperature of the internal fluid, but in no case is it to be less than 50°C.

1.5 Design symbols

1.5.1 The symbols used in this Chapter are defined as follows:

a = percentage negative manufacturing tolerance on thickness;

b = bending allowance [mm];

c = corrosion allowance[mm];

D = outside diameter of pipe [mm] (see 1.5.2);

d = inside diameter of pipe [mm] (see 1-5.3);

e = weld efficiency factor (see 1.5.4);

P = design pressure, in [N/mm^2];

Pt = hydraulic test pressure, in IN/mm^2];

R = radius of curvature of a pipe bend at the centreline of the pipe [mm};

T = design temperature, in C^o;

t = the minimum thickness of a straight pipe [mm] including corrosion allowance and negative tolerance, where applicable;

t_b = the minimum thickness of a straight pipe to be used for a pipe bend [mm] including bending allowance, corrosion allowance and negative tolerance, where applicable;

σ= maximum permissible design stress, in [N/mm^2].

1.5.2 The outside diameter, D, is subject to manufacturing tolerance, but these are not to be used in the evaluation of formulae.

1.5.3 The inside diameter d, is not to be confused with nominal size, which is an accepted designation associated with outside diameters of standard rolling sizes.

1.5.4 The weld efficiency factor e, is to be taken as1.0 for seamless and electric resistance and induction welded steel pipes. Where other methods of pipe manufacture are proposed, the Value of e will be specially considered.

1.6 Heat treatment

1.6.1 Method of heat treatment and means of temperature control and recording are to be to ehe satisfaction of Surveyors.

Section 2

Carbon and Low Alloy Steel Pipes and Fittings

2.1 Materials

2.1.1 Materials for Class I and Class II piping systems, also for vessel-side valves and fittings and valves on the collision bulkhead, are to be manufactured and tested in accordance with the appropriate *requirements* of *Ch8. Pt.2. 'Inspection and Testing of Materials. of Rules & Regulations for the Construction and Classification of Steel* Vessels

2.1.2 Materials for Class lll piping systems may be manufactured and tested in accordance with the requirements of acceptable national international specifications. Pipes having forge welded longitudinal seams are not to be used for oil fuel systems, for heating coils in oil tanks, or for pressures exceeding 0.4 [N/mm^2]. The manufacturer's test certificate will be acceptable and is to be provided for each consignment of material.

2.2 Minimum thickness of steel pipes and bends

2.2.1 The maximum permissible design stress, σ is to be taken as the lowest of the following values :-

$$\sigma = \frac{Et}{1.6} \quad \text{or} \quad \sigma = \frac{R_{20}}{2.7} \quad \text{or} \quad \sigma = \frac{S_R}{1.6}$$

Where

Et= specified minimum lower yield or 0.2 per cent proof stress at the design temperature.

R_{20}= specified minimum tensile strength at ambient temperature.

S_R = average stress to produce rupture in 100.000 hours at the design temperature.

2.2.1 : Carbon and carbon-manganese steel pies : Maximum permissible stress [N/mm^2]					
Design temp. ^{o}C	**Specified minimum tensile strength [N/mm^2]**				
	320	360	410	460	490
50	107	120	136	151	160
100	105	117	131	146	156
150	99	110	124	139	148
200	92	103	117	132	141
250	78	91	106	122	131
300	62	76	93	111	121

2.2.2 The maximum thickness, t, of straight steel pipes is to be determined by the following formula :-

t = $\left(\frac{PD}{2\sigma e+P} + c\right)\frac{100}{100-a}$ [mm]

where,

P, D, e and a are defined in Sec. 1, Cl. 1.5.1

σ is defined in 2.2.1 and also obtained from Tables 2.2.1.

c is obtained from Table 2.2.2.

Table 2.2.2 : Values of c for steel pipes	
Piping service	**C [mm] (See Note)**
Compressed air systems	1.0
Hydraulic/Lubricating oil systems	0.3
Fuel oil systems	1.0
Cargo oil systems	2.0
Refrigerating plants	0.3
Fresh water systems	0.8
Note: For pipes passing through tanks an additional corrosion allowance is to be considered according to the figures given in Table and depending upon the external medium in order to account for the external corrosion.	

2.2.3 The minimum thickness, t_o, of a straight steel pipe to be used for a pipe bend is to be determined by the following formula, except where it can be demonstrated that the use of a thickness less than t_b would not reduce the thickness below 't' at any point after bending :-

$$t_b = \left(\frac{PD}{200\sigma e + P} + b + c\right)\frac{100}{100 - a} \text{ [mm]}$$

where,

P, D, R, e, b and a are defined in Sec. 1, C1.1.5.1;

σ and c are defined in tables 2.2.1 and 2.2.2 respectively;

$$b = \frac{D}{2.5R}\left(\frac{PD}{2\sigma e + P}\right) \text{ [mm]}$$

In general R not to be less than 3D

2.2.4 The minimum thickness calculated in accordance with 2.2.2 and 2.2.3 is not to be less than that given in Table 2.2.4. Where the pipes are efficiently protected against corrosion, the thickness may be reduced by not more than 1.0 [mm]. For threaded pipes, where permitted, the thickness is to be measured at the bottom of the threads.

Table 2.2.4 : Minimum pipe thicknesses, t [mm] (see note)		
External diameter D [mm].	Pipes in general	Venting overflow & sounding pipes for structural tanks
10.2-12	1.6	-
13.5-19.3	1.8	-
20	2	
21.3-25	2	-
26.9 - 33.7	2	-
38-44.5	2	4.5
48.3	2.3	4 5
51 -63.5	2.3	4.5
70	2.6	4.5
76.1 -82.5	2.6	4.5
88.9 -108	2.9	4.5
114.3-127	3.2	4 5
133-139.7	3.6	4 5
152.4-168.3	4	4.5
177.8	4.5	5
193.7	4.5	5.4
219.1	4.5	5.9

244.5-273	5	6.3
298.5-368	5.6	6.3
406.4-457.2	6.3	6.3

2.3 Flange connections

2.3.1 Flanges with their pressure-temperature ratings in accordance with recognized national/international standards will normally be accepted.

2 3.2 Flanges may be cut from plates or may be forged or cast. The material is to be suitable for the design temperature. Flanges may be attached to the branches by screwing and expanding or by welding. Alternative methods of flange attachment may be accepted provided details are submitted for consideration.

2.3.3 Examples of accepted flanged connections and their uses are given in Fig. 2.3.1 and Table 2 3.1 respectively.

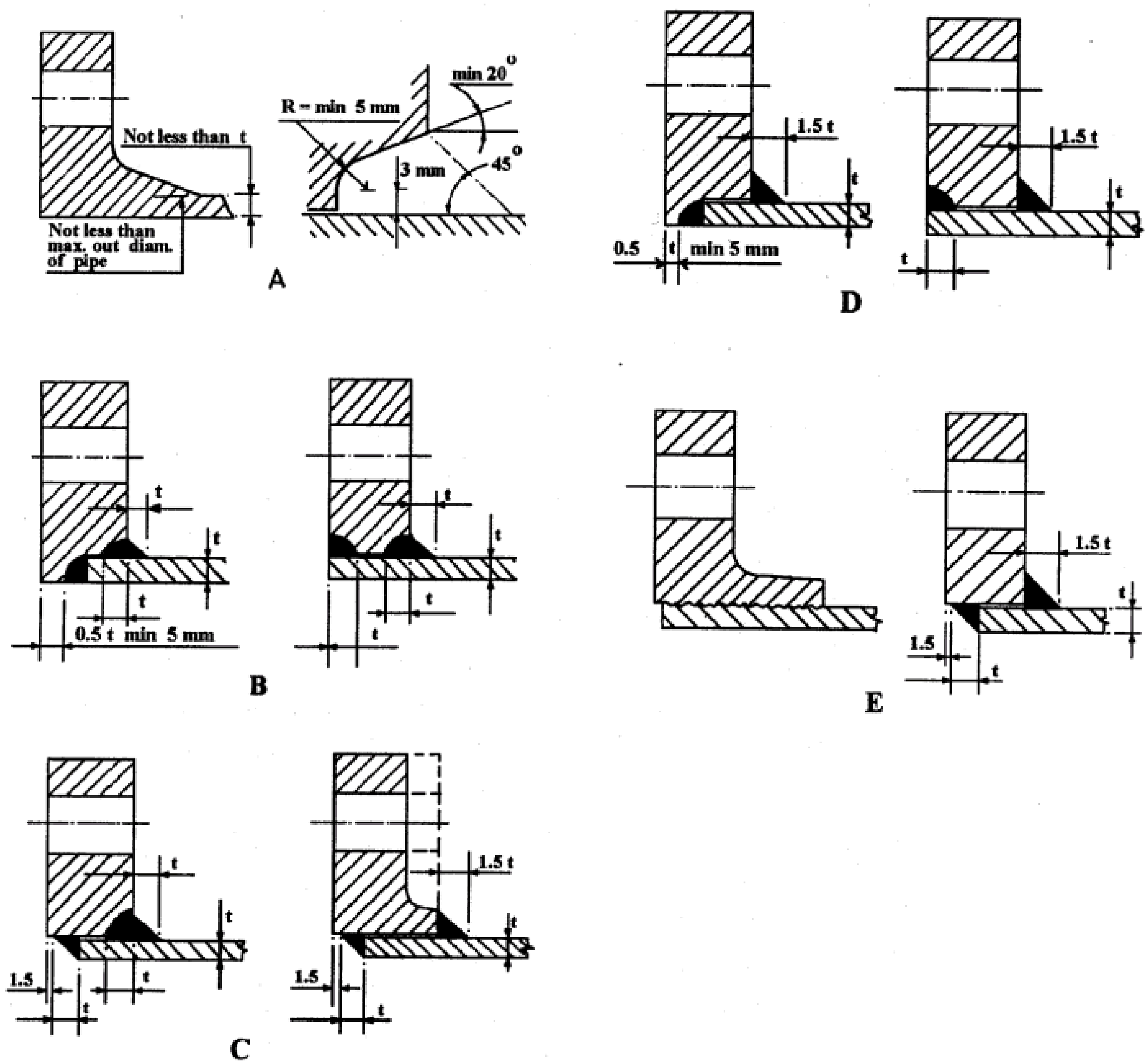

Fig. 2.3.1

Table 2.3.1 : Type of flange connections

Class of piping	Lub. and fuel oil	Other media	
	Typical flange application	t°C	Typical flange application
II	A-B-C	> 250 ≤ 250	ABC A-B-C-D-E
III	A-B-C-E		A-B-C-D-E

2.3.4 Where flanges are secured by screwing, as indicated in Fig.2.3-1. the pipe and flange are to be screwed with a vanishing thread and the diameter of the screwed position of pipe over the thread is not to be appreciably less than the outside diameters of the unscrewed pipe. After the flange has been screwed hard home, the pipe is to be expanded into the flange. The vanishing thread on a pipe is to be not less than three pitches in length, and the diameter at the root of the thread is to increase uniformly from the standard root diameter to the diameter at the top of the thread. This may be produced by suitably grinding the dies, and the flange should be tapered out to the same formation

2.4 Threaded sleeve joints

2.4.1 Threaded sleeve joints, in accordance with national or other established standards, may be used with carbon steel pipes within the limits given in Table 2.4.1 and for services other than pipe systems conveying combustible fluids.

Table 2.4.1 : Limiting design conditions for threaded sleeve joints

Nominal bore [mm]	Maximum pressure [N/mm^2]	Maximum temperature °c
=<25	1.2	260
> 25 =< 40	1.0	260
> 40 =< 80	0.85	260
>80=<100	0.7	260

2.5 Non-destructive examination of welded pipes.

2.5.1 In addition to visual examination of pipe welds by the Surveyors, non-destructive examination of butt and fillet welds is to be carried out in accordance with 2.5.2 to 2.5.4 to the satisfaction of the Surveyors.

2.5.2 Selected butt welds of pipes of outside diameter of 101.6 [mm] and over in Class II piping systems are to be radiographed at Surveyor's discretion. Use of ultrasonic examination in lieu of radiography will be specially considered.

2.5.3 Selected fillet welds in pipes of 101.6 [mm] outside diameter and over in Class II piping systems are to be examined by magnetic particle or liquid penetrant flaw testing at Surveyor's discretion.

2.5.4 Defects in welds are to be rectified and re- examined by the appropriate test method, all to the satisfaction of the Surveyors.

2.6 Post-weld heat treatment

2.6.1 Carbon and carbon-manganese steel pipes and fabricated branch pieces, manufactured from material having a carbon content not exceeding 0.25 per cent and having a thickness exceeding 30 [mm], are to be given a stress relieving heat treatment on completion of welding. All pipes and branches having carbon content in excess of 0.25 per cent are to be given a stress relieving heat treatment. Where oxy-acetylene welding has been employed, however, all the pipes and branch pieces are to be normalized on completion of welding.

Section 3
Copper and Copper Alloys Pipes and Fittings

3.1 Materials

3.1.1 Materials for Class II piping systems and shipside valves and fittings and valves on the collision bulkhead are to be manufactured and tested in accordance with the requirements of Ch 8. Pt 2, Inspection and Testing of Materials, of Rules & Regulations for the Construction and Classification of Steel Vessels.

3.1.2 Materials for Class III piping systems are to be manufactured and tested in accordance with the requirements of acceptable national/international specifications. The manufacturer's test certificate will be acceptable and is to be provided for each consignment of material.

3.1.3 Pipes are to be seamless and branches are to be provided by cast or stamped fittings, pipe pressings or other approved fabrications.

3.1.4 Brazing and welding materials are to be suitable for the operating temperature and for the medium being carried. Alt brazing and welding are to be carried out to the satisfaction of the Surveyors.

3.1.5 In general, the maximum permissible service temperature of copper and copper alloy pipes, valves and fittings is not to exceed 200°C for copper and aluminium brass, and 300°C for copper nickel. Cast bronze valves and fittings complying with the requirements of Ch.8, Pt.2, Inspection and Testing of Materials, of Rules & Regulations for the Construction and Classification of Steel Vessels may be accepted up to 260°C.

3 2 Minimum thickness of pipes

3.2.1 The minimum thickness, t, of straight copper and copper alloy pipes is to be determined by the following formula :-

$$t = \left(\frac{PD}{200\sigma e + P} + c\right)\frac{100}{100 - a} \text{ [mm]}$$

where P. D and a are as defined in Sec.1, Cl 1.5.1

σ = maximum permissible design stress, in [N/mm^2]. from Table 3.2.1; Intermediate values of stresses may be obtained by linear interpolation;

c = corrosion allowance;

= 0.8 [mm] for copper, aluminium brass and copper-nickel alloys where the nickel content is less than 10 per cent;

= 0.5 [mm] for copper-nickel alloys where the nickel content is 10 per cent or greater.

= 0 where the media are non-corrosive relative to the pipe material.

Table 3.2.1 : Copper and copper alloy pipes

Pipe material	Condition of supply	Specified d min.tensile strength [N/mm^2]	Permissible stress [N/mm^2]					
			Maximum design temperature °C					
			50	75	100	125	150	175
Copper	Annealed	220	41.2	41.2	40.2	40.2	34.3	27.5
Aluminium brass	Annealed	320	78.5	78.5	78.5	78.5	78.5	51.0
90/10 copper nickel iron	Annealed	270	68.6	68.6	67.7	65.7	63.7	61.8
70/30 copper nickel	Annealed	360	81.4	79.4	77.5	75.5	73.5	71.6
			Maximum design temperature °C					
			200	225	250	275	300	
Copper	Annealed	220	18.6	-	-	-	-	
Aluminium brass	Annealed	320	24.5	-	-	-	-	
90/10 copper nickel iron	Annealed	270	58 8	55.9	52.0	48.1	44.1	
70/30 copper nickel	Annealed	360	69.6	67.7	65.7	63.7	61.8	

3.2.2 The minimum thickness, t_b. of a straight seamless copper or copper alloy pipe to be used for a pipe bend is to be determined by the formula below, except where it can be demonstrated that the use of a thickness less than t_b would not reduce the thickness below 't' at any point after bending :

$$t_b = \left(\frac{PD}{200\sigma e + P} + b + c\right)\frac{100}{100 - a} \text{ [mm]}$$

where P, D, b and c are defined in sec. 1 Cl.1.5.1, and e and c are defined in 3.2.1

$$b = \frac{D}{2.5R}\left(\frac{PD}{2\sigma e + P}\right)\text{[mm]}$$

In general, R is to be not less than 3D.

Table 3.2.2: Limiting design conditions for threaded sleeve joints.		
Standard pipe sizes (outside diameter) [mm]	Minimum overriding nominal thickness [mm]	
	Copper	Copper alloy
8 to 10	1.0	0.8
12 to 20	1.2	1.0
25 to 44.5	1.5	1.2
50 to 76.1	2.0	1.5
88.9 to 108	2.5	2.0
133 to 159	3.0	2.5
193.7 to 267	3.5	3.0
273 to 457.2	4.0	3.5
508	4.5	4.0

3.2.3 Where the minimum thickness calculated by 3.2.1 or 3.2.2 is less than shown in Table 3.2.2. the minimum nominal thickness for the appropriate standard pipe size shown in the Table is to be used. No allowance is required for negative tolerance or reduction in thickness due to bending on this nominal thickness. For threaded pipes, where permitted, the minimum thickness is to be measured at the bottom of the thread.

3.3 Heat treatment

3.3.1 Pipes which have been hardened by cold bending are to be suitably heat treated on completion of fabrication and prior to being tested by hydraulic pressure. Copper pipes are to be annealed and copper alloy pipes are to be either annealed or stress relief heat treated.

Section 4

Cast Iron Pipes and Fittings

4.1 Spheroidal or nodular graphite cast iron

4.1.1 Spheroidal or nodular graphite iron castings for pipes, valves and fittings in Class II and III piping systems are to be made in a grade having a specified minimum elongation not less than 12 per cent on gauge length of $5.65\sqrt{So}$, where So is the actual cross-sectional area of the test piece.

4.1.2 Castings for Class II and III systems, also for shipside valves and fittings and valves on collision bulkhead, are to be manufactured and tested in accordance with the requirements of acceptable national specifications. A manufacturer's test certificate will be accepted and is to be provided for each consignment of material.

4.1.3 Where the elongation is less than the minimum required by 4.1.1. the material is, in general, to be subject to the same limitations as grey cast iron.

4.2 Grey cast iron

4.2 1 Grey cast iron pipes, valves and fittings will, in general, be accepted in Class III piping systems except as stated in 4.2.2.

4 2.2 Grey cast iron is not to be used for the following:

a) Pipes for steam systems and fire extinguishing systems;

b) Pipes, valves and fittings for boiler blow down systems and other piping systems subject to shock or vibration;

c) Shipside valves and fittings;

d) Valves fitted on collision bulkhead;

e) Clean ballast lines through cargo oil tanks to forward ballast tanks;

f) Bilge lines in tanks;

g) Outlet valves of fuel tanks with static head.

4.2.3 Grey iron castings for piping systems are to comply with acceptable national/international specifications.

Section 5
Plastic Pipes

5.1 General

5.1.1 Proposals to use plastics material in shipboard piping systems will be considered in relation to the properties of the materials, the operating conditions of temperature and pressure, and the intended service. Any proposed service for plastic pipes not mentioned in these Rules is to be submitted for special consideration.

5.1.2 The specification of the plastics material including mechanical and thermal properties and chemical resistance data, is to be submitted for consideration.

5.1.3 These requirements are applicable to thermo-plastic pipes but, where appropriate, may also be applied to pipes manufactured in fibre-reinforced thermosetting resins.

5.1 4 Plastics pipes are not to be used where they will be subjected to temperatures above 60°C or below 0°C Special consideration will be given to particular material in appropriate applications at higher temperatures.

5.2 Applications

5.2.1 Plastics pipes of approved type may be used for the following services:

a)Air and sounding pipes to tanks used exclusively for carrying water ballast or fresh water, with the exception of the portion above deck;
b)Sounding pipes to cargo holds;
c)Water ballast and fresh water pipes situated inside tanks used exclusively for carrying water ballast or fresh water; and
d) Scupper pipes draining inboard provided they are not led within the boundaries of refrigerated chambers. The first two items (a and b) are not applicable to passenger vessels.

5.2 2 Plastics pipes may be used for domestic and similar services for which there are no Rule requirements, such as for the following:

a) Domestic cold sea and freshwater systems;
b) Sanitary systems;
c) Sanitary and domestic waste pipes wholly, situated above the freeboard deck; and
d) Water pipes associated with air conditioning plants.

Not withstanding the foregoing, plastics pipes are not to be used in sea water systems where leakage or failure of the pipes could give rise to the danger of flooding.

5.2.3 Since plastics materials are generally heat sensitive and very susceptible to fire damage, plastics pipes will not be acceptable for service essential to safety, such as the following:

a) Fire extinguishing pipes;
b) Bilge pipes in cargo holds;
c) Bilge and ballast pipes in the machinery space;
d) Main and auxiliary water circulating pipes;
e) Feed and condensate pipes; and
f) Pipes carrying-oil or other flammable liquids,

5.3 Intactness of bulkheads and decks

5.3.1 Where plastics pipes are arranged to pass through watertight or fire resisting bulkheads or decks, provision is to be made for maintaining the integrity of the bulkhead or deck in the event of pipe failure. Details of the arrangements are to be submitted for approval.

5.4 Design and construction

5.4.1 Pipes and fittings are to be of robust construction and are to comply with the requirements of such national/international standards as may be consistent with their intended use. Particulars of scantlings and joints are to be submitted for consideration.

5.4.2 All-pipes are to be adequately but freely supported. Suitable provision for expansion and contraction to be made in each range of pipes to allow for large movements between plastics pipe and steel structure, the coefficient of thermal expansion for plastics being eight or more times that of steel.

5.4.3 All fittings and branches are to be suitable for the intended service and are to have joints of cemented, flanged or other approved types.

5.4.4 The strength of the pipes and fittings and the acceptability of any jointing system employed is to be check tested at the Surveyor's discretion. The strength of pipes, fittings, joints between pipes and joints between pipes and fittings, as appropriate, is to be determined by hydraulic pressure tests to destruction of sample assemblies. The pressure is to be so applied that failure of the test sample assembly occurs in not less than 5 minutes. Deformation of the pipes and fittings during tests is acceptable.

Section 6
Flexible Hoses

6.1 General

6.1.1 Short joining lengths of flexible hoses of approved type may be used, where necessary to accommodate relative movement between various items of machinery connected to permanent piping systems.

6.1.2 For the purpose of approval for the applications in 6.2, details of the materials and construction of the hoses, and the method of attaching the end fittings, are to be submitted for consideration.

6.1.3 In general, the use of hose clips as a means of securing the ends of hoses is to be restricted to the engine cooling water system, where the hose consists of a short straight length joining two metal pipes, between two fixed points on the engine.

6.1.4 Prototype pressure tests are to be carried out on each new type of hose, complete with end fittings and in no case is-the bursting pressure to be less than five times the maximum working pressure in service.

6.1.5 Attention is to be given to any statutory requirements of the National Authority of the country in which the vessel is to be registered. Such requirements may include a fire test for hoses that are intended to be used in systems conveying flammable fluids or sea water.

6.2 Applications

6.2.1 Synthetic rubber hoses, with integral cotton or similar braid reinforcement, may be used in fresh and sea water cooling systems. In the case of sea water systems, where failure of the hoses could give rise to the danger of flooding, the hoses are to be suitably enclosed.

6.2.2 Synthetic rubber hoses, with single or double-closely woven integral wire braid reinforcement or convoluted metal pipes with wire braid protection, may be used in bilge. ballast, compressed air, fresh water, sea water, fuel oil and lubricating oil systems. Where synthetic rubber hoses are used for fuel oil supply to burners, the hoses are to have external wire braid protection in addition to the integral wire braid.

Section 7
Hydraulic Tests on Pipes and Fittings

7.1 Hydraulic tests before installation on board

7.1.1 All Class ll pipes and their associated fittings are to be tested by hydraulic pressure to the Surveyors satisfaction. Further, all steam feed, compressed air and fuel oil pipes, together with their fittings, are to be similarly tested where the design pressure is greater than 0.35 [N/mm2]. The test is to be carried out after completion of manufacture and before installation on board and where applicable before insulating and coating.

7.1.2 The test pressure is to be 1.5 time design pressure.

7.1.3 All valve bodies are to be tested by hydraulic pressure to 1.5 times the nominal pressure rating at ambient temperature.However, the test pressure need not be more than 7 [N/mm2] above the design pressure specified for the design temperature.

7.2 Testing after assembly on board

7.2.1 Heating coils in tanks and fuel oil piping are to be tested by hydraulic pressure, after installation on board, to 1.5 times the design pressure but in no case to less than 0.35 [N/mm2].

7.2.2 Where bilge pipes are accepted in way of double bottom tanks or deep tanks, the pipes after fitting are to be tested by hydraulic pressure to the same pressure as the tanks through which they pass.

End of Chapter

Chapter 3

Pumping and piping

Contents

Section

Section 1
General

1.1 Scope

1.1.1 The requirements of this chapter are applicable to all vessels excepts where otherwise stated.

1.1.2 Piping systems layouts. For which no requirements are given herein. Will be specially considered.

1.2 Plans

1.2.1 The following plans in diagrammatic form are to submitted for consideration before proceeding with the work.

a) General arrangement of pumps and piping systems;
b) Fuel oil filling, transfer and service piping systems;
c) Bilge and ballast piping systems;
e) Liquid cargo pumping systems;
f) Hydraulic power piping systems for essential services;
g) Compressed air piping systems;
h) Steering gear piping systems;
i) Sea water and fresh water service piping systems;
j) Air and sounding piping systems;
k) Steam and feed water piping systems
l) Sanitary piping systems;

m) Fire main and fire extinguishing piping

1.2.2 The plans are to include the information like, wall thickness, maximum working pressure temperature and material of all pipes and type, size and material of the valve fittings

1.3 Materials

1.3.1 The materials to be used in piping systems are to be suitable for the service intended. In general, except, where otherwise stated, pipes, valves and fittings are to be made of Steel, cast iron, copper, alloy or other approved material.

1.3.2 Cast iron is not to be used for:

a) Shipside and collision bulkhead fittings;
b) Outlet valves of fuel tanks with static head;
c) Bilge and ballast lines passing through double bottom tanks, pipe tunnel and cargo oil tanks;
d) Any piping which can be subjected to shock such as water hammer.

1.3.3 Materials sensitive to heat such as aluminium, lead or plastics, are not to be used in systems essential to the safe operation of the vessel.

1.4 Design Pressure

1.4.1 The design pressure is considered to be, the most severe condition of co-incident pressure and temperature excepted in normal operation. For this purpose the maximum difference in pressure between inside and outside of the part is to be considered.

1.5 Design temperature

1.5.1 Unless otherwise specified the temperature used in design is to be not less than the mean metal temperature (through the thickness) excepted under operating conditions for the part considered.

1.5.2 When sudden cyclic changes in temperature are apt to occur in normal operation with only minor pressure fluctuations, the design is to be governed by the highest probable operating temperature and corresponding pressure.

1.6. Redundancy

1.6.1 Redundancy is the ability of a system or a component thereof to maintain or restore its function when one failure has occurred. This can be achieved for instance by installation of more units or alternative means for performing the function.

1.7 Valves and cocks

1.7.1 All the valves and cocks are to be so designed and constructed so that the valve covers or glands will not slacken up when the valves are operated.

1.7.2 All the valves are to be designed to close with right hand (clockwise when facing the end of the stem) motion of the wheel of the valve.

1.7.3. All the valves and cocks are to be fitted in places where they are easily accessible at all times and are to be fitted with legible nameplates indicating their function in the system and their installation is to be such that it can be readily observed that they are open or closed.

1.7.4 All the valves and cocks fitted with remote control are to be provided with local manual control independent of the remote control system inoperable.

1.7.5 The valves, cocks and other fittings which are attached directly to plating, which is required to be of watertight construction, are to be secured to the plating by means of studs screwed into the plating and not by bolts passing through clearance holes. Alternatively the studs may be welded to the plating.

1.8 Shipside fittings (Other than sanitary discharges and scuppers)

1.8.1 All sea inlet and overboard discharge valves are to be fitted in either of the following ways:

a) directly on the shell plating;

b) to the plating of fabricated steel water boxes of rigid construction integral with the vessel's plating;

c) to short, rigid distance pieces welded to the shell plating.

1.8.2 All valves and cocks fitted directly to the shell plating are to have spigots extending through the plating. These spigot on valves may however be omitted if the valves are fitted on pads which themselves from spigots in way of plating.

1.8.3 Valves and cocks are to be attached to the shell plating by bolts tapped into the plating and fitted with countersunk heads, or by studs screwed into heavy steel pads fitted to the plating., The stud holes are not to penetrate the pad plating.

1.8.4 Vessel side valves and fittings, if made of steel or material with low corrosion resistance, are to be suitably protected against wastage.

1.8.5 Gratings are to be fitted at all openings in ship's side for inlet of seawater. The net area through the gratings is to be at least twice the area of the valves connected to the opening.

1.8.6 The scantlings of valves and valve stools fitted with steam, or compressed air clearing connections are to be suitable for the maximum pressure to which the valves and stools may be subjected.

1.9 Piping Installation

1.9.1 Heavy pipes and valves are to be so supported that their weight is not taken up by connected pumps and fittings.

1.9.2 Support of the pipes is to be such that detrimental vibrations do not arise in the system.

1.9.3 Where pipes are carried through watertight bulkheads or tank tops, means are to be made to ensure the integrity of the watertightness of the compartment.

1.9.4 As far as possible, Installation of pipes for water, oil, or steam, is to be avoided near electric switchboards. If this is impracticable, all the joints in pipe line and valves are to be at a safe distance from the switchboards and shielded to prevent damage to switchboard.

1.9.5 Provision is to be made to take care of expansion or contraction stresses in pipes due to temperature stresses or working of the hull.

1.9.6 Expansion pieces of approved type, made of oil resistant re-inforced rubber or other approved material may be used in circulating water systems in machinery spaces.

1.9.7 All piping systems, where a pressure greater than the designed pressure could be developed, are to be protected by suitable relief valves.

1.9.8 All pipes, situated in cargo-spaces, fish holds or other spaces, where they can be damaged mechanically, are to be suitably protected.

1.9.9 All pipes which pass through chambers intended for the carriage or storage of refrigerated cargo are to be well insulated. In case the temperature of the chamber is below 0^oC the pipes are to be insulated from the ship's structure also, except at positions where the temperature of ship's structure is always above 0^oC and is controlled by outside temperature.

Air refreshing pipes leading to and from refrigerated chambers need not be insulated from the ship's structure.

Section 2

Bilge and Ballast Piping System

2.1 General

2.1.1 All vessels are to be provided with necessary pumps, suction and discharge piping and means of drainage so arranged that any compartment can be pumped out effectively, when the vessel is on an even keel and is either upright or has a list of not more than 5 degrees, through at least one suction, except from machinery spaces where at least two suctions are required, one of which is to be a branch bilge suction and the other is to be a direct bilge suction. Wing suctions will, generally, be necessary for this purpose, except for short narrow compartments, where a single suction may be sufficient.

2.1.2 All passenger vessels are to be provided with an efficient bilge pumping plant capable of pumping from and draining any watertight compartment under all practicable conditions after a casualty whether the vessel is upright or listed.

2.1.3 Attention is drawn to any relevant statutory requirements of the National Authority of the county in which the vessels is to be registered.

2.2 Drainage of cargo holds

2.2.1 In vessels having only one hold, and this over 30 [m] in length, bilge suctions are to be provided in the fore and after sections of the hold.

2.2.2 In vessels having a flat bottom with breadth exceeding 5 [m], bilge suctions are to be fitted at the wings.

2.2.3 Where close ceilings or continuous gusset plates are fitted over the bilges, arrangements are to be made whereby the water in the hold may find its way to the suction pipes.

2.2.4 In vessels fitted with double bottoms, suitably located bilge wells are to be provided.

2.3 Drainage from fore and aft peaks

2.3.1 Where the peaks are used as tanks, a power pump suction is to be led to each tank, except in case of small tanks (generally not exceeding 2 [m^2]) used for the carriage of domestic fresh water where hand pumps may be used.

2.3.2 The peaks may be drained by hand pumps provided the peaks are not used as tanks and they are not connected to bilge main. The suction lift is to be well within the capacity of the hand pumps and is not to exceed 7.3 [m].

The after peak may be drained by means of a self closing cock situated in a well lighted and accessible position, and draining into engine room or tunnel.

2.3.3 The collision bulkhead is not to be pierced below the bulkhead deck by more than one pipe for dealing with the contents inside the fore peak tank except as permitted in 2.3.4. The pipe is to be provided with a screw down valve capable of being operated from above the bulkhead deck and the chest of the valve is to be secured to the collision bulkhead inside the tank except as permitted by 2.3.5. An indicator is to be provided to indicate whether the valve is open or shut.

2.3.4 In vessels, other than passenger vessels, where the forepeak is divided into two compartments, the collision bulkhead may be pierced by two pipes, i.e. one for each compartment and fitted as in 2.3.3.

2.3.5 In vessels other than passenger vessels, the valve required by 2.3.3 may be fitted on the after side of the collision bulkhead, provided the valve is readily accessible at all time and is not subject to mechanical damage.

2.4 Drainage from tanks, cofferdams and void spaces

2.4.1 All the tanks except self-draining tanks, whether for water ballast, oil fuel, liquid cargoes, etc. are to be provided with suction pipes led to suitable power pumps. The pumping plant is to be so arranged that any water or liquid within any compartment of the vessel can be pumped out through at least one suction, when the vessel is on an even keel and is either upright or has a list of not more than 5 degrees.

2.4.2 Where the length of the ballast tank exceeds 30 [m], an additional suction is to be provided at the forward end of the tank. Where the width of the tank is unusually large, suctions near the centreline in addition to wing suctions may be required.

2.4.3 Suction pipes from the cofferdams and void spaces are to be led to the main bilge line.

2.4.4 In vessels where deep tanks may be used for either water ballast or dry cargo, provision is to be made for blanking the water ballast suction and filling when the tank is being used for carrying cargo and for blanking the bilge line when the tank is being used for carriage of water ballast.

2.5 Drainage from spaces above fore and after peaks and above machinery spaces

2.5.1 Provision is to be made for the drainage of chain locker and watertight compartments above the fore peak tank by hand or power pump suctions.

2.5.2 Steering gear compartments or other small enclosed spaces situated above the after peak tank are to be provided with suitable means of drainage, either by hand or power bilge suctions.

2.5.3 If the compartments referred to in 2.5.2 are adequately isolated from the adjacent tween decks, they may be drained by scuppers of not less than 38 [mm] bore, discharging into the tunnel (or machinery spaces in case of vessels with machinery aft) and fitted with self-closing cocks situated in well lighted and visible positions. These arrangements are not specially approved in relation to subdivision considerations.

2.5.4 Accommodation spaces which overhang machinery spaces may also be drained as in 2.5.3.

2.6 Drainage from machinery spaces

2.6.1 The bilge drainage arrangements for machinery spaces are to be in accordance with the requirements of 2.1.

2.6.2 In vessels in which the propelling machinery is situated at the after end of the vessel. It will generally be necessary for the bilge suctions to be fitted in the forward wings as well as in the after end of the machinery space, but each case will be dealt with according to the size and structural arrangements of the compartment.

2.6.3 Where the machinery space is divided into watertight compartments, the drainage system for all compartments except for main engine room is to be same as for cargo hold except that one direct bilge suction from each watertight compartment would also be required.

2.7 Sizes of bilge suctions

2.7.1 The internal diameter of the bilge pipes is not to be less than that found by the following formula to the nearest 5 [mm] commercial size available:

a) $d_m = 1.5 \sqrt{L(B + D)} + 25$ [mm]

b) $d_m = 2.0 \sqrt{C(B = D)} + 25$ [mm]

where,

d_m = internal diameter of bilge main [mm];

d_b = internal diameter of branch bilge [mm];

L = Rule length of vessel [m];

B = Moulded breadth of vessel [m];

C = Length of the compartment [m];

D = Moulded depth to bulkhead deck [m].

2.7.2 In any case, bilge main suction line and branch bilge suction line diameters are not to be less than 40 [mm] and the diameter of that main bilge line is not be less than that of the branch bilge line.

2.7.3 The internal diameter of the direct bilge suction is not to have less than the main bilge line when connected to a power pump and not less than branch bilge suction when connected to a hand pump.

2.7.4 In oil tankers and similar vessels, where the engine room pumps do not deal with bilge drainage outside the machinery spaces, the rule diameter of the bilge main may be reduced provided the proposed cross-sectional area of the bilge main is not less than twice that required for the branch bilge suction in machinery spaces.

2.7.5 The area of each branch pipe connecting the bilge main to a distribution chest is to be not less than the sum of the areas required by the rules for the two largest branch bilge suction pipes connected to that chest, but need not be greater than that required for the main bilge line.

2.8 Bilge pumps and ejectors

2.8.1 In vessels with main propulsion engines up to 220 [kW] (300 shp), at least one power bilge is to be provided which may be driven by the main engines. In addition hand pump suctions are to be fitted. In vessels where the main propulsion engines power exceeds 220 [kW] (300 shp) at least two power bilge pumps are to be provided and at least one of which is to be independently driven. See also 2.11 for requirements regarding passenger vessels.

2.8.2 The capacity of the bilge pump may be found by the following formula:

$Q = 5.75 \times 10^{-3} \times d^2$ [m^3/hour]

Where,

Q = capacity of pump [m^3/hour]

d = rule diameter of bilge main [mm].

2.8.3 In vessels, other than passenger vessels, where one bilge pump is of slightly less than rule capacity, the deficiency may be made good by an excess capacity of the other pump. In general this deficiency is to be limited to 30 percent.

2.8.4 An ejector in conjunction with a sea water pump may be accepted as a substitute for independent power bilge pump. This however, is not acceptable on passenger vessels.

2.9 Pump types

2.9.1 The bilge pumps required by the rules are to be of self-priming type, unless an approved priming system is provided for these vessels.

2.9.2 General service pumps and ballast pumps may be accepted as independent power bilge pumps provided:

a) Their capacity is adequate and in accordance with 2.8.2;

b) These pumps together with the pipelines to which they are connected, are fitted with necessary devices to ensure that there is no risk of entry of water or oil fuel in the holds or machinery spaces.

2.10 Bilge piping arrangements and fittings

2.10.1 Bilge pipes are not, as far as possible, to pass through double bottom tanks. If unavoidable, such bilge pipes are to be of heavy gauge, with welded joints or heavy flanged joints and are to be tested after fitting to the same pressure as the tanks through which they pass.

2.10.2 The parts of bilge pipes passing through deep tanks, intended to carry water ballast, fresh water, liquid cargo or fuel oil are normally to be contained in a pipe tunnel, but where this is not done, the pipes are to be of heavy gauge with welded or heavy flange joints. The open ends of such pipes are to be fitted with non-return valves. The pipes are to be tested, after fitting, to a pressure of not less than the maximum head to which the tanks may be subjected.

2.10.3 Expansion bends, not glands, are to be fitted to pipes passing through double bottom tanks or deep tanks.

2.10.4 The intactness of the machinery spaces, bulkheads and of tunnel plating is not to be impaired by fitting of scuppers discharging into machinery spaces or tunnel from adjacent compartments which are situated below the bulkhead deck. These scuppers may, however, be led into a strongly built scupper drain tank situated in the machinery space or tunnel but closed to these spaces and drained by means of a suction of appropriate size led from the main bilge line through a screw-down non-return valve.

a) The scupper tank air pipe is to be led above the bulkhead deck and provision is to be made for ascertaining the level of the water in the tank:
b) Where one tank is used for the drainage of several watertight compartments, the scupper pipes are to be provided with screw-down non-return valves.

2.10.5 No drain valve or cock is to be fitted to the collision bulkhead. Drain valves or cocks are not to be fitted to other watertight bulkheads if alternative means of drainage are practicable. These arrangements are not permissible in passenger vessels.

2.10.6 Where drain valves or cocks are fitted to bulkheads other, than collision bulkhead, as permitted by 2.10.5, the drain valves or cocks are to be at all times readily accessible and are to be capable of being shut off from positions above the bulkhead deck. Indicators are to be provided to show whether the drains are open or shut.

2.10.7 Bilge pipes which are required for draining cargo or machinery spaces are to be entirely distinct from sea inlet pipes or from pipes which may be used for filling or emptying spaces where water or oil is carried. This does not, however, exclude a bilge ejection connection, a connecting pipe from a pump to its suction valve chest, or a deep tank suction pipe suitably connected through a change-over device to bilge, ballast or oil line.

2.10.8 The arrangement of pumps, valves and piping is to be such that any pump could be opened up for overhaul and repairs without affecting the operation of the other pumps.

2.10.9 The arrangement of valves, pumps, cocks and their pipe connections is to be such as to prevent the possibility of placing one watertight compartment in communication with another, or of cargo spaces, machinery spaces or other dry spaces coming in communication with the sea or the tanks. For this purpose the bilge suction, pipe of any pump also having sea suction is to be fitted with a non-return valve which cannot permit communication between the bilges and the sea or the compartments in use as tanks.

2.10.10 Screw-down non-return valves are to be provided in the following fittings:

a) Bilge distribution chest valves;

b) Direct bilge suction and bilge pump connection to main line;

c) Bilge suction hose connections on the pumps or on the main line;

d) Emergency bilge suctions.

2.10.11 Bilge suction pipes from machinery spaces and shaft tunnel, except emergency bilge suction, are to be led from easily accessible mud boxes fitted with straight tail pipes to the bilges. The open ends of the tail pipes are not to be fitted with strum boxes. The mud boxes are to be provided with covers which can be easily opened and closed for cleaning purposes.

2.10.12 Strum boxes are to be fitted to the open ends of bilge suction pipes from the cargo holds. The diameter of holes from these strum boxes is not to be more than 10 [mm] and the total area of the holes is not to be less than twice the area of the pipes.

2.10.13 Where access manholes to bilge wells are necessary, they are to be fitted as near to the suction strums as practicable.

2.10.14 Adequate distance is to be provided between the open ends of suction pipes and bilge well bottom to permit adequate and easy flow of water and to facilitate cleaning.

2.10.15 All the valves, cocks and mud boxes are to be located in easily accessible positions above or at the same level as the floor plates. Where this is unavoidable, they may be fitted immediately below the floor plates provided the floor plates are capable of being opened and closed easily and suitably name plates are fitted indicating the fittings below.

2.10.16 Where relief valves are fitted to pumps having sea connections, these valves are to be fitted in readily visible positions above the platform. The arrangement is to be such that any discharge from the relief valves will also be readily visible.

2.10.17 Where non-return valves are fitted to the open ends of bilge suction pipes in cargo holds in order to decrease the risk of flooding, they are to be of an approved type which does not offer undue obstruction to the flow of water.

2.11 Additional requirements for passenger vessels

2.11.1 Where practicable, the power bilge pumps are to be placed in watertight compartments so arranged or situated that these compartments will not readily be flooded by the same damage. If the engines and boilers are in two or more watertight compartments, the pumps available for bilge service are to be distributed throughout these compartments as far as is possible.

2.11.2 In passenger vessels the arrangements are to be such that at least one power pump is available for use in all ordinary circumstances in which a vessel may be flooded at sea. This requirement will be satisfied if:

a) One of the required pumps is an emergency pump of reliable submersible type having a source of power situated above the bulkhead deck; OR
b) The pumps and their sources of power are so disposed throughout the length of the vessel that under any condition of flooding which the vessel is required by statutory requirements to withstand, at least one pump in undamaged compartment will be available.

2.11.3 Provision is to be made to prevent the compartment served by any bilge suction pipe being flooded in the event of the pipe being severed, or otherwise damaged by collision or grounding in any other compartment. For this purpose where the pipe is at any part situated nearer the side of the vessel than one-fifth the breadth of the vessel (measured at right angles to the centreline at the level of the deepest sub-division loadline), or in a duct keel, a non-return valve is to be fitted to the pipe in the compartment containing the open end.

2.11.4 All the distribution boxes, cocks and valves in connection with the bilge pumping arrangements are to be in positions which are accessible at all times under ordinary circumstances. They are to be so arranged that, in the event of flooding, one of the bilge pumps may be operative on any compartment, in addition damage to a pump or its pipe connecting to the bilge main outboard of a line drawn at one-fifth of the breadth of the vessel is not to put the bilge system out of action. If there is only one system of pipes common to all the pumps, the necessary cocks or valves for controlling the bilge suctions must be capable of being operated from above the bulkhead deck. Where in addition to the main bilge pumping system and so arranged that a pump is capable of operating on any compartment under flooding conditions in that case only the cocks and valves necessary for the operation of the emergency system need be capable of being operated from above the bulkhead deck.

2.11.5 All valves and cocks mentioned in 2.11.4 which can be operated from above the bulkhead deck shall have their controls at their place of operation clearly marked and provided with means to indicate whether they are open or closed.

2.12 Ballast system

2.12.1 Provision is to be made for ballasting and deballasting all the ballast tanks by pipe lines which are entirely separate and distinct from pipe lines used for bilging.

2.12.2 Where the length of the ballast tanks exceeds 30 [m], an additional suction is to be provided at the forward end of the tanks. Where the width of the tank is unusually large, suction near the centreline in addition to wing suctions may be required.

Section 3

Air and Sounding Piping Systems

3.1 General

3.1.1 Reference to oil in this Section is to be taken to mean oil which has a flash point of 60^{o}C or above (closed cup test).

3.1.2 The positions of vent, overflow and sounding pipes fitted above the weather deck are to be of steel.

3.1.3 Name plates are to be affixed to the upper ends of all vent and sounding pipes.

3.2 Air pipes

3.2.1 Vent pipes are to be fitted to all tanks, cofferdams, tunnels and other compartments which are not fitted with alternative ventilation arrangements.

3.2.2 The vent pipes are to be fitted at the opposite end of the tank to which the filling pipes are placed and/or at the highest part of the tank and are to be of the self draining type. Where the tank top is of unusual or irregular profile, special consideration will be given to the number and positions of the vent pipes.

3.2.3 Tanks provided with anodes for cathodic protection are to be provided with vent pipes at forward and aft ends.

3.2.4 Vent pipes to double bottom tanks, deep tanks extending to the shell plating or tanks which can be run up from the sea and sea chests are to be run up from the sea and sea chests are to be led above the bulkhead deck.

3.2.5 Vent pipes to oil fuel and cargo oil tanks, cofferdams, all tanks which can be pumped up, shaft tunnels and pipe tunnels are to be led above the bulkhead deck and to open air.

3.2.6 Vent pipes from lubricating oil storage tanks may terminate in the machinery spaces, provided that the open ends are so situated that issuing oil cannot come into contact with electrical equipment or heated surfaces.

3.2.7 The open ends of vent pipes to oil fuel and cargo oil tanks are to be situated where no danger will be incurred from issuing oil or vapour when the tank is being filled.

3.2.8 For details regarding height and closing devices for vent pipes see Pt.3, Ch. 11.

3.2.9 The open ends of vent pipes to oil fuel, cargo oil and ballast tanks fitted with anodes for cathodic protection, are to be fitted with a wire gauze diaphragm of incorrodible material which can be readily removed for cleaning. The clear area through the wire gauze is to be at least equal to the area of the vent pipe.

3.2.10 In the case of all tanks which can be pumped up either by vessel's pumps or by shore pumps through a filling main, the total cross-sectional area of the vent pipes to each tank, or of the overflow pipes where an overflow system is provided, is to be not less than 25 per cent greater than the effective area of the respective filling pipes.

3.3 Sounding arrangements

3.3.1 All tanks, cofferdams and pipe tunnels are to be provided with sounding pipes or other approved means for ascertaining the level of liquid in the tanks. Bilges of compartments which are not at all times readily accessible are to be provided with sounding pipes. The sounding are to be taken as near the suction pipes as practicable.

3.3.2 Where gauge glasses are used for indicating the level of liquid in tanks containing lubricating oil, oil fuel or other flammable liquid, the glasses are to be of heat resisting quality, adequately supported, protected from mechanical damage and fitted with self-closing valves at the lower ends and at the top ends if these are connected to the tanks below the maximum liquid level.

3.3.3 Except as permitted by 3.3.4 sounding pipes are to be led to positions above the bulkhead deck which are at all times accessible and in the case of oil fuel tanks, cargo oil tanks and lubricating oil tanks, the sounding pipes are to be led to safe positions on the open deck.

3.3.4 Short sounding pipes may be fitted to double bottom tanks and cofferdams in shaft tunnels and machinery spaces provided the pipes are to readily accessible. Short sounding pipes to oil fuel tanks, cargo oil tanks and lubricating oil tanks are not to be placed in the vicinity of boilers, preheaters, heated surfaces, electric generators or motor with commutator or collector rings or electric or electric appliances which are not totally enclosed. The short sounding pipes are to be arranged in such a way that overflow or oil spray will not reach any of machinery components mentioned above. The short sounding pipes are to be fitted with self-closing cocks having cylindrical plugs with weight loaded levers permanently attached and with pedals for opening or other approved arrangements. Short sounding pipes to tanks not intended for oil are to be fitted with screw caps attached by chain to the pipe or with shut off cocks.

3.3.5 In passenger vessels, short sounding pipes are permissible only for sounding cofferdams and double bottom tanks situated in the machinery space and are in all cases to be fitted with self closing cocks as described in 3.3.4.

3.3.6 Striking plates of adequate thickness and size are to be fitted under open ended sounding pipes. Where slotted pipes having closed ends are employed, the closing plugs are to be of substantial construction.

3.3.7 The upper ends of all sounding pipes are to be provided with efficient closing devices. The sounding pipes are to be arranged to be as straight as practicable, and if curved the curvature is to be large enough to permit easy passage of sounding rod/chain.

Section 4
Fuel Oil Systems

4.1 General

4.1.1 Oil fuel for machinery and boilers is normally to have a flash point now lower than 60^{o}C (closed cup test). For emergency generator engines, the oil fuel is to have a flash point not lower than 43^{o}C (closed cup test).

4.1.2 Fuels with flash point lower than 60^{o}C may be used in vessels intended for service restricted to geographical limits where it can be ensured that the temperature of the machinery and boiler spaces will always be 10^{o}C below the flash point of the fuel. In such cases safety precautions and the arrangements for storage and pumping will be specially considered. However, the flash point of the fuel is not to be less than 43^{o}C unless specially approved.

4.2 Oil fuel tanks

4.2.1 Oil fuel tanks are to be separated from fresh water and lubricating oil tanks by means of cofferdams.

4.2.2 Oil fuel tanks are not to be located directly above the highly heated surfaces.

4.3 Oil fuel piping

4.3.1 Oil fuel pressure pipes are to be led, where practicable, remote from heated surfaces and electrical appliances, but where this is impracticable the pipes are to have a minimum number of joints and are to be led in well lighted and readily visible positions.

4.3.2 Transfer, suction and other low pressure oil pipes and all pipes passing through oil storage tanks are to be made of cast iron or steel, having flanged joints suitable for a working pressure of not less than 0.69 [N/mm^2]. The flanges are to be machined and the jointing material is to be impervious to oil. Where the pipes are 25 [mm] bore or less, they may be seamless copper alloy, except those which pass through storage tanks.

4.3.3 Pipes in connection with compartments storing fresh water are to be separate and distinct from any pipes which may be used for oil or oily water and are not to be led through tanks which contain oil, nor are oil pipes to be led through fresh water tanks.

4.3.4 Pipes conveying vegetable oils or similar cargo oils are not to be led through oil fuel tanks, nor are oil fuel pipes to be led through tanks containing such cargoes.

4.3.5 In passenger vessels, provision is to be made for the transfer of oil fuel from any oil fuel storage or settling tank to any other oil fuel storage tank.

4.4 Arrangement of valves, cocks, pumps and fittings

4.4.1 The oil fuel and pumping piping arrangements are to be distinct from other pumping systems as far as practicable and the means provided for preventing dangerous interconnection in service are to be thoroughly effective.

4.4.2 All valves and cocks forming part of the oil fuel installation are to be capable of being controlled from readily accessible positions which, in the machinery spaces are to be above the working platform.

4.4.3 Every oil fuel suction pipe from a double bottom tank is to be fitted with a valve or a cock.

4.4.4 For oil fuel tanks which are situated above the double bottom tanks the inlet and outlet, pipes which are connected to the tank at a point lower than the outlet of the overflow pipe or below the top of the tanks without an overflow pipe, are to be fitted with shut off valves located on the tank itself.

4.4.5 In the machinery spaces valves, mentioned in 4.4.4, are to be capable of ‘being closed locally and from positions outside these spaces which will always be accessible in the event of fire occurring in these spaces. Instructions for closing the valves are to be indicated at the valves and at the remote control positions.

4.4.6 Settling tanks are to be provided with means for draining water from bottom of the tanks. If the settling tanks are not provided, the oil fuel bunkers or daily service tanks are to be fitted with water drains.

Open drains for removing water from oil tanks are to be fitted with valves or cocks of self-closing type and suitable provision is to be made for collecting the oily discharge.

4.4.7 Where a power driven pump is necessary for transferring oil fuel, a stand by pump is to be provided and connected ready for use, or alternatively, emergency connections may be made to another suitable power driven pump.

4.4.8 All pumps which are capable of developing a pressure exceeding the design pressure of the system are to be provided with relief valves. Each relief valve is to be in close circuit. i.e. arranged to discharge back to the suction side of the pump and to effectively limit the pump discharge pressure to the design pressure of the system.

4.4.9 Valves or cocks are to be interposed between the pumps on the suction and discharge pipes in order that any pump may be shut off for opening up and overhaul.

4.4.10 Drip trays are to be fitted under all oil fuel appliances which are required to be opened up frequently for cleaning or adjustment.

4.5 Filling arrangements

4.5.1 The bunkering of the vessel is to be carried out through a permanently fitted pipeline, provided with the required fittings and ensuring fuel delivery to all storage tanks. The open end of the fitting pipe is to be led to the tank bottom.

In passenger vessels fuel bunkering stations are to be isolated from other spaces and are to be efficiently drained and ventilated.

4.5.2 Provision is to be made against over-pressure in the filling pipes, and any relief valve fitted for this purpose is to be discharged in to an overflow tank or other safe position.

4.6 Oil fuel burning arrangements

4.6.1 Filters are to be fitted in the supply lines to the main and auxiliary machinery. For non-redundant units for essential services, it must be possible to clean the filters without stopping the unit or reducing the supply of filtered oil to the unit.

For auxiliary engines one single oil fuel filter for each engine may be accepted.

4.6.2 Where an oil fuel booster pump is fitted, which is essential to the operation of the main engine(S), a standby pump is to be provided. The standby pump is to be connected ready for immediate use but where two or more main engines are fitted, each with its own pump, a complete spare pump may be accepted provided that it readily accessible and can be easily installed.

4.6.3 Where pumps are provided for fuel valve cooling, the arrangements are to be as in 4.6.2.

4.7 Remote stop of oil fuel pumps and fans

4.7.1 Emergency stop for power supply to the following pumps and fans is to be arranged from a central place outside the engine and boiler room:

- oil fuel transfer pump;
- oil fuel booster pump;
- nozzle cooling pumps when oil fuel is used as coolant;
- oil fuel purifiers;
- pumps for oil-burning installations;
- fans for ventilation of engine rooms.

Section 5
Engine cooling Water Systems

5.1 General

5.1.1 Centrifugal cooling water pumps are to be installed as low as possible in the vessel.

5.2 Cooling water main supply

5.2.1 Provision is to be made for an adequate supply of cooling water to the main propelling machinery and essential auxiliary engines, also to lubricating oil and fresh water coolers, where these coolers are fitted. The cooling water pumps(s) may be worked from the engines or be driven independently.

5.3 cooling water standby supply

5.3.1 Provision is also to be made for a separate supply of cooling water from a suitable independent pump of adequate capacity.

5.3.2 The following arrangements are acceptable, depending on the purpose for which the cooling water is intended:

a) Where only one main engine, with power exceeding 370 [kW] (500 shp), is fitted, the standby pump is to be connected ready for immediate use;

b) Where more than one main engine is fitted, each with its own pump, a complete spare pump of each type may be accepted;

c) Where fresh water cooling is employed for main/auxiliary engines, a standby means of cooling need not be fitted if there are suitable emergency connections from a salt water system;

d) Where each auxiliary is fitted with a cooling water pump, standby means of cooling need not be provided for auxiliaries. Where, however a group of auxiliaries is supplied with cooling water from a common system, a standby cooling water pump is to be provided for this system. This pump is to be connected ready for immediate use and may be a suitable general service pump.

5.3.3 When selecting a pump for standby purposes, consideration is to be given to the maximum pressure which it can develop if the overboard discharge valve is partly or fully closed and, when necessary, condenser doors, water boxes, etc. are to be protected by an approved device against inadvertent over pressure.

5.4 Relief valves on cooling water pumps

5.4.1 Where cooling water pumps can develop a pressure head greater than the design pressure of the system, they are to be provided with relief valves on the pump discharge to effectively limit the pump discharge pressure to the design pressure of the system.

5.5 Sea inlets for cooling water pumps

5.5.1 Sea-water cooling systems for main and auxiliary machinery are to be connected to at least two cooling water inlets preferably on opposite sides of the vessel.

5.5.2 Where sea water is used for the direct cooling of main engines and auxiliaries, the sea water suction pipes are to be provided with strainers which can be cleaned without interrupting the cooling water supply.

Section 6

Lubricating Oil Piping Systems

6.1 General

6.1.1 Lubricating oil systems are to be entirely separated from other systems. This requirement, however, does not apply to hydraulic governing and maneuvering systems for main and auxiliary engines.

6.1.2 Lubricating oil tanks are to be separated from other tanks containing water, fuel oil or cargo oil by means of cofferdams.

6.2 Pumps

6.2.1 Where lubricating oil for the main engine(S) is circulated under pressure, a standby lubricating oil pump is to be provided where one main engine is fitted and the output of the engine exceeds 370 [kW] (500 shp).

6.2.2 Satisfactory lubrication of the engines is to be ensured while starting and maneuvering.

6.2.3 Similar provisions to those of 6.2.1 and 6.2.2 are to be made where separate lubricating oil systems are employed for piston cooling, reduction gearing, oil operated couplings and controllable pitch propellers, unless approved alternative arrangements are provided. Where the oil glands for stern tubes are provided with oil circulating pump, and the continuous running of this pump is necessary during normal operation, then a standby pump for this purpose is to be provided.

6.2.4 Independently driven rotary type pumps are to be fitted with non-return valves on the discharge side of the pumps.

6.2.5 A relief valve in close circuit is to be fitted on the pump discharge if the pump is capable of developing a pressure exceeding the design pressure of the system, the relief valve is to effectively limit the pump discharge pressure to the design pressure of the system.

6.3 Control of pumps and alarms

6.3.1 The power supply, to all independently driven lubricating oil pumps is to be capable of being stopped from a position outside the space which will always be accessible in the event of fire occurring in the compartment in which they are situated, as well as from the compartment itself.

6.3.2 All main and auxiliary engines intended for essential services are to be provided with means of indicating the lubricating oil pressure supply to them. Where such engines and turbines are of more than 75 [kW] (100 shp), audible and visual alarms are to be fitted to given warning of an appreciable reduction in pressure of the lubricating oil supply. Further, these alarms are to be actuated from the outlet side of any restrictions, such as filters, coolers, etc.

6.4 Filters

6.4.1 In systems, where lubricating oil is circulated under pressure, provision is to be made for efficient filtration of the oil. For non-redundant units, for essential service, it must be possible to clean the filters without stopping the unit or reducing the supply of filtered oil to the units.

6.5 Valves and cocks on lubricating oil tanks

6.5.1 Outlet valves and cocks on lubricating oil service tanks, other than double bottom tanks, situated in machinery spaces are to be capable of being closed locally and from positions outside the space which will always be accessible in the event of fire occurring in these spaces. Remote controls need only be fitted to outlet valves and cocks which are open in normal service and are not required for other outlets such as those on storage tanks.

Section 7

Engine Exhaust Gas Piping Systems

7.1 General

7.1.1 Where the surface temperature of the exhaust pipes and silencer may exceed 220^{o}C, they are to be water cooled or efficiently lagged.

7.1.2 Where lagging covering the exhaust piping including flanges, is oil-absorbing or may permit penetration of oil, the lagging is to be encased in sheet metal or equivalent. In locations where the Surveyor is satisfied that oil impingement could not occur, the lagging need not be encased.

7.1.3 Exhaust pipes which are led overboard near the waterline are to be protected against the possibility of water finding its way inboard.

Where the exhaust is cooled by water spray, the exhaust pipes are to be self-draining overboard.

7.1.4 Exhaust pipes of two or more engines are not to be connected together, but are to be led separately to the atmosphere unless arranged to prevent the return of gases to an idle engine.

7.1.5 In two-stroke engines fitted with exhaust gas turbo-chargers which operate on the impulse systems, provision is to be made to prevent broken piston rings entering the turbine casing and causing damage to blades and nozzle rings.

Section 8

Pumping and Piping Systems for Vessels not Fitted with Propelling Machinery

8.1 Scope

8.1.1 Following requirements are applicable to vessels not fitted with propelling machinery.

8.2 Vessels without auxiliary power

8.2.1 Hand pumps are to be fitted in number and position, as may be required for the efficient drainage of the vessel.

8.2.2 In general, one hand pump is to be provided for each compartment. Alternatively, two pumps connected to a bilge main, having at least one branch to each compartment are to be provided through non-return vales.

8.2.3 The hand pumps are to be capable of being worked from the upper deck or from positions above the load waterline which are at all times readily accessible. The suction lift is not to exceed 7.3 [m] and is to be well within the capacity of the pump.

8.2.4 The pump capacity is to be based upon the diamteter of the suction pipe required for compartment and as determined in Sec. 2.

8.3 Vessels with auxiliary power

8.3.1 In vessels in which auxiliary power is available on board, power pump suctions are to be provided for dealing with the drainage of tanks and of the bilges of the principal compartments.

8.3.2 The pumping arrangements are to be as required for self-propelled vessels, so far as these requirements are applicable.

End of Chapter

Chapter 4

Prime Movers and Propulsion Shafting Systems

Contents

Section

Section 1

General

1.1 General

1.1.1 The requirements of this Chapter are applicable to all vessels but may be modified for vessels intended for special services.

1.1.2 Prime movers of electric generators of less than 50 [kW] capacity, supplying power for lightening loads only, when the vessel is in harbour, need not be built under survey.

1.1.3 Attention is drawn to any relevant statutory requirements of the country in which the vessel is to be registered.

1.1.4 Power transmission systems not specified in this Chapter will be specially considered.

1.2 Materials

1.2.1 Materials intended for the main parts of the prime movers and power transmission systems are to be manufactured and tested in accordance with the requirements of Pt.2, Inspection and Testing of Materials, of Rules & Regulations for the Constructions and Classification of Steel Vessels.

1.3 Primemovers and reduction gearing

1.3.1 Primemovers and reduction gearing are to be designed, manufactured and tested in accordance with the requirements of Rules and regulations For the Construction & Classification of Steel Vessels.

1.4 Turning Gear

1.4.1 Arrangements are to be provided to turn the primemover of main propulsion systems and auxiliary drives.

Section 2

Main Propulsion Shafting

2.1 Scope

2.1.1 The requirements of this section relate, in particular, to formulae for determining the diameters of shafting for main propulsion installations, but requirements for couplings, coupling bolts, keys, keyways, sternbushes and associated components are also included. The diameter of shafting as calculated may require to be modified as a result of alignment considerations and vibration characteristics (See sec. 8) or the inclusion of stress raisers, other than those contained in this section.

2.2 Plans and Particulars

2.2.1 The following plans, in triplicate, together with the necessary particulars of the machinery, including the maximum power and revolutions per minute, are to be submitted for approval before the work is commenced:

- Final gear shaft;
- Thrust shaft;
- Intermediate shafting;
- Tube shaft, where applicable;
- Tail shaft;
- stern bush.

2.2.2 The specified minimum tensile strength of each shaft is to be stated.

2.2.3 A shafting arrangement plan indicating the relative position of the main engines, flywheel, flexible coupling, gearing, thrust block, line shafting and bearing, stern tube, 'A' brackets and propeller, as applicable, is to be submitted for information.

2.3 Materials for shafting

2.3.1 The materials are to comply with the relevant requirement of Ch.5, Pt.2, Inspection and Testing of Materials, of Rules & Regulations for the Construction and Classification of Steel Vessels. The specified minimum tensile strength of forgings is to be selected within the following general limits :-

a) Carbon and carbon-manganese steel-400-600 [N/m^2]

b) Alloy steels - Not exceeding 800 [N/m^2]

2.3.2 Ultrasonic tests are required on shaft forgings where the diameter is 250 [mm] or greater.

2.4 Intermediate and thrust shafts

2.4.1 The diameter, d, of the shaft is to be not less than determined by the following formula :

$$d = 103.5\, k\, a \sqrt[3]{\frac{410P}{(U+160)R}}[mm]$$

where,

a = 0.95 for turbine installations, electric propulsion installations and oil engine installations with slip type couplings;
= 1.0 for other oil engine installations;

k = 1.0 for shafts with integral coupling flanges complying with 2.7 or shrink fit couplings;

= 1.10 for shafts with keyways, where the fillet radii in the transverse section of the bottom of the keyway are not to be less than 0.0125 d; after a length of 0.2 d from the end of the keyway, the shaft diameter may be reduced to the diameter calculated with k = 1.0;

= 1.10 for shafts with transverse or radial holes, where the diameter of the hole is not greater, than 0.3 d;

= 1.20 for shafts with longitudinal slots having a length of not more than 1.4 d and a width of not more than 0.2 d, where d is calculated with k = 1.0;

U = Specified minimum tensile strength of the material [N/mm^2]

P = maximum shaft power [kW];

R = Revolution per minute corresponding to maximum shaft power giving maximum torque.

2.4.2 For shafts with design features other than stated in 2.4.1 the value of k will be specially considered.

2.5 Tailshafts and tube shafts

2.5.1 The diameter, d_p, of the tailshaft immediately forward of the forward face of the propeller boss or, if applicable, the forward face of the tailshaft flange, is to be not less than determined by the following formula :

$$d_p = 103.5\ ka\ \sqrt[3]{\frac{410P}{(U+160)R}}\,[mm]$$

where,

k = 1.22 for a shaft carrying a keyless propeller, or where the propeller is attached to an integral flange, and where the shaft is fitted with continuous liner or is oil lubricated and provided with an approved type of oil sealing gland;

= 1.26 for a shaft carrying a keyed propeller, and where the shaft is fitted with a continuous liner or is oil lubricated and provided with an approved type of oil sealing gland;

= 1.25 for a shaft carrying a keyless propeller, or where the propeller is attached to an integral flange and is fitted with water lubricated bearing with non-continuous shaft liners;

= 1.29 for a shaft carrying a keyed propeller and is fitted with water lubricated bearings with non-continuous shaft liners;

U = Specified minimum tensile strength of the shaft [N/mm^2], but is not to be taken greater than 600 [N/m^2];

P, a and R are defined in 2.4.1.

2.5.2 The diameter, d_p of the tailshaft determined in accordance with the formula in 2.5.1 is to extend over a length not less than that to the forward edge of the bearing immediately forward of the propeller or 2.5 d_p whichever is the greater.

2.5.3 The diameter of the portion of the tailshaft and tubeshaft forward of the length required by 2.5.2 to the forward end of the forward sterntube seal is to be determined in accordance with the formula in 2.5.1 except that;

k = 1.15 when k = 1.22 or 1.26 as required by 2.5.1

k = 1.18 when k = 1.25 or 1.29 as required by 2.5.1

The change of diameter from that required by 2.5.1 to that required by this clause should be gradual.

2.5.4 The taper of the shaft cone is normally not to be steeper than 1:12 on diameter in case of keyed shafts and 1 : 15 on diameter in case of keyless shafts.

2.5.5 Tailshafts which run in sterntubes and tube shafts may have the diameter forward of the forward stern tube seal gradually reduced to the diameter of the intermediate shaft. Abrupt changes in shaft section at the tailshaft/tubeshaft to intermediate shaft couplings is to be avoided.

2.6 Hollow shafts

2.6.1 For hollow shafts where the bore exceeds 40 per cent of the outside diameter of minimum shaft diameter is not to be less than that given by the following equation :

$$d_o = d \sqrt[3]{\left(1 - \left(\frac{d1}{do}\right)^4\right)} [mm]$$

where,

d_o = outside diameter [mm].

d = Rule size diameter of shaft [mm], calculated in accordance with 2.4 or 2.5

d_1 = diameter of central hole [mm].

2.6.2 where the diameter of central hole does not exceed 0.4 times the outside diameter, no increase over Rule size need be provided.

2.7 Integral couplings

2.7.1 The thickness of coupling flanges is not to be less than the minimum required diameter of the coupling bolts calculated as in para 2.9, where U_B = or 0.2 times the rule diameter of the shaft under consideration, whichever is greater.

2.7.2 The fillet radius at the base of the coupling flange is to be not less than 0.08 of the diameter of the shaft at the coupling. The fillets are to have a smooth finish and are not to be recessed in way of nuts and bolt heads.

2.7.3 Where the propeller is attached by means of flange, the thickness of the flange is to be not less than 0.25 times the actual diameter of the adjacent part of the tailshaft. The fillet radius at the base of the coupling flange is to be not less than 0.125 times the diameter of the shaft at the coupling.

2.8 Demountable couplings

2.8.1 Couplings are to be made of steel or other approved ductile material. the strength of demountable couplings and keys is to be equivalent to that of the shaft. Couplings are to be accurately fitted to the shaft.

2.8.2 Hydraulic and other shrink fit couplings will be specially considered upon submittal of detailed pre-loading and stress calculations and fitting instructions. In general, the torsional holding capacity is to be at least 2.8 times the transmitted torque and pre-load stress is not to exceed 70 per cent of the yield strength.

2.8.3 Provision is to be made to resist astern pull.

2.9 Coupling bots

2.9.1 The diameter of the coupling bolts of the fitted type at the joining faces of the coupling is to be not less than that given by the following formula:

$d_b = \sqrt{\frac{0.427\, d^3\, (U+155)}{\mathrm{NDU}_B}}\ [mm]$

where,

d_b = diameter of the fitted coupling bolts [mm];

d = required diameter [mm] for the shaft in accordance with 2.4 or 2.5 as appropriate calculated by taking the value of k as 1.0;

U = specified minimum tensile strength of the shaft material in [N/mm^2];

U_B = specified minimum tensile strength of the bolt material in [N/mm^2];

and also $U \leq U_B \leq 1.7U$;

N = Number of bolts in the coupling;

D = Pitch circle diameter of bolt holes [mm].

2.9.2 The diameter of the non-fitted bolts will be specially considered upon the submittal of detailed pre-loading and stress calculations and fitting instructions.

2.10 Tailshaft liners

2.10.1 the thickness, t, of bronze or gunmetal liners fitted on tail shafts, in way of bearings, is not to be less than given by following formula :

$t = \frac{168 + d_p}{28}$ [mm]

where,

t = thickness of liner [mm];

d_p = diameter of tail shaft under the liner [mm]

2.10.2 The thickness of the continuous liner between the bearings is not to be less than 0.75t.

2.10.3 continuous liners are preferably to be cast in one length. If made of several lengths, the joining of the separate pieces is to be made by welding through the whole thickness of liner before shrinking. In general, the load content of the gunmetal of each length forming a butt welded liner is not to exceed 0.5 per cent. The composition of the electrode or filler rods is to be substantially lead free.

2.10.4 The liners are to withstand a hydraulic, pressure of 0.2 [N/mm^2] after rough machining.

2.10.5 The liners are to be carefully shrunk or forced upon the shaft by hydraulic pressure, and they are not to be secured by pins.

2.10.6 Effective means are to be provided for preventing water from reaching the shaft at the part between the after end of the liner and the propeller boss.

2.10.7 If the liner does not fit the shaft tightly between the bearing portions In the stern tube, the space between the shaft and the liner is to be filled with a plastic insoluble non- corrosive compound.

2.11 Keys and keyways

2.11.1 Round ended or sled-runner ended keys are to be used, and the key ways in the propeller boss and cone of the tail shaft are to be provided with a smooth fillet at the bottom of the keyways. The radius of the fillet is to be at least 0.0125 of the diameter of the tail shaft at the top of the cone. The sharp edges at the top of the keyways are to be removed.

2.11.2 Two screwed pins are to be provided for securing the key in the keyway and the forward pin is to be placed at least one-third of the length of the key from the end. The depth of the tapped holes for the screwed pins is not to exceed the pin diameter and the edges of the holes are to be slightly beveled.

2.11.3 The distance between the top of the cone and the forward end of the keyway is to be not less than 0.2 of the diameter of the tailshaft at the top of the cone.

2.11.4 The effective sectional area of the key in shear, is to be not less than $\frac{d^3}{2.6d_1}$ [mm^2]

where,

d = diameter [mm], required for the intermediate shaft determined in accordance with 2.4, based on material having a specified minimum tensile strength of 400 [N/mm^2];

d_1 = diameter of shaft at mid-length of the key [mm].

2.12 Stern tube and bearings

2.12.1 The length of the bearing in the sternbush next to and supporting the propeller is to be as follows :

(a) For water lubricated bearings which are lined with lignum vitae, rubber composition or staves of approved plastic material; the length is to be not less than 4 times the rule diameter required for the tailshaft under the liner.

(b) For bearings which are white-metal lined, oil lubricated and provided with an approved type of oil sealing gland; the length of the bearing is to be approximately twice the rule diameter required for the tailshaft and is to be such that the nominal bearing pressure will not exceed 0.8 [N/mm^2]. The length of the bearing is to be not less than 1.5 times its rule diameter;

(c) For bearings of cast iron, bronze which are oil lubricated and fitted with an approved oil sealing gland; the length of the bearing is, in general, to be not less than 4 times the rule diameter required for tailshaft;

(d) For bearings which are grease lubricated; the length of bearing is to be not less than 4 times the rule diameter required for the tailshaft;

(e) For water lubricated bearings lined with two or more circumferentially spaced sectors of an approved plastics material, in which it can be shown that the sectors operate on hydrodyamic principles, the length of the bearing is to be such that the nominal bearing pressure will not exceed 0.55 [N/mm^2]. The length of the bearing is not to be less than twice actual diameter of shaft.

2.12.2 Forced water lubrication is to be provided for all bearings lined with rubber or plastics and for those bearings lined with lignum vitae where the shaft diameter is 380 [mm] or over. The supply water may come from a circulating pump or other pressure source. The water grooves in the bearings are to be of ample section and of a shape which will be little affected by weardown, particularly for bearings of the plastic type.

2.12.3 The shut off valve or cock controlling the supply of water is to be fitted direct to the after peak bulkhead, or to the sterntube where the water supply enters the sterntube forward of the bulkhead.

2.12.4 Where a tank supplying lubricating oil to the sterntube is fitted, it is to be located above the load water line and is to be provided with a low level alarm device in the engine room.

2.12.5 Where sternbush bearings are oil lubricated, provision is to be made for cooling the oil by maintaing water in the after peak tank above the level of the sterntube or by other approved means. Means of ascertaining the temperature of the oil in the sternbush are also to be provided.

2.12.6 The oil seating glands used for stertube bearing, which are oil lubricated, are to be of approved type.

Section 3
Propellers

3.1 Scope

3.1.1 The requirements of this Section cover the construction, materials and inspection of propellers.

3.2 Plans and particulars

3.2.1 A plan in triplicate, of the propeller is to be submitted for approval, together with the following particulars:

a) Maximum shaft power, P, in [kW];
b) Revolutions per minute of the propeller at maximum power, R;
c) Propeller diameter, D [m];
d) Pitch at 25 per cent radius (for solid propellers only). $P_{0.25}$ [m];
e) Pitch at 35 per cent radius (for controllable pitch propellers only) $P_{0.35}$ [m];
h) Pitch at 70 per cent radius, $P_{0.7,}$ [m];
g) Length of blade section of the expanded cylindrical section at 25 per cent radius (for solid propeller only), $P_{0.7}$, [m]
h) Length of blade section of expanded cylindrical section are 35 per cent radius (for controllable pitch propellers only) $L_{0.35}$ in [mm];
i) Rake at blade tip measured at shaft axis (backward rake positive forward rake negative). K. in [m];
j) Number of blades N;
k) Developed area ratio, a.

3.3 Materials

3.3.1 Castings for propellers and propeller blades are to comply with the requirement of Ch.8 Pt. 2, Inspection and Testing of Materials of Rules & Regulations for the Construction and Classification of Steel Vessels. The specified minimum tensile strength is to be not less than started in Table 3.4.1.

3.3.2 When it is proposed to use materials which are not included in Table 3.4.1, details of the chemical composition, mechanical properties and density are to be submitted for approval.

3.4 Design

3.4.1 Minimum blade thickness

3.4.1.1 Where the propeller blades are of conventional design, the thickness, t, of the propeller blades at 25 per cent radius for solid propellers, at 35 per cent for controllable pitch propellers, neglecting any increase due to fillets is to be not less than :

a) For fixed propeller

$$t_{0.25} = 1003 \sqrt{\frac{AP}{C_n C\, R\, N} + \frac{0.024 BKCs}{C\, C_n}}\ [\mathrm{mm}]$$

b) For controllable pitch propellers

$$t_{0.25} = 805 \sqrt{\frac{AP}{C_n C\,R\,N} + \frac{0.015BKC_s}{C\,C_n}}\ [\text{mm}]$$

where,

$t_{0.25}$ = minimum blade thickness required at 25 per cent radius;

$t_{0.35}$ = minimum blade thickness required at 35 per cent radius;

C_n = Section modulus coefficient at 25 per cent radius or 35 per cent radius as applicable;

$= \frac{I_o}{U_f\,L\,T^2}$ and is not to be taken

greater than 0.10;

I_o = Moment of inertia of the expanded cylndrical section at 25 per cent radius or 35 per cent radius, as applicable about a straight line passing through the centre of gravity parallel to the pitch line or to the nose-tail line, in [mm^4];

U_f = maximum normal distance from the moment of inertia axis to points on the face boundary (tension side) of the Section at 25 per cent radius or 35 per cent radius, as applicable [mm];

L = Length of the blade Section of the expanded cylindrical Section at 25 per cent radius or 35 per cent radius, as applicable, [mm];

T = Maximum thickness of the expanded cylindrical Section at 25 per cent radius or 35 per cent radius, as applicable, [mm];

C_s = Section area cerfficient at 25 per cent radius or 35 per cent radius as applicable;

$= \frac{a_s}{L\,T}$

a_s = area of the expandec cylindrical Section at 25 per cent radius or 35 per cent radius, as applicable [mm^2];

f = material constant as per Table 3.4.1;

w = material constant as per Table 3.4.1;

a) For fixed-pitch propellers

$A = 1.0 + \frac{6.0\,D}{P_{0.7}} + \frac{4.3P_{0.25}}{D}$

$B = \left(\frac{4300wa}{N}\right)\left(\frac{R}{100}\right)\text{^}2\left(\frac{D}{200}\right)\text{^}3$

$$C = \left(1 + \frac{1.5P_{0.25}}{D}\right) (L_{o25}\, f - B)$$

b) For controllable pitch propellers

$$A = 1.0 + \frac{6.0\ D}{P_{0.7}} + \frac{3.0P_{0.35}}{D}$$

$$B = \left(\frac{4900wa}{N}\right)\left(\frac{R}{100}\right)^{\wedge}2\ \left(\frac{D}{20}\right)^{\wedge}3$$

$$C = \left(1 + \frac{1.5P_{0.35}}{D}\right) (L_{o35}\, f - B)$$

3.4.1.2 Propellers of unusual design or application will be subject to special consideration upon submittal of detailed stress calculations.

3.4.1.3 Fillets at the root of the blades are not to be considered in the determination of blade thickness.

Table 3.4.1 : Material constants

Materaial	**Specified min. UTS [N/mm²]**	**f**	**W**
Manganese bronze Grade Cu 1	440	22.6	8.3
Ni- Manganese bronze Grade Cu 2	440	22.9	8.0
Ni-Aluminium bronze Grade Cu 3	590	25.7	7.5
Min-Aluminium bronze Grade Cu 4	630	25.6	7.5
Cast iron	250	11.77	7.2
Carbon and low alloy steels	400	14.0	7.9
Note: The value of **f** may be increased by 10 percent for twin screw and outboard propellers of triple screw vessels.			

3.4.2 Keyless propellers

3.4.2.1 Where propellers are fitted without keys, detailed stress calculations and fitting instructions are to be submitted for approval.

3.4.3 Controllable pitch propellers

3.4.3.1 In the case of controllable - pitch propeller, means are to be provided to lock the blades in ahead position in case of the failure of the pitch operating mechanism.

3.4.3.2 A propeller pitch indicator is to be fitted at each station from which it is possible to control the pitch of the propeller.

3.5 Fitting of propellers

3.5.1 The propeller boss is to be a good fit on the tailshaft cone. The forward edge of the bore of the propeller boss is to be rounded to about 6 [mm] radius.

3.5.2 The exposed part of the tailshaft is to be protected from the action of water by filling all spaces between propeller hub, cap and shaft with a suitable filling material. The propeller assembly is to be sealed at the forward end with a well-fitted soft rudder packing ring. When the rubber ring is fitted in an external gland, the hub counterbore is to be filled with suitable material, and clearances between shaft liner and hub connterbore are to be kept to a minimum.

When the rubber ring is fitted internally, ample clearance is to be provided between liner and hub and the ring is to be sufficiently sized to squeeze in to the clearance space when the propeller is driven up on the shaft and, where necessary, a filler piece is to be fitted in the propeller - hub keyway to provide a flat unbroken seating for the ring. The recess formed at the small end of the taper by the over hanging propeller hub is to be packed with red lead putty or rust-preventing compound before the propeller nut is put on.

3.5.3 Effective means are to be provided to prevent the slackening of the propeller nut.

Section 4
Vibrations and Alignment

4.1 Scope

4.1.1 The requirements of the Section are applicable to main propulsion systems with power exceeding 200 [kW].

4.1.2 Unless otherwise advised, it is the responsibility of the Vesselbuilder as the main contractor to ensure, in co-operation with the Engine builders, that the information required by this Section is prepared and submitted.

4.2 Basic system requirements

4.2.1 The systems are to be free from excessive torsional, axial and lateral vibration, and are to be aligned in accordance with tolerances agreed with the respective manufactures.

4.2.2 Where changes are subsequently made to a dynamic system which has been approved, revised calculations are to be submitted for consideration.

4.3 Resilient mountings

4.3.1 Where the machinery is installed on resilient mountings, liner vibration (steady state and transient) is not to exceed the limiting valves agreed with the manufactures of the machinery nor those of the resilient mountings.

4.3.2 Misalignment arising from such vibration is not to impose excessive loading on machinery components within the system.

4.4 Torsional vibration

4.4.1 Torsional vibration calculations, including an analysis of the vibratory torques and stresses for the dynamic systems formed by the oil engines, turbines, motors, generators, flexible couplings, gearing, shafting and propeller, where applicable, including all braches, are to be submitted for approval together with the associated plans.

4.4.2 Particulars of the division of power developed throughout the speed range for turbines, or from all intended combinations of operation in oil engine installations having more than one engine and/or with power take-off systems are to be submitted.

4.4.3 Any special speed requirements for prolonged periods in service are to be indicated, e.g., range of trawling revolutions per minute, range of operation revolutions per minute with a controllable pitch propeller, idling speed, etc.

4.4.4 The calculations and/or measurements carried out on oil engine installations containing transmission items sensitive to vibratory torque, e.g. gearing, flexible couplings, or generator rotors and their drives are to take into account the effects of engine malfunction commonly experienced in service, such as cylinder(s) not firing.

4.4.5 Restricted speed ranges will be imposed in regions of speed where stresses are considered to be excessive for continuous running. Similar restrictions will be imposed, or other protective measures required to be taken, where vibratory torques are considered to be excessive for particular machinery items.

4.4.6 Where calculations indicate the possibility of excessive torsional vibration within the range of working speeds, torsional vibration measurements, using the appropriate recognized techniques, may be required to be taken from the machinery installation for the purpose of determining the need for restricted speed ranges.

4.5 Axial vibrations

4.5.1 For all main propulsion shafting systems, the shiplbuilder are to ensure that amplitudes due to axial vibrations are satisfactory throughout the speed range,so far as practicable. Where appropriate, amplitudes may be reduced by the use of suitable vibration dampers or phasing of propeller and engine, etc.

4.5.2 Unless previous experience of similar installation shows it to be unnecessary, calculations of the shafting systems are to be carried out. These calculations are to include the effect of the thrust block seating and the surrounding hull structure taking part in the vibration. The result of these calculations or the evidence of previous experience is to be submitted for consideration.

4.5.3 Where calculations indicate the possibility of excessive axial vibration amplitudes within the range of working speeds, measurements using an appropriate recognized technique may be required to be taken from the shafting systems for the purpose of determining the need for restricted speed ranges.

4.6 Lateral vibrations

4.6.1 For all main propulsion shafting systems, the shipbuilders are to ensure that amplitudes due to lateral vibrations are satisfactory throughout the speed range.

4.6.2 Unless previous experience of similar installations shows it to be unnecessary, calculations of lateral, or bending, vibration characteristics of the shafting system are to be carried out. These calculations, taking account of dynamic bearing stiffnesses, are to cover the frequencies giving rise-to-all critical speeds which may result in significant amplitudes within the speed range, and are to indicate relative deflections and bending moments throughout the shafting system.

4.6.3 The result of these calculations, or the evidence of previous experience, is to be submitted for consideration.

4.6.4 Where calculation indicate the possibility of excessive lateral vibration amplitudes within the range of working speeds, measurements using an appropriate recognized technique may be required to be taken from the shafting system for the purpose of determining the need for restricted speed ranges.

4.7 Shaft alignment

4.7.1 For main propulsion installations, the shafting is to be aligned to give acceptable bearing reactions, and bending moments at all conditions of vessel loading and operation. The shipbuilder is to position the bearings and construct the bearing seatings to minimize the effects of movements under all operating conditions.

4.7.2 For geared installations, where two or more pinions are driving the final reduction wheel, calculations are to be submitted to verify that shaft alignment is such that proper bearing reactions are maintained under all operating conditions.

4.7.3 Shaft alignment is to be verified by measurement.

End of Chapter

Chapter 5
Boilers and Pressure Vessels
Contents

Section

Section 1
General

1.1 Scope

1.1.1 The requirements of this Chapter are applicable to pressure vessels of seamless and fusion welded construction and their mountings and fittings, for the following uses:

a) Fired boilers;
b) Exhaust gas heated boilers;
c) Economizers, superheaters, reheaters and steam receivers for, and associated with (a) to (b).
d) Steam heated steam generators,
e) Other pressure vessels, not included in (a) to (d)

1.1.2 Consideration will be given to arrangements or details of boilers, pressure vessels and equipment which can be shown to comply with other recognized standards, provided they are not less effective.

1.2 Design pressure

1.2.1 The design pressure is the maximum permissible working pressure and is to be not less than the highest set pressure of any safety valve.

1.2.2 The calculations made to determine the scantlings of the pressure parts are to be based on the design pressure, adjusted where necessary to take account of pressure variations corresponding to the most severe operational conditions.

1.2.3 It is desirable that there should be a margin between the normal pressure at which the boiler or pressure vessel operates and the lowest pressure at which any safety valve is set to lift, to prevent unnecessary lifting of the safety valve.

1.3 Metal temperature

1.3.1 The metal temperature, T, used to evaluate the allowable stress is to be taken as the actual metal temperature expected under operating conditions for the pressure part concerned and is to be stated by the manufacturer when plans of the pressure parts are submitted for consideration.

1.3.2 For boilers, the design metal temperature is not to be taken less than the following values, unless justified by an exact calculation of the temperature drop and is in no case to be taken less than 250°C:

a) For steam heated steam generators, secondary drums of double evaporation boilers, steam receivers and pressure part of fired pressure vessels not heated by hot gases and adequately protected by insulation, the metal temperature, T is to be taken as the maximum temperature of the internal fluid;

b) For pressure parts heated by hot gases, T is to be taken as not less than 25°C in excess of the maximum temperature of the internal fluid;

c) For combustion chambers of the type used in horizontal wet-back boilers, T is to be taken as not less than 50°C in excess of the maximum temperature of the internal fluid;

d) For furnaces, fire boxes, rear-tube plates of dry-back boilers and pressure parts subject to similar rates of heat transfer, T is to be taken as not less than 90°C in excess of the maximum temperature of the internal fluid;

(e) For boiler, superheater, reheater and economizer tubes, the design temperature is to be taken as under :

- For boiler tubes the design temperature is to be taken as not less than saturated steam temperature plus 25°C for tubes mainly subject to convection heat, or plus 50°C for tubes mainly subjected to radiant heat;
- For superheater and reheater tubes, the design temperature is to be taken as not less than steam temperature expected in the part being considered, plus 35°C for tubes mainly subject to radiant heat the design temperature is to be taken as not less than the steam temperature excepted in the part being considered, plus 50°C, but the actual metal temperature is to be stated when submitting plans;
- The design temperature for economizer tubes is to be taken as not less than 35°C in excess of the maximum temperature of the internal fluid.

1.3.3 In general any parts of drums or headers not protected by tubes and exposed to radiation from fire or to the impact of hot gases is to be protected by a shield of good refractory material or by other approved means.

1.3.4 Drums and headers of thickness greater than 30 [mm] are not to be exposed to combustion gases having an anticipated temperature in excess of 650°C unless they are efficiently cooled by closely arranged tubes.

1.4 Plans and particulars

1.4.1 The following plans, in triplicate, for boiler and pressure vessels are to be submitted for approval, in so far as applicable:

a) General arrangement, including arrangement of valves and fittings;
b) Sectional assembly;
c) Seating arrangements;
d) Steam, water drum and header details;
e) Water wall details;
f) Steam and superheater tubing, including the tube support arrangements;
g) Economizer details;
h) Casing arrangement;
i) Reheat section;
j) Fuel oil burning arrangement;
k) Forced draft system;
l) Boiler mountings including steam stop valves, safety valves and their relieving capacities, feed water connections, below-off arrangements, watergauges, test cocks, etc.

1.4.2 The plans are to include the following particulars, in so far as applicable :
a) Scantlings;
b) Materials;
c) Weld details;
d) Design pressures and temperatures;
e) Heating surface areas of boilers and superheaters;
f) Estimated pressure drop through superheater;
g) Estimated evaporation rate;
h) Proposed setting pressure of safety valves on steam drum and superheater;
i) Pressure-vessel class;
j) Details of heat treatment and testing of welds;
k) Calculations of thickness, when required;
l) Test pressures.

1.5 Classification of pressure vessels

1.5.1 For Rule purposes, boilers and pressure vessels are graded as shown in Table 1.5.1.

1.5.2 Pressure vessels which are constructed in accordance with the requirements of Class 2 or Class 3 will, if manufactured in accordance with the requirements of a superior class, be approved with the scantlings appropriate to that class.

Table 1.5.1 : Grading to pressure vessels			
	Boilers	**Steam-heated steam generators**	**Other pressure Vessels**
Class 1	p > 3.5	$D_1 > \left(\frac{15}{p} - 1\right)$ 1000	P > 50 or t > 38
Class 2	p ≤ 3.5	$D_1 > \left(\frac{15}{p} - 1\right)$ 1000	P ≤ 50 or D1 > ($\frac{20}{p}$ - 1) 1000 and 16 < t ≤ 38 or material temperature >150°C
Class 3			D1 < $\left(\frac{20}{p} - 1\right)$ 1000 and t ≤ 16 and material temperature ≤ 150°C
Notes : P = design pressure, in bar D_1 = internal diameter [mm] t = shell thickness [mm]			

1.5.3 In special circumstances relating to service conditions, materials, operating temperature, the carriage of dangerous gases and liquids, etc. it may be required that certain pressure vessels be manufactured in accordance with the requirements of a superior class.

1.6 Materials

1.6.1 Materials used in the construction of boilers and pressure vessels are to be manufactured in accordance with the requirements of Pt. 2 Inspection and Testing of Materials, of Rules & Regulations for the Construction and Classification of Steel Vessels.

1.6.2 The specified minimum tensile strength of carbon and carbon manganese steel plates, pipes, forgings and castings is to be within the following general limits :

a) For seamless and Class 1 and Class 2 fusion welded pressure vessels - 340 - 520 [N/mm^2];
b) For boiler furnaces, combustion chambers and flanged plates - 400 - 520 [N/mm^2]

1.6.3 The specified minimum tensile strength of low alloy steel plates, pipes, forgings and castings is to be within the general limits of 400-500 [N/mm^2] and pressure vessels made in these steels are to be either seamless or Class 1 fusion welded.

1.6.4 The specified minimum tensile strength of boiler and superheater tubes is to be within the following general limits :

a) Carbon and carbon-manganese steels-320 -460 [N/mm^2]
b) Low alloy steels - 400 - 500 [N/mm^2].

1.6.5 Where it is proposed to use materials other than those specified in Pt. 2, Inspection and Testing of Materials of Rules & Regulations for the Construction and Classification of Steel Vessel, details of the chemical compositions heat treatment and mechanical properties are to be submitted for approval. In such cases the values of the mechanical properties used for deriving the allowable stress are to subjected to agreement by classification society.

1.6.6 Where a fusion welded pressure vessel is to be made of alloy steel and approval of the scantlings is required on the basis of the high temperature properties of the material, particulars of the welding consumables to be used, including typical mechanical properties and chemical composition of the deposited weld metal are to be submitted for approval.

1.7 Pressure parts of irregular shape

1.7.1 Where pressure parts are of such irregular shape that it is impracticable to design their scantlings by the application of formulae given in this Chapter, the suitability of their construction is to be determined by hydraulic proof test of a prototype or by an agreed alternative method.

1.8 Adverse working conditions

1.8.1 Where working conditions are adverse, special consideration may be required to be given to increasing the scantlings derived from the formulae, e.g. by increasing the corrosion or other allowance at present shown in the formulae, or by adopting a design pressure higher than defined in 1.2, to offset the possible reduction of life in service caused by the adverse conditions, In this connection, where necessary, account should also be taken of any excess of loading resulting from :

a) impact loads, including rapidly fluctuating pressures;
b) weight of the vessel and normal contents under operating and test conditions;
c) superimosed loads such as other pressure vessels, operating equipment, insulation, corrosion-resistant or erosion resistant linings and piping;
d) reaction of supporting lugs, rings, saddles or other types of supports;

or

e) the effect of temperature gradients on maximum stress.

1.9 Design

1.9.1 The boilers and pressure vessels are to be designed in accordance with the requirements of *Ch.5, Pt.4, Main and Auxiliary Machinery, of Rules & Regulations for the Construction and Classification of Steel Vessels.*

1.10 Manufacture

1.10.1 The manufacture of boilers and pressure vessels is to be carried out in accordance with the requirements of *Ch.10, Pt.4, Main and Auxiliary Machinery, of Rules & Regulations for the construction and Classification of Steel Vessels.*

End of Chapter

Chapter 6
Steering Gears
Contents

Section

Section 1
General

1.1 General

1.1.1 All vessels are to be provided with reliable steering systems which would allow the vessel to be steered safely having regard to the use and principal dimensions of the vessel. This requirement does not apply to vessels intended to be pushed only. Proposals to fit a hand tiller only will receive special consideration.

1.1.2 For vessels not fitted with rudders but equipped with steering propellers/nozzles or Voith-Schneider propellers, see 2.5. For vessels fitted with rudders, a steering gear is to be provided.

1.1.3 The steering gear is to be secured to the seating by fitted bolts, and suitable chocking arrangements are to be provided. The seating is to be of substantial construction.

1.1.4 The steering gear is to be so designed that the rudder cannot change position when not intended to do so.

1.1.5 Steering gears may be manually operated (steering chains and rods or hand/hydraulic) or fully powered (electric or electric/hydraulic). However, when the rule diameter of the rudderstock exceeds 150 [mm] in way of tiller, a fully powered steering gear is to be provided.

1.1.6 Manually operated gears or power assisted gears are only acceptable when the operation does not require an effort exceeding 16 [kgf] under normal conditions.

1.1.7 If a fully powered steering gear is fitted an independent secondary means of steering is to be provided.

1.1.8 Requirements for chemical tankers, gas carriers and similar vessels will be specially considered.

Section 2
Design Criteria

2.1 General

2.1.1 The entire steering gear is to be designed, constructed and installed to allow for a permanent transverse list of up to 15 and for ambient temperatures commensurate with the area in which he vessel is to operate.

2.1.2 The parts comprising the steering gear are to be so dimensioned that they can withstand all the maximum stresses to which they will be subjected in normal operating conditions. The steering gear is to be sufficiently strong so that in the event of rudder touching the bottom or bank, the maximum damage would be limited to deformation or fracturing of the rudder stock.

2.1.3 The steering gear is to be so designed that a rudder angle of not less than 35 on-either side can be obtained.

2.1.4 Where the steering gear is manually operated, on an average one complete turn of the hand wheel is to correspond to at least 3 of rudder angle.

2.1.5 Where the steering gear is fully powered, it is to be capable of turning the rudder at an average rate of 4 per second through the entire rudder arc when the rudder is fully immersed and with the vessel at full speed.

2.1.6 Where fully powered steering gear is provided with a second, manually operated gear the latter is to permit the vessel to proceed to a mooring at reduced speed.

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2.2 Fully powered steering gear

2.2.1 Fully powered steering gears may be of the direct electric or electric/hydraulic type.

2.2.2 Powered steering gears are to be fitted with means to limit the torque exerted by the drive.

2.2.3 In case of failure of the main drive and the secondary drive not engaging automatically, it is to be possible to engage the secondary drive by hand at the steering position within 5 seconds. with the rudder in any position.

2.2.4 At the steering station, automatic indication is to be provided as to which drive is in operation.

2.2.5 If the independent secondary drive is manual the power drive is not to actuate the hand wheel. A device is to be fitted to prevent inadvertent turning of the hand wheel when the manual drive is engaged automatically.

2.2.6 Where the main steering gear is power hydraulically operated whilst the secondary steering is a manually operated hydraulic system, the piping of both systems is to be completely separate, and the main installation is to operate without using the steering wheel pump of the secondary installation.

2.2.7 Where both the main and secondary drive are power hydraulic, the respective pumps must be driven independently.

2.2.8 Where the secondary pump is driven by an engine which does not operate continuously whilst the vessel is in motion, means are to be provided to operate the steering gear instantly whilst the emergency engine is gaining the required speed.

2.2.9 The two installations are to have separate pipes, valves, controls, etc. Where the independent functioning of the two installations is ensured, they may have common components.

2.3 Manual drive

2.3.1 Where the sole steering installation is a manually operated system, an independent secondary steering system is not required, provided that in the case of a hydraulic system, the dimensioning, construction and layout of the piping precludes deterioration through mechanical action or fire, and the construction of the steering wheel pump ensures faultless operation.

2.4 Rudder position

2.4.1 If the position of the rudder(s) is not clearly perceivable from the steering station, a reliable rudder angle indicator is to be provided at the steering station.

2.4.2 Any rudder angle indicator fitted, is to function for both the main and secondary steering gear.

2.5 Rudder propellers and Voith Schneider equipment

2.5.1 Where a steering propeller/nozzle or Voith Schneider propeller is fitted, two independent control systems are to be provided between the steering station and the propulsion installation.

2.5.2 Where two or more independent steering propulsion installation are fitted, a secondary independent control system is not required provided the vessel remains sufficiently maneuverable in the event of one of the installations failing.

2.6 Tillers, quadrants and connecting rods

2.6.1 For the requirements regarding rudder, rudder stock. See Pt.3, Ch.12.

2.6.2 All components transmitting mechanical forces to the rudder stock are to have strength of at least equivalent to the rudder stock in way of the tiller. The combined resultant stress, σ_e, caused by the transmission of rudder torque, Q_r, in tillers, vanes and other power transmitting components is not to exceed 138 [N/mm2], i.e.

$\sigma_e \sqrt{\sigma^2 + 3\tau^2} \leq 138$ [N/mm:]

where,

σ_e = The combined equivalent stress. [N/mm2]

σ = The bending stress. [N/mm2]

τ = torsional shear stress. [N/mm2]

Q_r = The rudder torque [N-m] calculated as per pt. 3. Ch. 12 Sec. 3.2:

2.6.3 The section modulus 'Z' [cm3] and the sectional area 'A' [cm2] of the tiller arms is not to be less than the following:

Z — 0.012Qr $\left(1 - \frac{X}{R}\right)$ [cm2]

A = 2.0 $\frac{Qr}{R}$ x 10^{-4} [cm2]

where,

R = The distance [m] from the point of application of the effort on the tiller to the centre of rudder stock; and

x = The distance [m] from the section under consideration to the centre of the rudder stock.

2.6.4 The boss may be fitted on the rudder stock by shrinking with/without key or may be of the split type. The ratio between the mean of outer and inner diameters of the boss is to be not less than 1.75 and the height of the boss is not to be less than the inner diameter of the boss.

2.6.5 Co-efficient of friction for shrink fitting is not to be taken greater than 0.17 for dry fitting and 0.15 for oil injection fitting.

2.6.6 In case of split type boss, the total number of joining bolts is to be at least 4. The distance of the centre of the bolts from the centre of the rudder stock is generally to be 1.15du and the thickness of the coupling flange is to be at least 1.1 times the required bolt diameter. The thickness of shim to be fitted between two halves before machining is to be 0.0015du. The diameter of the coupling bolt d_b is to be not less than:

d_b = 0.60 $\frac{du}{\sqrt{n}}$ [mm]

where,

d_u = The rudder stock diameter in way of the tiller calculated in accordance with Pt. 3. Ch. 12, Sec. 3;

n = Total number of joining bolts.

2.6.7 The shear area of the key. As, is not to be less than :

A_s = $\frac{0.18Qr}{dm}$ [cm2]

where,

dm = diameter of the conical part of the rudderstock at midway of key, [mm]

The keyway is to extend over the full depth of the tiller and have rounded edges. The abutting surface area of the key, Ab, (discounted rounded edges) between the key and the rudder stock or the key and the tiller boss is not to be less than :

$A_b \geq 0.5 A_s$

2.6.8 Where higher tensile bolts are used on bolted tillers and quadrants, the yield and ultimate tensile stresses of the bolt material are to be stated on the plans submitted for approval, together with full details of the methods to be adopted to obtain the required setting-up stress. Where patent nuts or systems are used, the manufacturer's instructions for assembly should be adhered to.

2.6.9 In bow rudders having a vertical locking pin operated from the deck above, positive means are to be provided to ensure that the pin can be lowered only when the rudder is exactly central. In addition, an indicator is to be fitted at deck to show when the rudder is exactly central.

2.6.10 Steel-wire rope, chain and other mechanical systems, when these are used for rudder stock diameters of 120 [mm] and less but excluding allowance for strengthening in ice, will be specially considered. In general the breaking strength of rods/chains etc. is not to be less than :

Breaking strength $\geq 6 \frac{Qr}{R}$ [N]

Where R is definded in 2.6.3.

2.7 Locking or brake gear and springs

2.7.1 An efficient locking or brake arrangement is to be fitted to all gears to keep the rudder steady when necessary. In the case of hydraulic steering gears which are fitted with isolating valves on the body of the gear and duplicate power units, an additional mechanical brake need not be fitted.

2.7:2 In bow rudders having a vertical locking pin operated from the deck above, positive means are to be provided to ensure that the pin can be lowered only when the rudder is exactly central !n addition, an indicator is to be rifted at the deck to show when the rudder is exactly central.

2.7.3 The steering gear, unless hydraulically powered, is to be protected by means of springs or buffers from damage by impact on the rudder.

2.8 Rudder stops

2.8.1 Suitable stopping arrangements are to be provided for the rudder. Cut-outs on the steering engine are to be arranged to operate at a smaller angle of helm than those for the rudder.

End of Chapter

Chapter 7
Control Engineering Systems
Contents

Section

Section 1
General Requirements

1.1 General

1.1.1 This Chapter applies to all vessels and is in addition to other relevant Chapters of the Rules.

1.1.2 Attention should also be given to any relevant requirements of National, International or Local Authorities which would apply to the vessels in service.

1.1.3 This Chapter states requirements for systems of automatic or remote control which may be used for controlling the machinery contained in 1.2.2. The design and installation of other control equipment is to be such that there is no risk of danger due to failure.

1.1.4 The details of control systems will vary with the type of machinery being controlled and special Consideration will be given to each case.

1.2 Plans

1.2.1 Where control systems are applied to essential machinery or equipment as listed in 1.2.2, plans are to be submitted in triplicate. They are to include or to be accompanied by:

- Details of operating medium, i.e. pneumatic, hydraulic or electric, including standby sources of power.
- Description and/or block diagram showing method of operation.
- Line diagrams of control circuits.
- Lists of points monitored.
- List of alarm points.
- List of control points.
- Test facilities provided.
- Test schedules.

1.2.2 Control systems. Plans are required for the following :

- Ballast systems.
- Bilge systems.
- Cargo pumping systems for tankers.
- Controllable pitch propellers.
- Electrical generating plant.
- Fire detection systems.
- Main propelling machinery including essential auxiliaries.
- Steam raising plant.
- Transverse thrust units.
- Steering gear plant.

1.2.3 Alarm systems. Details of the overall alarm system linking engine room, wheelhouse and, where applicable, accommodation spaces are to be submitted.

1.2.4 Control Station. Location· and details of control station are to be submitted, e.g. control panels.

1.2.5 Standard system. Where it is intended to employ a system which has been previously approved, plans may not be required to be submitted.

1.3 Alarm and control equipment

1.3.1 Major units of equipment associated with control, alarm and safety systems as defined in 1.2 are to be surveyed at the manufacturers' works and the inspection and testing is to be to the Surveyor's satisfaction.

1.3.2-Equipment used in control alarm safety systems should whenever practicable, be selected from the List of Type Approved Control and Electrical Equipment published by IRS. A copy of classification society (IRS) Test Requirements for the Type Approval of Control and Electrical Equipment will be furnished on application.

1.3.3 Assessment of performance parameters, such-as accuracy, repeatability and the like, are to be in accordance with an acceptable National or International Standard.

1.4 Alterations or additions

1.4.1 When an alteration or addition to the approved system(s) is proposed, plans are to be submitted for approval. The alterations, or additions are to be carried out under survey, and the inspection, testing and installation is to be to the Surveyor's satisfaction.

Section 2
Essential Features for Control and Alarm Systems

2.1 General

2.1.1 Where it is proposed to install control and alarm systems to the equipment defined in 1.2.2 the applicable features contained in 2.2 to 2.5 are to be incorporated in the system design.

2.2 Control station(s) for machinery

2.2.1 A system of alarm displays and controls are to be provided which readily ensure identification of faults in the machinery and satisfactory supervision of related equipment.

2.3 Alarm system

2.3.1 Where an alarm system, which will provide warning of faults in the machinery and control systems is installed, the requirements of 2.3.1 to 2.3.10 are to be satisfied.

2.3.2 Machinery and control system faults are to be indicated at the relevant control station to advise duty personnel of a fault condition.

2.3.3 Individual alarm channels may be displayed as group alarms at the main control station (if Fitted) or alternatively at subsidiary control stations.

2.3.4 All alarms are to be both audible and visual. If arrangements are made to silence audible alarms they are not to extinguish visual alarms.

2.3.5 If an alarm has been acknowledged and a second fault occurs before the first was rectified then audible and visual alarms are again to operate.

2.3.6 Failure of the power supply to the alarm system is to be indicated.

2.3.7 The alarm system should be designed with self-monitoring properties. As far as practical, any fault in the alarm system should cause it to fail to the alarm condition.

2.3.8 The alarm system is to be designed as far as practical to function independently of control systems, such that a failure or malfunction in these systems will not prevent the alarm from operating.

2.3.9 Disconnection Or manual overriding of any part the alarm system should be clearly indicated.

2.3.10 The alarm system is to be capable of being tested.

2.4 Control systems

2.4.1 Control systems for machinery operations are to be stable throughout their operating range.

2.4.2 Failure of the power supply to a control system for propulsion machinery and associated systems is to operate an audible and visual alarm.

2.4.3 When remote or automatic controls are provided, sufficient instrumentation is to be fitted at the relevant control stations to ensure effective control and indicate that the system is functioning correctly.

2.4.4 Where valves are operated by remote or automatic control, the system of control should include the following safety features:

(a) Failure of actuator power should not permit a closed valve to open inadvertently.

(b) Positive indication is to be provided at the remote control station for the service to show the actual valve position or alternatively that the valve is fully open or closed. Valve position indicating systems are to be of an approved type.

(c) Equipment located in places which may be flooded should be capable of operating when submerged.

(d) A secondary means of operating the valves, which may be local manual control is to be provided.

2.5 Fire detection alarms systems

2.5.1 Where an automatic fire detection system is to be fitted in a machinery space the requirements of 2.5.2 to 2.5.9 are to be satisfied.

2.5.2 A fire detector indicator panel is to be located in such a position that a fire in the machinery spaces will not render it inoperative.

2.5.3 The audible fire alarm is to have a characteristic tone which distinguishes it from any other alarm system. The audible fire alarm is to be audible on all parts of the bridge and in the accommodation areas.

2.5.4 The alarm system should, so far as practicable, be designed with self-monitoring properties.

2.5.5 Failure of power supply to the alarm system is to be indicated.

2.5.6 Detector heads of an approved type are to be located in the machinery spaces so that all potential fire outbreak points are guarded.

2.5.7 The fire detection system is to be capable of being tested.

2.5.8 it is to be demonstrated to the Surveyor's satisfaction that detector heads are so located that air currents will not render the system ineffective.

2.5.9 A drawing showing the location of the fire detector heads and the fire indicator panel, is to be submitted.

Section 3
Control and- Supervision of Machinery

3.1 General

3.1.1 When machinery, as defined in 1.2.2, is fitted with automatic or remote controls so that under normal operating conditions it does not require any manual intervention by the operators then it is to be provided with the arrangements specified in 3.2 to 3.7. Alternative arrangements which provide equivalent safeguards will be considered.

3.2 Oil engines for propulsion purposes

3.2. I The following systems are to be provided with alarms:

System	Alarm
Lubricating oil pressure for the engine including gearing	Low
Lubricating oil pressure for the engine including	Failure, see 3.2.2
Cooling system (s) Temperature	High
Cooling system (s) Temperature	Excessively high, see 3.2.3

3.2.2 In the case of the lubricating oil system, in addition to the alarm indication as required by 3.2.1. at complete loss of lubricating oil the engine is to be stopped automatically or alternatively a second and separate alarm is to be provided giving audible and visible warning in the wheelhouse and in the engine room. The circuit and sensor employed for this automatic stop or alarm are to be additional to the alarm circuit and sensor required by 3.2.1.

3.2.3 In the case of cooling system(s), in addition to the alarm indication as required by 3.21. a shutdown system for excessively high temperatures may be fitted, which is to be independent of the alarm system.

3.2.4 Prolonged running in a restricted speed range is to be prevented automatically, alternatively, Indication of restricted speed ranges is to be provided at each control station.

3.3 Boilers

3.3.1 A system of water level detection is to be fitted which will operate alarms and shut off automatically the oil supply to the burners when the water level falls to a predetermined tow level.

3.3.2 The oil fuel is to be shut off automatically from the burners, and alarms are to operate on flame failure and failure of combustion air supply detected by either Iow pressure at the fan-outlet or stopping of the fan motor.

3.3.3 Where the burner flame(s) is/are extinguished and reignited automatically in response to steam demand then after total flame failure re-ignition shall not take place until the furnace has been purged of explosive gases.

3.4 Auxiliary engines

3.4.1 The following systems for auxiliary engines of more than 37 kW (50 shp) are to be provided with alarms:

System	**Alarm**
Lubricating oil pressure	Low *
Cooling system temperature	High *
* These alarms may be combined with an automatic shutdown system, if fitted	

3.5 Remote control for propulsion machinery

3.5.1 The following systems are to be provided with alarms:

System	**Alarm**
Operating-medium forhydraulic or pneumatic coupling in propulsion system	Low pressure
Operating medium for hydraulic or pneumatic remote control system for main engine	Low pressure
Electrical supply to remote control system for main engine	Loss of supply

3.6 Controllable pitch propellers and transverse thrust units

3.6.1 Preferred alarms and safeguards are indicated in 3.6.2 to 3.6.4.

3.6.2 In the case of main propulsion systems, means are to be provided to prevent the engines and shafting being subjected to excessive torque due to changes in propeller pitch alternatively an engine overload indicator may be fitted at each station for which it is possible to control the pitch of the propeller.

3.6.3 Where transverse thrust units are remotely controlled, means are to be provided at the remote control station to stop the propulsion unit.

3.6.4 The following systems are to be provided with alarms:

System	Alarm
Hydraulic system pressure	Low
Power supply to the control system between the remote control station and hydraulic actuator	Low of supply

3.7 Steering gear

3.7.1 For power operated steering gear, safeguards and alarms are to be provided as indicated in 3.7.2 and 3.7.5.

3.7.2 Provision should be made at the bridge to ensure that the steering gear may be rapidly and effectively transferred to an alternative power and control system, which may be manual.

3.7.3 Where the alternative steering gear system is also power operated this system should be independent of the main power system.

3.7.4 The control system for the alternative steering gear system required by 3.7.2 is to be independent of the main steering gear control system.

3.7.5 The following systems are to be provided with alarms:

System	**Alarm**
Steering gear power system (s)	Failure
Steering gear control systems (s)	Failure
Steering gear hydraulic oil tank level	Low

3.8 Main propulsion shafting

3.8.1 Where a tank supplying lubricating oil to the sternbush is fitted, it is to be located above the load waterline and is to be provided with a Iow level alarm.

End of Chapter

Chapter 8
Spare Gear
Contents

Section

Section 1
General

1.1 General

1.1.1 Adequate spare parts for the propelling and essential auxiliary machinery together with necessary tools for maintenance and repair are to be readily available for use.

1.1.2 Spare parts are to be supplied and their location is to be the responsibility of the Owner but must take in to account the design and arrangements of the machinery and the intended service and operation of the vessel. Account should also be taken of the recommendations of the machinery manufacturer and any applicable statutory requirements of the country of registration of the vessel.

1.2 Table of spare parts

1.2.1 For guidance purposes spare parts for main and auxiliary machinery installations are shown in the following Tables:-

- Table 1.2.1 - Spare parts for main internal combustion engines;
- Table 1.2.2 - Spare-parts for auxiliary boilers;
- Table 1.2.3 - Spare parts for auxiliary air compressors.

Table 1.2.1 - Main internal combustion engines			
Sr. No.	Item	Spare Part	Qty.
1	Main thrust block	Pads for one face of thrust block	1 set
		Complete white metal thrust shoe of soild ring type	1
		Inner and outer race with rollers, where roller thrust bearings are fitted	1
2	Cyclinder valves	Exhaust valves, complete with casings, seats, springs and other fittings for one cylinder	1 set
		Air inlet valves, complete with casings, seats springs and other fittings for one cylinder	1 set

		Starting air valve, complete with casing, seat, springs and other fittings	1
		Relief valve, complete	1
		Fuel valves of each size and type fitted complete with all fittings, for one engine	1/4 set
3		Special gaskets and packing of each size and type fitted for cylinder cover and cylinder liner for one cylinder	1 set

Table 1.2.2 - Auxiliary boilers			
Sr. No.	Item	Spare Part	Qty.
1	Tube stoppers or plugs	Tube stoppers or plugs, of each size used. for boiler superheater and economiser tubes	10
2	Fire bars	Fire bars for one boiler, where coal fired	Half set
3	Oil fuel burners	Oil fuel burners complete, for one boiler	1 set

Table 1.2.3 - Auxiliary air comprssor			
Sr. No.	Item	Spare Part	Qty.
1	Piston rings	Rings of each size fitted for one piston	1 set
2	Valves	Suction and delivery valves, complete, of each size fitted	Half set

End of Chapter

PART D
ELECTRICAL INSTALLATIONS

Electrical Installations - Equipment and Systems

Contents

Section

Section 1

General Information

1.1 General

1.1.1 The requirements of this Chapter apply to self-propelled and non self-propelled vessels for service on inland waterways unless otherwise stated. Attention should also be given to any relevant applicable requirements of National or Local Authorities.

1.1.2 In passenger vessels, services essential for safety are to be maintained under emergency conditions and the safety of vessel and personnel from electrical hazards is to be assured.

1.1.3 Electrical installations are to be constructed and installed in accordance with the relevant sections of this Chapter and are to be inspected and tested-by the Surveyors. Compliance with the requirements of an acceptable National or International Standard may be accepted as meeting the requirements of this Chapter, subject-to inspection and testing by the Surveyors.

1.1.4 Classification society will be prepared to give consideration to special cases or to arrangements which are equivalent to the Rules. Consideration will also be given to the electrical arrangements of small vessels and vessels to be assigned class notation for a specified-limited service.

1.2 Plans

1.2.1 The plans and particulars in 1.2.2 to 1.2.4 are to be submitted in triplicate for approval.

1.2.2 Electrical Equipment: The arrangement plan and circuit diagram of the switchboard(s). Diagrams of-the wiring system including cable sizes, type of insulation, normal working current in the circuits and the capacity, type and make of protective devices. Calculations of short circuit currents at main busbars and the secondary side of transformers are to be submitted.

1.2.3 Oil tankers, and similar vessels: A general arrangement of the vessel showing hazardous zones or spaces and the location of electrical equipment in such zones or spaces. A schedule of safe type electrical equipment located in 'hazardous zones or spaces giving details of the type of equipment fitted, the Certifying Authority, the certificate number and copies of the certificate.

1.2.4 Centralised, remote or automatic controls: See Ch.7.

1.3 Additions or alterations

1.3.1 Additions or alterations, (temporary or permanent) to the approved load of an existing installation are not to be made until it has been ascertained that the current carrying capacity and the condition of the existing accessories, conductors and switchgear are adequate for the proposed modification.

1.3.2 Plans for the proposed modificatins are to be submitted for approval and the alterations or additions are to be carried out under the inspection, and to the satisfaction of the Surveyors.

1.4 Application

1.4.1 Except where a specific statement is made to the contrary, all requirements of this Chapter are applicable to both alternating current and direct current installations.

1.4.2 Direct current equipment is to operate satisfactorily under voltage fluctuations of plus 6 per cent and minus 10 per cent.

1.4.3 Alternating current equipment is to operate satisfactorily under voltage fluctuations of plus 6 per cent and minus 10 per cent at rated frequency, and under frequency fluctuations of ± 5 per cent per at rated voltage.

1.4.4 Contactors and similar electromagnetic equipment are not to drop out at or above 85 per cent rated voltage.

1.4.5 For D.C. installations supplied by batteries, consideration is to be given to the supply voltage variations between the battery's full charged and minimum charged voltages. For installations with float charging, the maximum charging voltage is also to be considered.

1.5 Ambient reference conditions

1.5.1 The rating of electrical equipment is to be suitable for the temperature conditions associated with the geographical limits of the intended service. See also Ch.1.

1.6 Location and construction

1.6.1 Electrical equipment is to be placed in accessible and adequately lighted spaces clear of flammable material and heat sources. The spaces should be well ventilated, and the equipment should not be exposed to risk of mechanical injury or damage from water, excessive moisture, steam, oil or any other dangerous fluid. Where necessarily exposed to such hazards, the equipment is to be suitably-constructed or enclosed.

1.6.2 Live parts are to be efficiently shielded from any accidental contact.

1.6.3 All electrical apparatus and equipment is to be constructed and installed so as to avoid injury or electrical shock when handled or touched in the course of normal operation.

1.6.4 All nuts and bolts/screws used to connect or secure current- carrying parts and working parts are to be effectively locked, to prevent them from working loose during operation.

1.7 Earthing

1.7.1 All non-current-carrying exposed metal parts of electrical machines or equipment are to be effectively earthed.

1.7.2 All accessible non-current-carrying metal parts of portable electrical apparatus rated in excess of 55 volts are to be earthed through a suitable conductor unless equivalent safety provisions are made such as by double insulation or by an isolating transformer.

1.7.3 In general earthing connections are to be equal to the cross section of the current-carrying conductor up to 16 [mm2]. Above this figure they are to be equal to at least half the cross section of the current carrying conductor, with a minimum of 16 [mm^2]. Earthing connections which are not made of copper are to have a conductance not less than that specified for a copper earthing connection. These are to be securely installed and protected where necessary against mechanical damage and electrolytic corrosion. These are to be made in an accessible location and secured at both ends by corrosion resistant screws or clamps with cross section corresponding to the earth conductor. Such screws or clamps are not to be used for other purposes. Suitable washers and conductor terminals are to be used so that a reliable contact is ensured.

1.7.4 The metallic sheaths of cables other than the measuring circuits are to be earthed at their two ends.

1.8 Creepage and clearance

1.8.1 Distance between live parts and between live parts and earthed metal, whether across surfaces or in air, are to be adequate for the working voltages considering the nature of the insulating material and the transient over voltages developed by switch and fault conditions.

1.9 Electrical equipment for use in explosive gas atmospheres

1.9.1 Where the Rules require electrical equipment to be of a "safe type", such equipment is to be certified for the gase/vopours involved. The equipment should conform to IEC publication 79, "Electrical Apparatus for Explosive Gas Atmospheres" or an equivalent national standard.

1.9.2 Copies of type test certificate by a competent independent Testing Authority are to be made available.

1.9.3 When "safe type" equipment is permitted in hazardous zones or spaces all switches and protective devices are to interrupt all lines or phases and, where practicable, are to be located in a non-hazardous zone or space unless specifically permitted otherwise. Appropriate labels of non-flammable material are to be permanently affixed to such equipment, switches and protective devices for identification purposes.

Section 2
System Design

2.1 Design

2.1.1 Supply and distribution systems

2. 1.1.1 The following systems of generation and distribution are acceptable for parallel systems at constant voltage:-

a) d.c. two wire insulated.
b) a.c. single - phase two-wire insulated.
c) a.c. three-phase, three-wire insulated.
d) a.c. three-phase, four-wire with neutral earthed but without hull return.

2.1.1.2 Systems of generation and distribution, other than those specified above, will, upon application, be given special consideration.

2.1.2 Earth indication

2.1.2.1 Every insulated distribution system is to be provided with lamps or other means to indicate the state of insulation from earth. Where lamp indicators are used, the lamps are to be of the metal filament type and their power is not to exceed 30 watts.

2.1.3 Number and rating of generating sets

2.1.3.1 The number and rating of service generating sets are to be adequate to ensure the operation of services essential for the propulsion and safety of the vessel.

2.1.3.2 On oil tankers and similar vessels, where electrical power is required for essential equipment, the generating plant and converting plant is to be of such capacity that this essential equipment can be operated satisfactorily even with one generating set or converting set out or action.

2.1.4 The emergency source of power in passenger vessels

2.1.4.1 All passenger vessels are to be provided with an, emergency source of electrical power. On vessels having a rule length of 25 [m] or more, the emergency source is to be situated outside the engine room and the space is to be constructed of watertight and fire resisting bulkheads and decks.

2.1.4.2 Where emergency generating sets are fitted they are to be capable of being started readily when cold.

2.1.4.3 If hand starting is demonstrated to be practicable, alternative means of starting are not required. Where hand starting is not practicable, other means are to be provided and, in general, should provide for at least 12 starts in a period of thirty minutes without recourse to sources within the machinery space.

2. 1.4.4 The emergency source of power is to be either:

a) A generator driven by a suitable prime mover with an independent fuel supply and with satisfactory starting arrangements; the fuel used is to have a flash point of not less than 43°C or
b) An accumulator (storage) battery capable of carrying the emergency load without recharging or excessive voltage drop.

2.1.4.5 An indicator is to be mounted in the machinery space, or in the wheelhouse, to indicate when any accumulator battery fitted in accordance with 2.1.4.4 is being discharged.

2.1.4.6 The emergency switchboard is to be installed as near as is practicable to the emergency source of power.

2.1.4.7 The emergency switchboard may be supplied from the main switchboard during normal operation.

2.1.4.8 The power available is to be sufficient to supply all services necessary for the safety of passengers and crew in an emergency, due regard being paid to such services as may have to be operated simultaneously. Special consideration is to be given to emergency lighting in all alleyways, stairways and exits, in the machinery spaces and in the control stations where radio, main navigating or central fire recording equipment or the emergency generator is located, to fire detection and alarm system, to the emergency fire pump if electrically driven, automatic sprinkler systems if fitted, and to navigation lights. The power is to be adequate for a period of at least 3 hours.

2.1.5 Essential services

2.1.5.1 Where essential services are duplicated, they are to be served by individual circuits separated throughout their length as widely as is practicable and without the use of common feeders, protective devices or control circuits.

2.1.6 Diversity factor

2.1.6.1 Circuits supplying two or more final sub-circuits are to be rated, in accordance with the total connected load subject, where justified, to the application of a diversity factor. Where spare ways (feeders) are provided on a section or distribution board, an allowance for future increase of load is to be added to the total connected load before application of any diversity factor.

2.1.6.2 The diversity factor may be applied when calculating cable size and when calculating the rating of switchgear and fusegear.

2.1.6.3 The diversity factors are not applicable to supply cables to distribution switchboards for lighting and heating.

2.1.7 Lighting circuits

2.1.7.1 Lighting circuits are to be supplied by final sub-circuits, which are separate from those for heating and power. This provision need not be applied to cabin fans and small wardrobe heaters.

2.1.7.2 A final sub-circuit of rating exceeding 15 amperes is not to supply more than one point.

2.1.7.3 A final sub-circuit of rating 15 amperes or less is not to supply more than the following number of lighting points :-

10 for 24-55 V circuits
14 for 110 - 127 V circuits
18 for 220 - 250 V circuits

This provision is not applicable to final sub-circuits for cornice lighting, panel lighting and electric signs where lampholders are closely grouped, in such cases, the number of points is unrestricted provided the maximum operating current in the sub-circuit does not exceed 10 amperes.

2.1.7.4 Lighting of unattended spaces, such as cargo spaces is to be controlled by multi-pole linked switches located outside such spaces. Provision is to be made for the complete isolation of these circuits and locking in the "OFF" position of the means of control.

2.1.7.5 Emergency lighting is to be fitted in accordance with 2.1.4.

2.1.8 Motor circuits

2.1.8.1 A separate final sub-circuit is to be provided for every motor required for essential services and for every motor of 1 [kW] or more.

2.1.9 Motor control

2.1.9.1 Every electric motor is to be provided with an efficient means of starting and stopping so placed as to be easily accessible to be person controlling the motor.

2.1.9.2 Every motor required for essential services and for every motor of 0.5 [kW] or more is to be provided with the control apparatus as mentioned in 2.1.9.4 to 2.1.9.8.

2.1.9.3 When motor control gear is being selected, the maximum current of the motor is to be taken as its rated full load current.

2.1.9.4 Efficient means of isolation are to be provided so that all voltage may be cut off from the motor and any associated apparatus including any automatic circuit breaker.

2.1.9.5 Where the primary means of isolation (viz. that provided at the switchboard, section board or distribution fuse board) is remote from a motor, one of the following provisions is to be made:-

a) An additional means of isolation fitted adjacent to the motor; or
b) Provision made for locking the primary means of isolation in the OFF position; or
c) Provision made so that the fuses in each line can be readily removed and retained by authorized personnel.

2.1.9.6 Means to prevent the undesired restarting after a stoppage due to low volts or complete loss of volts are to be provided. This does not apply to motors where a dangerous condition might result from the failure to restart automatically e.g. steering gear motor. It is, however, to be ensured that the total starting current of motors having automatic re-start will not cause excessive voltage drop or overcurrent on the installation.

2.1.9.7 Means for automatic disconnection of the supply in the event of excess current due to mechanical overloading of the motor are to be provided. (This does not apply to steering gear motors).

2.1.9.8 Where fuses are installed to protect polyphase motor circuits, means are to be provided to protect the motor against unacceptable overload in the case of single phasing.

2.1.10 Remote stops for ventilation fans and pumps

2.1.10.1: Ventilating fans for machinery and cargo spaces are to be provided with means for stopping them from easily accessible control stations located outside such spaces.

2.1.10.2 Motors driving forced and induced draught fans, independently driven pumps delivering oil to main propulsion machinery, for bearing lubrication and piston cooling, oil fuel transfer pumps, oil fuel unit pumps and other similar fuel pumps, fuel and lubricating oil purifiers and their attached pumps are to be fitted with remote controls situated outside the space concerned so that the electrical supply thereto can be disconnected in the event of fire arising in the space in which they are located.

2.1.10.3 in passenger vessels all power ventilation systems; except cargo and machinery space ventilation, which is to be in accordance with 2.1.10.1, are to be fitted with master controls so that all fans may be stopped from either of two separate positions which are to be situated as far apart as practicable.

2.1.11 Steering gear

2.1.11.1 Where electrical control of the steering system is fitted, an independent alternative control system is to be installed. This may be a duplicate electrical control system or control by other means.

2.1.11.2 Provision is to be made on the bridge to transfer the steering control Instantaneously to the alternative means of control.

2.1.11.3 Indicators for running indication of steering gear motors are to be installed on the bridge.

2.1.11.4 Audible and visual alarms are to operate at the steering positions for failure of steering gear power system and failure of steering gear control system.

2.1.12 Fire detection, alarm and extinguishing system on passenger vessels.

2.1.12.1 Where electrically driven emergency fire pumps are installed in accordance with Ch.9 the supply to such pumps is not to pass through the main machinery space.

2.1.12.2 Any fire alarm system is to operate both audible and visual signals at the fire detection control station(s).

2.1.13 Navigation lights

2.1.13.1 Each navigation light is to be controlled and protected in each insulated pole by a switch and fuse or circuit breaker mounted in the distribution board.

2.1.13.2 Automatic indication of failure is to be provided unless the lights are visible from the bridge.

2.1.13.3 Any statutory requirements of the country of registration are to be complied with and may be accepted as an ·alternative to the above.

2.1.14 Size of batteries and charging facilities.

2.1.14.1 Where batteries are used for starting main engines, they are to be of adequate capacity to meet the requirements of Ch.4.

2.1.14.2 Adequate charging facilities are to be provided, and where batteries are charged from line voltage by means of a series resistor, protection against reversal of current is to be provided when the charging voltage is 20 per cent of line voltage or higher. Means are also to be provided to isolate the batteries from the Iow voltage system when being charged from a higher voltage system.

2.1.15 Heating and cooking equipment

2.1.15.1 Every heating or cooking appliance is to be controlled as a complete unit by a multi-pole linked switch mounted in the vicinity of the appliance.

2.1.15.2 In the case of small heaters, for individual cabins or similar small dry accommodation spaces where the floor coverings, bulkheads and ceiling linings are of insulating materials, a single pole switch is acceptable.

2.1.15.3 Heating, arrangements of the exposed element type are not to be used in any location.

2.1.16 Temporary external supply/shore connection

2.1.16.1 Where arrangements are provided for the supply of electric power from a source on shore or elsewhere, a connection box is to be installed in an easily, accessible location in a manner suitable for the convenient reception of flexible cables from the external source. This box should contain a circuit-breaker or isolating switch and fuses and terminals of ample size and suitable shape to facilitate a satisfactory connection. The mechanical stress of the portable cable is to be conveyed directly to the metallic framework and not to electrical connectors. Suitable cables, permanently fixed are to be provided, connecting the circuit breaker/isolating switch in the connection box to a linked switch and/or circuit breaker at the main switchboard.

21.16.2 For alternating current systems an earthed terminal is to be provided for the reception of three-phase external supplies with earthed neutrals.

2.1.16.3 The external connection is to be provided with an indicator at the main switchboard in order to show when the cable is energized.

2.1.16.4 Means are to be provided for checking the polarity (for direct current) or the phase sequence (for three-phase alternating curtain) of the incoming supply. This device should be connected between the incoming connectors and the interrupting device in the connection box.

2.1.16.5 A notice is to be provided at the connection box giving complete information on the system of supply and the normal voltage (and frequency for alternating current) of the vessel installed system. Full details of the procedure for effecting the connection are to be given on this notice.

2.1.16.6 Alternate arrangements for providing a temporary external supply will be specially considered.

2.2 Protection

2.2.1 General

2.2.1.1 installations are to be protected against accidental over-currents including short circuits. The choice, location and characteristics of the protective device are to provide complete and coordinated protection to ensure:-

a) Elimination of the fault to reduce damage to the system and hazard of fire.
b) Continuity of service so as to maintain, through the discriminative action of the protective devices, the supply to circuits not directly affected by the fault.

2.2.2 Protection against overload

2.2.2.1 Protection against overloads may be provided by circuit-breakers, automatic switches or fuses. The tripping characteristics of these devices are to be appropriate to the system. Fuses rated above 320 amperes are not to be used for protection against overload, but may be used for short-circuit protection.

2.2.3 Protection against short-circuit

2.2.3.1 Protection against short-circuit currents is to be provided by circuit-breakers or fuses.

2.2.3.2 The breaking capacity of every protective device is to be not less than the maximum value of the short-circuit current which can flow at the point of installation at the instant of contact separation.

2.2.3.3 The making capacity of even circuit-breaker or switch intended to be capable of being closed, if necessary, on short circuit, is to be not less than the maximum value of the short-circuit current at the point of installation. On alternating current this maximum value corresponds to the peak value allowing for maximum asymmetry.

2.2.3.4 Every protective device or contactor not intended for short circuit interruption is to be adequate for the maximum short-circuit current which can occur at the point of installation having regard to the time required for the short circuit to be removed.

2.2.3.5 In the absence of precise data of rotating machine the following short-circuit currents at the machines terminals are to be assumed. The short circuit is to be the sum of short circuit currents of generators and that of motors;

a) Direct current systems

   Ten times full Ioad current for generators normally connected (including spare).

   Six times full load current for motors simultaneously in service;

b) Alternating current systems.

   Ten times full load current for generators normally connected (including spare) - symmetrical RMS.

   Three times full load current for motors simultaneously in service.

2.2.4 Combined circuit-breakers and fuses

2.2.4.1 The use of a circuit-breaker of breaking capacity less than the prospective short-circuit current at the point of installation is permitted, provided that it is preceded on the generator side by fuses, or by a circuit-breaker having at least the necessary breaking capacity. The generator breakers are not to be used for this purpose.

2.2:4.2 Fused circuit-breakers with fuses connected to the side may be used where operation of the circuit-breaker and fuses is coordinated.

2.2.4.3 The characteristics of the arrangement are to be such that:-

a) When the short-circuit current is broken, the circuit-breaker on the Ioad side is not to be damaged and is to be capable further service,

b) When the circuit-breaker is closed on the short-circuit current, the remainder of the installation is not to be damaged. However, it is admissible that the circuit-breaker on the load side may require servicing after the fault has been cleared.

2.2.5 Protection of circuits

2.2.5.1 Short circuit protection is to be provided in each live pole of a direct current system and in each phase of an alternating current system.

2.2.5.2 Protection against overloads is to be provided as follows:-

a) Two-wire direct current or single-phase alternating current system - at least one line or phase.

b) Insulated three-phase alternating current system atleast two phases.

c) Earthed three-phase alternating current system - all three phases.

2.2.5.3 No fuse, non-linked switch or non-linked circuit-breaker is to be inserted in an earthed conductor. Any switch or circuit-breaker fitted is to operate simultaneously in the earthed conductor and the insulated conductors.

2.2.5.4 These requirements de not preclude the provision (for test purposes) of an isolating link to be used only when the other conductors are isolated.

2.2.6 Protection of generators

2.2.6.1 In addition to over-current protection, the provisions of 2.2.6.2 to 2.2.6.7 are to be adhered to as a minimum.

2.2.6.2 For generators not arranged to run in parallel a multi-pole circuit-breaker arranged to open simultaneously all insulated poles or in the case of generators rated at less than 50 [kW] a multi-pole linked switch with a fuse in each insulated pole on the generator side is to be provided. The fuse rating in such cases is to be maximum 125 per cent of the generator rated current.

2.2.6.3 For generators arranged to run in parallel a circuit-breaker arranged to open simultaneously all insulated poles is to be provided. This circuit-breaker is to be provided with :-

a) For direct current generators, instantaneous reverse-current protection operating at not more than 15 per cent rated current,
b) For alternating current generators -
    i) A reverse-power protection with time delay selected and set within the limits of 2 per cent to 15 per cent of full load to a value fixed in accordance with characteristics of primemovers.
    ii) Advice for protection against the effects of parallel connection in opposite phase.

2.2.6.4 The reverse-current protection is to be adequate to deal with the reverse-current conditions emanating from the network. e.g. from winches. The reverse-power protection specified for alternating current generator may be replaced by other devices ensuring adequate protection of the prime movers.

2.2.6.5 Generator circuit-breakers are normally to be provided with under voltage release.

2.2.7 Protection of feeder circuits

2.2.7.1 Isolation and protection of each main distribution circuit is to be ensured by a multipole circuit-breaker or multi-pole switch and fuses. The provisions of 2.2.2, 2.2.3 and 2.2.5 are to be complied with. The protective devices are to allow excess current to pass during the normal accelerating period of motors. Where multi-pole switch and fuses are used, the fuses are generally to be installed between the busbars and the switch.

2.2.7.2 Circuits which supply motors fitted with overload protection may be provided with short-circuit protection only.

2.2.7.3 Motors of rating exceeding 0.5 [kW] are to be protected individually against overload and short-circuit. The short-circuit protection can be provided by the same protective device for the motor and its supply cable. The overload protection may be replaced by an overload alarm, if desired by the Owner.

2.2.8 Protection of power transformers

2.2.8.1 the primary circuits of power transformers are to be protected against short-circuit by circuit-breakers or fuses. The rating of fuses of the setting for overcurrent releases of circuit breakers is not to exceed 125 per cent of rated primary current. Switched and circuit-breakers are to be capable of withstanding surge currents.

2.2.8.2 when transformers are arranged to operate in parallel means are to be provided for isolation of the secondary circuits. Switches and circuit-breakers are to be capable of withstanding surge currents.

2.**2.9 Protection of lighting circuits**

2.2.9.1 Lighting circuits are to be provided with overload and short-circuit protection.

2.2.10 Protection of meters, pilot lamps, capacitors and control circuits

2.2.10.1 Protection is to be provided for voltmeters voltage coils of measuring instruments earth indicating devices and pilot lamps, together with their connecting leads by means of protective devices fitted to each insulated pole or phase.

2.2.10.2 A pilot lamp installed as an integral part of another item of equipment need not be individually protected provided it is fitted in the same enclosure .Where a fault in a pilot lamp would jeopardise the supply to essential equipment such lamps are to be individually protected.

2.2.11 Protection of batteries

2.2.11.1 Accumulator batteries other than engine starting batteries are to be protected against short circuit by devices in each insulated pole, placed at a position adjacent to the battery compartment.

2.2.12 Protection of communication circuits

2.2.12.1 Communications circuits other than those supplied from primary batteries are to be protected against overload and short-circuit.

Section 3

Cables

3.1 General

3.1.1 Cables are to be in accordance with an acceptable National of International standard due regard being given to the ambient conditions stated in 1.5.

3.2 Insulating materials

3.2.1 Permitted insulating materials with maximum rated conductor temperatures are given in Table 3.2.1.

3.2.2 The rated operating temperature of the insulating material is to be at least 10° C higher than the maximum ambient temperature liable to be produced in the space where the cable is installed.

3.2.3 Where a rubber or rubber like material with maximum conductor temperature greater than 60° C is used. It is to be readily identifiable.

3.3 Sheaths and protective coverings

3.3.1 Cables are to be protected by one or more of the following and the material of the sheath or protective covering is to be compatible with the material of the insulation :-

a) Sheath
   Lead-alloy
   Copper
   Non-metallic

b) Protective covering
   Steel-wire armour
   Steel-tape armour
   Metal-braid armour (basket weave)
   Fibrous braid

3.3.2 Unsheathed cables e.g. rubber insulated taped and braided or equivalent may be used only if instated in condult.

3.3.3 Non-metallic sheath : Polychloroprene compound polyvinyl chloride compound and chlorosulphonated polyethylene may be used for impervious sheaths. Other compounds will be given due consideration.

3.3.4 Fibrous braid : Textile braid is to be of cotton, hemp, asbestos, glass or other equivalent fiber, and is to be of strength suitable for the size of the cable. It is to be effectively impregnated with a compound which is resistant to moisture and which is flame retarding.

Table 3.2.1 : Insulating materials	
Insulating materials	Max. rated conductor temp. oC
Elastomeric Compounds	
Natural or synthetic rubber (general purpose)	60
Rubber	
Butyl rubber	80
Ethylene propylene rubber	85
Silicone rubber	95
Thermoplastic Compounds	
Polyvinyl chloride (general purpose)	60
Polyvinyl chloride (heat resisting quality)	75
Other Materials	
Minerals	95
Notes: 1. Silicone rubber and mineral insulation may be used for higher temperatures (upto 150° C for silicone rubber and upto 250°C for mineral insulation) when installed where they are not liable to be touched by personnel. Proposals for such installations will be specially considered. 2. The temperature of the conductor is the combination of ambient temperature and temperature rise due to load. 3. Other insulating materials will be considered.	

3.3.5. Cables fitted in the following locations :

- Decks exposed exposed to weather;
- Bathrooms;
- Cargo holds;
- Machinery spaces;

or any other location where water condensation or harmful vapour (e.g. oil vapour) may be present are to have an impervious sheath. In permanently wet situations, metallic sheaths are to be used for cables with hygroscopic insulation.

3.3.6 All cables are to be of flame retardant type or fire-resisting type, except that non flame-retardant cables may be accepted for final circuits only where cables are installed in metallic conduits having internal diameter not exceeding 25 [mm] and provided the conduits are electrically and mechanically continuous.

3.4 Voltage rating

3.4.1 The rated voltage of any cable is to be not lower than the nominal voltage of the circuit for which it is used.

3.4.2 The voltage drop from the main switchboard bus bars to any point in the installation when the cables are carrying maximum current under normal conditions of service is not to exceed 6 per cent of the nominal voltage.

3.5 Current rating

3.5.1 The highest continuous load carried by a cable is not to exceed its current rating. The diversity factor of the individual loads and the duration of the maximum demand may be allowed for in estimating the maximum continuous load and is to be shown on the plans submitted for approval.

3.5.2 In assessing the current rating of lighting circuits, every lampholder is to be assessed at the maximum load likely to be connected to it, with a minimum of 60 W, unless the fitting is to connected as to take only a lamp rated at less than 60 W.

3.5.3 Cable supplying winches, cranes, windlasses and capstans are to be suitably rated for their duty. Unless the duty is such as to require a longer time rating, cables for winch or crane motors may be half hour rated on the basis of the half hour [kW] rating of the motors. Cables for windlass and capstan motors are to be not less than one hour rated on the basis of the one hour [kW] rating of the motor. In all cases the rating is to be subject to the voltages drop being within the specified limits.

3.5.4 The current ratings given in Tables 3.5.1 to 3.5.5 are based on the maximum operating conductor temperatures given in Table 3.2.1. Alternatively current rating in accordance with an acceptable National or International Standard may be applied See 3.1.1.

Table 3.5.1 : General purpose rubber and PVC insulation current rating (Based on ambient temp. 45oC)			
Nominal cross-section	Single core	2 core	3 or 4 core
[mm2]	amperes	amperes	amperes
1	8	7	6
1.5	12	10	8
2.5	17	14	12
4	22	19	15
6	29	25	20
10	40	34	28

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<tr><td>400</td><td>390</td><td>380</td><td>332</td><td>323</td><td>273</td><td>266</td></tr>
<tr><td>500</td><td>450</td><td>430</td><td>383</td><td>365</td><td>315</td><td>301</td></tr>
<tr><td>630</td><td>520</td><td>470</td><td>442</td><td>400</td><td>364</td><td>329</td></tr>
</table>

3.6 Correction factors for current rating

3.6.1 Bunching of cables: Where more than six cables belonging to the same circuit are bunched together a correction factor of 0.85 is to be applied.

Table 3.5.2 : Heat resisting PVC insulation current rating (Baed on amient temp. 45°C)			
Nominal cross-section	Single core	2 core	3 or 4 core
[mm2]	amperes	amperes	amperes
1	13	7	6
1.5	17	10	8
2.5	24	14	12
4	32	19	15
6	41	25	20
10	57	34	28
16	76	46	38
25	100	60	50
35	125	74	61
50	150	89	74
70	190	115	95
95	230	140	116

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<tr><td>400</td><td>570</td><td>560</td><td>485</td><td>475</td><td>400</td><td>390</td></tr>
<tr><td>500</td><td>650</td><td>620</td><td>550</td><td>530</td><td>455</td><td>435</td></tr>
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</table>

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<tr><td colspan="7">Table 3.5.3 : Butyl insulation current rating
(Based on ambient temp. 45oC)</td></tr>
<tr><td>Nominal cross-section</td><td colspan="2">Single core</td><td colspan="2">2 core</td><td colspan="2">3 or 4 core</td></tr>
<tr><td>[mm2]</td><td colspan="2">amperes</td><td colspan="2">amperes</td><td colspan="2">amperes</td></tr>
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<tr><td>400</td><td>610</td><td>590</td><td>519</td><td>502</td><td>427</td><td>413</td></tr>
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<tr><td>630</td><td>740</td><td>690</td><td>672</td><td>587</td><td>553</td><td>483</td></tr>
</table>

Table 3.5.4 : Ethylene Propylene rubber, cross-linked polyethylene insulaiton current rating (Based on ambient temp. 45oC)						
Nominal cross-section	Single core		2 core		3 or 4 core	
[mm2]	amperes		amperes		amperes	
1	15		13		11	
1.5	19		16		13	
2.5	26		22		18	
4	35		30		25	
6	45		38		32	
10	63		54		44	
16	84		71		59	
25	110		94		77	
35	140		119		98	
50	165		140		116	
70	215		183		151	
95	260		221		182	
120	300		255		210	
150	340		289		238	
185	390		332		273	
240	460		391		322	
300	530		450		371	
	d. c.	a. c.	d. c.	a. c.	d. c.	a. c.
400	650	630	558	536	445	441
500	740	680	629	578	518	476
630	840	740	714	629	588	516

Table 3.5.5 : Silicon rubber, mineral insulation current rating (Based on ambient temp. 45oC)			
Nominal cross-section	Single core	2 core	3 or 4 core
[mm2]	amperes	amperes	amperes
1	20	17	14
1.5	24	20	17
2.5	32	27	22
4	42	36	29

6	55	47	39
10	75	64	53
16	100	85	70
25	135	115	95
35	165	140	116
50	200	175	140
70	255	217	179
95	310	264	217
120	360	306	252
150	410	349	287
185	470	400	329
240	570	485	400
300	660	560	460

Table 3.6.1 : Correction factors for temperature							
Insulation	25	30	35	40	45	50	55
Rubber of PVC (general purpose)	1.53	1.41	1.29	1.15	1.00	0.82	0.58
PVC (heat-resisting quality)	1.29	1.22	1.15	1.08	1.00	0.91	0.82
Butyl rubber	1.25	1.2	1.13	1.07	1.pp	0.93	0.85
Ethylene propylene rubber, cross-linked polyethylene	1.22	1.17	1.12	1.06	1.00	0.94	0.87
Mineral, silicone rubber	-	-	-	1.05	1.00	0.95	0.89
Notes : 1. For cables in refrigerated chamber and holds and for vessels restricted to service in non tropical waters, correction factors for 35o C may be acceptable. 2. Correction factors for intermediate values of the ambient temperature can be ascertained by interpolation.							

Table 3.6.2 : Correction factors for intermittent rating				
Correction factor	Half-hour rating		One-hour rating	
	With metallic sheath [mm2]	Without metallic sheath [mm2]	With metallic sheath [mm2]	Without metallic sheath [mm2]
1.00	Upto 20	Upto 75	Upto 67	Upto 230

1.10	21 - 40	76 - 125	68 - 170	231 - 400
1.15	41 - 65	126 - 180	171 - 290	401 - 600
1.20	66 - 95	181 - 250	291 - 430	-
1.25	96 - 120	251 - 320	431 - 600	-
1.30	131 - 170	321 - 400	-	-
1.35	171 - 220	401 - 500	-	-
1.40	221 - 270	-	-	-

3.6.2 Ambient temperature : The current ratings in Table 3.5.1 to 3.5.5 are based on an ambient temperature of 45oC. For other values of ambient temperature the correction factors shown in Table 3.6.1 are to be applied.

3.6.3 Intermittent service : Where the load is intermittent, the correction factors in Table 3.6.2 may be applied for half hour and one hour ratings. In no case is a shorter rating than one half hour rating to be used, whatever the degree of intermittency.

3.7 Testing

3.7.1 Tests in accordance with an acceptable National or International Standard are to be made at the manufacturer's works prior to dispatch.

3.8 Connections between entrained vessels

3.8.1 Cables are to be suitable for used in the connections between entrained vessels i.e., are to be flexible, robust and of commensurate cross-section area.

3.8.2 The connection is to include provisions for the continuity o1 out-of-balance o: earth-fault current return. The connecting device is to include provisions to ensure that this circuit closed before, and opened after, the live circuits.

3.8.3 Terminal plugs and sockets, if used, are to be so arranged that any exposed pins cannot be energized.

3.8.4 Where hall-return system are used, hull polarity is to be compatible.

3.9 Installation of cables

3.9.1 Cables runs are to be, as far as practicable, straight and accessible and as high as possible above bilges.

3.9.2 Cables having insulting materials with different maximum-rated conductor temperatures are not to be bunched together, or, where this is not practicable, the cables are to be operated so that no cable reaches temperature higher than that permitted for the lowest temperature-rated cable in the group.

3.9.3 Cables having a protective covering which may damage the covering of other cables are not to be bunched with those other cables.

3.9.4 The minimum internal radius of bends of installed cables is to be generally in accordance with following:

4d	for cables without braiding, armouring or other metal sheath and with an overall diameter not exceeding 25 [mm]
6d	for all other cables
(d=overall diameter of cable)	

3.9.5 Cables, are to be effectively supported and secured in a manner that prevents damage to their coverings.

3.9.6 Supports and accessories are to be robust! and are to be of corrosion-resistant material or suitably corrosion inhibited before erection.

3.9.7 The distance between supports, for horizontal as well as vertical runs of cables, is to be chosen according to the type/size of cable but generally in accordance with Table 3.9.1.

3.10 Mechanical protection of cables

3.10.1 Cables exposed to risk of mechanical damage are to be protected by metal channels or casing or enclosed in steel conduit unless the protective covering (e.g. armour or sheath) is adequate to withstand the possible damage.

Table 3.9.1 : Distance between supports		Non-armoured cables	Armoured cables
External diameter of cable			
Exceeding	Not exceeding		
[mm]	[mm]	[mm]	[mm]
-	8	200	250
8	13	250	300
13	20	300	350
20	30	350	400

3.10.2 Cables, In spaces where there is exceptional risk of mechanical damage (e.g. on weather decks, in cargo hold areas and inside the cargo holds) and also below the floor in engine room, are to be suitably protected, even if armoured unless the steel structure affords adequate protection.

3.10.3 Metal casings for mechanical protection of cables are to be efficiently protected against corrosion.

3.11 Earthing of metal coverings

3.11.1 Metal coverings of cables are to be effectively earthed at both ends of the cable except in final sub-circuits, where earthing at the supply end only will be considered adequate. This does not necessarily apply to instrumentation cables where single point earthing may be desirable for technical reasons.

3.11.2 The electrical continuity of all metal coverings of cables throughout the length of the cable, particularly at joints and tappings, is to be ensured.

3.11.3 The lead sheath lead-sheathed cables is not to be used as sole means or earthing the non-current carrying parts of items of equipment.

3.12 Penetration of bulkheads and decks by cables

3.12.1 Penetration or watertight bulkheads or decks is to be carried out with either individual watertight glands or with packed watertight boxes carrying several cables. In either case. the watertight integrity and strength of the bulkheads and decks are to be maintained. Where cables with polyvinyl chloride insulation are being installed, particular care is to be taken to avoid damage to the sheathing during the fitting of watertight bulkhead glands.

3.12.2 Where cables pass through non-watertight bulkheads or structural steel, the holes are to be bushed, in order to protect the cables, with lead or other approved material Which will prevent damage to the cables by abrasion. If the steel is 6 [mm] thick, adequately rounded edges may be accepted as the equivalent of bushing.

3.12.3 Cables passing through decks are to be protected by deck tubes or ducts.

3.12.4 Materials used for glands and bushings are to be such that there is no risk of corrosion.

3.12.5 Where rectangular holes are cut in bulkheads or structural steel the corners are to be adequately rounded.

3.13 Installation of cables in pipes and conduits

3.13.1 Installation of cables in pipes and conduits is to be carried out in such a manner that there is no damage to the cable covering.

3.13.2 Metal conduit systems are to be earthed and are to be mechanically and electrically continuous across joints. Individual short lengths of conduit need not be earthed.

3.13.3 The internal radius of bend of pipes and conduit is to be not less than that laid down for cables, provided that for pipes exceeding 64 [mm] diameter the internal radius of bend is not less than twice the diameter of the pipe.

3.13.4 The drawing in factor (ratio of the sum of the cross-sectional areas of the cables, based on their external diameter, to the internal cross-section area of the pipe) is not to exceed 0.4.

3.13.5 Expansion joints are to be provided where necessary.

3.13.6 Cable pipe and conduits are to be adequately and effectively protected against corrosion. Where necessary openings are to be provided at the highest and lowest points to permit air circulation and to prevent accumulation of water.

3.13.7 Where cables are laid in trunks the trunks are to be so constructed as not to afford passage for fire from one deck or compartment to another.

3.13.8 Non-metallic ducting or conduit is to be of flame retardant material PVC conduit is not to be used in refrigerated spaces or on open decks, unless specially approved.

3.14 Cables for alternating current

3.14.1 Generally, multi-core cables are to be used in A.C. installations. Where it is necessary to use single-core cables for alternating current circuits rated in excess of 20 amperes the requirements of 3.14.2 to 3.14.8 are to be complied with.

3.14.2 Cables are to be either non-armoured or armoured with non-magnetic material.

3.14.3 If installed in pipe or conduit cables belonging to the same circuit are to be installed in the same conduit, unless the conduit or pipe is of non-magnetic material.

3.14.4 Cable clips are to include cables of all phases of a circuit unless the clips are of non-magnetic material.

3.14.5 When installing two, three or four single-core cables forming respectively single-phase circuits, three-phase circuits or three-phase and neutral circuits, the cables are to be in contact with one another, as far as possible. In any case, the distance between the external covering of two adjacent cables is not to be greater than one diameter.

3.14.6 In the case of circuits using two or more parallel connected cables per phase, all cables are to have the same length and cross sectional area.

3.14.7 Where single core cables of rating exceeding 50 amperes are used, magnetic material is not to be placed between single-core cables of a group. If these cables pass through steel plates, all cables of he same circuit are to pass through the plate or gland so constructed that there is no magnetic material between the cables and suitable clearance is provided between the cable core and magnetic material. This clearance, wherever practicable, is not to be less than 75 [mm] when the current exceeds 300 amperes. For currents between 50 amperes and 300 amperes the clearance may be proportionately reduced.

3.14.8 If single-core cables of current rating greater than 250 amperes are run along a steel bulkhead, where practicable the cables should be spaced away from the steel.

3.15 Cable ends

3.15.1 The ends of all conductors of cross-sectional area greater than 4 [mm2} are to be fitted with soldering sockets, compression type sockets of mechanical clamps. Corrosive fluxes are not to be used.

3.15.2 Cables having hygroscopic insulation (e.g. mineral insulated} are to have their ends sealed against ingress of moisture.

3.15.3 Cables with a supplementary insulating belt beneath the protective sheath are to have additional insulation at those points where the insulation of each core makes or may make contact with earthed metal.

3.16 Joints and branch circuits in cable systems

3.16.1 Cable runs are normally not to include joints. However, if a joint is necessary it is to be carried so that all conductors are adequately secured, insulated and protected from atmospheric action. Terminals and busbars are to be of dimensions adequate for the cable rating.

Section 4
Switchboards

4.1 General

4.1.1 Switchboards, section boards and distribution boards are to be constructed of, or enclosed with non-flammable, non-hydroscopic material and are to be so installed that live parts are sufficiently guarded and adequate space is provided for maintenance. Also they are to be protected where necessary in way of pipes etc.

4.1.2 All measuring instruments and all apparatus controlling circuits are to be clearly and indelibly labeled for identification purposes. An indelible label is to be permanently secured adjacent to every fuse and every circuit breaker and marked with particulars of the full load current of the generator, motor or cable which the fuse or circuit breaker protects. Where inverse time limit and/or reverse current devices are provided in connection with a circuit breaker, the appropriate settings of these devices are to be stated on the label. Name plates are to be of flame retardant material.

4.2 Instruments

4.2.1 Sufficient instrumentation is to be provided for measuring voltage, current, frequency and for alternating current generators above 50 [kW].

4.2.2 Where alternating current generators are required to operate in parallel, synchronising arrangements are to be fitted.

4.3 Instrument transformers

4.3.1 The secondary windings of instrument transformers are to be earthed.

4.4 Switchgear

4.4.1 Circuit breakers and switches are to be of the air break type and are to be constructed in accordance with an acceptable National or International Standard.

4.4.2 Report of tests to establish the capacity of circuit-breakers are to be submitted for consideration when required.

4.4.3 Overcurrent releases are to be calibrated in amperes and settings marked on the circuit-breaker.

4.5 Fuses

4.5.1 Fuses are to comply with an acceptable National or international Standard.

4.5.2 Fuse links and fuse bases are to be marked with particulars of rated current and rated voltage. Each fuse position is to be permanently and indelibly labeled with the current carrying capacity of the circuit protected by it and with the appropriate approved size of fuse or replaceable element.

4.6 Testing

4.6,1 Before installation, switchboards complete or in sections with all components are to pass the following tests at the manufacturer's works and a certificate furnished. A high voltage test is to be carried out in all switching and control apparatus for systems greater than 60V with a test voltage of 1000V plus twice the rated voltage with a minimum of 2000V at any frequency between 25 and 100 Hz for one minute applied between (a) all current-carrying parts connected together and earth and (b) between current carrying parts of opposite polarity or phases.

4.6.2 For systems of 60V or less the test shall be at 500V for one minute.

4.6.3 Instruments and ancillary apparatus may be disconnected during the high voltage test.

4.6.4 Immediately after the high voltage test the insulation resistance between (a) all current-carrying parts connected together and earth and (b) between current carrying, parts of opposite polarity or phase, shall not be less than 1 Megohm when tested with a direct current voltage of at least 500V.

4.6.5 Functional tests. The correct functions of the installation components in line with the connections intended to be made have to be checked as far as possible.

Section 5

Control Gear

5.1.1 Control gear is to comply with an acceptable National or International Standard, amended where necessary for ambient temperature.

5.1.2 Control gear, including isolating and reversing switches, is to be so arranged that shunt field circuits are not disconnected without adequate discharging path being provided.

5.2 Testing

5.2.1 Control gear and resistors are to be tested by the manufacturers with a high voltage applied between the earthed frame and all live parts and a certificate furnished by them to this effect. For operating voltages above 55 V, the test voltage is to be 1000 V plus twice the rated voltage with a minimum of 2000 V. The voltage is to be alternating at any frequency between 25 and 100 Hz and is to be maintained for one minute without failure.

5.2.2 Control gear and resistors operating at 55 V or below are to be tested to 500 V for one minute.

5.2.3 Immediately after the high voltage test, the insulation resistance between (a) all current-carrying parts connected together and earth, and (b) between current-carrying parts of opposite polarity or phase, is not to be less than 1 megaohm when tested with a direct current voltage of at least 500 V.

5.2.4 Instruments and ancillary apparatus may be disconnected during the high voltage test.

5.2.5 Functional Test: The correct functions of the installation components in line with the connections intended to be made, have to be checked as far as possible.

Controls

Rotating Machines Construction and testing

6.1 General

6.1.1 Rotating machines are to be constructed in accordance with an acceptable National or International Standard, due regard being given to the ambient conditions stated in 1.5.

6.2 Rating

6.2.1 Vessels service generators including their exciters, and continuously rated motors are to be suitable for continuous duty at their full rated output at maximum cooling air or water temperature for an unlimited period, without the limits of temperature rise in 6.3 being exceeded. Other generators and motors are to be rated in accordance with the duty which they are to perform, and when tested under rated load conditions the temperature rise is not to exceed the values in 6.3. Alternatively limits of temperature rise in accordance with an acceptable National or International Standard may be applied.

6.3 Temperature rise

6.3.1 The limits of temperature rise specified in Table 6.3.1 are based on a cooling air temperature of 45°C and a cooling water temperature of 30°C.

6.3.2 If the temperature of the cooling medium is known to exceed the value given in 6.3-I. the permissible temperature rise is to be reduced by an amount equal to the excess temperature of the cooling medium.

6.3.3 if the temperature of the cooling medium is known to be permanently less than the value given in 6.3.1, the permissible temperature rise may be increased by an amount equal to the difference between the declared temperature and that given in 6.3.1 upto a maximum of 15°C.

Table 6.3.1 : Limits of temperature rise in °C

Item	Part of machines	Method of measurement of temperature	Temperature rise in air-cooled machines °C Insulation Class		
			A	E	B
1 (a)	a.c. windings	R	50	65	70
		T	40	55	60
(b)	Field windling of a.c and d.c. machines having d.c. excitation other than those in Item 2 and 3	R	50	65	70
		T	40	55	60
(c)	Windings of armatures having commutators	R	50	65	70
		T	40	55	60
2	Field windlings of turbine-type machines having d.c. excitation	R	-	-	80
3 (a)	Low-resistance field windings of more than on layer and compensating windings	T.R	50	65	70
(b)	Single-layer windings with exposed bare surfaces	T.R	55	70	80
4	Permanently short-circuited windings uninsulated	T	50	65	70
5	Permanently short-circuited windings uninsulated	T	The temperature rise of these parts shall in no case reach such a value that there is a risk of injury to any insulting or other material on adjacent parts		

6	Iron core and other parts not in contact with windings	-	The temperature rise of these parts shall in no case reach such a value that there is a risk of injury to any insulating or other material on adjacent part		
7	Iron core and other parts in contact with windings	T	50	65	70
8	Commutators and slip-rings open or enclosed	T	50	60	70

Notes:

1 T = Thermometer method

R = Resistance method

2 When Class F or Class H insulation is employed the permitted temperature rises are respectively

20°C and 40°C higher than the values given for Class B insulation.

3 Classes of insulation are to be in accordance with IEC Publication 85 (1957) - "Recommendations

for the Classification of Material for the insulation of Electrical Machinery and Apparatus in relation

to their Thermal Stability in Service"

6.4 Direct current service generators

6.4.1 Shunt wound direct current generators are to be provided with automatic voltage regulators.

6.4.2 Direct current generators used for charging batteries without series-regulating resistors are to be either:-

a) Shunt wound, or

b) Compound wound with switches arranged so that the series winding can be switched out of service.

6.4.3 if terminal voltage is required to be manually adjusted to ensure satisfactory operation of generators then facilities are to be provided at the switchboard or at an appropriate and convenient control position to enable such adjustment to be made.

6.4.4 For each direct current generator, whilst being driven by its prime mover, at any temperature within the working range, the means provided is to be capable of adjusting the voltage at any load between no load and full load to within:-

a) 10 per cent of rated voltage for generators of rating less than 100 [kW],

b) 0.5 per cent of rated voltage for generators of rating exceeding 100 [kW].

6.4.5 The inherent regulation of service generators is to be such that the following conditions are fulfilled:-

a) For shunt or stabilised shunt wound generators when the voltage has been set at full load, the steady voltage at no load is not to not exceed 115% of the full load value and the voltage obtained at any intermediate value is not to exceed no load value. operating temperature, and starting at 20 per cent load with voltage within 1 per cent of rated voltage, then at full load the voltage is to be within 2.5 per cent of rated voltage. The average of the ascending and descending load/voltage curves between 20 per cent load and full load is not to vary more than 4 per cent from rated voltage.

b) For compound wound generators with the generator at full load operating temperature, and starting at 20 per cent load with voltage with 1 per cent of rated voltage, then at full load the voltage is to be within 2.5 per cent of rated voltage. The average of the ascending and descending load/voltage curves between 20 per cent load and full load is not to vary more than 4 per cent from rated voltage.

6.4.6 Generators are to be capable of delivering continuously the full load current and normal rated voltage at the terminals when running at full load engine speed at all ambient temperatures up to the specified maximum.

6.4.7 Generators required to run in parallel are to be stable from no load up to the total combined load of the group, and load sharing is to be satisfactory.

6.4.8 The series winding of each two-wire generator is to be connected to the negative terminal.

6.4.9 Equalizer connections are to have a cross-sectional area appropriate to the system but in no case less than 50 per cent of that of the negative connection from the generator to the switchboard.

6.5 Alternating current service generators

6.5.1 Each alternating current service generator, unless of the self regulating type, is to be provided with automatic means of voltage regulation.

6.5.2 The voltage regulation of any alternating current generator with its regulating equipment is to be such that at all loads from zero to full load the voltage at rated power factor is maintained under steady conditions within 2.5 per cent of rated voltage.

6.5.3 Alternating current generators required to run in parallel are to be stable from 20 per cent full load [kW] upto the total combined full load [kW] of the group, and load sharing is to be such that the load on any generator does not normally differ from its proportionate share of the total load by more than 15 per cent of the rated output [kW] of the largest machine or 25 per cent of the rated output [kW.] of the individual machine, whichever is less.

6.5.4 When generators are operated in parallel, the KVA loads of the individual generating sets are not to differ from their proportionate share of the total KVA load by more than 5 per cent of the rated KVA output of the largest machine when operating at 0.8 power factor.

6.6 Inspection and testing

6.6.1 On machines for essential services tests are to be carried out in accordance with the relevant standard and a certificate furnished by the manufacturers.

6.6.2 Generators and motors of 100 [kW] or over intended for essential services are to be inspected by the Surveyors during manufacture and testing.

Section 7
Transformers - Construction and Testing

7.1 General

7.1.1 Transformers are to be in accordance with an acceptable National of International Standard due regard being given to the ambient conditions stated in 1.5.

7.1.2Transformers are to be of the dry, natural air cooled type. Proposals for the use of liquid cooled transformers will be subject to special consideration.

7.2 Installation

7.2.1 Transformers are to be placed in easily accessible well ventilated spaces free from any gaseous or acid fumes. They are to be clear of non-protected ignitable materials, and so arranged as to be protected against shocks and any damage resulting from water, oil, liquid fuel steam etc.

7.3 Construction

7.3.1 Transformers are to be double wound except those for motor starting.

7.3.2 Each transformer is to be provided with a name plate of corrosion-resistant metal giving information on make, type serial number insulation class and any other technical data necessary for the application of the transformer.

7.4 Regulation

7.4.1 The inherent regulation at 0.8 power factor is not to exceed 5 per cent.

7.4.2 Regulation of the complete system is to complete system is to comply with 3.4.2.

7.5 Short circuit

7.5.1 All transformers are to be constructed to withstand, without damage, the thermal and mechanical effects of a short-circuit at the terminals of any winding for 2 seconds with rated primary voltage and frequency without damage.

7.6 Tests

7.6.1 Transformer for essential services are to be tested by the manufacturer in accordance with the relevant standard and test certificates supplied.

Section 8
Miscellaneous Equipment

8.1 Accumulator batteries

8.1.1 Construction

8.1.1.1 The cells of all batteries are to be so constructed and secured as to prevent spilling of the electrolyte due to the motion' of the vessel and to prevent emission of acid or alkaline spray.

8.1.1.2 All batteries are to be provided with durable labels of flame retardant material, giving information on the application for which the battery, is intended, voltage and capacity.

8.1.2 Location

8.1.2.1 Alkaline batteries and lead acid batteries of the vented type are not to be installed in the same compartment.

8.1.2.2 Large batteries are to be installed in a space assigned to them only. A box on deck would meet this requirement if adequately ventilated and Provided with means to prevent ingress of water.

8.1.2.3 Engine starting batteries are to be located as close as practicable to the engine(s) served. If such batteries cannot be accommodated in the battery compartment, they are to be installed so that adequate ventilation is ensured.

8.1.3 Installation

8.1.3.1 Batteries should be so arranged that each cell or crate of cells is accessible from the top and at least one side.

8.1.3.2 Cells or crates are to be carried on nonabsorbent insulating supports Similar insulators are to be fitted to prevent any movement of ceils arising flora the motion of the vessel. Adequate space for circulation o! air is to be ensured.

8.1.3.3 Where acid is used as the electrolyte a tray of acid resisting material is to be provided below the cells unless the deck-below is similarly protected.

8.1.3.4 The interiors of all compartments including the shelves, are to be painted with corrosion resistant paint.

8.1.3.5 A permanent notice is to be fitted to all compartments prohibiting naked lights and Smoking in the compartment.

8.1.3.6 Switches, fuses and other electrical equipment liable to cause an arc are not to be fitted in battery compartments.

8.1 4 Ventilation

8.1.4.1 Battery compartments, lockers and boxes are to be adequately ventilated by an independent ventilating system to avoid accumulation of flammable gases. Particular attention should be given to the fact that these gases are lighter than air and tend to accumulate at the top of the spaces.

8.1.4.2 Natural ventilation may be employed if ducts can be run directly from the top of the compartment to the open air with no part of the duct more than 45 degrees from the vertical. If natural ventilation is impracticable, mechanical ventilation is to be installed. Interior surfaces of ducts and fans are to be painted with corrosion- resistant paint Fan motors are not to be located in the air stream.

8.1.4.3 Necessary precautions are to be taken to prevent sparking due to possible contact by the ventilation fan blades with fixed parts.

8.1.4.4 All openings through the battery compartment bulkheads or decks, other than ventilation openings, are to be effectively sealed to reduce the possibility of escape of gas from the battery compartment into the vessel.

8.2 Luminaries

8.2.1 General

8.2.1.1 Lighting fittings installed in engine rooms or similar spaces where they are exposed to the risk of mechanical damage are to be provided with suitable grilled mechanical guards to protect their lamps and glass globes against such damage.

8 2.1 2 Precautions are to be taken so that a lamp for one voltage cannot be inserted in a lampholder for another voltage.

8.2.1.3 Incandescent lamps are to be in accordance with the following :-

B22	upto 250 V and 200 W
F27	upto 250 V and 200 W
E40	upto 210 V and 3000 W

8.2.1.4 Lampholders are to be constructed of flame-retarding and non- hygroscopic material. All metal parts are to be of robust construction. Goliath landholders (E40) are to be provided with means for locking the lamp in the holder. The temperature of cable connections is not to exceed the maximum conductor temperature permitted for the cable as given in Table 3.2.1.

8.2.1.5 The ratings of tubular fluorescent lamps are not to exceed 250 V and 80W.

8.3 Accessories - Construction and testing

8.3.1 Enclosures

8.3.1.1 Enclosures are to be of metal or of flame-retardant insulating materials.

8.3.2 Inspection and draw boxes

8.3.2.1 If metal conduit systems are used, inspection and draw boxes are to be of metal and are to be in rigid electrical and mechanical connection with the conduits.

8.3.3 Socket outlets and plugs

8.3.3.1 Socket outlets and plugs are to be so constructed that they cannot be readily short-circuited whether the plug is in or out and so that a pin of the plug cannot be made to earth either pole of the socket outlet.

8.3.3.2 All socket outlets of current rating 16 amperes or more are to be provided with a switch.

8.3.3.3 Where it is necessary to earth the non-current-carrying parts of portable or transportable equipment, an effective means of earthing is to be provided at the socket outlet.

8.3.3.4 In all wet situations socket outlets and plugs are to be effectively shielded against rain and spray and are to be provided with means for maintaining this quality after removal of the plug.

8.4 Heating and cooking equipment

8.4.1 General

8.4.1.1 Heaters are to be so constructed, installed and protected that clothing, bedding and other inflammable material cannot come in contact with them in such a manner as to cause risk of fire. There is to be no excessive heating of adjacent bulkheads or decks.

8.5 Lightning conductors

8.5.1 Lightning conductors are to be fitted to each mast of all wood, composite and steel vessels having wooden masts or topmasts. They need not be fitted to steel vessels having steel masts, unless the mast is partly or completely insulated from the vessel's hull.

8.5.2 Lightning conductors are to be run as straight as possible, and sharp bends in the conductors are to be avoided. All clamps used are to be of brass or copper, preferably of the serrated contact type, and efficiently locked. Soldered connections are not acceptable.

8.5.3 The resistance of the lightning conductors, measured between the mast head and the position on the earth plate or hull to which the lightning conductor Is earthed, is not to exceed 0.02 ohms.

8.5.4 The lightning conductors are to be composed of continuous copper tape and/or rope, having a section not less than 100 [mm^2] and are to be riveted with copper rivets or fastened with copper clamps to an appropriate copper spike of not less than 13 [mm] in diameter and projecting at last 150 [mm] above the top of the mast. The lower end of the lightning conductor is to be securely clamped to a copper plate having an area of at least 0.2 [m^2], fixed to the vessel's hull well below the light load waterline in such a manner that it is immersed under all conditions of heel. In steel vessels fitted with wooden masts, the lower end of the lightning conductor is to be securely clamped to the nearest metal forming part of the hull.

Section 9
Trials

9.1 General

9.1.1 Before a new installation, or any alteration or addition to an existing installation, is put into service the tests and trials specified in this Section are to be carried out. These tests and trials are intended to demonstrate the general condition of the installation at the time of completion. They are in addition to any acceptance tests which may have been carried out at the manufacturer's works.

9.2 Insulation resistance measurement

9.2.1 Insulation resistance is to be measured using a self-contained instrument such as a direct reading ohm-meter of the generator type applying a voltage of at least 500 V. Where a circuit incorporates capacitors of more than 2μF total capacitance, a constant-voltage type instrument is to be used to ensure accurate test readings.

9.2.2 Power and light circuits : The insulation resistance between all insulated poles and earth and where practicable, between poles, is to be at least 1 megaohm. The installation may be subdivided and appliances may be disconnected if initial tests produce results less than this figure.

9.2.3 Low voltage circuits: Circuits operating at less than 55 V are to have an insulation resistance of at least 0.33 megaohm.

9.2.4 Switchboards, Section boards and distribution boards: The insulation resistance is to be at least 1 megaohm when measured between each busbar and earth and between busbars. The test may be made with all circuit breakers and switches open, all fuse links for pilot lamps, earth fault-indicating lamps. voltmeters, etc., removed and voltage coils temporarily disconnected, where otherwise damage may result.

9.2.5 Generators and motors : The insulation resistance of generators and motors, in normal working condition and with all parts in place, is to be measured and recorded. The test should be carried out with the machine hot, if possible. The insulation resistance of generator and motor cables, field windings and control gear is to be at least 1 megaohm.

9.3 Earth continuity

9.3.1 Tests are to be made to verify that all earth continuity conductors are effective and that the bonding and earthing of metallic conduit and/or sheathing of cables is effective.

9.4 Performance

9.4.1 It is to be established that the provisions of the Rules have been complied with respect to the criteria mentioned in this sub-section.

9.4.2 Temperatures of Joints, connections, circuit-breakers and fuses.

9.4.3 The operation of engine governors, synchronising devices overspeed trips, reverse-current reverse-power, over-current and under voltage trips and other safety devices.

9.4.4 Satisfactory commutation, excitation and performance of each generator throughout a run at full rated load.

9.4.5 Voltage regulation of every generator when full rated load is suddenly thrown off.

9.4.6 For alternating current and direct current generators, satisfactory parallel operation and [kW] load sharing of all generators capable of being operated in parallel at all loads up to normal working load. For alternating current generators satisfactory parallel operation and KVA load sharing of all generators capable of being operated in parallel at all loads up to normal working load.

9.4.7 All essential motors and other important equipment are to be operated under service conditions, though not necessarily at full load or simultaneously, for a sufficient length of time to demonstrate that they are satisfactory.

9.5 Voltage drop

9.5.1 Voltage drop is to be measured, where necessary, to verify that this is not excessive.

End of Chapter

ANNEXURE-2

FORMS

FORM No. 1

[Section 1.13]
Official Log Book

OFFICIAL LOG BOOK
for
AN INLAND MECHANICALLY PROPELLED VESSEL

[See subsection 1.13 of these Rules and Section 63C of IV Act 1917]

Name of Vessel	Official No.	Port of Registry	Registered Tonnage		Name of Master	No. of his Certificate
			Gross	Net		

Port at which and date when voyage commenced	Port at which and date when voyage terminated

DIRECTIONS AS TO KEEPING OFFICIAL LOGS.

1. An official log shall be kept in the prescribed form in every Inland Vessel.
2. The official log may, at the discretion of the master or owner, be kept distinct from or united with the ordinary ship's log so that in all cases the spaces in the official log book be duly filled up.
3. The importance of keeping this book properly, and duly making all the entries at the proper time, and with the strictest regard to form, cannot be too strongly impressed on masters. By neglecting to do so masters render themselves liable to heavy penalties, and their owners to serious loss whilst members of their crew will suffer inconvenience from not being able to obtain records of their services. The absence of proper entries will also prevent fines or forfeitures from being enforced and will tend to prevent the maintenance of discipline.
4. An entry required by the Act in the official log book shall be made as soon as possible after the occurrence to which it relates, and, if not made on the same day as that occurrence, shall be made and dated so as to show the date of the occurrence and of the entry respecting it.
5. Every entry in the official log book shall be signed by the master and by the officer or some other member of the crew and also
6. If it is an entry of injury or death, shall be signed by the medical officer on board, if any, and if it is an entry of wages due to or the property of a seaman or apprentice who dies, shall be signed by the officer and by some member of the crew besides the master.
7. Every entry made in an official log book in the manner provided by these rules shall be admissible in evidence.

8. Care must be taken whenever there is a change of master to see that documents handed over are up-to-date.
9. Entries must be made in order of date, and no blanks should be left.
10. If any entry in the Official Log relates in any way to a member of the crew the page number is to be entered against the man's name in the Official Log and Index.

Entries required to be made in official log books

1. If any offence within the meaning of the Act of desertion or absence without leave or against discipline is committed or if any act of misconduct is committed for which the offender's agreement imposes fine and it is intended to enforced the fine
   a) an entry of the offences or acts shall be made in the official log-book and signed by the master and one of the persons employed or engaged in any capacity on board of the mechanically propelled vessel;
   b) the offender shall be furnished with a copy of the entry and have the same read over distinctly and audibly to him and may thereupon make such reply thereto as he thinks fit;
   c) a statement to a copy of the entry having been so furnished and entry having been so read over and the reply, if any made by the offender shall likewise be entered and signed in the manner aforesaid;
   d) in any subsequent legal proceedings the entries by this section required shall, if practicable, be produced or proved, and in default of such production or proof, the court hearing the case may in its discretion refuse to receive evidence of the offence or act of misconduct.
2. Every case in which the crew has faced shortage of food and/or drinking water.
3. Every case in which a member of the crew is promoted to a higher grade of service with the date of such promotion, the grade and the rate of wages which the seaman is to receive.
4. in cases of illness, frequent entries (daily if possible) showing the progress and treatment of patient.
5. Every case of drunkenness or misconduct on the part of any member of crew whether the Master wishes the case to be investigated or not.
6. Every important accident or damage to ship or cargo.
7. every conviction by a legal tribunal of a member of his crew and the punishment inflicted;
8. a report on the quality of work of each member of his crew; or a statement that the master declines to give an opinion thereon with a statement of his reasons for so declining.
9. Every case of illness, hurt or injury happening to a member of his crew with the nature thereof and the medical treatment adopted (if any);
10. Every case of death happening on board and the cause thereof, together with such particulars as may be prescribed;
11. Every birth happening on board, with the sex of the infant, the names of the parents and such other particulars as may be prescribed;
12. The name of every seaman or apprentice who ceases to be a member of the crew otherwise than by death, with the place, time, manner and cause thereof;
13. The wages due to any seaman or apprentice who dies during the voyage and the gross amount of all deductions to be made therefrom;
14. The money or other property taken over of any seaman or apprentice who dies during the voyage;
15. Any other matter which is to be prescribed for entry in the official log book.

FORM No. 1A

[Section 2.7.3]

Form for expressing the intention to build a new vessel

To,

Chief Surveyor / Competent Authority,

Govt. of ________________

Subject: Expression of Intention to Build a New Inland Mechanically Propelled Vessel

Dear Sir,

I / We (name of the owner/company) intend to order building of a new mechanically propelled vessel to be registered in the State within the provisions of the Inland Vessel Act 1917.

You are requested to record the proposed details and accord the category under which the vessel is to be constructed. We hereby undertake to have the vessel constructed and equipped as per the construction rules applicable to the category of vessel assigned.

1. Owner's name and address
2. Length, breadth and depth of vessel
3. Type of Vessel
   (Passenger, cargo cum passenger, Chemical Carrier, Liquid Carrier etc)
4. Intended Area of Operation (Zone 1/2/3)
5. Particulars of hull
   a) Builders name and address
   b) Material of the hull
   c) Whether with a deck above free board deck
6. Particulars of propulsion of Engines
   (a) Number of sets with BHP of each
   (b) Manufacturer's name and brand

Signature of Owner

Enclosures: Plans, Drawings etc. as per Rule 2.8.4 (b), (c) & (d)

FORM No. 2

[Section 2.8.2]

Application for Survey of Inland Vessel

To

Date:

The Chief Surveyor / Surveying Authority **Place:**

At Port……………………………………..

Application for (indicate type) Survey of Inland Vessel

I/We the authorized persons under the law hereby apply to you to make necessary arrangement for the Initial / Periodical / Dry Docking / Special Survey (strike out the not applicable ones) of the Inland Vessel detailed below.

The particulars of the vessel are as under;

1. Name of vessel
2. Official No of the vessel
3. Port of registry of vessel
4. Tonnage (i) Registered .... (ii) Gross ....
5. Type of the vessel
   (Passenger / Passenger-cum-cargo / Cargo / Tanker – state type etc)
6. Category of the Vessel
7. Year Hull Built
8. Address of Hull Builder
9. Hull Dimensions
10. Place and date of last survey
11. Type & BHP of main propulsion Machinery
12. Details of other machineries

13. Owner’s name and address with telephone no.

14. Agents name and address with telephone no.

15. Date and time of proposed visit of surveyor

16. Place of proposed Survey

Station.............. Signature of Owner/Master/Authorized Person
Date................

Enclosures:

1. Documents as per requirement
2. Proof of payment of Survey fee and other charges
3. Copy of last Certificate of Survey
4. Copy of Certificate of Registration (if already registered)
5. Document establishing the Authority of Authorized Person (if making request)

FORM No. 3

[<u>Section 2.8.4a</u>]

Particulars to be furnished for Survey of New Vessel or Vessels which are to be surveyed for the first time

1. Name of vessel (if already named)

2. Owner's name and address

3. Length, breadth and depth of vessel

4. Type of Vessel.
   (Passenger, cargo cum passenger, Chemical Carrier, Liquid Carrier etc)

5. Particulars of hull

   a) Year of built
   b) Builders name and address

   c) Builders certificate
   d) Material of the hull
   e) Number of Bulk heads, their placement and thickness
   f) Hull plating material and thickness

6. Particulars of propulsion of Engines
   a) Number of sets fitted
   b) Manufacturer's name and brand

   c) Model Number
   d) Year of built
   e) Type of Engine *with HP of each*
   f) Diameter of propulsion shaft and material
   g) Type and Number of gears
   h) Test certificate

7. Particulars of equipment

   a) Anchor-Port, Starboard (weight & Material of each)
   b) Anchor-Spare (weight & material of each Equipment)

c) Chain: size type and length and test certificate(Port)
d) Chain: size type and length and test certificate(Starboard)
e) Ropes- size, material and number of ropes
f) Search Lights, number, size and power
g) Life buoys, Buoyant apparatus with Self Ignited lights, Number with buoyant lanyard
h) Navigation Lights giving particulars and certificate, main mast, auxiliary mast, port, Starboard, Stem, Anchor not under command
i) Shapes for anchor not under command etc.
j) Sound signals : Mechanical or Electrical

8. Particulars of fire appliance

a) Number, size and capacity of fire pumps
b) Fire mains, diameter ,material and number of hydrants
c) Number of hose
d) Nozzles
   (i) Jet type
   (ii) Spray type
   (iii) Jet/Spray type
e) Any other equipment

9. Number of portable fire extinguisher with particulars and name of manufactures

a) Soda Acid
b) Foam
c) Dry Powder
d) Any other types

10 Particulars of communication equipment

11 Particulars of navigation equipment

12 Particulars of pollution control devices

a) Sewage treatment and disposal

b) Solid waste processing and disposal

c) Sound Pollution Control

d) Water consumption /day

e) Source of water

13. Plans, Drawings Etc. : As per Rule 2.8.4 of the Rules.

FORM No. 4

[Section 2.8.6]

Appointment of Date and Time of Survey of Inland Vessels

Ref No.:

Dated:

To,

The owner or master,

(Name of the Inland Vessel)

Sir,

This has reference to your request for (Type of Survey) Survey of the Inland Vessel under Inland Vessel Act 1917 vide application No. _______ dated ________.

Please be informed that the Surveyor will be boarding the vessel at ____ hrs on
for the purpose of the requested survey.

You are advised to keep all the documents and the vessel ready for the requested survey in accordance with the Inland Vessel Act 1917 and the Inland Vessel Rules of the State.

In case undue delay owing to lack of readiness of the vessel and/or its crew, the Surveyor may have to postpone the Survey for which all costs shall have to be borne by you in accordance with the Rules in force.

Yours Sincerely,

Chief Surveyor/Surveyor.

FORM No. 5

[Section 2.9.5]

Intimation of Defects / Deficiencies observed during the Survey of Inland Vessels

Ref No.:

Dated:

To,

The owner or master,

(Name of the Inland Vessel)

Sir,

This has reference to (Type of Survey) Survey of the above referred Inland Vessel carried out by me on _________, in accordance with the Inland Vessel Act 1917 and the applicable State Rules.

Please be advised that below detailed deficiencies/defects were observed during the Survey:

a) Hull –
b) Machinery -
c) Equipment –
d) Documentation and Records –
e) Manning –

You are requested to make good the above defects / deficiencies within _____ days from the issuance of this letter and intimate the compliance in writing to this office for verification of the corrective measures in respect of above deficiencies.

Kindly note that if you fail to make good the above referred deficiencies / defects, your application under which this survey was conducted shall stand closed. Thereafter, you will be required to make a fresh application for the Survey.

Yours Sincerely,

Chief Surveyor/Surveyor.

FORM No. 6

[Section 2.10.1]

Declaration of Survey

Ref. No.:

Dated:

This is to certify that I have surveyed the Inland Vessel named __________________________ , Official No. ________________ , in accordance with the Inland Vessel Act 1917 and the applicable State Rules.

During the survey, the condition of vessel and its equipment as detailed in the "RECORD OF VESSEL EQUIPMENT AND VESSEL INFORMATION" attached as annexure to this Declaration of Survey.

Based on the details contained in the Record of Vessel Equipment and Vessel Information together with the number and qualification of personnel manning the vessel, the vessel is fit and inland waterways worthy for the trade/purpose stated therein.

Surveyor

Enclosure: Record of Equipment and Vessel Information

RECORD OF EQUIPMENT AND VESSEL INFORMATION

Name of vessel	Type of vessel	Category of Vessel	Number of passengers	Official number

Hull Material	Name of the Builder	Place of Building	Date of build	Means of Propulsion	Total BHP of Main Engine	Date of Engine Construction

Length	Breadth	Depth	GRT	NRT

Fire fighting	Number/Type	Condition	Location
Fire plan			
Fire pumps (hand)			
Fire pumps (mech)			
Portable extinguishers			
Fixed extinguishing system:			
Components			
Fire buckets			
Sand boxes			
Hydrants			
Hoses, fittings and nozzles			

Equipment	Number	Type/Condition	Location
Anchors			
Anchor cables/chains			
Bilge pumps			
Winches			
Cranes			
Derricks			
Towing equipment			
Ropes and lines			
Collision mat			
Gangway			
Fenders			
Boat hook			
First aid kit			
Binoculars			
Waste containers			
Heaving line			
Axe			
Torch			

Navigation Equipment	Number	Condition	Location
Navigation lights			
Sound signals			
Shapes			
Radar			
Compass			
GPS receiver			
Echo sounder			
Communications equipment			
Nautical publications			
Log book			

Location of passengers on specific decks and spaces in maximum loaded condition						
Deck/Space						
Max^{m} number of passengers						

Record of Equipment and Vessel Information Sheet 2of 2

Freeboard				
Minimum freeboard, equivalent to:	………………………			
Number of passengers				
Cargo (tonnes)				

Life-saving equipment	Number	Type/Condition	Location
Lifejackets			
Lifeboats			
Liferafts			
Launching arrangements			
Flotation devices			
Lifebuoys			
Flares – parachute			
Flares – hand-held			
Smoke signals			
Emergency communications			
Radar transponder/reflector			
Rescue boat			
Liferaft/lifeboat equipment			

Machinery/Electrical	Power BHP	Type/Condition	Location
Main machinery			
Main generator			
Emergency generator			
Main steering gear			
Auxiliary steering gear			
Switchboard	-		
Shore connection			
Batteries			
Signal light switches			

Accommodation/Safety	Condition	Comment
Escape routes		
Washrooms		
Toilets		
Galley		
Messroom		
Water tanks		
Heating/cooling/ventilation		
Berth/locker		
Access to accommodation		
Lighting		
Machinery guards		
Guard rails		
Non-slip surfaces		
Ladders/companionways		
Noise insulation/protection/notices		
Foam flotation material: density		

Issued at: ………………(Place of issue of certificate) …………… on: ………….. (Date of Issue)……………

(Signature of authorized official issuing the certificate) (Seal of the issuing authority appropriate).

FORM No. 7

[Section 2.11]

Notice Regarding Certificate of Survey

Ref. No.:

Dated:

To,

The Owner / Master,

Inland Vessel _________________,

____

Sir,

This is to advise you that the Certificate of survey of the above named Inland Vessel, surveyed on _________________is ready for delivery, and it will be delivered at the office of the undersigned at any time during office hours on application and payment of the following dues:

1. __________
2. ___________

You are hereby reminded of your obligation under section 8(1) of the Act sending the declaration of survey within 14 days of its receipt by you to the officer appointed by the State Government, failing which you shall be liable to forfeiture under section 8(2).

Yours faithfully,

Certifying Authority

(Appointed under section 9(2) of the Act)

FORM No. 8

[Section 2.12]

Application for Certificate of Survey

From

……………………………………………………

……………………………………………………

……………………………………………………

To

Certifying Authority *(appointed under section 9(2) of the Act)*

……………………………………………….……

…………………………………………………….

Sir,

Subject: Application for certificate of Survey

This has reference to your Notice regarding Certificate of Survey No.____________________dated ____________________intimating about the readiness of Certificate of Survey in respect of Inland Vessel __________________________.

It is requested that the Certificate of Survey may kindly be issued.

Yours faithfully,

Signature

Name of the Owner

FORM No. 9

[Section 2.13]

Certificate of Survey – Category A Vessels

Certificate of Survey No. ____________________Vessel Category:__________________

Date of Issue: ___________________ Date of Expiry: ___________________

This is Certificate of Survey has been issued subsequent to Survey carried out of the below detailed inland vessel.

Name of the Vessel ______________________________Official No. ________________

Port of Registry ______________________ Certificate of Registry No. _______________

Gross Tonnage ______________________Registered Tonnage ______________________

Name of the Master ____

Master's CoC Grade __________________,No. ___________,Place of Issue _________

Name and Address of Owner or Agent ____

____

Date Survey Carried Out ___________________ Place Survey Carried Out ____________

PLYING LIMITS:-

Limits beyond which this Vessel is not to ply.

____

____

NUMBER OF PASSENGERS

This Inland Vessel is, according to the declaration of the Surveyor, fit to carry, when there is no Encumbrance of Passenger Accommodation.

Deck passengers	A	B	C	Second Cabin Passengers	Saloon Passengers
	When plying by night (smooth and partially smooth water)	When plying by day (smooth and partially smooth water)	When plying by day on voyages which do not last more than six hours (smooth water only)		
(i) between decks					
(ii) main decks					
(iii) upper or bridge					
TOTAL					
Grand Total					

**Two Children under 12 years of age to be reckoned as one passenger*

ENCUMBRANCE:-

In case the space measured for passenger accommodation is occupied by cattle, or by cargo, or other articles, the above stated passenger carrying capacity is to be adjusted as follows:.

When plying by night (Smooth and partially smooth water)	Then for every 9 superficial feet of such space so occupied on the deck or in the cabins	ONE PASSENGER is to be deducted from the numbers above stated.
When plying by day (Smooth and partially smooth water)	Then for every 6 superficial feet of such space so occupied on the upper or main deck, and for every 9 superficial feet of such space so occupied in the between decks or in the cabins .	ONE PASSENGER is to be deducted from the numbers above stated.
When plying by day on voyages which do not last more than 6 hours (smooth water only)	Then for every 3 superficial feet of such space so occupied on the upper or main deck, and every 9 superficial feet of such space so occupied in the between deck or in the cabins.	ONE PASSENGER is to be deducted from the numbers Above stated.

Freeboard Assigned ____________mm; Loading Marks placed on the vessel's side: Yes/No,

Maximum permissible Cargo carriage capacity: __________tonnes and/or _____passengers.

Safety Equipment carried on the Vessel:

Boats			Safety Equipment (LSA/FFA) carried on the vessel	
Boat	of the aggregate capacity of	cubic feet		

THIS IS TO CERTIFY that the provisions of the law with respect to the survey of the above mentioned Inland Vessel and the Transmission of declaration in respect thereof, have been complied with.

THIS CERTIFICATE, unless previously cancelled or revoked, to be in force until the........ day of ....20.....

Examined and Registered. Signed by Chief Surveyor

1. If the vessel is out of place of survey, it must be surveyed and have a new Certificate before it first begins to ply and after its return or subsequent return to place of survey.
2. THIS CERTIFICATE, OR THE DUPLICATE thereof, or copy in the vernacular is to be put up in a conspicuous place or part of the vessel where it will be visible to all persons on board the same.
3. In case of any accident occasioning loss of life, or any material damage affecting the seaworthiness or efficiency or the vessel to be either in the hull or in part of the machinery a report by letter, signed by the Owner or Master is to be forwarded to the authorized engineer and ship surveyor's Office, within 24 hours after the happening of the accident, or as soon thereafter as possible.

FORM No. 10
[Section 2.13]
Certificate of Survey – Category B Vessels

Certificate of Survey No. ____________________Vessel Category:__________________

Date of Issue: ___________________ Date of Expiry: ___________________

This is Certificate of Survey has been issued subsequent to Survey carried out of the below detailed inland vessel.

Name of the Vessel ______________________________Official No. _______________

Port of Registry _____________________ Certificate of Registry No. _______________

Gross Tonnage ______________________Registered Tonnage _____________________

Name of the Master ____

Master's CoC Grade __________________,No. ___________,Place of Issue _________

Name and Address of Owner or Agent ____

____

Date Survey Carried Out ___________________

Place Survey Carried Out __________________

PLYING LIMITS:-

Limits beyond which this Vessel is not to ply.

____

____

Freeboard Assigned ______________mm; Loading Marks placed on the vessel's side: Yes/No,

Maximum permissible Cargo carriage capacity: _____________tonnes.

Safety Equipment carried on the Vessel:

Boats			Safety Equipment (LSA/FFA) carried on the vessel	
Boat	of the aggregate capacity of	cubic feet		

THIS IS TO CERTIFY that the provisions of the law with respect to the survey of the above mentioned Inland Vessel and the Transmission of declaration in respect thereof have been complied with.

THIS CERTIFICATE, unless previously cancelled or revoked, to be in force until the........ day of ....20.....

Examined and Registered. Signed by Chief Surveyor

1. If the vessel is out of place of survey, it must be surveyed and have a new Certificate before it first begins to ply and after its return or subsequent return to place of survey.
2. THIS CERTIFICATE, OR THE DUPLICATE thereof, or copy in the vernacular is to be put up in a conspicuous place or part of the vessel where it will be visible to all persons on board the same.
3. In case of any accident occasioning loss of life, or any material damage affecting the seaworthiness or efficiency or the vessel to be either in the hull or in part of the machinery a report by letter, signed by the Owner or Master is to be forwarded to the authorized engineer and ship surveyor's Office, within 24 hours after the happening of the accident, or as soon thereafter as possible.

FORM No. 11

[Section 2.17.2]

Application for Change of Name of the Vessel

Dated:

Ref. No.:

From

To,

The Chief Surveyor of Inland Vessels,

…………….…………………………….

Sir,

Sub: Change of name of the vessel on Certificate of Survey No.: ……………………… I …………………………….……… R/O ……………………………………………… being the owner /master of Inland Vessel …………………………………...… (name) bearing Official No. ……………………... hereby request that the name of the vessel may be changed as ………………………………………………… (here enter the new name). The certificate of survey No………………….. dated …………………………. in original is enclosed herewith for making the change of name.

Signature

Name of owner/ master

Enclosures: as stated above.

FORM No. 11(a)

[Section 2.4.6]

Detention Order of the Vessel

Dated:

Place:

To,

The Master / Owner,

Inland Vessel: __

Kindly be advised that Inland Vessel ……………………….. Official No. …………….of …………………… Port of registry was inspected by the undersigned at ……………… on …………………. at the port of ……………………………………..

In view of the defects / deficiencies listed as annexure to this letter, the vessel is hereby provisionally detained under the power vested under rule 2.4.6 Inland Vessels Rules of the State.

The Vessel is forbidden to sail out from the port last inspected by the undersigned till further orders.

The master/owner have been issued copy of this order together with annexure on …………………………… at………………………………….

OR

The master/owner have refused to accept the Order and the Order is pasted on the vessel on …………. in the presence of …………… whose signature are appended below.

Signature

FORM No.12

[Section 3.4.1]

Book of Registration

Registration Mark: ___ ____

Name of Vessel ____

Port of Registry ________________________Year of Registry ________________

Name of the Owner ____

Address of
owner____

DESCRIPTION OF INLAND VESSEL

Type of Vessel Cargo/Passenger etc. ________________ Category ______________

Gross Tonnage __________________ Registered Tonnage ____________________

PARTICULAR OF VESSELS

Length overall ____

Breadth Extreme ____

Depth of underside of deck amid ships, at side ______________________________

Builder Name and Address ____

Year of Built ____

Type of Hull wood, steel etc. ____________________________________

Number of Decks ____

No. of Bulkheads ____

TRANSACTION

Name of person from whom title is derived	No. of Shares affected	Date of and hour of Registry

ENGINE

Internal combustion engine No.____________________________________

Description____

No. of sets ____

Made by ____

Year of Make ____

Surface, jet or Non condensing ____________________________________

No. of cylinders per set ____

Diameter of cylinder in inches ____________________________________

Stroke in inches ____

N.H.P._________________B.H.P._______________I.H.P._____________

PROPULSION

Type: Single/ twin screw/ side quarter etc. ____________________________

Revolution per minute (RPM) __________________ Speed of Vessel ________________

Propulsion geared or direct driven ____

REGISTERING AUTHORITY

Date _____________________

SUBSEQUENT TO REGISTRATION

Nature & Date of transaction

Name, Residence and occupation

Number of transaction of
Transferee Mortgagee or other
Person acquiring title or power

FORM No. 13
[Section 3.5]
Application for Registration

To

The Registering Authority,

____

I, ……………………………………………………………………………………………..

Resident of ………………………………..………………………………………………

being the Owner/Master of an Inland Vessel ………………………………………………

hereby request that the said vessel be registered at the ………………………………………

I agree to pay such fees as may be payable under the Rules. Particulars in respect of the said Vessel is as under:-

1. Owner’s name and address in full
2. Occupation
3. Name of Master and his Certificate No.
4. Name of Registry and No. if previously registered
5. When and how the vessel was secured
6. Kind of vessel, viz., motor, name and address of engine makers with horse power, speed and the year of make.
7. Name and address of builders with place and year of build.
8. Details of Insurance Certificate

Enclosures:-

a) A statement by the owner that the provisions of the Act and these rules have been complied with; A duplicate of the Certificate of Survey;
b) Challan receipt evidencing payment of such fees as specified in the schedule for the registration of the vessel.
c) Copy of the 3rd party insurance certificate of the vessel duly attested.

Place:
Date: Signature of the Owner/ Master of the vessel

FORM No. 14
[Section 3.8.1]
Declaration of Ownership

I/ We ____

____

subject to the state of ________________ residing permanently at ___________________

____

having original place of business at ____

____

do hereby declare that vessel named ____

was built at ____

in the year _____________and was purchased by me on ___________________________

for rupees ____

and wish to have the same registered in my name at the port of _______________ and that I am the sole owner of the same . I further declare that the vessel is intended to ply in the port of ____

Signature of Owner

Made and subscribed the _______________day of ___________________20_____ by the

Above named _________________________in the presence of _____________________

Signature of Magistrate/ Notary Public/Registering Authority

Note:- The declaration shall be made before a registering Authority, a Magistrate or a Notary Public.

FORM No. 15
[Section 3.8.2]
Appointment of Date and Time of Inspection of the Inland Vessel
By the Registering Authority

Dated:

Ref. No.:

To,

The Owner/Master on the Inland Vessel

____

____

Sir/Madam,

In acknowledging receipt of your application for registration of the vessel named above under Inland Vessel Act 1917 (1 of 1917) this to state that Registering Authority/ Surveyor shall proceed on board the vessel at ____________hours on ______________ day of _________________, 20_____.

You are requested to afford to the Registering Authority/Surveyor all reasonable facilities for the registration of the Inland Vessel and all such information respecting the vessel as he may require for the purpose of registration.

Yours faithfully

Registering Authority

Inland Vessels

FORM No. 16

[Section 3.8.4]

Carving and Marking Note

Dated:

Ref. No.:

To,

The Owner/Master on the Inland Vessel

____

____

Sir/Madam,

This has reference to your application for registration of the above named vessel and subsequent enquiry of the vessel conducted under the provisions of section 3.8 of these rules. You advised to have the below enumerated marks carved on the vessel's hull as per the provisions of section 3.11 of these rules:

Name of the Vessel:

Official No. ____

Port of Registry: ______________________________Year of Registry: ________________

You are further advised to contact this office after the completion of requisite carving (which in no case shall be greater than 15 days from the date of issue of this letter) for final inspection for the purpose of registering the vessel.

Please also be advised that you shall be required to surrender this carving note in original at the time of issuance of Certificate of Registry.

Yours faithfully

Registering Authority

Inland Vessels

____

FORM No. 17

[Section 3.13.3]

Application for Registration of Alteration

To,

The Registering Authority,

____

Sir/Madam,

I,

being the owner of inland vessel named Official No. ______________________ hereby report that the following alterations have been carried out on the vessel:

1. ____

2. ____

3. ____

I therefore, apply for registering the alterations / the issue of a fresh Registration Certificate. I enclose herewith a duplicate copy of treasury challan showing the deposit of the necessary fees.

I also enclose herewith the original certificate of Registration No.

Date _____________ (SIGNATURE OF THE OWNER)

FORM No. 18

[Section 3.14]

Application for Transfer of Registry

To,

Registering Authority

____

I, ____________________________________resident of ________________________

____

being the owner of an Inland Vessel Name ____________________________________ official no. ____________________ hereby request that the registry of the said vessel may kindly be transferred from your register to the register of the Registering Authority of ____ in the state of ____________________________________ . The certificate of registration is enclosed herewith. The certificate of registration will be forwarded to the Registering Authority of ______________________________ on demand.

Treasury Challan for Rs. ____________________________________ is also enclosed.

Place

Date ___________________

SIGNATURE OF OWNER

FORM No. 19

[Section 3.20.2]

Appeal against Refusal to Register / Cancellation/ Suspension of the Certificate of Registry

Dated:

To,

The Appellant Authority,

____

Dear Sir / Madam,

This is to request your kind attention to my appeal regarding Certificate of Registry in respect of my inland vessel named ______________________________. The required details pertaining to my case are as follows:

1. Name of the Appellant

2. Registering Authority passing the original Order

3. Date of receipt of the original Order

4. Nature of the order appealed against (specify whether the order is under section 19 F, 19N or 19 O of the Act) with No. and date of the Order

5. Address at which the appellant undertakes to receive the notices.

6. Address to which the notice may be sent to the respondent.

7. Relief claimed in the appeal

8. Grounds of Appeal

i.)

ii)

iii)

etc

Place: Signature of
Date: Appellant/ Authorised Representative

Verification

I / We…………………………………………………………………………the Appellant do hereby declare that what is stated above is true to the best of my/ our knowledge, information and belief.

Dated this …………………..………………..day of …………………………………………

Signature of Appellant (s)

N.B. – The appeal shall be presented in duplicate and should be accompanied by two copies (at least one of which should be the original or an attested copy) of the order appealed against.

FORM No. 20
[Section 3.22.8]
Instrument creating Mortgage

Name of the Vessel ______________________________ Official No. _______________

Certificate of Registry No. ______________________ Place of Registry _____________

Date of Registry ____

Description of the vessel (whether propelled wholly or in part by electricity, steam or other mechanical power): ____________________Horse power of Engine: _______________

Hull (Length for identification..............................)

Equipment:

Boats	Length	Breadth	Depth
No.1	....	....	....
No.2	....	....	....
No.3	....	....	....

Gross Registered Tonnage _______________Net Registered Tonnage ______________and described in more detail in the certificate of survey and book of registry.

I/We the undersigned ***(Full Name & Address with description of mortgager or mortgagers)*** in consideration of... this day lent to ***(Full name, address and Description of mortgagee. If joint mortgagees are concerned they shall be described, if the Mortgagee is a Company, the full title and address shall be given).***

Me / Us ………………………………………………………………..........................

do hereby for ***Myself / ourselves*** and ***my / our*** heirs, executors or administrators covenant with the said ....

Firstly, that ***(Full Name & Address with description of mortgager or mortgagers)*** or ***my / our*** heirs, executors, or administrators, will pay to the said.. the said sum of............................together with interest thereon at the rate of .... per cent, per annum on the ***(Insert day fixed for Payment of Principal Amount)*** day of .... next.

Secondly, that if the said principal sum is not paid on the said day ***(Full Name & Address with description of mortgager or mortgagers)*** or ***my / our*** heirs, executors of administrators, will during as the same or any part thereof remains unpaid, pay to the said... interest on the whole or such part thereof as may for the time being remain unpaid, at the rate of .... per cent per annum, by equal half-yearly payments on the ....day of ....and .... Day of...................................in every year; and for better securing to the said ……………………..... the re-payment in manner aforesaid of the said principal sum and interest.

I / We hereby mortgage to the said .... shares of which ***(Full Name & Address with description of mortgager or mortgagers)*** the owner in the Inland vessel above particularly described, and in her boats, and appurtenances,

Lastly, ***I / We*** for ***myself / ourselves*** and ***my / our*** heirs, executors or administrators covenant with the said... and his assigns that ***I / We*** have power to mortgage in manner aforesaid the above mentioned shares, and that the same are free from encumbrances ***(If any prior encumbrances add, "save as appears by the book of registration of th e sai d vessel").***

In witness where of ***I / We*** have here unto subscribed ***my / our*** name and affixed ***(full name and address with description of the mortgager or mortgagers)*** seal this .... day of …......... and Executed by the above named.. In the presence of

Witness 1 (Name, Full Address and Signature, Seal) …………………………………......

Witness 2 (Name, Full Address and Signature, Seal) ……………………………………...

Mortgage (By Company or Body Corporate) (to secure principal sum and interest)

Name of the Vessel ______________________________ Official No. ________________

Certificate of Registry No. _____________________ Place of Registry _______________

Date of Registry ____

Description of the vessel (whether propelled wholly or in part by electricity, steam or other mechanical power): ____________________Horse power of Engine: ______________

Hull (Length for identification..............................)

Equipment:

Boats	Length	Breadth	Depth
No.1	....	....	....
No.2	....	....	....
No.3	....	....	....

Gross Registered Tonnage _______________Net Registered Tonnage ______________and as described in more detail in the certificate of survey and book of registry.

We, ***(Name in full of Company together with its principal place of business)*** in consideration of................................ this day lent to us by ***(Full name, address and description of mortgagee. If joint mortgagees are concern*****ed they shall be described, if the mortgagee is a Company, the full title and address shall be given)** do hereby for ourselves and our successors covenant with the said ……………………………................................. and ***his / theirs / its*** assigns firstly, that we or our successors, will pay to the said.. or ***his / theirs / its*** assigns the said sum of .... together with interest thereon at the rate of .... per cent, per annum on the ***(Insert the day fixed for payment of principal)*** as above day of .... next; and

Secondly, that of the principal sum is not paid on the said day, we or our successors will, during such time as the same or any part thereof remains unpaid, pay to the said ………….. or ***his / theirs / its*** assigns interest on the whole or such part thereof as may for the time being unpaid, at the rate of.................. per cent, per annum, by equal half-yearly payments on the...................... day of....................... and day of .... in every year; and for better securing the said...................... the repayment in manner aforesaid of the said principal sum and interest we hereby mortgage to the said .... share/shares of which we are the Owners in the vessel above particularly described and in her boats and appurtenances.

Lastly, we for ourselves and our successors covenant with the said........... and ***his / theirs / its*** assigns that we have power to mortgage in manner aforesaid the above mentioned shares and that the same are free from encumbrances. ***(I f an y prior en cu m bran ces add, "save as***

appears by th e book of r egist rati on of th e sad vessel.")

In witness whereof we have hereunto affixed our common seal this....................... day of .... and the common seal of the .... was affixed hereunto in the presence of .... (Description of witnesses, Directors, Secretary as the case may be)

FORM No. 21
[Section 3.22.9]
Instrument creating Transfer of Mortgage
By Individual or Joint Owners

I / We the within-mentioned ………………………………………..………………son of ………………………………………………………………..…… in consideration of …………………….. this day paid to ***Me / Us*** by ………………………………….. hereby transfer to ***Him / Them /It*** ……………………………… the benefit of the within written security.

In witness whereof ***I / We*** have here-un-to subscribed ***My / Our*** name ……………………………………. and affixed ***My / Our*** Seal this ……………………. Day of ………………………. and Executed by the above- named ……………………….. in the presence of ***(Name, address and signature of at least two witness).***

(By Company or Body Corporate)

The within-mentioned …………………… in consideration of…………………… this day paid to it by …………………… hereby transfer to ***Him / Them /It*** the benefit of the within-written security.

In witness whereof we have here unto affixed our common seal this …….day of …….

This common seal of the ……………………………. was affixed in the presence of (Signature and description of at least two witnesses, Directors, Secretary etc. as the case may be.)

N.B. – In the case of transfer of mortgage it shall be made by endorsement in the above forms.

FORM No. 22
[Section 3.22.10]

Instrument creating Discharge of Mortgage

In case of Mortgage is paid off, a Memorandum of its Discharge one of the following forms must be used.

By Individual or Joint Owners

Received the sum of ………………………………………..in discharge of this within written security, dated at…………….day of ………….20…………..

(*) The name and signature of atleast two witnesses.

By Companies or Body Corporate

Received the sum of……………………………….in discharge of the within-written security.

In witness whereof we have here-un –to affix our common seal this ………Day of……..… 20…...…. at…………

The common seal of the …………………………………………….……was affixed with presence of…………………………. (Description and Signature of at least two witnesses ie ., Director, Secretary etc.)

FORM No. 23

[Section 4.4, 4.5, 4.5(a)]

Application Form for appearing in Certificate of Competency

APPLICATION FOR CERTIFICATE OF COMPETENCY TO ACT AS ENGINEER/ ENGINE DRIVER/ SERANG/ MASTER OF AN INLAND MECHANICALLY PROPELLED VESSEL.

Note:-The applicant shall submit this form duly filled in along with the necessary certificates to the examination centre for permission to appear in the examination.

PART-A

Personal particulars

Passport size photograph of the

(1) Name in full :-
(2) Surname :-
(3) Nationality :-
(4) Permanent Address :-
:-
:-

(5) Date of birth :-
(6) Place of birth :-

PART-B

Particulars of all previous certificate (if any)

(1) Number :-
(2) Competency of service :-
(3) Grade :-
(4) Where issued :-
(5) Date of issue :-

(6) Is the certificate at any time suspended or cancelled by court or authority (if yes provide details) ……….……………………………………………………………………..........

…………………………………………………………………………………………….

PART-C

Certificate now required

(1) Grade :-
(2) Competency :-

PART- D

HAVE YOU APPEARED FOR THIS EXAMINATION EARLIER? Yes/No.

If Yes mention year & month.

PART-E

Declaration to be made by applicant:

N.B. Any person who makes, procures to be made or assists in making any false representation for the purpose of obtaining for himself, or any other person, a certificate either of competency or service, is for each offence liable to be punished for cheating under Section 420 of the Indian Penal Code and also for knowingly giving false information to the public servant under section 182 of the Indian Penal Code, of 1860.

DECLARATION

I do hereby declare that the particulars contained in Part A, B, C, D & E of this form are correct and true to the best of my knowledge and belief, and that the papers enumerated in Part-G and sent with this form are true and genuine documents, given and signed by the persons whose names appear on them, I further declare that the statement in Part-G contains true and correct account of the whole of my services without exception.

Date........

Signature of the Applicant

Present Address ....

……………………………....................

PART-F

CERTIFICATE OF THE EXAMINER

The declaration under Part-E above was signed in my presence and the fee of Rs......... received.

Date: Examiner

PART-G

LIST OF TESTIMONIALS AND STATEMENT OF SERVICE ON RIVERS OR SHORE OR SEA

1. If served on board ship

    (i) No. of testimonials/ certificates (if any :-
    (ii) Name of ship where employed :-
    (iii) Horse power of the engine on which worked :-
    (iv) Port of registry and official no. of the ship :-

2. Service particulars of the Applicant:

    (i) Capacity :-
    (ii) Date of appointment
    (iii) Date of termination/leaving
    (iv) State if continuing
    (v) Total period served

        a) Years :
        b) Months:
        c) Days :

    (vi) Total service
    (vii) Total service on shore/river:
    (viii) Period served for which certificates are now produced:-
    (ix) Period served for which no certificates are produced :-

PART-H

CERTIFICATE OF THE EXAMINER

Note :- The examiner should fill up Part-H and I and forward this form to the Chief Examiner along with the testimonials and other certificates.

1. Date and place of examination

2. Insert passed or failed against each item below:

(i) In written examination :

(ii) In the viva examination:

3. Rank for which passed:

PART-I

PERSONAL DESCRIPTION OF APPLICANT

1. Height:
   Meters Centimeters

2. Complexion:

3. Personal marks or peculiarities, if any,

4. Colour of (a) Hair :-
   (b) Eyes :-

I hereby certify that the particulars contained in Part-H and Part-I are correct.

Date......

Place......

Name and signature of examiner

FORM No. 24

[Section 4.4, 4.5, 4.5(a)]

Medical Certificate for appearing in Certificate of Competency

(To be filled in by a registered medical practitioner appointed for the purpose by the State Government or person authorized in this behalf by the State Government.

1. Name of applicant:
2. Identification Marks (1)

   (2)

3 (a) Does the applicant to the best of your judgment suffer from any defect of vision? Yes/No
If so, has it been corrected by suitable spectacle? Yes/No

(b) Can the applicant to the best of your judgment readily distinguish the pigmentary colours, red and green?

(c) In your opinion is he able to distinguish with his eye sight at a distance of 25 meters in good day light? Yes/No

(d) In your opinion does the applicant suffer from a degree of deafness which would prevent his hearing, the ordinary sound signals? Yes/No

(e) In the opinion does the applicant suffer from night blindness? Or deformity or lose of number which would interfere with the efficient performance of his duties as a driver? Yes/No
If so, give your reasons in details:

I certify that I have personally examined the applicant ……………………………………………… I also certify that while examining the applicant I have directed special attention to the distant vision and hearing ability the condition of the arms, legs, heads, hand joints of both extremities of the candidate and to the best of my judgment he is medically fit/not fit to hold a driving licence.

The applicant is not medically fit to hold a licence for the following reasons:-

Signature

1. Name and designation of the Medical Officer/Practitioner

(Seal)

2. Registration Number of Medical Officer

Date: Signature or thumb impression of the Candidate

Note: The Medical Officer shall affix his signature over the Photograph affixed in such a manner that part of his signature is upon the photograph and part on the certificate.

FORM No. 25
[<u>Section 4.4.7 & 4.5.7</u>]
Certificate of Service

No. :

Name :

Son/wife/daughter of :
Permanent Address :

Present Address :

Date of Birth :
Height :

Marks of identification (1)
(2)

PHOTO

Signature or Left Thumb Impression

Based on assessment of your service record in Army / Navy/ Coast Guard, your medical fitness certificate and the preparatory course for ____________________ together with the 4 basic safety course certificates, I have been found duly qualified to fulfill the duties of a ________________________________(Master/Serang/Engine Driver/Lascar) on an Inland mechanically propelled Vessel __________________(limitations if any), I do here by under the provisions of the rules issued under Inland Vessels Rules, 2012 grant you the certificate of competency as a _ (First class Master/Second class Master/Serang/Engineer/First class Engine Driver/Second class Engine Driver / Lascar) on an inland mechanically propelled vessel ____________________ (limitations if any).

Date......

Place......

Name and signature of Chief Examiner

FORM No. 26
[Section 4.4.8 & 4.5.8]
License to act as Master / Engineer of an Inland Vessel

No. :

Name :

Son/wife/daughter of :

Permanent Address :

Present Address :

Date of Birth :

Height :

Marks of identification (1)

(2)

PHOTO

Signature or Left Thumb Impression

Based on assessment of your service record and Master Class 2 / Engine Driver Class 1 Certificate of Competency No. ______________dated: _____________issued at ________________________

I hereby grant you this License to act as Master / Engineer of an Inland Vessel up to _____BHP/NHP.

This License remains valid until the validity of your Master Class 2 / Engine Driver Class 1 Certificate of Competency detailed above.

Date......

Place......

Name and signature of Chief Examiner

FORM No. 27

[Section 4.10]

Application Form for Revalidation of Certificate of Competency

APPLICATION FOR REVALIDATION OF CERTIFICATE OF COMPETENCY TO ACT AS ENGINEER/ ENGINE DRIVER/ SERANG/ MASTER OF AN INLAND MECHANICALLY PROPELLED VESSEL.

Note:-The applicant shall submit this form duly filled in along with the necessary certificates / documents to the issuing authority for revalidation of certificate of competency.

PART-A

Personal particulars

(1) Name in full :-
(2) Surname :-
(3) Nationality :-
(4) Permanent Address :-
:-
:-

Passport size photograph of the

(5) Date of birth :-
(6) Place of birth :-

PART-B

Particulars of the certificate to be revalidated

(1) Number :-
(2) Competency of service :-
(3) Grade :-
(4) Where issued :-
(5) Date of issue :-

(6) Is the certificate at any time suspended or cancelled by court or authority (if yes provide details) ……….……………………………………………………………………..........

……………………………………………………………………………………………….

PART-C

Please tick the condition of revalidation being complied with by the applicant seeking revalidation

(1) Minimum service of 1 year in last 5 years on an inland vessel as described in section 4.10.1 of these rules.

(2) Minimum service of 1 year in last 10 years on an inland vessel & successfully completed the preparatory course for grant of applicable grade of Certificate of Competency as described in section 4.10.2 of these rules.

(3) Successfully completed the preparatory course for grant of applicable grade Certificate of Competency and to appear in oral examination as described in section 4.10.3 of these rules. :-

PART-D

(1) Details of Service on Inland Vessels in last 5 / 10 years (delete the inapplicable)

S. No.	Vessel Name	Vessel Identification / Official No.	Vessel BHP	Rank	From	To	Period

(2) Details of Preparatory Course Attended (if applicable)

Preparatory Course Grade: ______________________ Institute: _________________________
From:____ To: _____________________________
Preparatory Course Certificate No. __________________________ Dated: _______________

PART-E

<u>DECLARATION</u>

I do hereby declare that the particulars contained in Part A, B, C, D & E of this form are correct and true to the best of my knowledge and belief, and that the papers attached / sent with this form are true and genuine documents, given and signed by the persons whose names appear on them.

<u>Date........</u>

Signature of the Applicant

Present Address ....

…………………………….....................

PART-F

CERTIFICATE OF THE EXAMINER

The declaration under Part-E above was signed in my presence and the fee of Rs............................received.

Date: Examiner

PART-G

CERTIFICATE OF THE EXAMINER

Note :- The examiner should fill up Part-G and H and forward this form to the Chief Examiner along with the testimonials and other certificates.

1. Date and place of Assessment of documents submitted

2. Passed or failed in Oral Examination (if applicable)

3. Revalidation of Certificate No.______________, Grade ____________recommended / not recommended. (in case of not recommended cases, please state reasons)

PART-H

PERSONAL DESCRIPTION OF APPLICANT

1. Height:
   Meters Centimeters

2. Complexion:

3. Personal marks or peculiarities, if any,

4. Colour of (a) Hair :-
   (b) Eyes :-

I hereby certify that the particulars contained in Part-G and Part-H are correct.

Date......

Place......

Name and signature of examiner