2017

Rules and Guidance for the Classification of Mobile Offshore Units

KR

Rules

2017

Rules for the Classification of

Mobile Offshore Units

Guidance

2017

Guidance Relating to the Rules for the Classification of

Mobile Offshore Units

2017

Rules for the Classification of Mobile Offshore Units

RB-01-E

KR

APPLICATION OF
"RULES FOR THE CLASSIFICATION OF
MOBILE OFFSHORE UNITS"

1. Unless expressly specified otherwise, the requirements in the Rules apply to Mobile Offshore Units for which contracts for construction are signed on or after 1 July 2017.
2. The amendments to the Rules for 2016 edition and their effective date are as follows;

Effective Date 1 July 2017

< No revision>

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CHAPTER 1 GENERAL

Section 1 General

101. Application

1. The requirements in the Rules are to be applied to the design, manufacture, installation and survey of mobile offshore units classed with the Society or intended to be classed under the Society. Mobile offshore units (hereinafter referred to as "units" in the Rules) as used herein are the units which are not intended for service at one particular offshore location and which are capable of moving for the intended offshore operation. However, for the restricted service units, special consideration may be given by the Society. The mobile offshore drilling units engaged in drilling operation are to comply with **Rules for the Classification of Mobile Offshore Drilling Units.**

2. The requirements in the Rules are to be considered as minima by the Society. In addition, particular National Governments may have regulations which might be in excess of these requirements.

3. The Society is prepared to offer assistance, upon the request of an Owner or designer, in evaluating a specific design against published National regulations.

4. Evaluation must be made of other possible loading condition peculiar to the type of unit under consideration. Calculations substantiating the adequacy of the design are to be submitted to the Society. Machinery and electrical installations, etc. for other special purpose units will be subject to approval by the Society, as found to be applicable.

5. The items listed below, where applicable, are covered by the Rules and are subject to approval by the Society.

- Material
- Structural strength
- Welding
- Stability, intact and damaged
- Weathertight/watertight integrity
- Temporary or emergency mooring equipment
- Jacking system
- Propulsion machinery, including shafts and propellers
- Steering gear and rudders
- Auxiliary machinery
- Pumping and piping systems, including valves
- Boilers and pressure vessels
- Electrical installations
- Protection against fire and explosion

6. Floating structures, which are not for industrial purpose, such as floating hotel, floating restaurant and floating performing place, etc. are to be applied to **Guidance for Floating Structures.**

102. Types of units

Units are classified into the following four groups depending upon their types.

(1) Self-elevating Units : Self-elevating unit is a unit having hulls with sufficient buoyancy to safely transport the unit to the desired location, after which the hull is raised to a predetermined elevation above the sea surface on its legs, which are supported by the sea bed. Equipment and supplies may be transported on the unit, or may be added to the unit in its elevated position. The legs of such units may penetrate the sea bed, may be fitted with enlarged sections or foot-

ings to reduce penetration, or may be attached to bottom pads or mat.

(2) Column-stabilized Units : Column-stabilized unit is a unit which depends upon the buoyancy of widely spaced columns for flotation and stability for all afloat modes of operation or in the raising or lowering of the unit, as may be applicable. The columns are connected at their top to an upper structure supporting the equipment. Lower hulls or footings may be provided at the bottom of the columns for additional buoyancy or to provide sufficient area to support the unit on the sea bed. Bracing members of tubular or structural sections may be used to connect the columns, lower hulls or footings and to support the upper structure. Operations may be carried out in the floating condition, in which condition the unit is described as a semisubmersible, or when supported by the sea bed, in which condition the unit is described as submersible. A semisubmersible unit may be designed to operate either floating or supported by the sea bed, provided each type of operation has been found to be satisfactory.

(3) Surface Type Units

(A) Ship Type Units : Ship type unit is a seagoing ship-shaped unit having a displacement type hull or hulls, of the single, catamaran or trimaran type, which have been designed or converted for operations in the floating condition. The unit of this type has propelling machinery.

(B) Barge Type Units : Barge type unit is a seagoing unit having a displacement type hull or hulls, which have been designed or converted for operations in the floating condition. The unit of this type has no propelling machinery.

(4) Other Type of Units : Units other than those specified in (1) to (3), are to be in accordance with the relevant requirements in this Chapter and are to be at the discretion of the Society.

103. Exemptions

The Rules are not to be applied to the following items ;

(1) Machinery, electrical and piping systems used exclusively for industrial purpose, except in so far as their design or arrangement may affect the safety of the unit.

(2) Determination of the adequacy of sea bed conditions, regarding bearing capacity, resistance to possible sliding and anchor holding capability.

The assessment of the required holding capacity, arrangement and operation of position mooring equipment and dynamic positioning equipment used for station-keeping activities in connection with the unit's operation is the responsibility of the Owner, and is not included in the Rules.

104. Equivalency and novel features

1. Alternative hull construction, equipment, machinery and their arrangement and scantlings will be accepted by the Society, provided that the Society is satisfied that such construction, equipment, machinery and their arrangement and scantlings are equivalent to those required in the Rules.

2. Units which contain novel features of design, with respect to buoyancy, elevating arrangements, structural arrangements, machinery, etc., to which the Rules are not directly applicable, may be classed, when approved by the Society on the basis that the Rules, in so far as applicable, have been complied with and that special consideration has been given to the novel features based on the best information available at the time.

105. Load line

1. Any unit to which a load line is required, is to be assigned under the applicable terms of the **International Convention on Load Lines, 1966**.(hereinafter referred as "**ICLL**" in the Rules)

2. All units other than those specified in **Par 1** are to have load line marks which designate the maximum permissible draft when the unit is in the afloat condition.

3. Load line markings are to be placed at suitable visible locations on the structure to the satisfaction of the Society. These marks, where applicable, are to be visible to the person in charge of mooring, lowering or otherwise operating the unit.

4. The permissible draught is to be established on the basis of meeting the applicable stability and structural requirements as set forth herein for afloat modes of operation, with such seasonal allowances as may be determined.

5. In no case is the draught to exceed that permitted **ICLL**.

6. A load line, where assigned, is not applicable to bottom-supported units when resting on the sea bed, or when lowering to or raising from such position.

7. Self-elevating Units and Surface Type Units

For self-elevating units and surface type units, the load line is to be accordance with not only **Par 1** through **6** but also following requirements.

(1) Freeboard of the units is to be assigned in accordance with **ICLL** after confirming that the hull structure has a sufficient strength for the draft corresponding to the freeboard assigned. Freeboard of units which cannot be assigned in accordance with **ICLL** due to special forms of units, however, is to be assigned in accordance with the requirements in **Ch 4, 6** and **7** at floating condition.

(2) Where moonpools are arranged within the hull in open communication with the sea, the volume of the moonpool should not be included in calculation of any hydrostatic properties.

(3) Where the moonpool has a larger cross sectional area above the waterline at 85% of the depth for freeboard (depth for freeboard has the same meaning as defined in regulation 3 of the 1988 LL Protocol) than below, an addition is to be made to the geometric freeboard corresponding to the lost buoyancy. This addition of for the excess portion above the waterline at 85% of the depth for freeboard is to be dealt with the following (A) to (C) as below for wells and recesses.

(A) Where an enclosed superstructure contains part of the moonpool, deduction is to be made for the effective length of the superstructure.

(B) Where open wells or recesses are arranged in the freeboard deck, a corrosion equal to the volume of the well of recess to the freeboard deck divided by the waterplane area at 85% of the depth for freeboard is to be made to the freeboard obtained after all other corrections, except bow height correction, have been made.

(C) In stability calculation, free surface effects of the flooded well or recess are to be taken into consideration.

(4) Where small notches or relatively narrow cut-outs at the stern of the unit, the same procedure for correction described in (3) is to be carried out.

(5) Narrow wing extensions at the stern of the unit are to be considered as appendage. The appendages are not to be included in the calculation of freeboard length.

8. Column Stabilized Units

(1) The freeboard of the unit are to be determined by the requirements of **Ch 4, 6, 7** and **Par 9.** (2)

(2) The enclosed deck structure of the if this unit is to be appropriate to the Society.

(3) The position of openings which cannot be closed in emergencies is not to be located below the deck structure of the unit.

9. Vertical distance between the wave crests and underside of deck structure

(1) Self-elevating Units

The unit is to be designed for a crest clearance of either 1.2 m, or 10 % of the combined storm tide, astronomical tide and height of the maximum wave crest above the mean low water level, whichever is smaller, between the underside of the unit in the elevated position and the crest of the design wave. The crest elevation is to be measured above the level of the combined astronomical and storm tides.

(2) Column Stabilized Units

(A) Vertical distance between the lower surface of deck structure and wave crest is to be ensured for all afloat modes of operation, taking into account the predicted motion of the unit relative to the surface of the sea.

(B) For on-bottom modes of operation, clearances are to be in accordance with those specified in (1).

106. Operating Booklet

An Operating Booklet is to be provided for each unit to the satisfaction of the Society, and its copy is to be submitted to the Society. The booklet is to include the following information, as applicable to the particular unit, so as to provide suitable guidance to the operating personnel with regard to safe operation of the unit :

(1) General description of the unit and light ship data based on the results of inclining experiment of the unit, etc.
(2) Pertinent data for each approved mode of operation, including design and variable loading, environmental conditions, assumed sea bed conditions, draught, etc.
(3) The lowest temperatures of atmosphere and sea water assumed at the design stage.
(4) General arrangement showing watertight compartments, closures, vents, allowable deck loadings, etc.
(5) Hydrostatic curves or equivalent data.
(6) Capacity plan showing capacity of tanks, centre of gravity, free surface corrections, etc.
(7) Instructions for operation, including precautions to be taken in adverse weather, changing mode of operation, any inherent limitations of operation, etc.
(8) Plans and descriptions of the ballast system and instructions for ballasting. If permanent ballast is to be used, the weight, location and substance used are to be clearly indicated.
(9) Piping diagrams of fuel oil transfer systems.
(10) Hazardous areas plan
(11) Fire control plan
(12) Arrangement of life-saving appliances together with escape routes.
(13) Stability information in the form of maximum KG versus draught curve, or other suitable parameters based upon compliance with the required intact and damaged stability criteria.
(14) Representative examples of loading conditions for each approved mode of operation specified in **107.**, together with means for evaluation of other loading conditions.
(15) Diagrams of main and auxiliary wiring systems.
(16) Details of emergency shutdown procedures for electrical equipment.
(17) Identification of the helicopter assumed in the design of the helicopter deck.

107. Construction booklet

A set of plans showing the exact location and extent of application of different grades and strengths of structural materials, together with a description of the material and welding procedures employed, is to be placed aboard the unit. Any other relevant construction information is to be included in the booklet, including restrictions or prohibitions regarding repairs or modifications.

Section 2 Definitions

201. Application

The definitions of terms and symbols which appear in the Rules are to be as specified in this Section, unless otherwise specified, and definitions of terms and symbols not specified in the Rules are to be as specified in **Rules for the Classification of Steel Ships** and **Rules for the Classification of Steel Barges**.

202. Length(L)

1. For self-elevating units and barge type units, length is the distance in metres on the summer load line, between the insides of shell platings at the fore and after end.

2. For column-stabilized units, length is the maximum distance in metres between the fore and after end of the primary hull structure which is projected to the centre line of the unit.

3. For ship type units, length is the distance in metres on the summer load line, from the fore side of the stem to the centre of the rudder stock, or 96 % of the length on the summer load line, whichever is the greater.

203. Breadth(B)

1. For column-stabilized units, breadth is the horizontal distance in metres measured perpendicularly to the longitudinal centre line at the broadest part of the primary hull structure.
2. For self-elevating units, ship type units and barge type units, breadth is the horizontal distance in metres between outside of frames at the broadest part of hull.

204. Depth(D)

1. For column-stabilized units, depth is the vertical distance in metres from the top of bottom plating of the lower hull or footing to the top of beam of the uppermost continuous deck at side measured at the middle of L.
2. For self-elevating units, ship type units and barge type units, depth is the vertical distance in metres from the top of bottom plating to the top of beam of the uppermost continuous deck at side measured at the middle of L.

205. Design water depth

Design water depth is the vertical distance in metres from the sea bed to the mean low water level plus the height of astronomical and storm tides.

206. Light ship weight

Light ship weight is the weight of the complete unit in tons with all its permanently installed machinery, equipment and outfit, including permanent ballast, spare parts normally retained on board, and liquids in machinery and piping to their normal working levels, but does not include cargo, liquid in storage or reserve supply tanks, items of consumable or variable loads, any allowance for stores, or crew and their effects.

207. Modes of operation

A mode of operation is a condition or manner in which a unit may operate or function while on location or in transit. In the application of the Rules, the approved modes of operation of a unit are defined as follows.

(1) Operating condition : Operating condition is a condition wherein a unit is on location for the purposes of operations, and combined environmental and operational loadings are within the appropriate design limits established for such operations. The unit may be either afloat or supported on the sea bed, as applicable.
(2) Severe storm condition : Severe storm condition is a condition during which a unit may be subjected to the severest environmental loadings for which the unit is designed. Operations are assumed to have been discontinued due to the severity of the environmental loadings. The unit may be either afloat or supported on the sea bed, as applicable.
(3) Transit condition : Transit condition is a condition wherein a unit is moving from one geographical location to another without any operation of its purpose.
(4) Temporary mooring condition : Temporary mooring condition is a condition wherein a unit is temporarily moored in the afloat condition.

208. Non-self-propelled unit

Non-self-propelled unit is the unit which has no propulsion machinery or designed to be towed or pushed by other ships when the unit voyages through the ocean normally even if the unit has propulsion machinery.

209. Self-propelled unit

Self-propelled unit is the unit other than non-self-propelled unit.

210. Working area

The working area is an area where operators are engaged in the operation work of the unit.

211. Control station

Control stations are those spaces in which the ships radio equipment, main navigation equipment or emergency source of power is located and control panels for posture or position control equipment, leg elevation control equipment, central ballast control devices, central fire detection central fire alarm devices are installed.

212. Down flooding

Down flooding means any flooding of the interior or any part of the buoyant structure of a unit through openings which cannot be closed weathertight, watertight or which are required for operational reasons to be left open in all weather conditions, as appropriate for the intact and damage stability criteria.

213. Weathertight

Weathertight means that in any sea conditions water will not penetrate into the unit.

214. Watertight

Watertight means that capability of preventing the passage of water through structure in any direction under the head of water for which the surrounding structure is designed.

215. Moulded draught

The moulded draught is the vertical distance in metres measured from the moulded base line to the assigned load line. Certain components of a unit's structure, machinery or equipment may extend below the moulded base line.

216. Moulded base line

The moulded base line is a horizontal line extending through the upper surface of the bottom plating. ⚓

CHAPTER 2 CLASSIFICATION AND SURVEYS

Section 1 General

101. General

1. The classification and surveys of units intended to be classed with the Society or classed with the Society are to be in accordance with the requirements specified in this Chapter.
2. In the case of items not specified in this Chapter, the requirements specified in **Pt 1** of **Rules for the Classification of Steel Ships** are to be applied.
3. For Surface Type Units the survey requirements detailed in this Chapter replace those requirements laid out in **Pt 1** of **Rules for the Classification of Steel Ships** except when noted in the text. The thickness measurement requirements of **Pt 1** of **Rules for the Classification of Steel Ships** are adapted and incorporated into **Table 2.1** of this Chapter.

102. Definition

1. Ballast tank

A ballast tank is a tank which is used primarily for salt water ballast.

2. Preload tank

A preload tank is a tank within the hull of a self-elevating unit. These tanks are periodically filled with salt water ballast and used to preload the footings of the unit prior to commencing drilling operations. Preload tanks are considered equivalent to ballast tank.

3. Spaces

Spaces are separated compartments

4. Coating condition

Coating condition is defined as follows:

(1) **GOOD** condition with only minor spot rusting

(2) **FAIR** condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20 % or more of areas under consideration, but less than as defined for POOR condition

(3) **POOR** condition with general breakdown of coating over 20 % or more, or hard scale at 10 % or more, of areas under consideration

5. Close-up Survey

A Close-up Survey is a survey where the details of structural components are within the close visual inspection range of the Surveyor, i.e. normally within reach of hand.

6. Transverse section(girth belt)

A transverse section(girth belt) includes all continuous longitudinal members such as plating, longitudinals and girders at a given section of the unit.

7. Representative spaces

Representative spaces are those which are expected to reflect the conditions of other spaces of similar type and service and with similar corrosion prevention systems. When selecting representative spaces, account is to be taken of the service and repair history on board and identifiable critical structural areas and/or suspect areas.

8. Critical structural area

Critical structural areas are locations which have been identified from calculations to require monitoring or from the service history of the subject unit or from similar units or sister units, if applicable, to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the unit.

9. Suspect area

Suspect areas are locations showing substantial corrosion and/or are considered by the Surveyor to be prone to rapid wastage.

10. Substantial corrosion

Substantial corrosion is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75 % of allowable margins, but within acceptable limits.

11. Excessive diminution

Excessive diminution is an extent of corrosion beyond allowable limits.

12. Corrosion prevention system

A corrosion prevention system is normally considered a full hard protective coating. Hard protective coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

13. Prompt and thorough repair

A prompt and thorough repair is a permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the imposition of any associated condition of classification, or recommendation.

14. Special consideration

Special consideration or specially considered (in connection with Close-up Surveys and thickness measurements) means sufficient close-up inspection and thickness measurements are to be taken to confirm the actual average condition of the structure under the coating.

15. Propulsion assist

Propulsion assist are non-self-propelled units fitted with thrusters intended to assist in manoeuvring or propelling while under tow.

103. Repairs

1. Any damage in association with wastage over the allowable limits(including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, will affect the unit's structural, watertight or weathertight integrity, is to be promptly and thoroughly (see **102. 13**) repaired. For location where adequate repair facilities are not available, consideration may be given to allow the unit to proceed directly to a repair facility. This may require temporary repairs for the intended voyage.

2. Additionally, when a survey results in the identification of structural defects or corrosion, either of which, in the opinion of the Surveyor, will impair the unit's fitness for continued service, remedial measures are to be implemented before the unit continues in service.

3. Where the damage found on structure mentioned in **Par 1** is isolated and of a localised nature which does not affect the unit's structural integrity, consideration may be given by the Surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a Recommendation/Condition of Class in accordance with IACS PR No.35(Procedure for Imposing and Clearing Recommendation/Condition of Class), with a specific time limit.

Section 2 Classification

201. Classification

Units built and surveyed for the classification in accordance with this Rules or in accordance with requirements deemed to be equivalent to this Rules by the Society will be assigned a class and registered in the Register of Ships.

202. Class notations

The class will be distinguished by the class notations and the class notations assigned to the units classed with the Society are to be in accordance with the requirements specified in **Pt 1, Ch 1, 201.** of **Rules for the Classification of Steel Ships.** However, "Mobile Offshore Unit" shall be assigned as a ship type notation and the following notations shall be assigned as special feature notations.

(1) The following special feature notations shall be assigned according to the type of unit.
  (A) Self-elevating
  (B) Column-stabilized
  (C) Ship Type
  (D) Barge Type

(2) The following special feature notations shall be assigned according to the purpose of unit.
  (A) Crane
  (B) Accommodation
  (C) Floating Pier
  (D) Special feature notations according to other purposes of units

203. Maintenance of classification

1. Units classed with the Society are to be subjected to the surveys to maintain the classification and are to be maintained in good condition in accordance with the requirements specified in this Chapter.

2. Plans and particulars of any proposed alterations to the approved scantlings or arrangements of hull, machinery or equipment are to be submitted for approval by the Society before the work is commenced and such alterations are to be surveyed by the Surveyor of the Society.

204. Classification Survey during Construction

1. General

At the Classification Survey during Construction, the hull, machinery and equipment are to be examined in detail in order to ascertain that they meet the relevant requirements of this Rules.

2. Submission of plans and documents

(1) At the Classification Survey during Construction, the following plans and documents are to be submitted to the Society for approval before the work is commenced.
  (A) Hull and equipment
    (a) Transverse section showing scantlings
    (b) Longitudinal section showing scantlings
    (c) Deck construction plan(including details of well and helicopter deck)
    (d) Framing
    (e) Shell expansion
    (f) Final stability data
    (g) Methods and locations for non-destructive testing
    (h) Construction plan of watertight bulkheads and deep tanks indicating the highest position of tank and positions of tops of overflow pipes
    (i) Construction of leg, bottom mats, leg tanks and load transmitting parts of jacking system, etc.
    (j) Construction of columns, lower hull, footings
    (k) Construction of superstructures and deckhouses

(l) Details of arrangement and closing devices of watertight doors and hatchways, etc.
(m) Seatings of boilers, main engines, thrust blocks, plummer blocks, dynamos and other important auxiliary machinery
(n) Construction of machinery casings
(o) Construction of cargo handling appliances and its foundation
(p) Pumping arrangements
(q) Steering gear
(r) Construction of fire protection
(s) Means of escape
(t) Temporary mooring arrangements and towing arrangements
(u) Welding details and procedures
(v) Details of corrosion control arrangements
(w) Documents in respect of maintenance, corrosion control and inspection
(x) Other plans and/or documents considered necessary by the Society

(B) Machinery
(a) For self-elevating unit, construction plan and operating diagram of jacking systems
(b) General arrangement of machinery spaces, boilers and pressure vessels, main and auxiliary engines, shaftings, and auxiliary machinery and pipings, etc. specified in **Pt 5, Ch 1** of **Rules for the Classification of Steel Ships.**
(c) Electrical installations specified in **Pt 6, Ch 1** of **Rules for the Classification of Steel Ships**, and automatic and remote control system specified in **Pt 6, Ch 2** of **Rules for the Classification of Steel Ships.**
(d) Fire extinguishing arrangements and inert gas system
(e) Other plans and/or documents considered necessary by the Society

(2) At the Classification Survey during Construction, the following plans and documents are to be submitted to the Society for reference.
(A) Specifications
(B) General arrangement
(C) Summary of distributions of fixed and variable weights
(D) Plan indicating design loadings for all decks
(E) Preliminary stability data
(F) Structural analysis and calculation for relevant loading conditions
(G) Resultant forces and moments from wind, waves, current, mooring and other environmental loadings taken into account in the structural analysis
(H) Calculations for significant operational loads from derrick and other equipment
(I) For self-elevating unit, calculations substantiating adequacy of structure to transmit forces between legs and hull through the jacking systems
(J) Evaluation of the unit's stability to resist overturning while bearing on the sea bed
(K) Lines or offsets
(L) Capacity plans and sounding tables of tanks
(M) Plans showing arrangement of watertight compartments, openings, their closing appliances, etc., necessary for calculation of stability
(N) Other plans and/or documents considered necessary by the Society
Submitted calculations are to be suitably referenced. Results from relevant model tests or dynamic response calculations may be submitted as alternatives or as substantiation for the required calculations.

3. Presence of Surveyors

(1) At the Classification Survey during Construction, the presence of the Surveyor is required at the following stages of the work in relation to hull and equipment.
(A) When the tests of the materials specified in **Pt 2, Ch 1** of **Rules for the Classification of Steel Ships** and the equipment specified in **Pt 4** of **Rules for the Classification of Steel Ships** are carried out.
(B) When the tests of welding specified in **Pt 2, Ch 2** of **Rules for the Classification of Steel Ships** are carried out.
(C) When designated by the Society during shop work or sub-assembly.
(D) When each block is assembled and erected.
(E) When each part of the hull is completed.

(F) When structural tests, leak test, hose tests and non-destructive tests are carried out.
(G) When performance tests are carried out on closing appliances of openings, anchoring and mooring equipment, cargo handling appliances, fire detection systems, etc.
(H) When each part of the fire protection construction is completed.
(I) When measurement of principal dimensions, hull deflection, etc. are carried out.
(J) When a loading instrument is installed on board.
(K) When the load line mark is marked.
(L) When the onboard tests and stability experiments are carried out.
(M) When the sea trials are carried out.
(N) When deemed necessary by the Society.

(2) At the Classification Survey during Construction, the presence of a Surveyor is required at the following stages of the work in relation to machinery.
(A) Units not provided with propelling machinery
(a) When the tests specified in **Ch 10, 109.** are carried out. However, the presence of the surveyors at respective tests of apparatuses used for the systems specified in **Ch 10, 101. 3** may be modified in accordance with the usage of the apparatuses.
(b) When generators, prime movers for generators and essential auxiliaries are installed on board.
(c) When sea trials are carried out.
(d) For offshore storage units subject to the requirements in **Ch 11, 403. 6,** when the tests regarding to those requirements are carried out.
(B) Units provided with propelling machinery
(a) When the tests specified in **Ch 10, 109.** are carried out.
(b) When the tests of materials of main parts of machinery prescribed in **Pt 2** of **Rules for the Classification of Steel Ships** are carried out.
(c) Main parts of machinery
(i) When the tests prescribed in **Pt 5** and **6** of **Rules for the Classification of Steel Ships** according to the respective kind of machinery are carried out.
(ii) When machining of the main parts is finished and, if necessary, at the proper stage during machining.
(iii) In the case of welded construction, before welding is commenced and when it is completed.
(iv) When shop trials are carried out on main engines and generators.
(d) When main engines, generators and essential auxiliaries are installed on board.
(e) When performance tests/onboard tests are carried out on remote control devices of closing appliances, remote control devices for machinery and gears, automatic control devices, steering gears, jacking systems, fire fighting system and pipings.
(f) When sea trials are carried out.

(3) For column-stabilized units, when the draught scales are fitted.
(4) For units requiring the mooring system specified in **Ch 3, Sec 8** when that system is installed on the unit.
(5) For units with a dynamic positioning system, when components of the dynamic positioning system are installed on the units and tests are carried out in accordance with the testing procedure.

4. Tests

At the Classification Survey during Construction, hydrostatic tests, leak tests, hose tests and performance tests, etc are to be carried out in accordance with the relevant requirements of this Rules.

5. Sea trials and stability experiments

(1) At the Classification Survey during Construction, the following tests corresponding to the type of unit are to be carried out during the sea trials in addition to the relevant test items of sea trials specified in **Pt 1, Ch 1, 308.** of **Rules for the Classification of Steel Ships.**
(A) For self-elevating units, elevating and lowering tests of legs and decks and function tests of their safety devices; and where legs are not provided with bottom mats, pre-loading tests on each leg to a load as near as possible to that of the strength calculation specified in **Ch 5, 103.**
(B) For column-stabilized units, a function test of the ballast system
(C) For units with the dynamic positioning system, performance tests of the dynamic positioning system.

(2) Stability experiments

(A) At the Classification Survey during Construction, stability experiments are to be carried out upon completion of the unit. In addition, a stability information booklet prepared on the basis of the particulars of stability determined by the results of stability experiments is to be approved by the Society and provided on board.

(B) The stability experiments of an individual unit may be dispensed with, provided that reliable stability data can be obtained from the stability experiments of a similar unit and approval is given by the Society. However, the stability experiments for a column-stabilized unit are to be carried out even though the stability data is available from a similar unit.

205. Classification Survey after Construction

1. General

At the Classification Survey after Construction, the examination of the hull, machinery and equipment are carried out as required for the Special Survey corresponding to the age, kind and purpose of the units and the actual scantlings, etc. of the main parts of units are to be measured as necessary.

2. Submission of plans and documents

At the Classification Survey after Construction, plans and documents as may be required for the Classification Survey during Construction are to be submitted. If plans and documents cannot be obtained, facilities are to be given for the Surveyor to take the necessary information from the unit.

3. Sea trials and stability experiments

At the Classification Survey after Construction, sea trials and stability experiments are to be carried out in accordance with the requirements specified in **204. 5**. However, sea trials and stability experiments may be dispensed with provided that sufficient information based on previous tests is available and neither alteration nor repair affecting sea trials and stability experiments has been made after such previous tests. The stability experiments for a column-stabilized unit may be required where deemed necessary by the Society even though the stability data is available from a similar unit.

Section 3 Surveys

301. General

1. Units classed with the Society are to be subjected to the following surveys to maintain the classification.

(1) Special Surveys
(2) Annual Surveys
(3) Docking Surveys
(4) Surveys of Propeller Shaft and Stern Tube Shaft, Etc.
(5) Boiler Surveys
(6) Continuous Surveys
(7) Alteration Survey
(8) Occasional Surveys

2. In the Annual Surveys and Special Surveys to hull and equipment of units, the requirements among those in **Pt 1, Ch 2** of **Rules for the Classification of Steel Ships** which are deemed especially difficult to apply in relation to the type and purpose of units may be modified in their application under the approval of the Society on the occasion of plan approval for Classification Survey, submitting information in relation to the maintenance, corrosion control and inspection.

3. It is the responsibility of the owner/operator of the unit to report to the Society without delay any damage, defect or breakdown, which could invalidate the conditions for which a classification has been assigned so that it may be examined at the earliest opportunity by the Surveyor. All repairs found necessary by the Surveyor are to be carried out to Surveyor's satisfaction.

4. Plan and procedures for Special Surveys, Continuous Surveys, and Docking Surveys(or In-water Survey in lieu of Docking Survey) are to be submitted for review in advance of the survey and made available on board. These should include drawings or forms for identifying the areas to be surveyed, the extent of hull cleaning, non-destructive testing locations(including NDT methods), nomenclature, and for the recording of any damage or deterioration found. Submitted data, after review by the Society, will be subject to revision if found to be necessary in light of experience.

5. Preparation for survey

(1) Conditions for survey
(A) The Owner is to provide the necessary facilities for a safe execution of the survey. For confined space entry, the requirements of IACS PR No.37(Procedural Requirement for Confined Space Safe Entry) should be followed.
(B) Tanks and spaces are to be safe for access, i.e. gas freed, ventilated, and illuminated.
(C) In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces are to be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces are to be sufficiently clean and free from water, scale, dirt, oil residues etc. to reveal corrosion, deformation, fractures, damages, or other structural deterioration. However, those areas of structure whose renewal has already been decided by the Owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed.
(D) Sufficient illumination is to be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration.
(E) Where soft or semi-hard coatings have been applied, safe access is to be provided for the Surveyor to verify the effectiveness of the coating and to carry out an assessment of the conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft or semi-hard coating is to be removed.

(2) Access to structures
  (A) For survey, means are to be provided to enable the Surveyor to examine the hull structure in a safe and practical way.
  (B) For survey in void compartments and water ballast tanks, one or more of the following means for access, acceptable to the Surveyor, is to be provided:
    (a) permanent staging and passages through structures
    (b) temporary staging and passages through structures
    (c) hydraulic arm vehicles such as conventional cherry pickers, lifts and movable platforms
    (d) boats or rafts
    (e) other equivalent means
(3) Equipment for survey
  (A) Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required. Thickness measurements are to be carried out by a firm approved by the Society in accordance with **Pt 1, Annex 1-11** of **Guidance Relating to the Rules for the Classification of Steel Ships**.
  (B) One or more of the following fracture detection procedures may be required if deemed necessary by the Surveyor:
    (a) radiographic equipment
    (b) ultrasonic equipment
    (c) magnetic particle equipment
    (d) dye penetrant
    (e) other acceptable NDT Techniques
(4) Surveys offshore or at anchorage
  (A) Survey offshore or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard.
  (B) A communication system is to be arranged between the survey party in the tank or space and the responsible officer on deck. This system must also include the personnel in charge of ballast pump handling if boats or rafts are used.
  (C) When boats or rafts are used, appropriate life jackets are to be available for all participants. Boats or rafts are to have satisfactory residual buoyancy and stability even if one chamber is ruptured. A safety check-list is to be provided.
  (D) Surveys of tanks by means of boats or rafts may only be undertaken at the sole discretion of the Surveyor, who is to take into account the safety arrangements provided, including weather forecasting and unit response in reasonable sea conditions.

302. Annual Survey

1. Due date

The due date of annual surveys is to be in accordance with **Pt 1, Ch 2, 201.** of **Rules for the Classification of Steel Ships.**

2. Scope

The survey consists of an examination for the purpose of verifying, as far as practicable, that the hull, structure, equipment, and machinery are maintained in accordance with the applicable Rule requirements

3. Hull, structure and equipment

At each Annual Survey the exposed parts of the hull, deck, deck house, structures attached to the deck, derrick substructure, including supporting structure, accessible internal spaces, and the applicable parts listed below are to be generally examined and placed in satisfactory condition as found necessary.

And the Surveyors are to be satisfied at each Annual Survey that no material alterations have been made to the unit, its structural arrangements, subdivision, superstructure, fittings, and closing appliances upon which the stability calculations or the load line assignment is based.

Suspect areas identified at previous surveys are to be examined. Thickness measurements are to be taken of the areas of substantial corrosion and the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. **Table 2.2** may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the Annual Survey is credited as completed.

(1) All units
- (A) Accessible hatchways, manholes and other openings.
- (B) Machinery casings and covers, companionways, and deck houses protecting openings.
- (C) Portlights together with deadcovers, cargo ports and similar openings in hull sides, ends, or in enclosed superstructures.
- (D) Ventilators, tank vent pipes together with flame screens, and overboard discharges from enclosed spaces.
- (E) Watertight bulkheads and end bulkheads of enclosed superstructures.
- (F) Closing appliances for all the above (A) to (E), including hatch covers, doors, together with their respective securing devices, dogs, sill, coamings and supports.
- (G) Freeing ports together with bars, shutters and hinges.
- (H) Protection of the crew, guard rails, lifelines, gangways, and deck houses accommodating crew.
- (I) Windlass and attachment of anchor racks and anchor cables.
- (J) The type, location and extent of corrosion control as well as effectiveness, and repairs or renewals should be reported and submitted to the Society at each survey.
- (K) Documentations on board including the stability data, etc. approved by the Society are to be confirmed to be kept on board.
- (L) Where the loading instrument having a stability computation capability is provided on board, the system is to be tested.

(2) Surface type units

In addition to the requirements of above (1) the following items are to be examined:
- (A) The hull and deck structure in vicinity of any other structural changes in section, slots, steps,
- (B) openings in the deck or hull
- (C) the back-up structure in way of structural members or sponsons connecting to the hull.

(3) Self-elevating units.

In addition to the requirements of above (1) the following items are to be examined:
- (A) Legs as accessible above the waterline
- (B) Jack house structures and attachment to upper hull or platform
- (C) Jacking or other elevating systems and leg guides, externally
- (D) Plating and supporting structure in way of leg wells

(4) Column-stabilized unit
In addition to the requirements of above (1) the following items are to be examined:
Columns, diagonal and horizontal braces together with any other parts of the upper hull supporting structure as accessible above the waterline.

(5) At the 1st Annual Survey after construction, Column-stabilized and Self-elevating Units may be subject to examination of major structural components including non-destructive testing, as deemed necessary by the Society. If the Society deems such survey to be necessary, the extent should be agreed to by the Society and the Owner or operator prior to commencement of the Survey.

4. Machinery

(1) Propelling machinery of self-propelled units is to be surveyed in accordance with the requirements specified in **Pt 1, Ch 2, 203.** and **502. 2** (4), (5), (8), (9) (a), (10) and (12) of **Rules for the Classification of Steel Ships.**

(2) Machinery of units not provided with propelling machinery is to be complied with the following requirements.
(A) A general examination of machinery is to be carried out.
(B) The inspections and performance tests specified in **Pt 1, Ch 2, 203. 14, 20, 24** and **502. 2** (5), (8), (9) (a), (10) and (12) of **Rules for the Classification of Steel Ships** are carried out.

(3) For units with propulsion-assist or dynamic positioning, propulsion-assist and dynamic positioning equipment should be surveyed on the basis of Annual Survey-Machinery in accordance with **Pt 1, Ch 2, Sec 5** of **Rules for the Classification of Steel Ships**.

(4) Other tests and inspections considered necessary by the Surveyor are to be carried out.

5. Electrical Equipment

A general examination of electrical machinery, the emergency sources of electrical power, the switchgear, and other electrical equipment, including operation of same is to be carried out. The operation of the emergency sources of power, including their automatic operation, is to be confirmed as far as practicable.

6. Shipboard Automatic and Remote-Control Systems

A general examination of the automatic and remote-control system is to be made to the Surveyor's satisfaction. The machinery-space fire-detection and bilge water-level alarms are to be tested to confirm satisfactory operation.

7. Special Features

A general examination of hazardous areas, remote shutdown arrangements, fire fighting systems where included in the Society's Rules, self-elevating systems, piping systems, and bilge systems is to be made.

303. Special survey

1. Due range

Special Surveys of hull, structure, equipment, and machinery are to be carried out at 5 year intervals to renew the Certificate of Classification.

(1) The first Special Survey is to be completed within 5 years from the date of the initial Classification Survey and thereafter within 5 years from the credited date of the previous Special Survey. Extensions of class beyond the 5th year may be granted in exceptional circumstances(for a definition of exceptional circumstances, see **Pt 1, Ch 2, 401. 1** of **Rules for the Classification of Steel Ships**). In this case the next period of class will start from the expiry date of the Special Survey before the extension was granted.

(2) For survey completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For Survey completed more than three months before the expiry date of the Special Survey, the period of class will start from the survey completion date.

(3) The Special Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Special Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Special Survey.

(4) A survey planning meeting is to be held prior to the commencement of the survey.

(5) When considered necessary by the Society the interval between Special Surveys may be reduced.

(6) Special Survey requirements of units of unusual design, in lay-up or in unusual circumstances will be determined on individual basis.

(7) At the request of the Owner, and upon the Society's approval of the proposed arrangements, a system of Continuous Survey may be undertaken whereby the Special Survey requirements are carried out in regular rotation in accordance with the Rules of the Society to complete all the requirements of the particular Special Survey within a five year period. Any defects that may affect classification found during the survey, are to be reported to the Society and dealt with to the satisfaction of the Surveyor.

2. Kind of Special Survey

The kinds of Special Surveys are to be in accordance with **Pt 1, Ch 2, 402.** of **Rules for the Classification of Steel Ships.**

3. Scope

(1) The Special Surveys shall include, in addition to Annual Survey requirements per **302.**, the following examinations, tests, and checks of sufficient extent to verify that the hull, structure, equipment, and machinery are in satisfactory condition and that the unit is in compliance with the applicable Rule requirements for the new period of class of 5 years to be assigned subject to proper maintenance and operation and the periodical surveys carried out at the due dates.

(2) The examinations of the hull are to be supplemented by thickness measurements and testing as required, to verify that the structural integrity. The aim of the examination is to discover excessive diminution, substantial corrosion, significant deformation, fractures, damages, or other structural deterioration, that may be present.

(3) The Special Survey is to include examination of underwater parts per **304.**

4. Special Survey No. 1

(1) Hull, structure and equipments

(A) All units

The following parts are to be examined:

(a) The hull or platform structure including tanks, watertight bulkheads and deck, cofferdams, void spaces, sponsons, chain lockers, duck keels, helicopter deck and its supporting structure, machinery spaces, peak spaces, steering gear spaces, and all other internal spaces are to be examined externally and internally for damage, fractures, or excessive diminution. Thickness gauging of plating and framing, non-destructive testing and tightness testing may be required where wastage is evident or suspected.

(b) All tanks, compartments and free-flooding spaces throughout the unit are to be examined externally and internally for excess diminution or damage.

(c) Internal examinations of spud cans and mats may be specially considered.

(d) Watertight integrity of tanks, bulkheads, hull, decks and other compartments is to be verified by visual inspection.

(e) Suspect areas and critical structural areas should be examined and may be required to be tested for tightness, non-destructive tested or thickness gauged.

(f) All special and primary application structures (as defined in **Ch 3, Sec 10**) and identified critical structural areas are to be subjected to Close-up Survey.

(g) Tanks and other normally closed compartments are to be ventilated, gas freed and cleaned as necessary to expose damages and allow meaningful examination and thickness gauged in case of excessive diminution.

(h) Internal examination and testing of void spaces, compartments filled with foam or corrosion inhibitors, and tanks used only for lube oil, light fuel oil, diesel oil, fresh water, drinking water or other non-corrosive products may be waived provided that upon a general examination the Surveyor considers their condition to be satisfactory. External thickness gauging may be required to confirm corrosion control.

(i) Structures such as derrick substructure and supporting structure, Jack house, deck houses, superstructures, helicopter landing areas, raw water (sea water intake) towers and their respective attachments to the deck or hull.

(j) Windlass and attachments of anchor racks and anchor cable fairleads.

(k) Foundations and supporting headers, brackets, and stiffeners for drilling related apparatus, where attached to hull, deck, superstructure or deck house.

(l) Thickness gaugings are to be carried out where wastage is evident or suspect.

(m) Where provided, the condition of corrosion prevention system of ballast tanks is to be examined. Where a hard protective coating is found in POOR condition and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined at annual intervals. Thickness measurements are to be carried out as deemed necessary by the Surveyor.

(n) Thickness measurements are to be carried out in accordance with **1, 2** or **3** of **Table 2.1** as applicable**.** The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine areas of substantial corrosion. **Table 2.2** may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the survey is credited as completed.

(o) Where the loading instrument having a stability computation capability is provided on board, all approved test loading conditions are to be examined.

Table 2.1 Minimum requirements for Thickness Measurements at Special Survey

1. Surface type units

Special Survey No. 1	Special Survey No. 2	Special Survey No. 3	Special Survey No. 4 and Subsequent
1. Suspect areas throughout the unit	1. Suspect areas throughout the unit 2. One transverse section of deck plating in way of the moon pool opening within the amidships 0.6 L, together with internals in way as deemed necessary by the Surveyor. Where unit is configured with side ballast tanks, the plating and internals of the side ballast tanks are also to be gauged in way of the transverse section chosen. 3. Moon pool boundary bulkhead plating	1. Suspect areas throughout the unit 2. Two transverse sections(girth belts) of deck, bottom and side plating in way of moon pool and one hatch opening within the amidships 0.6 L, together with internals in way as deemed necessary by the Surveyor. Where unit is configured with side ballast tanks, the plating and internals of the side ballast tanks are also to be gauged in way of the transverse sections chosen, Remaining internals in the side ballast tanks are to be gauged as deemed necessary by the Surveyor. 3. Moon pool boundary bulkhead plating 4. Internals in forepeak tank and afterpeak tank as deemed necessary by the Surveyor	1. Suspect areas throughout the unit 2. A minimum of three transverse sections(girth belts) of deck, bottom, side and longitudinal bulkhead plating in way of the moon pool and other areas within amidships 0.5 L, together with internals in way(including in perimeter ballast tanks, where fitted in way of the transverse sections chosen) 3. Moon pool boundary bulkhead plating 4. Internals in forepeak and afterpeak tanks as deemed necessary by the Surveyor 5. Lowest strake of all transverse bulkheads in hold spaces. Remaining bulkhead plating are to be gauged as deemed necessary by the Surveyor. 6. All plates in two wind and water stakes, port and starboard, full length 7. All exposed main deck plating full length and all exposed first-tier superstructure deck plating(poop, bridge and forecastle decks) 8. All keel plates full length plus additional bottom plating as deemed necessary by the Surveyor, particularly in way of cofferdams and machinery spaces 9. Duck keel or pipe tunnel plating or pipe tunnel plating and internals as deemed necessary by the Surveyor 10. Plating of sea chests. Shell plating in way of overboard discharges as deemed necessary by the Surveyor.

(NOTES)

1) Thickness measurement locations are to be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering ballast history and arrangement and condition of protective coatings.
2) Thickness measurements of internals may be specially considered by the Surveyor if the hard protective coating is in GOOD condition.
3) For units less than 100 meters in length, the number of transverse sections required at Special Survey No. 3 may be reduced to one(1), and the number of transverse sections required at Special Survey No. 4 and subsequent Special Surveys may be reduced to two(2).
4) For units more than 100 meters in length, at Special Survey No. 3, thickness measurements of exposed deck plating within amidship 0.5 L may be required.

Table 2.1 Minimum requirements for Thickness Measurements at Special Survey (continued)
2. Self-elevating units

Special Survey No. 1	Special Survey No. 2	Special Survey No. 3	Special Survey No. 4 and Subsequent
1. Suspect areas throughout the unit(particular attention is to be paid to the legs in way of the splash zone[2])	1. Suspect areas throughout the unit	1. Suspect areas throughout the unit	1. Suspect areas throughout the unit
	2. Legs in way of splash zone[2]	2. Legs in way of splash zone[2]	2. Legs in way of splash zone[2]
	3. Primary structural members[1] where wastage is evident	3. Representative thickness measurements, throughout, of special portions of structural members and primary structural members[1]	3. All special portions of structural members and primary structural members[1]
		4. Leg well structure	4. Leg well structure
		5. Representative thickness measurements of deck, bottom and side shell plating of hull and mat	5. Representative thickness measurements of deck, bottom and side shell plating of hull and mat
			6. Substructure of derrick as deemed necessary by the Surveyor
	4. Representative thickness measurements of upper hull deck and bottom plating and internal of one pre-load (ballast) tank	6. Representative thickness measurements of upper hull deck and bottom plating and internals of at least two pre-load (ballast) tanks	7. Representative thickness measurements of upper hull deck and bottom plating and internals of all pre-load (ballast) tanks

(NOTES)
1) Categories of structural members(primary structural members, secondary structural members and special portions of structural members) are defined in **Ch 3, 1002.**
2) Splash zone is to be considered as the structural area that has been periodically in and out of the water when the unit was at its operating depth, most of the time during the past five-year period. Based on operational record of the unit, additional zones may also be gauged.

Table 2.1 Minimum requirements for Thickness Measurements at Special Survey (continued)
3. Column-stabilized units

Special Survey No. 1	Special Survey No. 2	Special Survey No. 3	Special Survey No. 4 and Subsequent
1. Suspect areas throughout the unit	1. Suspect areas throughout the unit	1. Suspect areas throughout the unit	1. Suspect areas throughout the unit
2. Columns and bracings where wastage is evident in splash zone[2]	2. Representative thickness measurements of columns and bracings in splash zone[2] together with internals in way as deemed necessary by the Surveyor	2. One transverse section (girth belt) of each two columns and two bracings in splash zone[2] together with internals in way as deemed necessary by the Surveyor	2. One transverse section (girth belt) of each one-half of the columns and bracings in splash zone[2] and internals in way as deemed necessary by the Surveyor (i.e., gauge half of the unit's columns and bracings in splash zone[2])
	3. Special portions of structural members and primary structural members[1] where wastage is evident	3. Representative thickness measurements, throughout, of special portions of structural members and primary structural members[1]	3. All special portions of structural members and primary structural members[1]
		4. Lower hulls in way of mooring lines where wastage is evident	4. Lower hulls in way of mooring lines where wastage is evident
		5. One transverse section (girth belt) of each lower hull between one set of columns	5. One transverse section (girth belt) of each lower hull between one set of columns
			6. Representative thickness measurements of substructure of drilling derrick

(NOTES)
1) Categories of structural members(primary structural members, secondary structural members and special portions of structural members) are defined in **Ch 3, 1002.**
2) Splash zone is to be considered as the structural area that has been periodically in and out of the water when the unit was at its operating depth, most of the time during the past five-year period. Based on operational record of the unit, additional zones may also be gauged.

Table 2.2 Requirements for extent of additional thickness measurement at those areas of substantial corrosion

Structural Member	Extent of Measurement	Pattern of Measurement
Plating	Suspect area and adjacent plates	5 point pattern over 1 m^2
Stiffeners	Suspect area	3 measurements each in line across web and flange

(B) Surface type units

In addition to the requirements of (A) the following items are to be examined:

(a) Structural appendages and ducts for positioning units.

(C) Self-elevating units

In addition to the requirements of (A) the following items are to be examined:

(a) All legs including chords, diagonal and horizontal braces, gussets, racks, joints, together with leg guides. Tubular or similar type legs are to be examined externally and internally, together with internal stiffeners and pinholes as applicable.

(b) Structure in, around and under jack house and leg wells. Non-destructive testing of these areas may be required.

(c) Leg jacking or other elevating systems externally. Non-destructive testing of these areas may be required.

(d) Leg connections to bottom mats or spud cans, including non-destructive testing of leg connections to mats or spud cans

(e) Jetting piping systems or other external piping, particularly where penetrating mats or spud cans

(f) Spud cans or mats. Where the spud cans or mat are partly or entirely obscured below the mud line where the Special Survey is otherwise being completed, consideration may be given to postponement of these examinations until the next rig move.

(D) Column-stabilized units

In addition to the requirements of (A) the following items are to be examined:

(a) Connections of columns and diagonals to upper hull, structure or platform and lower hull, structure or pontoons. Joints of supporting structure including diagonals, braces and horizontals, together with gussets and brackets. Internal continuation or back-up structure for the above. Non-destructive examination maybe required of these areas.

(2) Machinery

(A) Non-self-propelled units

In addition to the requirements for Annual Surveys, at each Special Survey, special attention is to be given to the following items as applicable:

(a) All openings to the sea, including sanitary and other overboard discharges, together with cocks and valves connected therewith are to be examined internally and externally while the Unit is in drydock, or at the time of underwater examination in lieu of drydocking, and the fastenings to the shell plating are to be renewed when considered necessary by the Surveyor.

(b) Pumps and pumping arrangements, including valves, cocks, pipes and strainers are to be examined. Non-metallic flexible expansion pieces in the main salt water circulating system are to be examined internally and externally. The Surveyor is to be satisfied with the operation of the bilge and ballast systems. Other systems are to be tested as considered necessary.

(c) The foundations of machinery are to be examined.

(d) Heat exchangers and other unfired pressure vessels within the scope of classification are to be examined, opened up or thickness gauged and pressure tested as considered necessary, and associated relief valves proved operable. Evaporators that operate with a vacuum on the shell need not be opened, but may be accepted on basis of satisfactory external examination and operational test or review of operating records.

(B) Self-propelled Units

In addition to the requirements for non-propelled units, the main and auxiliary propulsion machinery, including associated pressure vessels should be surveyed. In addition, examination of the steering machinery is to be carried out, including an operational test and checking or relief-valve settings. The machinery may be required to be opened for further examination as considered necessary by the Surveyor.

(C) Units with Propulsion - Assist or Dynamic Position

Propulsion-assist and dynamic positioning equipment should be surveyed on the basis of Special Survey-Machinery in accordance with **Pt 1, Ch 2, Sec 5** of **Rules for the Classification of Steel Ships.**

(3) Other equipments

(A) Electrical Equipment

In addition to the requirements for Annual Surveys, at each Special Survey, special attention is to be given to the following items as applicable:

(a) Fittings and connections on main switchboards and distribution panels are to be examined, and care is to be taken to see that no circuits are overfused.

(b) Cables are to be examined as far as practicable without undue disturbance of fixtures.

(c) All generators are to be run under load, either separately or in parallel. Switches and circuit breakers are to be tested.

(d) All equipment and circuits are to be inspected for possible development of physical changes or deterioration. The insulation resistance of the circuits is to be measured between conductors and between conductors and ground and these values compared with those previously measured.

(e) Electrical auxiliaries installed for vital purposes, generators and motors are to be examined and their prime movers opened for inspection. The insulation resistance of each generator and motor is to be measured.

(f) The windings of main propulsion generators and motors are to be thoroughly examined and found or made dry and clean. Particular attention is to be paid to the ends of all windings of stators and rotors.

(g) Emergency power systems are to be examined and tested.

(B) Shipboard Automatic and Remote-Control Systems

In addition to the requirements of Annual Surveys the following parts are to be examined:

(a) Control Actuators: All mechanical, hydraulic, and pneumatic control actuators and their power systems are to be examined and tested as considered necessary.

(b) Electrical equipments: The insulation resistance of the windings of electrical control motors or actuators is to be measured, with all circuits of different voltages above ground being tested separately to the Surveyor's satisfaction.

(c) Unattended Plants: Control systems for unattended machinery spaces are to be subjected to dock trials at reduced power on the propulsion engine to verify the proper performance of all automatic functions, alarms, and safety systems.

(C) Special Features (All Types)

Units may have many items of machinery and electrical equipment not found on conventional vessels. Certain of these items are required for classification even if the unit is without propulsion machinery. Items to be especially examined and reported upon at all Special Surveys are as follows:

(a) Hazardous Areas

(i) Electric lighting, electrical fixtures, and instrumentation are to be examined, proven satisfactory and verified as explosion-proof or intrinsically safe.

(ii) Ventilating systems including ductwork, fans, intake and exhaust locations for enclosed restricted areas are to be examined, tested and proven satisfactory.

(iii) Ventilating-air alarm systems to be proven satisfactory.

(iv) Electrical motors are to be examined including closed-loop ventilating systems for large d-c motors.

(v) Automatic power disconnect to motors in case of loss of ventilating air is to be proved satisfactory.

(b) Remote shutdown arrangements

(i) Remote shutdown for fuel-oil transfer service pumps and ventilating equipment are to be proved satisfactory.

(ii) Oil tank outlet valves where required to be capable of being remotely closed are to be proved satisfactory.

(iii) Emergency switches for all electrical equipment including main and emergency generators, except alarm and communication systems and lighting in vital areas such as escape routes and landing platforms, are to be proved satisfactory.

(c) Fire fighting systems

A general examination of the fire detection and extinguishing systems is to be made in order that the Surveyor may be satisfied with its efficient state. The following items are to be especially examined.

(i) Fire hoses, nozzles, and spanners at each fire station.

(ii) Servicing of all portable extinguishers.

(iii) Weighing and re-charging as necessary of all dry chemical and CO_2 extinguishers.

(iv) Fire pumps and piping including operation and capacity.

(v) Alarm system including fire and gas detection.

(d) Self-elevating Systems

On self-elevating type units, the elevating systems are to be examined and reported on. Pinions and gears of the climbing pinion gear train of rack and pinion systems are to be examined, as far as practicable, to the Surveyor's satisfaction by an effective crack detection method.

(e) Miscellaneous - Bilge alarm systems, if fitted, to be tested.

5. Special Survey No. 2 and Subsequent Special Surveys

In addition to the requirements for Special Survey No.1, following items should be surveyed.

(1) These Surveys are to be at least as comprehensive as Special Survey No. 1, with special attention being given to the condition and thickness of material in high corrosion areas.

(2) Representative gaugings will be required as per **Table 2.1**.

(3) Special attention should be paid to splash zones on structure, legs or related structure, and in ballast tanks, pre-load tanks, free-flooding spaces, spud cans and mats.

304. Docking Surveys

1. Due range

(1) There is to be a minimum of two examination of the outside of the unit's bottom and related items during each five-year special survey period. One such examination is to be carried out in conjunction with the Special Survey. In all cases the interval between any tow such examinations is not to exceed 36 months. For units operating in salt water for less than six months each year, the survey interval may be increased by the Society.

(2) Consideration may be given at the discretion of the Society, to any special circumstances justifying an extension of the interval.

(3) Proposals for alternative means of examining the unit's bottom and related items while afloat may be considered, provided they are in general agreement with **309.**

2. Parts to be Examined

(1) Surface type units (ship or barge type units)

(A) External surfaces of the hull, keel, stem, stern frame, rudder, nozzles, and sea strainers are to be selectively cleaned to the satisfaction of the attending Surveyor and examined together with appendages, the propeller, exposed parts of stern bearing assembly, rudder pintle and gudgeon securing arrangements, sea chest and strainers, and their fastenings.

(B) Propeller shaft bearing, rudder bearing, and steering nozzle clearances are to be ascertained and recorded.

(2) Self-elevating units

(A) External surfaces of the upper hull or platform, spud cans, mat, underwater areas of legs, together with their connections as applicable, are to be selectively cleaned to the satisfaction of the attending Surveyor and examined.

(B) At each Docking Survey or equivalent, after Special Survey No. 2, the Surveyor is to be satisfied with the condition of the internal structure of the mat or spud cans. Leg connections to mat and spud cans are to be examined at each Docking Survey or equivalent. Non-destructive testing may be required of areas considered to be critical by the Society or found to be suspect by the Surveyor.

(3) Column-stabilized units

(A) External surfaces of the upper hull or platform, footings, pontoons or lower hulls, underwater areas of columns, bracing and their connections, sea chests, and propulsion units as applicable, are to be selectively cleaned and examined to the satisfaction of the attending Surveyor.

(B) Non-destructive testing may be required of areas considered to be critical by the Society or found to be suspect by the Surveyor.

3. Ballast Spaces

In conjunction with Docking Surveys(or equivalent) after Special Survey No. 1 and between subsequent Special Surveys, the following ballast spaces are to be internally examined, thickness gauged, placed in satisfactory condition as found necessary, and reported upon. If such examination reveals no visible structural defects, the examination may be limited to a verification that the corrosion prevention arrangements remain effective.

(1) All units

Particular attention is to be given to corrosion prevention systems in ballast spaces, free-flooding areas and other locations subjected to sea water from both sides.

(2) Surface type units (identical)

For surface type units, one peak tank and at least two other representative ballast tanks between the peak bulkheads used primarily for water ballast.

(3) Self-elevating units

Representative ballast tanks or free-flooding compartments in mat or spud cans, if accessible, and at least two representative hull pre-load tanks.

(4) Column-stabilized units

Representative ballast tanks in footings, lower hulls, or free-flooding compartments as accessible, and at least two ballast tanks in columns or upper hull, if applicable.

305. Surveys of Propeller shaft and Stern Tube Shaft, Etc.

1. Due range

Refer to the schedule in **Pt 1, Ch 2, Sec 7** of **Rules for the Classification of Steel Ships** for tailshaft surveys.

2. Extension of Intervals of Tailshaft Surveys

Surveys are to be carried out in accordance with the Rules of the Society, except that in the case of Mobile Offshore Drilling unit, due to low running hours on tailshafts, extended intervals between tailshaft surveys may be considered based on:

(1) Satisfactory diver's external examination of stern bearing and outboard seal area including wear-down check as far as is possible.
(2) Internal examination of the shaft area (inboard seals) in propulsion room(s).
(3) Confirmation of satisfactory lubricating oil records (oil loss rate, contamination).
(4) Shaft seal elements are examined/replaced in accordance with seal manufacturer's recommendations.

3. Other propulsion systems

Other propulsion systems shall be surveyed according to **Pt 1, Ch 2, 701. 3** of **Rules for the Classification of Steel Ships.**

306. Boiler surveys

1. Survey Interval

(1) Water-Tube boiler for propulsion
  (A) For units fitted with more than one boiler the interval between surveys is, in general, to be 2.5 years.
  (B) For units fitted with one boiler, the interval between survey is, in general, to be 2.5 years for the first 7.5 years; thereafter the boiler is to be surveyed within 3 months before or after every year.
(2) Waste-heat or fired auxiliary boilers used for the operation of the vessel, within the scope of classification, are to be surveyed at intervals, in general, of 2.5 years.

2. Extension of survey

The boiler surveys may be extended upon the request of an Owner within 6 months except for the boilers which are to be surveyed annually.

3. Survey items

The survey items in accordance with **Pt 1, Ch 2, Sec 8, 802.** of **Rules for the Classification of Steel Ships.**

307. Survey Preplanning and Record Keeping

1. A specific Survey Program for Special Surveys and Continuous Surveys must be worked out in advance of the Special Survey by the Owner in cooperation with the Society. The Survey Program shall be in written format.

2. Plans and procedures for Docking Surveys (or In-water Survey in lieu of Docking Survey) are to be submitted for review in advance of the survey and made available on board. These should include drawings or forms for identifying the areas to be surveyed, the extent of hull cleaning, non-destructive testing locations (including NDT methods), nomenclature, and for the recording of any damage or deterioration found. Submitted data, after review by the Society, will be subject to revision if found to be necessary in light of experience.

308. Occasional Surveys

1. Damage Survey

(1) It is the responsibility of the Owner/operator of the unit to report to the Society without delay any damage, defect or breakdown, which could invalidate the conditions for which a classification has been assigned so that it may be examined at the earliest opportunity by the Society's Surveyor(s). All repairs found necessary by the Surveyor are to be carried out to his satisfaction.

2. Repairs

(1) Where repairs to hull, legs, columns or other structures, machinery or equipment, which affect or may affect classification, are planned in advance to be carried out, a complete repair procedure including the extent of proposed repair and the need for Surveyors attendance is to be submitted to and agreed upon by the Society reasonably in advance. Failure to notify the Society, in advance of the repairs, may result in suspension of the unit's classification until such time as the repair is redone or evidence submitted to satisfy the Surveyor that the repair was properly carried out. This applies also to repairs during voyage or on site.

(2) The above is not intended to include maintenance and overhaul to hull, other structures, machinery and equipment in accordance with recommended manufacturers procedures and established marine practice and which does not require Society approval; however, any repair as a result of such maintenance and overhauls which affects or may affect classification is to be noted in the ships log and submitted to the Surveyor.

3. Lay-up and Reactivation Surveys

(1) When the Society is notified by the Owner that a unit has been laid-up, this status will be noted in the unit's survey status and surveys falling due during lay-up may then be held in abeyance until the unit reactivates, at which time they are to be brought up-to-date.

(2) Units which have been laid up and are returning to active service, regardless of whether the Society has been previously informed that the unit has been in lay-up, a Reactivation Survey is required. The requirements for the Reactivation Survey are to be specially considered in each case, having due regard being given to the status of surveys at the time of the commencement of lay-up, the length of the lay-up period and the conditions under which the unit has been maintained during that period.

4. Alterations

No alterations which may affect classification are to be made to the hull or machinery of a classed unit unless plans of proposed alterations are submitted and approved by the Society before the work of alterations is commenced. Such work is to be carried out in accordance with approved plans and tested on completion as required by the Society and to the satisfaction of the Surveyor.

5. Welding and Replacement of Materials

(1) Welding of steels, including high strength structural steel, is to be to the satisfaction of the Society.

(2) Welding or other fabrication performed on steels of special characteristics or repairs or renewals of such steel or in areas adjacent to such steel is to be accomplished with procedures approved by the Society considering the special materials involved. Substitution of steels differing from those originally installed is not to be made without approval by the Society.

309. In-water Survey in lieu of Docking Survey

1. General

Following are the procedures and conditions under which a properly conducted In-water Survey may be credited as equivalent to a Docking Survey.

Where in this case, an examination of the entire unit below the waterline is to be carried out by a suitably qualified diver using closed-circuit television with two-way communication capable of being monitored by the Surveyor.

2. Conditions

(1) Limitations
In-water Survey in lieu of Docking Survey may not be acceptable where there is record of abnormal deterioration or damage to the underwater structure; or where damage affecting the fitness of the unit is found during the course of the survey.

(2) Thickness Gauging and Non-Destructive Testing
Underwater or internal thickness gaugings of suspect areas may be required in conjunction with the In-water Survey. Means for underwater non-destructive testing may also be required for fracture detection.

(3) Plans and Data
Plans and procedures for the Docking Survey (In-water Survey) are to be submitted for review in advance of the survey and made available on board. These should include drawings or forms for identifying the areas to be surveyed, the extent of underwater cleaning, non-destructive testing locations (including NDT methods), nomenclature, and for the recording of any damage or deterioration found.

(4) Underwater Conditions
The in-water visibility and the cleanliness of the hull below the waterline is to be clear enough to permit a meaningful examination which allows the Surveyor and diver and/or ROV pilot to determine the condition of the plating, appendages and the welding. The Society is to be satisfied with the methods of orientation of the divers/ROVs on the plating, which should make use where necessary of permanent markings on the plating at selected points. Overall or spot cleaning may be required.

3. Physical Features

The following physical features are to be incorporated into the unit's design in order to facilitate the In-water Survey. When verified they will be noted in the Society for reference at subsequent surveys.

(1) Stern Bearing
For self-propelled units, means are to be provided for ascertaining that the seal assembly on oil-lubricated bearings is intact and for verifying that the clearance or wear-down of the stern bearing is not excessive. For use of the wear-down gauges, up-to-date records of the base depths are to be maintained on board. Whenever the stainless-steel seal sleeve is renewed or machined, the base readings for the wear-down gauge are to be re-established and noted in the vessel's records and in the survey report.

(2) Rudder Bearings
For self-propelled units with rudders, means and access are to be provided for determining the condition and clearance of the rudder bearings, and for verifying that all parts of the pintle and gudgeon assemblies are intact secure. This may require bolted access plates and a measuring arrangement.

(3) Sea Suctions
Means are to be provided to enable the diver to confirm that the sea suction openings are clear. Hinged sea suction grids would facilitate this operation.

(4) Sea Valves
For the Docking Survey (In-water Survey) associated with the Special Survey, means must be provided to examine any sea valve.

4. Procedures

(1) Exposed Areas
An examination of the outside of the structure above the waterline is to be carried out by the Surveyor. Means and access are to be provided to enable the Surveyor to accomplish visual inspection and non-destructive testing as necessary.

(2) Underwater Areas
An examination of the entire unit below the waterline is to be carried out by an approved service supplier in accordance with the **Guidance relating to the Rules for Classification of Steel Ships Pt 1, Annex 1-11.**

(3) Damage Areas
Damage areas are to be photographed. Internal examination, measurements, marking and thickness gauging of such locations may be necessary as determined by the attending Surveyor. Means are to be provided for location, orienting and identifying underwater surfaces in photographs or on video tapes.

5. Alternatives

The Society is prepared to consider alternatives to the above guidelines including remotely operated vehicles, provided means and details for accomplishing results are not less effective.

(1) **309.** would be applicable to all unit types due to contents of **Par 2** (3) - Plans and Data. ⚓

CHAPTER 3 HULL CONSTRUCTION AND EQUIPMENT

Section 1 General

101. Application

1. Hull construction and equipment of units are to be in accordance with the requirements in **Ch 4** to **6** in addition to the requirements in this Chapter, and further, the requirements in **Ch 7** to **9** according to the type of unit and those in **Ch 10** to **12** according to the purpose of unit. Where, however, the service area, operation area or operation season is restricted, the construction and equipment of the unit may be suitably modified, based on its condition under the approval of the Society.
2. Unless otherwise specially specified in this rule, the relevant requirements specified in **Rules for the Classification of Steel Ships** and **Rules for the Classification of Steel Barges** are correspondingly applied.

Section 2 Materials

201. Materials used

Rolled steels, steel castings and steel forgings used for hull construction and equipment are to be in accordance with the requirements in **Pt 2, Ch 1** of **Rules for the Classification of Steel Ships**. Where it is proposed to use steel or other material having properties differing from those specified in the Rules, the specification and properties of such material shall be submitted to the Society for consideration and special approval. Due consideration is to be given to the ratio of yield to ultimate strength of the materials to be used, and to their suitability with regard to structural location and to design temperatures.

202. Categories of structural members of self-elevating units and column-stabilized units

Structural members are to be grouped into the following three material application categories according to the design.

(1) Primary structural members
Structural members essential to the overall integrity of the unit, such as columns, legs, bracings, lower hulls, footings, bottom mats, shell platings of leg tanks, decks, main deck girders, and so on.

(2) Secondary structural members
Structural members of minor importance failure of which is unlikely to affect the overall integrity of the unit, such as internal structural members of primary members specified in (1) and other members.

(3) Special portions of structural members
Special portions of the primary structural members specified in (1), such as junctions which are specially important in structural viewpoint or in way of stress concentration and so on.

203. Categories of structural members of surface type units

1. Primary structural members

Sheer strake, deck stringer, bilge strake, hatch corner in way of stress concentration part which are outer $0.4L$ but within $0.6L$ amidship and primary structural members except those specified in **Par 3** such as bottom plating, side plating, deck plating, longitudinals on deck, etc. within 0.4 amidship.

2. Secondary structural members

Inner members of those specified in **Par 1** and stern frame, rudder plate, etc., and sheer strake, deck stringer, bilge strake, hatch corner in way of stress concentration part which are outer $0.6L$ amidship and primary structural members such as bottom plating, side plating, deck plating, longitudinals on deck etc. which are outer $0.4L$ amidship.

3. Special portions of structural members

Special members which are specially important in longitudinal strength viewpoint, such as sheer strake, deck stringer, bilge strake, hatch corner in way of stress concentration part which are within $0.4L$ amidship.

204. Definition of design service temperature of materials

Design service temperature of materials is the lowest of the daily average atmospheric temperatures, based on meteorological data, for any anticipated area of operation. If the data of the lowest daily average temperature are not available, the lowest monthly average temperature may be used. The design service temperature, however, need not be lower than 0℃ for members which are below the light draught.

205. Application of steels

1. Application of rolled steels for surface type units is to be in accordance with the requirements in **Pt 3, Ch 1, Sec 4** of **Rules for the Classification of Steel Ships**.

2. Application of rolled steels for self-elevating units and column-stabilized units is to be in accordance with **Table 3.1** to **3.3** depending on the categories of structural members, thickness and design service temperature.

Table 3.1 Application of Steels for Primary Structure Members

Thickness t (mm) / Service temperature T(°C)	$t \leq 12.5$	$12.5 < t \leq 19$	$19 < t \leq 25$	$25 < t \leq 35$	$35 < t \leq 50$
$0 \leq T$	*A, AH 32, AH 36*	*A, AH 32, AH 36*	*B, AH 32, AH 36*	*B, AH 32, AH 36*	*D, DH 32, DH 36*
$-10 \leq T < 0$	*A, AH 32, AH 36*	*B, AH 32, AH 36*	*D, DH 32, DH 36*	*D, DH 32, DH 36*	*E, DH 32, DH 36*
$-20 \leq T < -10$	*B, DH 32, DH 36*	*D, DH 32, DH 36*	*E, DH 32, DH 36*	*E, DH 32, DH 36*	*E, EH 32, EH 36*
$-30 \leq T < -20$	*D, DH 32, DH 36*	*E, DH 32, DH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*
$-40 \leq T < -30$	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*
$-50 \leq T < -40$	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*	*	*
* At the discretion of the Society.					

Table 3.2 Application of Steels for Secondary Structure Members

Thickness t (mm) / Service temperature T(°C)	$t \leq 12.5$	$12.5 < t \leq 19$	$19 < t \leq 25$	$25 < t \leq 35$	$35 < t \leq 50$
$0 \leq T$	*A, AH 32, AH 36*	*A, AH 32, AH 36*	*A, AH 32, AH 36*	*A, AH 32, AH 36*	*B, AH 32, AH 36*
$-10 \leq T < 0$	*A, AH 32, AH 36*	*A, AH 32, AH 36*	*B, AH 32, AH 36*	*B, AH 32, AH 36*	*D, DH 32, DH 36*
$-20 \leq T < -10$	*B, AH 32, AH 36*	*B, AH 32, AH 36*	*D, DH 32, DH 36*	*D, DH 32, DH 36*	*E, DH 32, DH 36*
$-30 \leq T < -20$	*D, DH 32, DH 36*	*D, DH 32, DH 36*	*E, DH 32, DH 36*	*E, DH 32, DH 36*	*E, EH 32, EH 36*
$-40 \leq T < -30$	*E, DH 32, DH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*
$-50 \leq T < -40$	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*	*
* At the discretion of the Society.					

Table 3.3 Application of Steels for Special Portion of Structure Members

Thickness t (mm) / Service temperature T(°C)	$t \leq 12.5$	$12.5 < t \leq 19$	$19 < t \leq 25$	$25 < t \leq 35$	$35 < t \leq 50$
$0 \leq T$	*B, AH 32, AH 36*	*D, DH 32, DH 36*	*D, DH 32, DH 36*	*E, DH 32, EH 36*	*E, DH 32, EH 36*
$-10 \leq T < 0$	*D, DH 32, DH 36*	*E, DH 32, DH 36*	*E, DH 32, DH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*
$-20 \leq T < -10$	*E, DH 32, DH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*
$-30 \leq T < -20$	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*E, EH 32, EH 36*	*	*
$-40 \leq T < -30$	*E, EH 32, EH 36*	*	*	*	*
$-50 \leq T < -40$	*	*	*	*	*
* At the discretion of the Society.					

Section 3 Welding

301. Welding structure

1. Welded joints of crossing parts at the ends of columns and bracings are, as a rule, to be of full-penetration type.

2. Size of fillet welds applied to respective internal structural members of columns and bracings is to be F1 specified in **Pt 3, Ch 1, Table 3.1.4** of **Rules for the Classification of Steel Ships**.

3. For welded joints other than specified in **Par 1** and **2,** welding is to be in accordance with the requirements in **Pt 3, Ch 1, Sec 5** of **Rules for the Classification of Steel Ships**.

4. Welding is to be carried out by the personnel qualified by the Society in accordance with the approved welding specification.

302. Joints of special design

In case of welded joints of special design, the Society may require tests to check the strength of the joints and any defects.

303. Underwater welding

Welders to be engaged in underwater welding are to be those who have been accepted through the qualification test approved by the Society.

Section 4 Ice Strengthening

401. Reinforcement

1. Units designed to be located in areas where ice strengthening may be necessary will be specially considered and, provided that the unit is reinforced as necessary for operation in the specified ice conditions to the satisfaction of the Society, and an appropriate Additional Special Feature Notations may be added to the Class Notation by the Society.
2. Ice strengthening for surface type units is to be in accordance with **Pt 3, Ch 20** of **Rules for the Classification of Steel Ships**.

Section 5 Corrosion Control

501. General

All steelworks are to be coated with a paint of good quality or to be corrosion controlled with an effect equivalent to or more than paint. Where, however, the requirements in **Ch 2, 304.** are applied, special considerations are to be paid to the prevention of corrosion.

Section 6 Fire Protection, Means of Escape and Fire Detection & Extinction

601. Fire protection

Unless otherwise specially specified in **Ch 9, 201.** of the Rules, fire protection arrangements complying with the requirements in **Pt 8, Ch 1** of **Rules for the Classification of Steel Ships** and the following (1) and (2) are to be provided in the units. In case where specially approved by the Society, the requirements may be properly modified.

(1) Casings of control spaces are to be constructed of steel or other materials equivalent thereto.

(2) In working areas, paint, varnishes and similar preparations having nitro-cellulose or other highly inflammable bases are not to be used.

602. Means of escape

Unless otherwise specially specified in **Ch 9, 202.** of the Rules, the requirements in **Pt 8, Ch 10** of **Rules for the Classification of Steel Ships** are correspondingly applied to the means of escape arranged in the unit.

603. Fire detection and extinction

Unless otherwise specially specified in **Ch 9** of the Rules, the requirements in **Pt 8, Ch 1** of **Rules for the Classification of Steel Ships** are correspondingly applied to the fire detection and extinction arranged in the unit.

Section 7 Guardrails and Bulwarks

701. General

1. Guardrails or bulwarks are to be provided on all exposed decks in order to prevent failing. The height and arrangement of the guardrails or bulwarks are to be in accordance with the requirements specified in **Pt 4, Ch 4** of **Rules for the Classification of Steel Ships**.
2. Regardless of the requirements in **Par 1,** suitable wirenets may be provided to the helicopter deck in a plane nearly same as the deck surface instead of the guardrails or bulwarks, if guardrails or bulwarks will become hindrances to take-off and landing of helicopters.
3. Regardless of the requirements in **Par 1,** guardrails or bulwarks which interfere with the operation may be eliminated under the approval of the Society upon the request of the Owner.

Section 8 Temporary or Emergency Mooring Equipment

801. General

Anchors, anchor chains and ropes necessary for temporary or emergency mooring are to be provided on units in accordance with the requirements in **Pt 4, Ch 8** of **Rules for the Classification of Steel Ships** according to their equipment number specified in **802.** Where, however, deemed appropriate by the Society, the requirements in **Ch 19** of **Rules for the Classification of Steel Barges** may be applied to the mooring equipment of units having no propelling machinery. And further, the mooring equipment of units moored for long period of time or semi-permanently is to be at the discretion of the Society.

802. Equipment number

1. The equipment number of surface type units is to comply with the requirements in **Pt 4, Ch 8** of **Rules for the Classification of Steel Ships** for ship type units and **Ch 19** of **Rules for the Classification of Steel Barges** for barge type units.
2. The equipment number of self-elevating units and column-stabilized units is to be obtained from the following formula.

$$\Delta^{\frac{2}{3}} + 2A_1 + 0.1A_2$$

Δ : Displacement of the unit in temporary mooring condition(t).

A_1 and A_2 : projected areas except that of legs of self-elevating units, above the water line on planes perpendicular and parallel to the centre line of the unit, respectively (m^2).

803. Equivalent mooring equipment

1. A part or whole parts of the temporary mooring arrangement and the mooring equipment for operating condition may be used in each other.
2. If the Society recognizes that the effect of mooring equipment for operating condition is equivalent to that of the temporary mooring equipment specified in **801.**, such mooring equipment for operating condition is regarded as the temporary mooring equipment specified in this Chapter.
3. Where approved by the Society, wire ropes, which is possessed breaking load not to be less than the breaking test load of anchor chain, may be used in lieu of anchor chain. In this case, however, the wire ropes are to satisfy the requirements in **Pt 4, Ch 8, Sec 5** of **Rules for the Classification of Steel Ships**.

804. Windlass

Units, except for those moored for a long period of time or semi-permanently, are to be provided with windlasses having a sufficient hoisting capacity.

Section 9 Access

901. General

1. Each space within the unit should be provided with at least one permanent means of access to enable, throughout the life of a unit, overall and close-up inspections and thickness measurements of the unit's structures to be carried out by the Administration, the company, and the unit's personnel and others as necessary. Such means of access should comply with the provisions of paragraph 904 and with the Technical provisions for means of access for inspections, adopted by the Maritime Safety Committee by resolution MSC.133(76), as may be amended by the Organization.
2. Where a permanent means of access may be susceptible to damage during normal operations or where it is impracticable to fit permanent means of access, the Administration may allow, in lieu thereof, the provision of movable or portable means of access, as specified in the Technical provisions, provided that the means of attaching, rigging, suspending or supporting the portable means of access forms a permanent part of the unit's structure. All portable equipment should be capable of being readily erected or deployed by the unit's personnel.
3. The construction and materials of all means of access and their attachment to the unit's structure should be to the satisfaction of the Administration. The means of access should be subject to inspection prior to, or in conjunction with, its use in carrying out surveys in accordance with **Ch 2**.

902. Safe access to holds, tanks, ballast tanks and other spaces

1. Safe access to holds, cofferdams, tanks and other spaces should be direct from the open deck and such as to ensure their complete inspection. Safe access may be from a machinery space, pump-room, deep cofferdam, pipe tunnel, hold, double hull space or similar compartment not intended for the carriage of oil or hazardous materials where it is impracticable to provide such access from an open deck.
2. Tanks, and subdivisions of tanks, having a length of 35 m or more, should be fitted with at least two access hatchways and ladders, as far apart as practicable. Tanks less than 35 m in length should be served by at least one access hatchway and ladder. When a tank is subdivided by one or more swash bulkheads or similar obstructions which do not allow ready means of access to the other parts of the tank, at least two hatchways and ladders should be fitted.
3. Each hold should be provided with at least two means of access as far apart as practicable. In general, these accesses should be arranged diagonally, e.g., one access near the forward bulkhead on the port side, the other one near the aft bulkhead on the starboard side.

903. Access manual

1. A unit's means of access to carry out overall and close-up inspections and thickness measurements should be described in an access manual which may be incorporated in the unit's operating manual. The manual should be updated as necessary, and an updated copy maintained on board. The structure access manual should include the following for each space:
   (1) plans showing the means of access to the space, with appropriate technical specifications and dimensions;
   (2) plans showing the means of access within each space to enable an overall inspection to be carried out, with appropriate technical specifications and dimensions. The plans should indicate from where each area in the space can be inspected;
   (3) plans showing the means of access within the space to enable close-up inspections to be carried out, with appropriate technical specifications and dimensions. The plans should indicate the positions of critical structural areas, whether the means of access is permanent or portable and from

where each area can be inspected;
(4) instructions for inspecting and maintaining the structural strength of all means of access and means of attachment, taking into account any corrosive atmosphere that may be within the space;
(5) instructions for safety guidance when rafting is used for close-up inspections and thickness measurements;
(6) instructions for the rigging and use of any portable means of access in a safe manner;
(7) an inventory of all portable means of access; and
(8) records of periodical inspections and maintenance of the unit's means of access.

2. For the purpose of this paragraph "critical structural areas" are locations which have been identified from calculations to require monitoring or from the service history of similar or sister units to be sensitive to cracking, buckling, deformation or corrosion which would impair the structural integrity of the unit.

904. General technical specifications

1. For access through horizontal openings, hatches or manholes, the dimensions should be sufficient to allow a person wearing a self-contained air-breathing apparatus and protective equipment to ascend or descend any ladder without obstruction and also provide a clear opening to facilitate the hoisting of an injured person from the bottom of a confined space. The minimum clear opening should not be less than 600 mm × 600 mm. When access to a hold is arranged through a flush manhole in the deck or a hatch, the top of the ladder should be placed as close as possible to the deck or hatch coaming. Access hatch coamings having a height greater than 900 mm should also have steps on the outside in conjunction with the ladder.

2. For access through vertical openings, or manholes, in swash bulkheads, floors, girders and web frames providing passage through the length and breadth of the space, the minimum opening should be not less than 600 mm × 800 mm at a height of not more than 600 mm from the bottom shell plating unless gratings or other footholds are provided.

Section 10 Towing Arrangements

1001. General

1. The design and arrangement of towing fittings should have regard to both normal and emergency conditions.

2. Equipments and fittings provided in accordance with paragraph **1** should meet the appropriate requirements of recognized standards acceptable to the Society(KS, JIS etc.) and arrangements are to be submitted to the Society for the approval

3. Each fitting or item of equipment provided under this regulation should be clearly marked with any restrictions associated with its safe operation, taking into account the strength of its attachment to the unit's structure

Section 11 Protective Coatings of Dedicated Seawater Ballast Tanks

1101. General

1. All dedicated seawater ballast tanks should be coated during construction in accordance with the IMO Res. MSC. 215(82). For the purpose of this section pre-load tanks on self-elevating units are to be considered dedicated seawater ballast tanks. Mat tanks and spud cans on such units are not to be considered dedicated seawater ballast tanks.

2. Maintenance of the protective coating system should be included in the overall unit's maintenance scheme. The effectiveness of the protective coating system should be verified during the life of a

unit by the Administration or an organization recognized by the Administration, based on the guidelines developed by the Organization.

Section 12 Anti-fouling Systems

1201. General

If anti-fouling systems are installed, they should conform to the requirements of the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001.

Section 13 Drainage and Sediment Control

1301. General

All ballast and preload tanks and related piping systems should be designed to facilitate effective drainage and removal of sediments. Coatings which could entrain sediments and harmful aquatic organisms should be avoided. ⚓

CHAPTER 4 DESIGN CONDITION

Section 1 Design Loads

101. Loads

1. In regard to loads in determining the scantlings of structural members and in calculating mooring forces for the units, unless otherwise specified elsewhere, the following loads are to be taken into account, where applicable.

(1) Deck loads
(2) Static loads such as water pressure in still water, buoyancy, dead load, etc.
(3) Wind loads
(4) Wave loads
(5) Loads caused by tide and current
(6) Loads caused by floating ice
(7) Loads caused by snow and ice accumulation
(8) Loads caused by earthquake in the case of bottoming-type units
(9) Impact loads caused when touching sea bed
(10) Loads caused by mooring
(11) Loads caused by mooring of tenders
(12) Loads caused by towing
(13) Loads caused by operation
(14) Loads due to helicopter landing
(15) Loads due to increase of resistance by marine growth
(16) Other loads considered necessary by the Society

2. The modes of operation for each unit are to be investigated using realistic loading conditions including gravity loading with relevant environmental loading for its intended areas of operation. The following environmental considerations should be included where applicable: wind, wave, current, ice, seabed conditions, temperature, fouling and earthquake.

3. Drawings of a unit are to be approved for the specified environmental conditions. Where possible, the above design environmental conditions apply to units and structural members should be based upon significant data with a period of recurrence of at least 50 years for the most severe anticipated environment.

4. If a unit is restricted to seasonal operations in order to avoid excessive wind and wave, such seasonal limitations must be specified.

102. Wind loads

1. The design wind velocity used in determining the wind loads may be specified by the Owner, but is not to be less than 25.8 m/sec (50 knots). However, the design wind velocity for the units intended for unrestricted services and operating sea areas is not to be less than 36 m/sec (70 knots) for the operating condition and not to be less than 51.5 m/sec (100 knots) for the severe storm condition, specified in **Ch 1, 207.**, respectively.

2. The wind pressure P is to be obtained from the following formula. The wind pressure, however, may be determined from the wind tunnel test considered appropriate by the Society.

$$P = 0.5 C_h C_s \rho V^2 \times 10^{-3} \quad (\mathrm{kN/m^2})$$

V : Design wind velocity specified in **Par 1** (m/sec).

P : Air mass density (1.222 $\mathrm{kg/m^3}$)

C_h : Height coefficient given by **Table 4.1** depending on the vertical height in metres at the location under consideration, where the vertical height is a vertical distance from sea sur-

face to the geometric centre of the projected area A specified in the following **Par 3.**

C_s : Shape coefficient given by **Table 4.2** depending on the shape of structural members.

Table 4.1 Height Coefficient C_h

Height (m)		C_h
Over	Not Exceeding	
	15.3	1.00
15.3	30.5	1.10
30.5	46.0	1.20
46.0	61.0	1.30
61.0	76.0	1.37
76.0	91.5	1.43
91.5	106.5	1.48
106.5	122.0	1.52
122.0	137.0	1.56
137.0	152.5	1.60
152.5	167.5	1.63
167.5	183.0	1.67
183.0	198.0	1.70
198.0	213.5	1.72
213.5	228.5	1.75
228.5	244.0	1.77
244.0	259.0	1.79
259.0		1.80

Table 4.2 Shape Coefficient C_s

Shape	C_s
Spherical	0.4
Cylindrical	0.5
Large flat surface (hull, deckhouse, smooth under-deck areas)	1.0
Drilling derrick	1.25
Wires	1.2
Exposed beams and girders under deck	1.3
Small parts	1.4
Isolated shapes (crane, beam, etc.)	1.5
Clustered deckhouses or similar structures	1.1

3. The wind load F is not to be less than obtained from the following formula with regard to each structural member of the unit. In addition, the resultant force and its acting point are to be determined for each wind direction. However, the wind force may be determined from the wind tunnel test considered appropriate by the Society.

$$F = P \times A \quad (\mathrm{kN})$$

P : Wind pressure specified in **Par 2** ($\mathrm{kN/m^2}$).

A : Projected area of all exposed structural members on a plane perpendicular to each wind direction in the upright condition or, if necessary, in the heeling condition ($\mathrm{m^2}$). In determining the projected area, the following requirements are to be applied.

(1) In the case of units with columns, the projected areas of all columns should be included. For self-elevating units, the projected areas of all legs or columns are to be included. Where, however, the legs are of open truss work which does not block wind passage, the above mentioned projected areas may be determined according to the requirements in (3).

(2) The projected areas of deckhouses, other structural members, cranes, etc. are to be separately calculated. Where, however, two or more structures such as deckhouses and the like are closely located, they may be considered as one block and their projected areas may be considered as a projected block area perpendicular to each wind direction. In this case, the shape coefficient C_s is to be taken as 1.1.

(3) The projected areas in case where derrick towers, booms, masts, etc. are of open truss work may be taken as 60 % of the projected block areas perpendicular to each wind direction assuming that they are not of open truss work.

(4) Areas exposed due to heel, should be included using the appropriate shape coefficients.

103. Wave loads

1. The design wave height to be used for wave load calculation may be specified by the Owner under the approval of the Society.
2. The design wave period to be used for wave load calculation is to be the period which gives the maximum effect to the unit.
3. If necessary, the velocities of current and tide are to be added vectorially to the wave particle velocity.
4. In calculating wind loads, the following requirements are to be applied.
   (1) The wave loads are to be calculated, based on acceptable wave theories appropriate to the design depth of water at the operation area subject to the approval by the Society. The wave loads, however, may be determined from the tank test approved by the Society on a model of the unit.
   (2) Waves from all directions are to be considered on the unit.
   (3) The wave loads produced by shipping water on the deck, the loads acting directly on the immersed elements of the unit and the loads resulting from heeled positions or accelerations due to its motion are also to be considered.
   (4) The vibration induced by waves is also to be considered.

104. Current loads

Consideration is to be given to the possible superposition of current and waves. In this case where this superposition is deemed necessary, the current velocity is to be added vectorially to the wave particle velocity and the resultant velocity is to be used to compute the total force.

105. Loads due to vortex shedding

The flutters of immersed structural members due to vortex shedding are also to be considered.

106. Deck loads

For deck loads, uniform and concentrated loads on the respective portions of the deck in each mode of operation and transit condition are to be taken into account. The values of the uniform loads, however, are not to be less than given in **Table 4.3.**

Table 4.3 Deck Loads

Kind of deck	Minimum load (kN/m^2)
Helicopter deck	2
Accommodation spaces (including corridors and similar spaces)	4.5
Work areas and machinery spaces	9
Storage areas	13

Section 2 Calculation of Strength

201. Structural analysis

The unit is to be analysed by the method deemed appropriate by the Society for a sufficient number of conditions including all conditions specified in **Ch 1, 107.**

202. Analysis of units resting on the sea bed

Units designed to rest on the sea bed are to be analysed assuming the overturning moment due to the combined environmental forces from any direction and the sufficient downward gravity loadings on the support footings or mat to withstand the moment.

203. Plastic analysis

Scantlings of structural members designed on the basis of plastic analysis are to be at the discretion of the Society.

204. Buckling strength

Structural members subject to in-plane loads are to have the sufficient strength against buckling in consideration of their shapes, scantlings, boundary conditions, etc.

205. Fatigue strength

1. The possibility of fatigue damage due to cyclic loading should be considered in the design of self-elevating and column-stabilized units.
2. The area anticipated stress concentration is to be considered to fatigue strength, the fatigue analysis is to be based on the intended mode and area of operations to be considered in the unit's design.
3. The fatigue life is to be based on a period of time equal to the specified design life of the unit. The period is normally not to be taken as less than 20 years.

206. Stress concentration

1. The effect of local stress concentrations is to be considered for notches in members or discontinuous parts of structure.
2. Where the tensile stresses acting on the thickness direction of plating, plate material with suitable through-thickness properties is required in accordance with **Pt 2, Ch 1** of **Rules for the Classification of Steel Ships**.

207. Bending stress

1. When calculating bending stresses of structural members, the effective width of the plate is to be determined in accordance with the requirements in **Pt 3, Ch 1, 602.** of **Rules for the Classification of Steel Ships**.
2. Where subjected to eccentric loadings, an increase of bending stress due to the deflections of the structural members is to be taken into account.

208. Shearing stress

When calculating shearing stresses in bulkheads, plate girder webs, hull side plating, etc., only the effective shear area of web is to be considered as being effective. In this regard, the total depth of the girder may be considered as the web depth.

209. Combination of stresses

1. In obtaining respective local stresses of the structural members, all the stress components concerned are to be summed up. In this case, for tubular members, the effect of circumferential stress due to external pressure is to be considered.

2. The scantlings are to be determined on the basis of criteria which combine, in a rational manner deemed appropriate by the Society, the individual stress components acting on the respective structural members.(See **210.**)

210. Equivalent stress

1. For plate structures, members may be designed according to the equivalent stress criterion, where the equivalent stress is obtained from the following formula.

$$\sqrt{\sigma_x^2+\sigma_y^2-\sigma_x\sigma_y+3\tau_{xy}^2}$$

σ_x, σ_y : Stress in the x- and y-directions at the centre of thickness of the plate, respectively ($\mathrm{N/mm^2}$).

τ_{xy} : Shearing stress in the $x-y$ plane($\mathrm{N/mm^2}$).

2. The equivalent stress specified in **Par 1** is not to exceed 0.7 and 0.9 times the yield strength of the material, for the static loading and combined loading condition specified in **301.**, respectively.

211. Corrosion allowance

1. In case where the unit is fitted with a corrosion protection system deemed appropriate by the Society, with regard to the corrosion allowance specified in **Par 2,** reduction may be made as deemed adequate by the Society.

2. Where the unit is not fitted with a corrosion protection system deemed appropriate by the Society, the scantlings determined by the analysing method specified in **Sec 2** in conjunction with the allowable stresses specified in **Sec 3** are to be added by a proper corrosion allowance. In this case, the corrosion allowance is, as a rule, not to be less than 2.5 mm and is to be determined considering the environmental condition, the means and degree of corrosion protection specified in **Ch 3, Sec 5** and the process of its maintenance. And further, where the requirements in **Rules for the Classification of Steel Ships** or **Rules for the Classification of Steel Barges** are applied, the scantlings are not to be less than those specified in the relevant requirements.

Section 3 Analysis of Overall Strength

301. Loading conditions

Analysis of overall strength is to be performed for the static loading and combined loading specified in the following (1) and (2) in the respective modes of operation specified in **Ch 1, 107.**

(1) The static loading is a condition in which the unit is afloat or resting on the sea bed in calm sea and is loaded with static loads only such as loads taken in operating condition, dead load of the unit, etc. which affect the overall strength.

(2) The combined loading is a condition in which the unit is loaded with combined loads of the static loads specified in (1), and dynamic loads such as wind loads, wave loads, etc. which affect the overall strength and loads induced by the accelerative motion of the unit due to these loads and heeling.

302. Allowable stresses

Allowable stresses for static loading and combined loading specified in **301.** are not to exceed the values in **Table 4.4** according to the kind of stress.

Table 4.4 Allowable Stresses for Static Loading and Combined Loading

Kind of stress	Static loading	Combined loading
Tensile	$0.6 \times \sigma_y$	$0.8 \times \sigma_y$
Bending	$0.6 \times (\sigma_y$ or σ_{cr}*)	$0.8 \times (\sigma_y$ or σ_{cr}*)
Shearing	$0.4 \times \sigma_y$ or $0.6 \times \tau_{cr}$*	$0.53 \times \sigma_y$ or $0.8 \times \tau_{cr}$*
Compressive	$0.6 \times (\sigma_y$ or σ_{cr} *)	$0.8 \times (\sigma_y$ or σ_{cr} *)

* : Whichever is the smaller
σ_y : Specified minimum yield stress of the material (N/mm^2).
σ_{cr} : Critical compressive buckling stress (N/mm^2).
τ_{cr} : Critical shear buckling stress(N/mm^2).

303. Combined compressive stress

In addition to **302.**, when structural members are subjected to axial compression or combined axial compression and bending, the extreme fibre stresses shall comply with the following requirement:

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \leq 1.0$$

f_a : Calculated compressive stress due to axial force(N/mm^2).
f_b : Calculated compressive stress due to bending (N/mm^2).
F_b : Allowable compressive stress due to bending prescribed in **Table 4.4** (N/mm^2).
F_a : Allowable axial compressive stress obtained from the following formula, but is not to exceed F_b (N/mm^2)

$$F_a = \eta \times \sigma_{cr,i} \times (1 - 0.13 \times \lambda/\lambda_0) \quad \cdots\cdots\cdots\cdots \quad \lambda < \lambda_0$$
$$= \eta \times \sigma_{cr,e} \times 0.87 \quad \cdots\cdots\cdots\cdots \quad \lambda \geq \lambda_0$$

$$\lambda = kl/r$$
$$\lambda_0 = \sqrt{2\pi^2 E/\sigma_y}$$

σ_y : As specified in **302.** (N/mm^2).
$\sigma_{cr,i}$: Inelastic column critical buckling stress (N/mm^2).
$\sigma_{cr,e}$: Elastic column critical buckling stress (N/mm^2).
η = 0.6 for static loading
= 0.8 for combined loading
kl = effective unsupported length
r = governing radius of gyration associated with kl
E = modulus of elasticity of the material

Section 4 Scantlings of Structural Members

401. General

1. For the primary structural members which contribute to the overall strength, the scantlings are to be determined in accordance with the requirements in **Sec 2** and **3.** However, the requirements in **402.** and **403.** may be applied.

2. For the structural members subjected to local loads only, the requirements in **Rules for the Classification of Steel Ships** may be applied under the approval of the Society.

402. Thickness of plating of hull structure

The thickness of plating of the primary hull structure such as shell plating which contributes to the overall strength, subjected to distributed loads, is not to be less than obtained from the following formulae, whichever is the greater.

$$75.2S\sqrt{\frac{h_s}{K_e}}+C \quad (\mathrm{mm}), \qquad 60.8S\sqrt{\frac{h_c}{K_p}}+C \quad (\mathrm{mm})$$

S : Spacing of transverse or longitudinal frames(m).

h_s : Head of water in static loading specified in **301.**(m).

h_c : Head of water in combined loading specified in **301.**(m).

K_e : As given by the following formulae, whichever is the smaller.

$$\frac{235-k\sigma_{s1}}{k}, \qquad 1.45\left(\frac{235-k\sigma_{s2}}{k}\right)$$

K_p : As given in (a) or (b) below.

(a) Where $\sigma_{c1}\times\sigma_{c2}>0$, the value given by the following formulae, whichever is the smaller.

$$\frac{5750-k^2\sigma_{c1}^2}{235k}, \qquad 2\left(\frac{235-k|\sigma_{c2}|}{k}\right)$$

(b) Where $\sigma_{c1}\times\sigma_{c2}<0$, the value given by the following formulae, whichever is the smaller.

$$\frac{5750-k^2\sigma_{c1}^2}{235k}, \qquad 2\left(\frac{235-k|\sigma_{c1}|-k|\sigma_{c2}|}{k}\right)$$

σ_{s1}, σ_{s2} and σ_{c1}, σ_{c2} : Axial stresses acting on the plating in static loading and combined loading, respectively ($\mathrm{N/mm^2}$). (See **Fig 4.1**)

k : Material factor, as given in the following.

Mild steels ---------- 1.00

High tensile steels

A 32, DH 32, EH 32 -------- 0.78

AH 36, DH 36, EH 36 -------- 0.72

For other high tensile steels, the value of k is to be dedicated at the discretion of the Society.

C : Corrosion allowance specified in **211.**

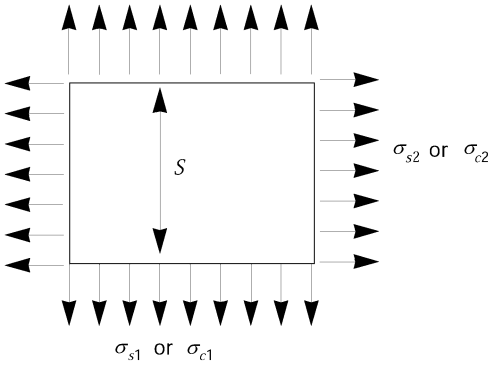

Fig 4.1 Axial stress σ_{s1}, σ_{s2}, σ_{c1}, σ_{c2}

403. Section modulus of transverse or longitudinal frames

The section modulus of transverse or longitudinal frames which support the panels prescribed in **402.** is to be obtained from the following formula.

$$1079C\left(\frac{kSh_c l^2}{235-k\sigma_{c0}}\right) \quad (\mathrm{cm}^3)$$

C : Coefficient given below.
1.0 for both ends fixed
1.5 for both ends simply supported

l : Span of frames (m).

σ_{c0} : Axial stress in combined loading ($\mathrm{N/mm}^2$).

S, h_c, k : As specified in **402.**

404. Local buckling of cylindrical shells

Unstiffened or ring-stiffened cylindrical shells subjected to axial compression or compression due to bending, and having proportions which satisfy the following relationship are to be checked for local buckling in addition to the overall buckling as specified in **303.**

$$D/t > E/9\sigma_y$$

D : Diameter of cylindrical shell

t : Thickness of shell plating

(D and t expressed in the same units.)

σ_y : Specified minimum yield stress of the material

E : Modulus of elasticity of the material

(σ_y and E expressed in the same unit system.)

Section 5 Helicopter Deck

501. Design loads

Plans showing the arrangement, scantlings and details of the helicopter deck are to be submitted. The arrangement plan is to show the overall size of the helicopter deck and the designated landing area. The design load in determining the scantlings of the members of helicopter deck is to be in accordance with following (1) to (3).

(1) Helicopter landing impact loading

(A) As for the deck loads in the range where a helicopter takes off or lands, a load of 75 % of the helicopter maximum take-off weight is to be taken on each of two square areas, 0.3 m × 0.3 m.

(B) For girders, stanchions, etc., the structural weight of the helicopter deck is to be considered in addition to the helicopter impact loading specified in (A).

(C) Where the upper deck of a structure or deck house is used as a helicopter deck and the spaces below are normally manned, the impact loading specified in (A) is to be multiplied by a factor of 1.15.

(2) Stowed helicopter loading

(A) The deck loads in the space where a helicopter is stowed are to be taken as wheel loadings at maximum take-off weight. In this case, the dynamical effect due to the motion of the unit is also to be taken into account.

(B) In addition to (A), a uniformly distributed loading of 0.5 kN/m^2, representing wet snow or ice is to be considered, if necessary.

(C) For girders, stanchions, etc., the structural weight of the helicopter deck is to be considered in addition to the loads specified in (A).

(3) Minimum deck load

The minimum deck load for helicopter deck is to be taken as 2 kN/m^2.

502. Allowable stresses

Allowable stresses of the structural members of the helicopter deck are not to exceed the values in **Table 4.5** in association with the design loads prescribed in **501.**

Table 4.5 Allowable Stresses

Structural members / Design loads	Deck plating	Deck beams	Girders, stanchions, truss supports, etc.
Helicopter landing impact load	*	σ_y	$0.9 \times \sigma_y'$
Stowed helicopter load	σ_y	$0.9 \times \sigma_y$	$0.8 \times \sigma_y'$
Overall distributed load	$0.6 \times \sigma_y$	$0.6 \times \sigma_y$	$0.6 \times \sigma_y'$

* : At the discretion of the Society.
σ_y : As specified in **302.** (N/mm^2).
σ_y : For members subjected to axial compression, σ_y or critical buckling stress, whichever is the smaller(N/mm^2).

503. Minimum thickness

The minimum thickness of helicopter deck plating is not to be less than 6 mm.

504. Landing appliances other than wheels

In case where a helicopter is provided with any other landing appliances other than wheels, the design loads are to be at the discretion of the Society.

505. Loadings on helicopter deck

Wind loadings and possible wave impact loadings on helicopter decks are to be considered. Where in this case, those loadings are in accordance with the discretion of the Society.

Section 6 Position Keeping Systems and Components

601. General

Units provided with position keeping systems equipment in accordance with this Section may have a Additional Installation Notation, "PKS" after the class notation.

602. Anchoring systems

1. General

Plans showing the arrangement and completed details of the anchoring system, including anchors, shackles, anchor lines consisting of chain, wire or rope, together with details of fairleads, windlasses, winches, and any other components of the anchoring system and their foundations are to be submitted to the Society.

2. Design

(1) An analysis of the anchoring arrangements expected to be utilized in the unit's operation is to be submitted to the Society. Among the items to be addressed are:
  (A) Design environmental conditions of waves, winds, currents, tides and ranges of water depth
  (B) Air and sea temperature
  (C) Ice condition (if applicable)
  (D) Description of analysis methodology

(2) The anchoring system should be designed so that a sudden failure of any single anchor line will not cause progressive failure of remaining lines in the anchoring arrangement.

(3) Anchoring system components should be designed utilizing adequate factors of safety and a design methodology suitable to identify the most severe loading condition for each component. In particular, sufficient numbers of heading angles together with the most severe combination of wind, current and wave are to be considered, usually from the same direction, to determine the maximum tension in each mooring line. When a particular site is being considered, any applicable cross sea conditions are also to be considered in the event that they might induce higher mooring loads.
  (A) When the Quasi Static Method is applied, the tension in each anchor line is to be calculated at the maximum excursion for each design condition defined in (B) below, combining the following steady state and dynamic responses of the Unit:
    (a) steady mean offset due to the defined wind, current, and steady wave forces
    (b) most probable maximum wave induced motions of the moored unit due to wave excitation

  For relatively deep water, the effect from damping and inertia forces in the anchor lines is to be considered in the analysis. The effects of slowly varying motions are to be included when the magnitudes of such motions are considered to be significant.

  (B) Factors of safety (FOS) are dependent on the design conditions of the system (intact, damaged, or transient), as well as the level of analyses (Quasi static or dynamic analysis). The minimum Quasi Static FOS, specified in the table below, at the maximum excursion of the unit for a range of headings should be satisfied if the quasi static method outlined in (A) is applied. Otherwise, the minimum Dynamic Analysis FOS in the table below should be satisfied, including the effects of line dynamics when these effects are considered significant.

Design Condition		Anchor Line FOS	
		Quasi Static	Dynamic Analysis
Operating	Intact	2.70	2.25
	Damaged	1.80	1.57
	Transient	1.40	1.22
Severe Storm	Intact	2.00	1.67
	Damaged	1.43	1.25
	Transient	1.18	1.05

where,
$FOS = PB / T_{max}$

PB = maximum rated breaking load of the weakest component of the anchor line.
T_{max} = maximum anchor line tension calculated in accordance with (A) or Section 5.1.3.2 of API RP 2SK for each of the following design conditions.

(a) Operating Intact: T_{max} determined under the most severe design environmental conditions for normal operations specified by the Owner or designer with all anchor lines intact.
(b) Operating Damaged: T_{max}, under the operating environmental conditions specified above, but assuming the sudden failure of any one anchor line, after reaching a steady-state condition.
(c) Operating Transient: T_{max}, under the operating environmental conditions specified above, due to transient motions resulting from the sudden failure of any one anchor line.
(d) Severe Storm Intact: T_{max} determined under the most severe design environmental conditions for severe storm specified by the Owner or designer with all anchor lines intact.
(e) Severe Storm Damaged: T_{max}, under the severe storm environmental conditions specified above, but assuming the sudden failure of any one anchor line, after reaching a steady-state condition.
(f) Severe Storm Transient: T_{max}, under the severe storm environmental conditions specified above, due to transient motions resulting from the sudden failure of any one anchor line.

The defined 'Operating' and 'Severe Storm' are to be the same as those identified for the design of the unit, unless the Society is satisfied that lesser conditions may be applicable to specific sites.

(C) In general, the maximum wave induced motions of the moored unit about the steady mean offset should be obtained by means of model tests. The Society may accept analytical calculations provided that the proposed method is based on a sound methodology which has been validated by model tests.
In the consideration of column-stabilized units, the value of C_s and C_h, as indicated in **Ch 4, 102. 2**, may be introduced in the analysis for position keeping mooring systems. The intent of **Ch 7, 203.**(Wind tunnel test) and of **Ch 7, 204.**(Other stability requirements) may also be considered by the Society.

(D) The Society may accept different analysis methodologies provided that it is satisfied that a level of safety equivalent to the one obtained by (A) and (B) above.

(E) The Society may give special consideration to an arrangement where the anchoring systems are used in conjunction with thrusters to maintain the unit on station.

603. Equipment

1. Windlass

(1) The design of the windlass is to provide for adequate dynamic braking capacity to control normal combinations of loads from the anchor, anchor line and anchor handling vessel during the deployment of the anchors at the maximum design payout speed of the windlass. The attachment of the windlass to the hull structure is to be designed to withstand the breaking strength of the anchor line.

(2) Each windlass is to be provided with two independent power operated brakes and each brake is to be capable of holding against a static load in the anchor lines of at least 50 percent of its breaking strength. Where the Society so allows, one of the brakes may be replaced by a manually operated brake.

(3) On loss of power to the windlasses, the power operated braking system should be automatically applied and be capable of holding against 50 percent of the total static braking capacity of the windlass.

2. Fairleads and sheaves

(1) Fairleads and sheaves should be designed to prevent excessive bending and wear of the anchor lines. The attachments to the hull or structure are to be such as to withstand the stresses imposed when an anchor line is loaded to its breaking strength.

604. Anchor line

1. The Society is to be ensured that the anchor lines are of a type that will satisfy the design conditions of the anchoring system.

2. Means are to be provided to enable the anchor lines to be released from the unit after loss of main power.

3. Means are to be provided for measuring anchor line tensions.

4. Anchor lines are to be of adequate length to prevent uplift of the anchors under the maximum design condition for the anticipated area(s) of operation. However, only steady wind, wave and current forces need to be applied in evaluating anchor uplift forces in transient conditions.

605. Anchors

1. Type and design of anchors are to be to the satisfaction of the Society.

2. All anchors are to be stowed to prevent movement during transit.

606. Quality control

1. Details of the quality control of the manufacturing process of the individual anchoring system components are to be submitted. Components should be designed, manufactured and tested in accordance with recognized standards insofar as possible and practical. Equipment so tested should, insofar as practical, be legibly and permanently marked with the Society's stamp and delivered with documentation which records the results of the tests.

607. Control stations

1. A manned control station is to be provided with means to indicate anchor line tensions at the individual windlass control positions and to indicate wind speed and direction.

2. Reliable means are to be provided to communicate between locations critical to the anchoring operation.

3. Means are to be provided at the individual windlass control positions to monitor anchor line tension, windlass power load and to indicate amount of anchor line payed out.

608. Dynamic positioning systems

1. Thrusters used as a sloe means of position keeping should provided a level of safety equivalent to that provided for anchoring arrangements to the satisfaction of the Society. ⚓

CHAPTER 5 TYPE OF UNITS

Section 1 Self-elevating Units

101. Application

The requirements in this Section apply to self-elevating units.

102. Overall strength

The overall strength of the unit is to be in accordance with the requirements in **Ch 4, Sec 2** and **3** The unbalanced supported condition by the legs, if necessary, is to be considered.

103. Legs

Legs are to be in accordance with the requirements in the following, in addition to the requirements in **102.** However, with regard to the motions of the unit and legs, they may be determined by an analytical method or from a model experiment deemed appropriate by the Society.

(1) Legs are to be either shell type or truss type and, as a rule, footings or bottom mats are to be fitted. Where footings or bottom mats are not fitted, proper consideration is to be given to the leg penetration of the sea bed and the end fixity of the leg. In strength calculation of such a leg, the leg is to be assumed as pin-supported at a position at least 3 metres below the sea bed.

(2) Legs in the field transit condition are to be in accordance with the followings. The field transit condition means the condition which does not exceed a twelve-hours voyage between two areas in protected locations or locations where the unit may be safely elevated. However, during any portion of the move, the unit is to be capable of arriving at a protected location or a location where the unit may be safely elevated within six hours.

(A) The legs are to have sufficient strength for the bending moment obtained from the following formulae :

$$m_1 + 1.2m_2 \quad (\text{kN-m})$$

m_1 : Dynamic bending moment caused by a 6° single amplitude of roll or pitch at the natural period of the unit (kN-m).

m_2 : Static bending moment due to gravity caused by a 6° legs' angle of inclination (kN-m).

(B) The legs are to be investigated for any proposed leg arrangement with respect to vertical position. Such investigations are to include strength and stability aspects.

(3) Legs in the ocean transit condition are to be designed in accordance with the followings :

(A) The legs are to be designed for acceleration and gravity moments resulting from the motions in the severest anticipated environmental transit condition, together with corresponding wind moments.

(B) The legs are to have sufficient strength for the bending moment obtained from the following formulae :

$$m_3 + 1.2m_4 \quad (\text{kN-m})$$

m_3 : Dynamic bending moment caused by a 15° single amplitude of roll or pitch at a 10-second period (kN-m).

m_4 : Static bending moment due to gravity caused by a 15° legs' angle of inclination (kN-m).

(C) For ocean transit condition, it may be necessary to reinforce or support the legs, or to remove sections of them.

(D) The approved condition is to be included in Operating Booklet.

(4) When computing leg stresses, while in the elevated position, the maximum overturning load on the unit, using the most adverse combination of applicable variable loadings together with the loadings as specified in **Ch 4,** is to be considered. Forces and moments due to lateral frame deflections of the legs are to be taken into account .

(5) Leg scantlings are to be determined in accordance with a method of rational analysis, to the satisfaction of the Society.

104. Hull structure

1. The hull is to be considered as a complete structure having sufficient strength to resist all induced stress while in the elevated position and supported by all legs.

2. The scantlings of the respective hull structural members are to be in accordance with the requirements in **Ch 4, Sec 2** and **3** with reference to the loads prescribed in **Ch 4, Sec 1** in addition to **102.**

3. The hull structure, including the parts of the well, etc., is to be good in the continuity of longitudinal strength and transverse strength.

4. Scantlings of units having other than rectangular hull configurations are to be subject to special consideration.

105. Bottom mats

1. The construction of bottom mats is to be designed so that loads transmitted from the legs may be evenly distributed to the respective parts of the mats.

2. The thickness of shell plating of the bottom mats without opening to the sea and scantlings of shell stiffeners are not to be less than determined by the requirements in **Ch 4, 402.** and **403.** In this case, the top of h_s is at the water level at flood tide, and the top of h_c is 0.6 times the design wave height in the severe storm condition above the water level at the design water depth.

3. The scantlings of watertight bulkheads and their stiffeners provided in the bottom mats are not to be less than determined by the requirements in **Pt 3, Ch 14** of **Rules for the Classification of Steel Ships**. In this case, the top of h is to be substituted to the top of h_c specified in **Par 2.**

4. Where the unit is resting on the sea bed, the effects of scouring are also to be considered. The effects of skirt plates, where provided, are to be specially considered.

5. Mats are to be designed to withstand the shock of touching bottom while the unit is afloat and subject to wave motions.

106. Deck elevating apparatus and load carrying members

1. Operating device, mechanism, strength and safety equipment of the deck elevating apparatus are to be in accordance with the requirements in **Ch 10, 105.**

2. Load carrying members which transmit loads from the legs to the hull are to have sufficient strength for the loads prescribed in **103.** and **Ch 4, Sec 1.**

3. Load carrying members are to be arranged so that loads transmitted from the legs are properly diffused into the hull structure.

107. Deckhouses

1. Deckhouses are to have sufficient strength for their size, function and locations and are to be constructed to approval plans.

2. General scantlings are to comply with the requirements in **Pt 3, Ch 17** of **Rules for the Classification of Steel Ships** and the scantlings of enclosed spaces are to comply with the requirements for bulkheads of unprotected house fronts in **Pt 3, Ch 17** of **Rules for the Classification of Steel Ships**.

108. Sea bed condition

Sea bed conditions are to be based upon the designer's assumptions, and these assumptions are to be recorded in the Operating Booklet. The operator is to be watchful against that actual conditions do not impose more severe loadings on the unit.

109. Wave clearance

The unit is to be designed for a crest clearance of either 1.2 m, or 10 % of the combined storm tide, astronomical tide and height of the maximum wave crest above the mean low water level, whichever is the smaller, between the underside of the unit in the elevated position and the crest of the design wave. This crest elevation is to be measured above the level of the combined astronomical and storm tides.

110. Preload capability

For units without bottom mats, all legs are to have the capability of being preloaded to the maximum applicable combined gravity plus overturning load. The approved preload procedure should be included in the Operating Booklet.

Section 2 Column-stabilized Units

201. Application

The requirements in this Section apply to the column-stabilized units.

202. Overall strength

1. The overall strength of the unit is to be in accordance with the requirements in **Ch 4, Sec 3.**
2. For units of this type, the highest stresses may be associated with less severe environmental conditions than the maxima specified by the owner or designer. Particular attention is to be given to such a case.

203. Strength of structure in way of position mooring system

Local structure in way of fairleads, winches, etc., forming a part of the position mooring system, is to be designed to the breaking strength of the mooring line or chain.

204. Upper structure

1. The scantlings of the upper structure are not to be less than those required by **Rules for the Classification of Steel Ships** in association with the loadings indicated on the deck loading plan. These loadings are not to be less than the requirements specified in **Ch 4, 106.**
2. When the upper structure is considered to be an effective member of the overall structural frame of the unit, the scantlings are to be sufficient to withstand actual local loadings plus any additional loadings superimposed due to frame action, within the stress limitations of **Ch 4.**
3. When upper structure is designed to be floating in any mode of operation or damaged condition, or to meet stability requirements, it is to be subject to special consideration.
4. Deckhouses fitted to the upper structure are to be designed in accordance with the requirements in **Pt 3, Ch 17** of **Rules for the Classification of Steel Ships**. The construction and scantlings of deckhouses provided on the hull of the unit are to be determined, taking account of their location and the environmental conditions in which the unit will operate.
5. The upper structure, including the parts of the well, etc., is to be good in the continuity of longitudinal strength and transverse strength.

205. Column, lower hulls and footings

1. Where columns, lower hulls or footings are of stiffened shell construction, the scantlings of plating, stiffeners, girders, etc. are not to be less than determined by the requirements in **Ch 4, 402.** and **403.** In this case, h_s and h_c are to be in accordance with the requirements in the followings.

(1) Where an internal space is loaded with liquid, h_s is the vertical distance in metres from the load line to the tank top and h_c is the vertical distance in metres from the tank top to the top of overflow pipes. Where, however, the specific gravity of the liquid is greater than that of sea water, h_s and h_c are to be modified taking account of specific gravity.

(2) Where an internal space is a void compartment, the top of h_s is at the load line and the top of h_c is 0.6 times the design wave height in the severe storm condition above the water level at the design water depth.

(3) The minimum values of h_s and h_c are not to be less than 6 metres for areas subject to wave immersion and 3.4 metres for other areas.

2. Where columns, lower hulls or footings are designed as shells either unstiffened or ring stiffened, the scantlings of shell plating and ring stiffeners are to be determined to satisfy the strength requirements in **Ch 4, Sec 2** and **3** in response to the design heads, h_s and h_c, specified in **Par 1.**

3. The scantlings of deep tank bulkheads and their stiffeners provided in columns, lower hulls or footings are not to be less than determined by the requirements in **Pt 3, Ch 15** of **Rules for the Classification of Steel Ships**.

4. When column, lower hull or footing is an effective member for the overall strength of the unit, the stress resulting from the overall strength is to be added by the stress determined by the requirements in **Par 1.**

5. Particular consideration is to be given to structural details, reinforcement, etc., in areas subject to high local loadings indicated in the followings ;

(1) Areas subject to bottom bearing loads, where applicable,
(2) Bulkheads of partially filled tanks, etc.,
(3) Areas liable to sustain external damages,
(4) Jointed parts between columns and footings or lower hulls,
(5) Areas subject to wave impact.

6. Where a unit is designed for operations while supported by the sea bed, the effects of scouring are to be considered. The effects of skirt plates, where provided, are to be specially considered.

206. Bracing members

1. Bracing members are to be designed to transmit loadings and to make the hull structure effective against environmental forces, and when the unit is supported by the sea bed, against the possibility of uneven bearing loads.

2. Bracing members are to have sufficient strength for buoyancy, wave and current forces and wave impact.

3. When bracing members are of tubular section, ring frames may be required to maintain stiffness and roundness of shape.

4. When bracings are watertight, they are to be suitably designed to prevent collapse from external hydrostatic pressure.

5. When any one slender bracing member are lost, overall strength of unit is compiled with the following requirements where overall structure analysis are carried out based upon the design loads specified in **Ch 4.**

(1) For determining the design loads, environmental loads such as wind force, wave force, etc,. are to be obtained from not less than 1 year return period.

(2) Notwithstanding the kind of stress, the allowable stress at the combined loads condition is to be following formulae.

$$\sigma_a = \sigma_Y$$

σ_a : allowable stress (N/mm^2)

σ_Y : specified yield stress of materials (N/mm^2)

(3) In case of taking into consideration of combined compression stress, η specified **Ch 4, Sec 3, 303.** may be 1.0

6. Underwater bracing members are to be provided with a leak detection system make it possible to detect fatigue cracks at an early stage.

207. Wave clearance

1. Unless deck structures are designed either in accordance with the requirements in **204. 3** or by considering wave impact, to the satisfaction of the Society, reasonable clearance between the lower surface of deck structure and the wave crest is to be ensured for all afloat modes of operation, taking into account the predicted motion of the unit relative to the surface of the sea.

2. For on-bottom modes of operation, clearances are to be in accordance with those specified in **109.**

Section 3 Surface Type Units

301. Application

The requirements in this Section apply to surface type units.

302. Ship-type units

The hull structure is to be in accordance with the requirements in the Rules, taking account of the followings. Where, however, approved by the Society, the requirements in **Rules for the Classification of Steel Ships** may apply, except the requirements in **Ch 3** and **4**.

(1) Where large deck openings such as wells, etc. are provided, the hull structure is to be suitably reinforced and to be good in the continuity of longitudinal strength and transverse strength.

(2) The plating of the well is to be suitably stiffened to prevent damage due to other objects which may become trapped in the well.

(3) The unit's structure in way of heavy concentrated loads is to be suitably reinforced.

(4) Local structures in way of fairleads, winches, etc., forming part of the position mooring system, are to be designed to the breaking strength of the mooring line or chain.

303. Barge-type units

The hull structure is to be in accordance with the requirements in this rule, taking account of the requirements in **302.** Where, however, approved by the Society, the requirements in **Rules for the Classification of Steel Barges** may apply. ⚓

CHAPTER 6 WATERTIGHT INTEGRITY

Section 1 Watertight Bulkheads

101. General

1. All units are to be provided with watertight bulkheads in accordance with the requirements in **Pt 3, Ch 14** of **Rules for the Classification of Steel Ships** and **Ch 14** of **Rules for the Classification of Steel Barges**. In the case of column-stabilized units, the scantlings of watertight flats and bulkheads are to be made of effective to that point necessary to meet the requirements of damage stability.
2. All surface type units are to be provided with a collision bulkhead in accordance with the requirements in **Pt 3, Ch 14, 201.** of **Rules for the Classification of Steel Ships**. However, where openings, etc. are provided on collision bulkhead, the requirements for watertight doors in **Pt 3, Ch 14, Sec 4** and **Pt 5, Ch 6, 107.** of **Rules for the Classification of Steel Ships** are to be satisfied.

102. Tank boundaries

1. Tight divisions and boundary bulkheads of all tanks are to be constructed in accordance with the requirements in **Pt 3, Ch 15** of **Rules for the Classification of Steel Ships**.
2. Tanks for fresh water or fuel oil, or any other tanks which are not intended to be kept entirely filled in service, are to have divisions or deep swashes as may be required to minimize the dynamic stress on the structure.
3. The arrangement of all tanks, together with their intended service and the height of the overflow pipes, is to be clearly indicated on the plans submitted for approval.
4. Each tank is to be tested in accordance with **Table 3.1.1** in **Pt 3, Ch 1** of **Rules for the Classification of Steel Ships**.

103. Boundary penetrations

1. Where watertight boundaries are required for damage stability, they are to be made watertight, including piping, ventilation, shafting, electrical penetrations, and so on. Piping systems and ventilation ducts within the extent of damage are to be provided with valves which are capable of being remotely operated from the weather deck, pump room, or other normally manned space, and are to be satisfactorily arranged to preclude the possibility of progressive flooding through the system to other spaces, in the event of damage. Valve position indicators are to be provided at the remotely operating positions.
2. Notwithstanding the requirements in **Par 1,** non-watertight ventilation ducts are to be provided with watertight valves at the division boundaries and the valves are to be capable of being operated from a remote location, with position indicators on the weather deck, or in a normally manned space. However, for self-elevating units, ventilating systems which are not used during the transit condition may be secured by alternative methods approved by the Society. In this case, necessary ventilation for closed spaces is to be arranged at the discretion of the Society.

Section 2 Closing Appliances

201. General

The construction and closing appliances of openings through which the sea water is likely to flow in are to be in accordance with the requirements in **Pt 4, Ch 3, Sec 3** of **Rules for the Classification of Steel Ships** and International Convention on Load Lines, except that those which are provided in column-stabilized units, which are not located within areas of calculated immersion and for which special considerations are given, are to be at the discretion of the Society.

202. General requirements related to watertight integrity

1. External openings, such as air pipes (regardless of closing appliances), ventilators, ventilation intakes and outlets, non-watertight hatches and weathertight doors, which are used during operation of the unit while afloat, are not to submerge when the unit is inclined to the first intercept of the righting moment and wind heeling moment curves in any intact or damaged condition. Openings, such as side scuttles of the non-opening type, manholes and small hatches, which are fitted with appliances to ensure watertight integrity, may be submerged(Such openings are not allowed to be fitted in the column of stabilized units). Such openings are not to be regarded as emergency exits. Where flooding of chain lockers or other buoyant volumes may occur, the openings to these spaces should be considered as downflooding points.
2. External openings fitted with appliances to ensure watertight integrity, which are kept permanently closed while afloat, are to comply with the requirements of paragraph **4**.
3. Internal openings fitted with appliances to ensure watertight integrity are to comply with the following:
   (1) Doors and hatch covers which are used during the operation of the unit while afloat should be remotely controlled from the central ballast control station and should also be operable locally from each side. Open/shut indicators should be provided at the control station. In addition, remotely operated doors provided to ensure the watertight integrity of internal openings which are used while at sea are to be sliding watertight doors with audible alarm. The power, control and indicators are to be operable in the event of main power failure. Particular attention is to be paid to minimizing the effect of control system failure. Each power-operated sliding watertight door shall be provided with an individual hand-operated mechanism. It shall be possible to open and close the door by hand at the door itself from both sides.
   (2) Doors or hatch covers in self-elevating units, or doors placed above the deepest load line draft in column-stabilized and surface units, which are normally closed while the unit is afloat may be of the quick acting type and should be provided with an alarm system (e.g., light signals) showing personnel both locally and at the central ballast control station whether the doors or hatch covers in question are open or closed. A notice should be affixed to each such door or hatch cover stating that it is not to be left open while the unit is afloat.
   (3) The closing appliances are to have strength, packing and means for securing which are sufficient to maintain watertightness under the design water pressure of the watertight boundary under consideration.
4. Internal openings fitted with appliances to ensure watertight integrity, which are to be kept permanently closed while afloat, are to comply with the following:
   (1) A signboard to the effect that the opening is always to be kept closed while afloat is to be fitted on the closing appliance in question.
   (2) Opening and closing of such closure devices should be noted in the unit's logbook, or equivalent.
   (3) Manholes fitted with bolted covers need not be dealt with as under (1).
   (4) The closing appliances are to have strength, packing and means for securing which are sufficient to maintain watertightness under the design water pressure of the watertight boundary under consideration.

203. General requirements related to weathertight integrity

1. Any opening, such as an air pipe, ventilator, ventilation intake or outlet, non-watertight sidescuttle, small hatch, door, etc., having its lower edge submerged below a waterline associated with the zones indicate in (1) or (2) below, is to be fitted with a weathertight closing appliance to ensure the weathertight integrity, when:
   (1) a unit is inclined to the range between the first intercept of the right moment curve and the wind heeling moment curve and the angle necessary to comply with the requirements of **Ch 7, 201.** during the intact condition of the unit while afloat; and
   (2) a column-stabilized unit is inclined to the range:
      (A) necessary to comply with the requirements of **Ch 7, 105. 1** (3) and with a zone measured 4.0 m perpendicularly above the final damaged waterline per **Ch 7, 105. 1** (1) referred to **Fig 6.1**, and
      (B) necessary to comply with the requirements of **Ch 7, 105. 2** (3).
2. External openings fitted with appliances to ensure weathertight integrity, which are kept permanently closed while afloat, are to comply with the requirements of **202. 4** (1) and (2).

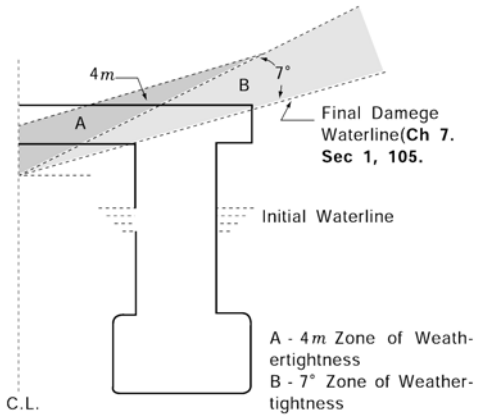

Fig 6.1 Minimum weathertight Integrity requirements for Column Stabilized Units

3. External openings fitted with appliances to ensure weathertight integrity, which are secured while afloat are to comply with the requirements of **202. 3** (1) and (2). ⚓

CHAPTER 7 STABILITY

Section 1 General Requirements of Stability

101. General

1. All units are to have positive stability in calm water equilibrium position, for the full range of draughts when in all modes of operation afloat, and for temporary positions when raising or lowering.

2. In addition to **Par 1,** all units are to meet the stability requirements set forth this Chapter for all applicable condition.

102. Intact stability

1. All units are to have sufficient stability (righting ability) to withstand the overturning effect of the force produced by a sustained wind from any horizontal direction, in accordance with the stability criteria given in **Sec 2,** for all afloat modes of operation.

2. Realistic operating conditions are to be evaluated, and the unit is to be capable of maintaining in operating mode with a sustained wind velocity designated by the Owner, but not less than 36 m/sec (70 knots).

3. The capability is to be provided to change the mode of operation of the unit to that corresponding to a severe storm condition, with a sustained with velocity of not less than 51.5 m/sec (100 knots), in reasonable period of time for the particular unit. In all cases, the limiting wind velocities are to be specified and instructions should be included in the Operating Booklet for changing the mode of operation by redistribution of the variable load and equipment, by changing draughts, or both.

4. For restricted operations consideration may be given to a reduced sustained wind velocity specified in **Par 2** and **3,** of not less than 25.8 m/sec (50 knots).

5. For the purpose of calculation, it is to be assumed that the unit is floating free of mooring restraints. However, the possible detrimental effects of mooring restraints are to be considered.

103. Damage stability

1. All units are to have sufficient stability to withstand the flooding from the sea of any single compartment or any combination of compartments consistent with the damage assumption set out in **104.**, for operating and transit modes of operation.

2. The unit is to possess sufficient reserve stability in the damaged condition to withstand the additional heeling moment of a 25.8 m/sec (50 knots) sustained wind superimposed from any direction.

3. The final waterline is to be below the lower edge of any opening which is not to comply with the requirements in **Ch 6, 202.** and **203.** so that the unit has the sufficient stability to withstand the heeling moment.

4. For all types of units, the ability to compensate for damage incurred, by pumping out or by ballasting other compartments, etc., is not to be considered as alleviating the requirements specified herein.

5. For the purpose of calculation, it is to be assumed that unit is floating free of mooring restraints. However, the possible detrimental effects of mooring restraints are to be considered.

104. Assumption of the damage extent

1. Damage extent of self-elevating units

In assessing the damage stability as required by **103.**, the following extent of damage is to be assumed to occur between effective watertight bulkheads.

(1) Horizontal penetration : 1.5 m
(2) Vertical extent : bottom shell upwards without limit.
(3) The distance between effective watertight bulkheads or their nearest stepped portions which are positioned within the assumed extent of horizontal penetration should be not less than 3 m; where there is a lesser distance, one or more of the adjacent bulkheads should be disregarded. Where a bottom mat is fitted, assumed damage penetration simultaneous to both the mat and the upper hull need only be considered when the lightest draught allows any part of the mat to fall within 1.5 m vertically of the waterline, and the difference in horizontal dimension of the upper hull and mat is less than 1.5 m in any area under consideration.
(4) If damage of a lesser extent than specified in (1) to (3) results in a more severe final equilibrium condition, such a lesser extent is to be assumed.
(5) All piping, ventilating systems, trunks, etc., within this extent are to be assumed damaged.
(6) Positive means of closure are to be provided to preclude progressive flooding of other intact spaces.
(7) The compartments adjacent to the bottom shell are also to be considered flooded individually.

2. Damage extent of column-stabilized units

In assessing the damage stability as required by **103.**, the following assumed damage conditions apply.

(1) Only those columns, underwater hulls and braces on the periphery of the unit are to be assumed to be damaged and the damage is to be assumed in the exposed portions of the columns, underwater hulls and braces.
(2) Columns and braces are to be assumed to be flooded by damage having a vertical extent of 3.0 m occurring at any level between 5.0 m above and 3.0 m below the drafts specified in the Operating manual. Where a watertight flat is located within this region, the damage is to be assumed to have occurred in both compartments above and below the watertight flat in question. Lesser distances above or below the draughts may be applied taking into account the actual operating conditions. However, the extent of required damage region should be at least 1.5 m above and below the draft in question.
(3) Horizontal penetration of damage is to be assumed to be 1.5 m.
(4) No vertical bulkhead is to be assumed to be damaged, except where bulkheads are spaced closer than a distance of one eighth of the column perimeter at the draught under consideration, measured at the periphery, in which case one or more of the bulkheads are to be disregarded.
(5) Footings or lower hulls are to be treated as damaged when operating at a light or transit condition in the same manner as indicated in (1) to (4).
(6) If damage of a lesser extent than specified in (1) to (5) results in a more severe damage equilibrium condition, such a lesser extent is to be assumed.
(7) All piping, ventilation systems, trunks, etc., within this extent of damage are to be assumed damaged.

3. Damage extent of surface type units

In assessing the damage stability as required by **103.**, the following extent of damage is to be assumed to occur between effective watertight bulkheads.

(1) Horizontal penetration : 1.5 m
(2) Vertical extent : bottom shell upwards without limit
(3) The distance between effective watertight bulkheads or their nearest stepped portions which are positioned within the assumed extent of horizontal penetration should be not less than 3 m; where there is a lesser distance, one or more of the adjacent bulkheads should be disregarded. If damage of a lesser extent than specified in (1) and (2) results in a more severe final equilibrium condition, such a lesser extent is to be assumed.
(4) All piping, ventilation systems, trunks, etc., within this extent are to be assumed damaged.
(5) The compartments bounded by the bottom shell are to be considered flooded individually.

105. Damage stability of column-stabilized units

The column-stabilized unit is to comply with the following in addition to **103.**

1. The column-stabilized units are to have the sufficient stability to meet following under the wind force specified in **103. 2.**

(1) The angle of inclination after the damage set out in **104. 2** (2) is not to exceed 17°.

(2) The final waterline is to be located below the lower edge of any opening that does not meet the requirements in **Ch 6, 202.** and **203.** However, no openings are provided in column. The openings within 4 m above the final waterline are to be made weathertight.

(3) The righting moment curve, after the damage, is to have from the first intercept with the wind heeling moment to the lesser of the extent of weathertight integrity or the second intercept, a range of at least 7°. Within this range, the righting moment curve is to reach a value of at least twice the wind heeling moment curves, both being measured at the same angle. (See **Fig 7.1**).

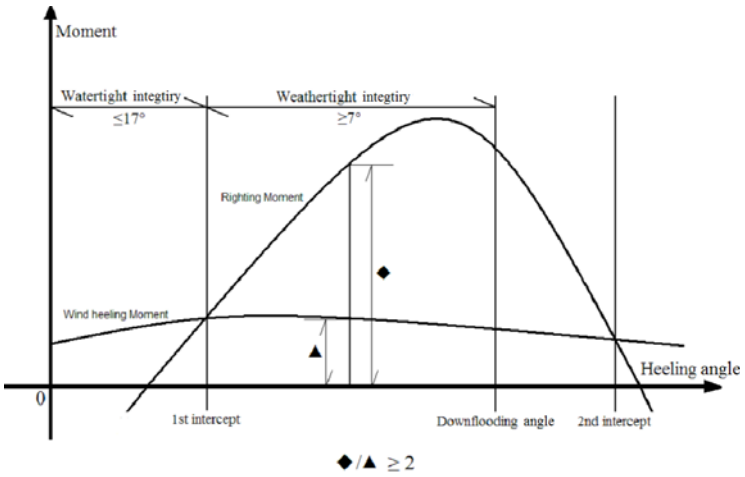

Fig 7.1 Residual damage stability requirements for column-stabilized units

2. The column-stabilized unit is to have sufficient buoyancy and stability to meet the following, in any operating or transit condition with the assumption of no wind to withstand the flooding of any watertight compartment wholly or partially below the waterline in question, which is a pump-room, a room containing machinery with a salt water cooling system or a compartment adjacent to the sea.

(1) The angle of inclination after flooding is not to be greater than 25°.

(2) The final waterline is to be located below the lower edge of any opening that does not meet the requirements in **Ch 6, 202.** and **203.** However, no openings are provided in column.

(3) Sufficient margin of stability is provided which requires a range of positive stability of at least 7° beyond the first intercept of the righting moment curve and the horizontal coordinate axis of the static stability curve to the second intercept of them or the downflooding angle, whichever is less.

106. Damage stability of self-elevating units and surface type units

1. The self-elevating unit and surface type unit are to comply with the requirements in **103.**

2. The flooding of any single compartment of the self-elevating unit while meeting the following criterion (see **Fig 7.2**):

$$RoS \geq 7^{o} + (1.5\theta_{s})$$

where,

$RoS \geq 10^{o}$

RoS : range of stability, in degrees $= \theta_m - \theta_s$

where,

θ_m : maximum angle of positive stability, in degrees

θ_s : static angle of inclination after damage, in degrees

The range of stability is determined without reference to the angle of downflooding.

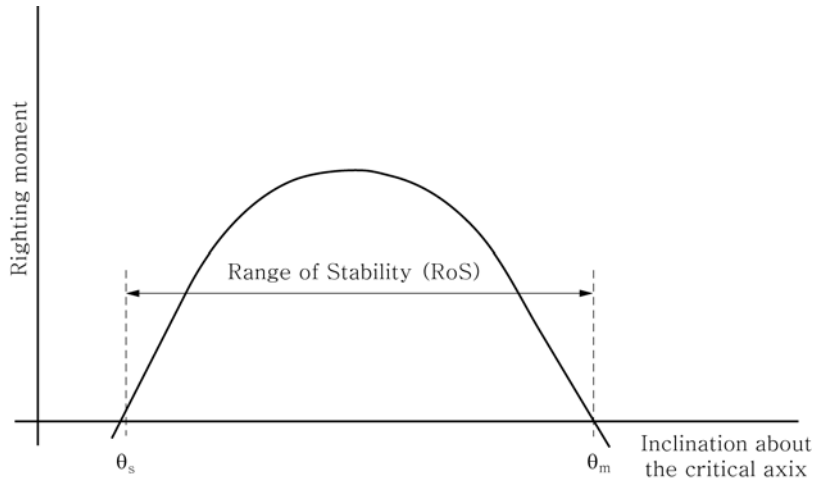

Fig 7.2 Residual Stability for Self-elevating Units

107. Inclining test

1. An inclining test will be required for the first unit of a design when as near to completion as possible, to determine accurately the light ship weight and position of centre of gravity.
2. An inclining test procedure is to be submitted to the Society for review prior to the test. An inclining test is to be carried out in the presence of the Surveyor.
3. For successive units of design, which are basically identical with regard to hull form, with the exception of minor changes in arrangement, machinery, equipment, etc., and with concurrence by the Society that such changes are minor, detailed weight calculations showing only the differences of weight and centres of gravity will be satisfactory, provided the accuracy of the calculations is confirmed by a deadweight survey.
4. The results of the inclining test, or deadweight survey and inclining experiment adjusted for weight differences, are to be reviewed by the Society prior to inclusion in the Operating Booklet.

Section 2 Stability Criterion under Wind Force

201. Intact condition

1. Righting moment curves and wind heeling moment curves related to the most critical axis, with supporting calculations, are to be prepared for a sufficient number of conditions covering the full range of drafts corresponding to afloat modes of operation.

2. Where drilling equipment is of the nature that it can be lowered and stowed, additional wind heeling moment and stability curves may be required, and such data is to clearly indicate the position of such equipment.

3. The righting moment curve is to comply with the following requirements depending on the type of unit. (See **Fig 7.3**)

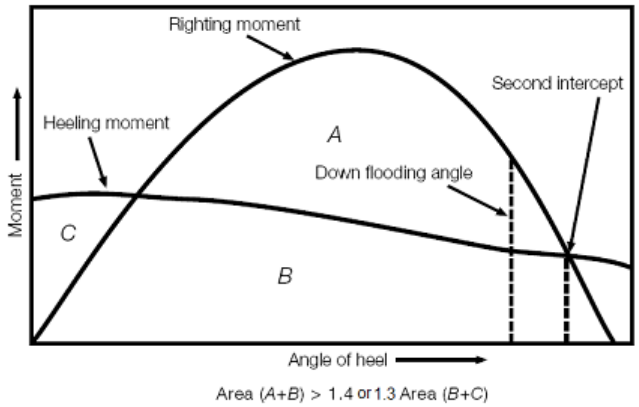

Fig 7.1 Righting moment and heeling moment curves

(1) Column-stabilized unit
The area under the righting moment curve to the angle of downflooding (area : A+B) is not to be less than 30 % in excess of the area under the wind heeling moment curve (area : B+C) to same limiting angle.

(2) Units except column-stabilized unit
The area under the righting moment curve to the second intersection(θ_3) or downflooding angle (θ_2), whichever is less (area : A+B) is not to be less than 40 % in excess of the area under the wind heeling moment curve (area : A+B) to the same limiting angle.

(3) In all cases, the righting moment curve is to be positive over the entire range of angles from upright to the second intersection(θ_3).

202. Wind heeling moment

1. The wind heeling moment is to be calculated at several angles of inclination for each mode of operation, based on the wind force obtained from **Ch 4.**

2. The calculations are to be performed in a manner to reflect the range of stability about the most critical axis.

3. The lever for the heeling force is to be taken vertically from the centre of lateral resistance or, if available, the centre of hydrodynamic pressure, of the underwater body to the centre of pressure of the areas subject to wind loading.

4. In calculating wind heeling moments for ship-shaped hulls, the curve may be assumed to vary as the cosine function of the vessel's heel.

203. Wind tunnel test

Wind heeling moments derived from authoritative wind tunnel tests on a representative model of the unit may be considered as alternatives to the method given in **202.** Such heeling moment determination is to include lift effects at various applicable heel angles, as well as drag effects.

204. Other stability criteria

The stability may be reviewed and evaluated in accordance with the alternative criteria deemed appropriate by the Society, taking into account the operation modes and environment conditions. ⚓

CHAPTER 8 HAZARDOUS AREA

Section 1 General

101. Application

1. The hazardous areas as specified may be extended or reduced depending on the actual arrangements in each case, by use of windshields, special ventilation arrangements, structural arrangements, etc.

2. For the purpose of this Chapter :

(1) An enclosed space is considered to be a space bounded by bulkheads and decks which may have doors, windows, of other similar openings.

(2) A semi-enclosed location is considered to be a location where natural conditions of ventilation are notably different from those on open decks due to the presence of structure such as roofs, windbreaks and bulkheads and which are so arranged that the dispersion of gas may not occur.

102. Definition of hazardous area

1. Hazardous areas are all those areas where, due to the possible presence of a flammable atmosphere, the use without proper consideration of machinery or electrical equipment may lead to fire hazard or explosion.

2. Hazardous areas are divided into zones as follows;

Zone 0 : an area in which an explosive gas-air mixture is continuously present or present for long periods.

Zone 1 : an area in which an explosive gas-air mixture is likely to occur in normal operating conditions.

Zone 2 : an area in which an explosive gas-air mixture is not likely to occur, and if it occurs, it will only exist for a short time.

Section 2 Extent of Hazardous Area

201. Application

For the purpose of machinery and electrical installations, hazardous areas are classified as in **202.** to **204.**. Hazardous areas not covered (such as, but not limited to, helicopter fuel storage areas, acetylene cylinder storage areas, battery rooms, paint lockers and flammable gas or vapour vents) in **202.** to **204.** are to be classified in accordance with section **102.**.

202. Hazardous areas Zone 0

Hazardous areas Zone 0 include ;

(1) The internal spaces of closed tanks and pipes for oil and gas products including escape gas outlet pipes.

(2) Outdoor location within 0.5 m from an opening to the hazardous areas defined in (1).

203. Hazardous areas Zone 1

Hazardous areas Zone 1 include ;

(1) Enclosed spaces containing tanks and pipes described in **202.** (1)

(2) Enclosed spaces containing liquid or solid substances that are likely to emit flammable gases or vapors

(3) An enclosed space or semi-enclosed location:

(A) Having a direct access or opening into the hazardous areas defined in (1) or (2) or other Zone 1 areas, through a door, a ventilation opening, etc.;

(B) Immediately adjacent to the closed tanks defined in 202. (1) or
(C) Containing pumps or piping used for conveying liquid described in **202.** (1), except for all welded or continuous closed piping systems without valves, flanges or similar devices;
(4) Outdoor location within 1 m beyond the Zone 0 area defined in **202.** (2).
(5) Outdoor location within 1.5 m from an opening to the hazardous areas defined in (1) to (3), such as a door, a ventilation opening, a tank vent, etc;
(6) Outdoor or semi-enclosed locations within 1.5 m from any equipment, container, etc., stowed in a designated open deck area, that are likely to emit flammable gases or vapors.

204. Hazardous areas Zone 2

Hazardous areas Zone 2 include;
(1) Outdoor location within 3 m from the boundaries of the closed tanks defined in **202.** (1)
(2) Outdoor location within 1.5 m from pumps or piping used for conveying liquid described in **202.** (1), except for all-welded or continuous closed piping systems without valves, flanges or similar devices;
(3) Outdoor location within 1.5 m beyond the Zone 1 areas defined in **202.** (4) and (5)
(4) Outdoor or semi-enclosed location within 1.5 m beyond the Zone 1 areas defined in **202.** (6).
(5) Air locks between a Zone 1 and a non-hazardous area.

205. Openings, access and ventilation conditions affecting the extent of hazardous zones

1. Except for operational reasons access doors or other openings are not to be provided between the following spaces.
(1) A non-hazardous space and a hazardous zone
(2) A Zone 2 space and a Zone 1 space

2. Where such access doors or other openings are provided, any enclosed space not referred to under **202.** or **203.** and having a direct access to any Zone 1 location or Zone 2 location becomes the same zone as the location except that ;
(1) An enclosed space with direct access to any Zone 1 location can be considered as Zone 2 :
(A) The access is fitted with a gas-tight door opening into the Zone 2 space, and
(B) Ventilation is such that the air flow with the door open is from the Zone 2 space into the Zone 1 location, and
(C) Loss of ventilation is alarmed at a manned station.
(2) An enclosed space with direct access to any Zone 1 location is not considered hazardous if ;
(A) The access is fitted with a self-closing gas-tight door forming an air lock, and
(B) The space has ventilation overpressure in relation to the hazardous space, and
(C) Loss of ventilation overpressure is alarmed at a manned station.
(3) An enclosed space with direct access to any Zone 2 location is not considered hazardous if ;
(A) The access is fitted with a self-closing gas-tight door that opens into the non-hazardous location, and
(B) Ventilation is such that the air flow with the door open is from the non-hazardous space into the Zone 2 locations, and
(C) Loss of ventilation is alarmed at a manned station.

3. Where ventilation arrangements of the intended safe space are considered sufficient by the Society to prevent any ingress of gas from the Zone 1 location, the two self-closing doors forming an air lock may be replaced by a single self-closing gas-tight door which opens into the non-hazardous location and has no hold-back device.

4. Piping systems should be designed to preclude direct communication between hazardous areas of different classifications and between hazardous and nonhazardous areas.

5. Hold-back devices should not be used on self-closing gastight doors forming hazardous area boundaries.

Section 3 Ventilation

301. General

1. Attention is to be given to ventilation inlet and outlet location and airflow in order to minimize the possibility of cross contamination.
2. Inlets are to be located in non-hazardous areas as high and as far away from any hazardous area as practicable.
3. Each air outlet is to be located in an outdoor area which, in the absence of the considered outlet, is of the same or lesser hazard than the ventilated space.
4. Ventilation for hazardous areas is to be completely separate from that used for non-hazardous areas.

302. Ventilation of hazardous areas

1. Where the ventilation duct passes through a hazardous area of a higher level, the ventilation duct should have overpressure in relation to this area and where the ventilation duct passes through a hazardous area of a lower level, the ventilation duct should have under-pressure in relation to this area.
2. The arrangement of ventilation inlet and outlet openings in the space is to be such that the entire space is efficiently ventilated, giving special consideration to location of equipment which may release gas, and to spaces where gas may accumulate.
3. The outlet air from Zone 1 and Zone 2 spaces is to be led in separate ducts to outdoor locations. The internal spaces of such ducts belong to the same Zone as the inlet space.
4. Air inlet ducts designed for constant relative underpressures are to be rigidly constructed to avoid air leaks.
5. Fans are to be designed so as to reduce the risk that sparks may occur.
6. Hazardous enclosed spaces should be adequately ventilated.
7. Where mechanical ventilation is applied, it should be such that the hazardous enclosed spaces are maintained with underpressure in relation to the less hazardous spaces or areas and nonhazardous enclosed spaces are maintained in overpressure in relation to adjacent hazardous locations. ⚓

CHAPTER 9 FIRE PROTECTION, MEANS OF ESCAPE AND FIRE EXTINCTION

Section 1 General

101. Application

1. The units are to comply with the requirements in this Chapter, in addition to the requirements in **Pt 8** of **Rules for the Classification of Steel Ships**. However, where approved specially by the Society, the requirements may be modified.
2. The requirements for fire detection and extinction specified in **Sec 3** to **6** of this Chapter apply to the ships to which the 「Korean Ship Safety Act」 does not apply.
3. For fire protection, means of escape and fire detection and extinction of the units, attention is to be paid to the requirements of the national regulations of the country in which the unit is registered.

Section 2 Fire Protection and Means of Escape

201. Fire protection

1. Hulls, superstructures, structural bulkheads, decks and deckhouses are to be constructed of steel or other material equivalent thereto.
2. In addition to complying with the specific provisions for fire integrity of bulkheads and decks, the minimum fire integrity of all bulkheads and decks shall be as prescribed in **Table 9.1** and **9.2** according to the spaces adjoining to the relevant bulkheads or decks.
3. Windows and sidescuttles, with the exception of navigating bridge windows, are to be of the non-opening type. Navigating bridge windows may be of the opening type provided the design of such windows would permit rapid closure. The Society may permit windows and sidescuttles outside hazardous areas to be of the opening type.
4. Continuous “B” class ceilings or linings in association with the relevant decks or bulkheads may be accepted as contributing wholly or in part to the required insulation and integrity of a division.
5. In approving structural fire protection details, the Society is to have regard to the risk of heat transmission at intersections and terminal points of required thermal barriers. The insulation of a deck or bulkhead is to be carried past the penetration, intersection or terminal point for a distance of at least 450 mm in the case of steel and aluminium structures. If a space is divided with a deck or a bulkhead of "A" class standard having insulation of different values, the insulation with the higher value is to continue on the deck or bulkhead with the insulation of the lesser value for a distance of at least 450 mm.
6. The fire resistance of doors should, as far as practicable, be equivalent to that of the division in which they are fitted. External doors in superstructures and deckhouses should be constructed to at least “A-0” class standard and be self-closing, where practicable.
7. Self-closing doors in fire rated bulkheads should not be fitted with hold-back hooks. However, hold-back arrangements incorporating remote release fittings of the fail-safe type may be utilized.

Table 9.1 Fire Integrity of Bulkheads Separating Adjacent Spaces

Spaces	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control stations (1)	A-0[(d)]	A-0	A-60	A-0	A-15	A-60	A-15	A-60	A-60	*	A-0
Corridors (2)		C	B-0	B-0 A-0[(b)]	B-0	A-60	A-0	A-0	A-0	*	B-0
Accommodation spaces (3)			C	B-0 A-0[(b)]	B-0	A-60	A-0	A-0	A-0	*	C
Stairways (4)				B-0 A-0[(b)]	B-0 A-0[(b)]	A-60	A-0	A-0	A-0	*	B-0 A-0[(b)]
Service spaces(low risk) (5)					C	A-60	A-0	A-0	A-0	*	B-0
Machinery spaces of Category A (6)						*(a)	A-0[(a)]	A-60	A-60	*	A-0
Other machinery spaces (7)							A-0[(a)] (C)	A-0	A-0	*	A-0
Hazardous areas (8)								-	A-0	-	A-0
Service spaces(high risk) (9)									A-0[(c)]	*	A-0
Open deck (10)										-	*
Sanitary and similar spaces (11)											C

Notes :

1. The following requirements are to govern application of the table :
   (1) Control stations are spaces as defined in **Ch 1, 111.** (A station where the emergency power source is located is not considered.)
   (2) Corridors mean corridors and lobbies.
   (3) Accommodation spaces are those used for public spaces, cabins, offices, hospitals, cinemas, games and hobby rooms and similar spaces, excluding corridors, lavatories and pantries containing no cooking appliances.
   (4) Stairways are interior stairways, lifts and escalators (other than those wholly contained within the machinery spaces) and enclosures thereto. In this connection a stairway which is enclosed only at one level is to be regarded as part of the space from which it is not separated by a fire door.
   (5) Service spaces (low risk) are lockers, store-rooms and working spaces in which flammable materials are not stored, drying rooms and laundries.
   (6) Machinery spaces of Category A are those spaces and trunks to such spaces which contain :
      (a) internal combustion machinery used for main propulsion ; or
      (b) internal combustion machinery used for purpose other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW(510PS) ; or
      (c) any oil-fired boiler or oil fuel unit.
   (7) Other machinery spaces are all other machinery spaces than machinery spaces of Category A, containing propelling machinery, boilers, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilating and air-conditioning machinery and similar spaces, including trunks to such spaces.
   (8) Hazardous areas are areas as defined in **Ch 8, 102. 1.**
   (9) Service spaces (high risk) are lockers, store-rooms and working spaces in which flammable materials are stored, galleys, pantries containing cooking appliances, paint rooms and workshops other than those forming part of the machinery space.
   (10) Open decks are open deck spaces, excluding hazardous areas.
   (11) Sanitary and similar spaces are communal sanitary facilities such as showers, bath, lavatories, etc., and isolated pantries containing no cooking appliances. Sanitary facilities which serve a space and with access only from that space are to be considered a portion of the space in which they are located.
2. Explanation for the subscripts and the marks on the table
   (a) Where the space contains an emergency power source or components of an emergency power source adjoining a space containing a ship's service generator or the components of a ship's service generator, the boundary bulkhead or deck between those spaces is to be an "A-60" class division.
   (b) Either of the divisions indicated above or below is to be provided in consideration of **201. 5** (1) and (3).
   (c) Where spaces are of the same numerical category and superscript (c) appears, a bulkhead or deck of rating shown in the table is only required when the adjacent spaces are for a different purpose, e.g. in category (9). A galley next to a galley does not require a bulkhead but a galley next to a paint room requires an "A-0" bulkhead.
   (d) Bulkheads separating the navigating bridge, chartroom and radio room from each other may be an "B-0" rating. Where an asterisk " * " appears in the table, the division is required to be of steel or equivalent material but not required to be of "A" class standard.

   Where " - " appears in the table, the division need not be of "A", "B" nor "C" class divisions.

Table 9.2 Fire Integrity of Decks Separating Adjacent Spaces

Spaces above deck / Spaces below deck	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
stations (1)	A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0	A-0	*	A-0
Corridors (2)	A-0	*	*	A-0	*	A-60	A-0	A-0	A-0	*	*
Accommodation spaces (3)	A-60	A-0	*	A-0	*	A-60	A-0	A-0	A-0	*	*
Stairways (4)	A-0	A-0	A-0	*	A-0	A-60	A-0	A-0	A-0	*	A-0
Service spaces(low risk) (5)	A-15	A-0	A-0	A-0	*	A-60	A-0	A-0	A-0	*	A-0
Machinery spaces of Category A (6)	A-60	A-60	A-60	A-60	A-60	*(a)	A-60	A-60	A-60	*	A-0
Other machinery spaces (7)	A-15	A-0	A-0	A-0	A-0	A-0(a)	*(a)	A-0	A-0	*	A-0
Hazardous areas (8)	A-60	A-0	A-0	A-0	A-0	A-60	A-0	-	A-0	-	A-0
Service spaces(high risk) (9)	A-60	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0(c)	*	A-0
Open deck (10)	*	*	*	*	*	*	*	-	*	-	*
Sanitary and similar spaces (11)	A-0	A-0	*	A-0	*	A-0	A-0	A-0	A-0	*	*

Note : The explanation for spaces, subscripts and marks on the table are as indicated in the Notes of **Table 9.1**

8. Protection of accommodation spaces, service spaces and control stations specified in **Ch 1, 211.**(excluding the space where the emergency source of electrical power is installed) is to be in accordance with the requirements in the followings.

(1) In general, accommodation spaces, service spaces and control stations are not be located adjacent to hazardous areas. However, where this is not practicable, an engineering evaluation is to be performed to ensure that the level of fire protection and blast resistance of the bulkheads and decks separating these spaces from the hazardous areas are adequate for the likely hazard.

(2) All bulkheads that are to be “A” class divisions are to extend from deck to deck and to the deckhouse side or other boundaries.

(3) All bulkheads required to be "B" class divisions are to extend from deck to deck and to the deckhouse side or other boundaries, unless continuous "B" class ceilings or linings are fitted on both sides of the bulkhead, in which case the bulkhead may terminate at the continuous ceiling or lining. In corridor bulkheads, ventilation openings may be permitted only in and under the doors of cabins, public spaces, offices and sanitary spaces. The openings are to be provided only in the lower half of the door. Where such an opening is in or under a door, the total net area of any such opening or openings is not to exceed 0.05 m^2. When such an opening is cut in a door it is to be fitted with a grille made of non-combustible material. Such openings are not to be provided in a door in a division forming a stairway enclosure.

(4) Stairs are to be constructed of steel or equivalent material.

(5) Stairways which penetrate only a single deck are to be protected at least at one level by "A" or "B" class divisions and self-closing doors so as to limit the rapid spread of fire from one deck to another. Personnel lift trunks are to be protected by "A" class divisions. Stairways and lift trunks which penetrate more than a single deck are to be surrounded by "A" class divisions and protected by self-closing doors at all levels.

(6) Air spaces enclosed behind ceilings, panellings or linings are to be divided by close fitting draught stops spaced not more than 14 m apart.

(7) Except for insulation in refrigerated compartments, insulation material, pipe and vent duct lagging, ceilings, linings and bulkheads are to be of non-combustible material. Insulation of pipe fittings for cold service systems and vapour barriers and adhesives used in conjunction with insulation need not be non-combustible but they are to be kept to a minimum and their exposed surfaces are to have low flame spread characteristics. In spaces where penetration of oil products is possible, the surfaces of the insulation are to be impervious to oil or oil vapours.

(8) The framing, including grounds and the joint pieces of bulkheads, linings, ceilings and draught

stops are to be of non-combustible material.

(9) All exposed surfaces in corridors and stairway enclosures and surfaces in concealed or inaccessible spaces in accommodation and service spaces and control stations are to have low flame spread characteristics. Exposed surfaces of ceilings in accommodation and service spaces and control stations are to have low flame spread characteristics.

(10) Bulkheads, linings and ceilings may have combustible veneers provided that the thickness of such veneers is not to exceed 2 mm within any space other than corridors, stairway enclo sures and control stations where the thickness is not to exceed l.5 mm. Alternately, thicker veneers of low calorific value not exceeding 45 MJ/m^2 will be considered.

(11) Primary deck coverings, if applied, are to be of approved materials by the Society which will not readily ignite, or give rise to toxic or explosive hazards at elevated temperatures.

(12) Paints, varnishes and other finishes used on exposed interior surfaces are not to offer an un due fire hazard in the judgement of the Society and are not to be capable of producing ex cessive quantities of smoke or toxic fumes.

(13) Ventilation ducts shall be of steel or equivalent material. However, short ducts, not generally exceeding 2 m in length and with a free cross-sectional area not exceeding 0.02 m^2, need not be steel or equivalent subject to the following conditions :

(A) subject to (B), the ducts are made of a material which has low flame spread characteristics;

(B) the ducts shall be made of heat resisting non-combustible material, which may be faced internally and externally with membranes having low flame-spread characteristics and, in each case, a calorific value not exceeding 45 MJ/m^2 of their surface area for the thickness used;

(C) the ducts are only used at the end of the ventilation device; and

(D) the ducts are not situated less than 600 mm, measured along the duct, from an opening in an "A" or "B" class division including continuous "B" class ceiling.

(14) Where a thin plated duct with a free cross-sectional area equal to, or less than, 0.02 m^2 pass es through "A" class bulkheads or decks, the opening is to be lined with a steel sheet sleeve having a thickness of at least 3 mm and a length of at least 200 mm, divided preferably into 100 mm on each side of the bulkhead or, in the case of the deck, wholly laid on the lower side of the decks pierced. Where ventilation ducts with a free cross-sectional area exceeding 0.02 m^2 pass through "A" class bulkheads or decks, the opening is to be lined with a steel sheet sleeve. However, where such ducts are of steel construction and pass through a deck or bulkhead, the ducts and sleeves are to comply with the following:

(A) The sleeves are to have a thickness of at least 3 mm and a length of at least 900 mm. When passing through bulkheads, this length shall be divided preferably into 450 mm on each side of the bulkhead. These ducts, or sleeves lining such ducts, shall be provided with fire insulation. The insulation shall have at least the same fire integrity as the bulkhead or deck through which the duct passes; and

(B) Ducts with a free cross-sectional area exceeding 0.075 m^2 shall be fitted with fire dampers in addition to the requirements of paragraph (A). The fire damper shall operate automatically, but shall also be capable of being closed manually from both sides of the bulkhead or deck. The damper shall be provided with an indicator which shows whether the damper is open or closed. Fire dampers are not required, however, where ducts pass through spaces surrounded by "A" class divisions, without serving those spaces, provided those ducts have the same fire integrity as the divisions which they pierce. Fire dampers shall be easily accessible. Where they are placed behind ceilings or linings, these ceilings or linings shall be provided with an inspection door on which a plate reporting the identification number of the fire damper is provided. The fire damper identification number shall also be placed on any remote controls required.

(15) Ducts provided for ventilation of machinery spaces of Category A, galleys and hazardous areas are not to pass through accommodation or service spaces or control stations. However, ducts provided for ventilation of machinery spaces of Category A and galleys, excluding hazardous areas, may pass through accommodation or service spaces or control stations where they com ply with the conditions specified in paragraphs (A) to (D) or (E) and (F) below:

(A) the ducts are constructed of steel having a thickness of at least 3 mm and 5 mm for ducts the widths or diameters of which are up to and including 300 mm and 760 mm and over respectively and, in the case of such ducts, the widths or diameters of which are between 300 mm and 760 mm having a thickness obtained by interpolation;

(B) the ducts are suitably supported and stiffened;

(C) the ducts are fitted with automatic fire dampers close to the boundaries penetrated; and

(D) the ducts are insulated to "A-60" class standard from the machinery spaces, galleys, vehicle spaces, ro-ro spaces or special category spaces to a point at least 5 m beyond each fire damper; or

(E) the ducts are constructed of steel in accordance with paragraphs (A) and (B); and

(F) the ducts are insulated to "A-60" class standard throughout the accommodation spaces, service spaces or control stations.

(16) Ducts provided for ventilation of accommodation, service spaces or control stations are not to pass through machinery spaces of Category A, galleys and hazardous areas. However, ducts provided for ventilation to accommodation spaces, service spaces or control stations may pass through machinery spaces of category A and galleys excluding hazardous areas where they comply with the conditions specified in paragraphs (A) to (C) or (D) and (E) below:

(A) the ducts where they pass through a machinery space of category A and galley are constructed of steel in accordance with paragraphs (11) (A) and (11) (B);

(B) automatic fire dampers are fitted close to the boundaries penetrated; and

(C) the integrity of the machinery space and galley boundaries is maintained at the penetrations; or

(D) the ducts where they pass through a machinery space of category A and galley are constructed of steel in accordance with paragraphs (11) (A) and (11) (B); and

(E) the ducts are insulated to "A-60" standard within the machinery space and galley.

(17) Where they pass through accommodation spaces or spaces containing combustible materials, the exhaust ducts from galley ranges should be of equivalent fire integrity to “A” class divisions and each galley exhaust duct should be fitted with:

(A) a grease trap readily removable for cleaning;

(B) a fire damper located in the galley end of the duct which is automatically and remotely operated and, in addition a remotely operated fire damper located in the exhaust end of the duct;

(C) arrangements, operable from within the galley, for shutting off the exhaust fans; and

(D) fixed means for extinguishing a fire within the duct.

(18) The main inlets and outlets of all ventilation systems are to be capable of being closed from outside the spaces being ventilated.

(19) Power ventilation of accommodation spaces, service spaces, control stations, machinery spaces and hazardous areas is to be capable of being stopped from an easily accessible position out side the space being served. The accessibility of this position in the event of a fire in the spaces served is to be specially considered. The means provided for stopping the power ven tilation serving machinery spaces or hazardous areas are to be entirely separate from the means provided for stopping ventilation of other spaces.

(20) The ventilation of the accommodation spaces and control stations is to be arranged in such a way as to prevent the ingress of flammable, toxic or noxious gases, or smokes from surround ing areas.

202. Means of escape

1. Within the accommodation spaces, service spaces and control stations, the means of escape specified in the following (1) to (3) are to be provided.

(1) In every general area which is likely to be regularly manned or in which personnel are accommodated, at least two separate escape routes are to be provided, situated as far apart as practicable, to allow ready means of escape to the open decks and embarkation stations. Where, however, deemed appropriate by the Society in consideration of the nature and location of spaces and the number of persons who might normally be accommodated or employed there, one of these means of escape may be dispensed with.

(2) Stairways are normally to be used for means of vertical escape. Where, however, the installation of a stairway is shown to be impracticable, a vertical ladder may be used for one of the means of escape.

(3) Every escape route is to be readily accessible and unobstructed. All exit doors along the route are to be readily operable. Dead-end corridors exceeding 7 m in length are not to be provided.

(4) In addition to the emergency lighting, the means of escape in accommodation areas, including stairways and exits, is to be marked by lighting or photoluminescent strip indicators placed not more than 300 mm above the deck at all points of the escape route, including angles and intersections. The marking is to enable personnel to identify the routes of escape and readily

identify the escape exits. If electric illumination is used, it should be supplied by the emergency source of power and it is to be so arranged that the failure of any single light or cut in a lighting strip will not result in the marking being ineffective. Additionally, escape route signs and fire equipment location markings should be of photoluminescent material or marked by lighting. The Society is to ensure that such lighting or photoluminescent equipment has been evaluated, tested and applied in accordance with the FSS Code.

2. Two means of escape are to be provided from every machinery space of Category A by either one of the following (1) or (2). Where, however, deemed appropriate by the Society in consideration of the nature and location of spaces and the number of persons who might normally be employed there, one of these means of escape may be dispensed with.

(1) Two sets of steel ladders, as widely separated as possible, leading to doors in the upper part of the space similarly separated and from which access is provided to the open deck. In general, one of these ladders is to provide continuous fire shelter from the lower part of the space to a safe position outside the space. This shelter is to be of steel insulated to the satisfaction of the Society and be provided with a self-closing steel door at the lower end. However, in cases where a safe escape route from the lower part of this space is provided due to special arrangements or dimension of machinery space, the shelter may be dispensed with at the discretion of the Society.

(2) One steel ladder leading to a door in the upper part of the space from which access is provided to the open deck and additionally, in the lower part of the space and in a position well separated from the ladder referred to, a steel door capable of being operated from each side and which provides access to a safe escape route from the lower part of the space to the open deck.

3. From machinery spaces other than those of Category A, escape routes are to be provided to the satisfaction of the Society, having regard to the nature and location of the space and whether persons are normally employed in that space.

4. Lifts are not to be considered as forming one of the required means of escape.

5. Stairways and corridors used as a means of escape should meet the provisions of paragraph 13.3 of the FSS Code.

6. Emergency escape breathing devices are to comply with the following requirements.

(1) Emergency escape breathing devices are to comply with the Fire Safety Systems Code. Spare emergency escape breathing devices shall be kept onboard.

(2) In machinery spaces of category A containing internal combustion machinery used for main propulsion, EEBDs are to be positioned as follows:

(A) one (1) EEBD in the engine control room, if located within the machinery space;

(B) one (1) EEBD in workshop areas. If there is, however, a direct access to an escape way from the workshop, an EEBD is not required; and

(C) one (1) EEBD on each deck or platform level near the escape ladder constituting the second means of escape from the machinery space (the other means being an enclosed escape trunk or watertight door at the lower level of the space).

(D) Alternatively, a different number or location may be determined by the Society taking into consideration the layout and dimensions or the normal manning of the space.

(3) For machinery spaces of category A other than those containing internal combustion machinery used for main propulsion, one (1) EEBD is to, as a minimum, be provided on each deck or platform level near the escape ladder constituting the second means of escape from the space (the other means being an enclosed escape trunk or watertight door at the lower level of the space).

(4) For other machinery spaces, the number and location of EEBDs are to be determined by the Society.

Section 3 Fire Detection and Extinction

301. Fire pumps

1. At least two water supply sources (sea chests, valves, strainers and pipes) are to be provided and so arranged that one supply source failure will not put all supply sources out of action.
2. At least two independently driven power pumps are to be provided, each arranged to draw directly from the sea and discharge into a fixed fire main. However, in units with high suction lifts, booster pumps and storage tanks may be installed.
3. The arrangements of the pumps, sea suctions and sources of power are to be such as to ensure that a fire in any space would not put both the required pumps out of action.
4. At least one of the required pumps specified in **Par 2** is to be dedicated for fire-fighting duties and be available for such duties at all times.
5. Every centrifugal pump which is connected to the fire main is to be fitted with a non-return valve.
6. Where either of the required pumps is located in a space not normally manned and is relatively far removed from working areas, suitable means are to be made for remote start-up of that pump and remote operation of associated suction and discharge valves.
7. Except as provided in **Par 4,** sanitary, ballast, bilge or general service pumps may be accepted as fire pumps, provided that they are not normally used for pumping oil.
8. Each pump is to be capable of delivering at least one jet simultaneously from each of any two fire hydrants, hoses and 19 mm nozzles while maintaining a minimum pressure of 0.35 MPa (3.568 kg/cm^2) at any hydrant. In addition, where a foam system is provided for protection of the helicopter deck, the pump is to be capable of maintaining a pressure of 0.7 MPa at the foam installation.
9. Each of the fire pumps is to have a capacity appropriate to the fire-fighting services supplied from the fire main at the pressure specified in **Par 8**. In addition, where a foam system is provided for protection of the helicopter deck, the water consumption used for foam system is to be added to the pump capacity. If the water consumption for any other fire protection or fire-fighting purpose should exceed the rate of the helicopter deck foam installation, this consumption is to be the determining factor in calculating the required capacity of the fire pumps. Where more pumps than required are installed, their capacity should be to the satisfaction of the Society. In no case is the single pump capacity to be less than 25 m^3/h.
10. Relief valves are to be provided in conjunction with all pumps connected to the fire main if the pumps are capable of developing a pressure exceeding the design pressure of the fire main, hydrants and hoses. Such valves are to be so placed and adjusted as to prevent excessive pressure in the fire main system.
11. With the required fire pumps operating simultaneously, the pressure maintained in the fire mains is to be adequate for the safe and efficient operation of all equipment supplied therefrom.

302. Fire mains

1. The fire main is, where practicable, to be routed clear of hazardous areas and be arranged in such a manner as to make maximum use of any thermal shielding or physical protection afforded by the structure of the unit.
2. The fire main is to be provided with isolating valves located so as to permit optimum utilization in the event of physical damage to any part of the main.
3. The fire main is not to have connections other than those necessary for fire-fighting purposes.
4. The diameter of the fire main and water service pipes is to be sufficient for the effective distribution of the maximum required discharge from the two fire pumps operating simultaneously.
5. All practical precautions consistent with having water readily available are to be taken to protect the fire main against freezing.

6. Materials readily rendered ineffective by heat are not to be used for fire mains and hydrants unless adequately protected. The pipes and hydrants are to be so placed that the fire hoses may be easily coupled to them.

7. The surface unit is to be provided with at least one international shore connection complying with **Pt 8, Ch 8, 101. 7** of **Rules for the Classification of Steel Ships**. Facilities are to be available enabling such a connection to be used on any side of the unit.

303. Fire hydrants and fire hoses

1. The number and position of the hydrants are to be such that at least two jets of water, not emanating from the same hydrant, one of which is to be from a single length of fire hose, may reach any part of the unit normally accessible to those on board while the unit is being navigated or is engaged in offshore operations. A hose is to be provided for every hydrant.

2. A cock or valve is to be fitted to serve each fire hose so that any fire hose may be removed while the fire pumps are operating.

3. Fire hoses are to be of non-perishable material approved and are to be sufficient in length to project a jet of water to any of the spaces in which they may be required to be used. Each hose is to be provided with a nozzle and the necessary couplings. Fire hoses, together with any necessary fittings and tools, are to be ready for use at any time and should be kept in conspicuous positions near the water service hydrants or connections. Fire hoses are to have a length of at least 10 m, but not more than:
   (1) 15 m in machinery spaces;
   (2) 20 m in other spaces and open decks; and
   (3) 25 m for open decks on ships with a maximum breadth in excess of 30 m.

304. Nozzles

1. Dual purpose jet spray nozzles are to be fitted throughout the unit and standard nozzle sizes are to 12 mm, 16 mm and 19 mm or as near thereto as possible.

2. For accommodation and service spaces, a nozzle size greater than 12 mm need not be used.

3. For machinery spaces and exterior locations, the nozzle size is to be such as to obtain the maximum discharge possible from two jets at the pressure specified in paragraph **301. 7** from the smallest pump, provided that a nozzle size greater than 19 mm need not be used.

305. Intermediate tanks

For water injection type fire extinguishing system in which an intermediate tank is employed due to the height of the units, the intermediate tank is to be in accordance with the requirements in the followings.

(1) The intermediate tanks are to be of such size and so operated that the lowest water level permitted will ensure that the supply of water is adequate for two hoses at a minimum of 0.35 MPa (3.568 kg/cm^2) nozzle pressure at the uppermost hydrant for at least 15 minutes. Minimum tank capacity is to be 10 m^3.

(2) A ballast tank which complies with the requirements specified in (1) may be used for the intermediate tank.

(3) Valves and pumps serving the intermediate tank which are not readily accessible are to be provided with means for remote operation.

(4) A low water level alarm is to be fitted.

(5) Two reliable and adequate means to replenish water in the intermediate tank are to be provided. These pumps are to be arranged in accordance with **301.** and at least one of the replenishment pumps is to be arranged for automatic operation.

(6) If the unit is intended to operate in cold weather, the fire-fighting system and the intermediate tank are to be protected from freezing.

306. Fire extinguishing systems in machinery spaces and in spaces containing fired processes

1. Where main or auxiliary oil-fired boilers and other fired processes of equivalent thermal rating are situated, or in spaces containing oil fuel units or settling tanks, the unit is to be provided with the following:

(1) One of the following fixed fire-extinguishing systems is to be provided.
(A) a fixed pressure water-spraying system
(B) a fixed fire-extinguishing system
(C) a fixed high expansion foam installation
Where the machinery space and spaces containing fired processes are not entirely separate, or if fuel oil can drain from the latter spaces into the machinery space, the combined machinery space and fired process space are to be considered as one compartment.

(2) At least two approved portable foam extinguishers or equivalent in each space containing a fired process and each space in which a part of the oil fuel installation is situated. In addition, at least one extinguisher of the same description with a capacity of 9 litres for each burner, provided that the total capacity of the additional extinguisher or extinguishers need not exceed 45 litres for any one space.

(3) A receptacle containing sand, sawdust impregnated with soda, or other approved dry material in such quantity as may be required by the Society. An approved portable extinguisher may be provided as an alternative.

2. The following arrangements are to be provided in the spaces containing internal combustion machinery used either for main propulsion or for other purposes when such machinery has a total power output of not less than 750 kW.

(1) One of the fixed arrangements required by **301. 1.**

(2) One approved foam-type extinguisher of not less than 45 litres capacity or equivalent in every engine space and one approved portable foam extinguisher for each 750 kW of engine power output or part thereof. The total number of portable extinguishers so supplied are to be not less than two and need not exceed six.

3. The Society is to give special consideration to the fire extinguishing arrangements to be provided in spaces not fitted with fixed fire extinguishing installations containing steam turbines which are separated from boiler rooms by watertight bulkheads.

4. Where a fire hazard exists in any machinery space for which no specific provisions for fire extinguishing appliances are prescribed in **Par 1** to **3**, there is to be provided in, or adjacent to, that space a number of approved portable fire extinguishers or other means of fire extinction to the satisfaction of the Society.

307. Portable fire extinguishers in accommodation space, service spaces, machinery spaces and working spaces

1. Except for the supplemental arrangements provided in **Par 2**, portable fire extinguishers in accommodation spaces, service spaces, control stations, machinery spaces of category A, other machinery spaces, cargo spaces, weather deck and other spaces should be provided in number and arrangement in accordance with **Pt 8, Ch 8, 202.** of **Guidance Relating to the Rules for the Classification of Steel Ships**.

2. **Table 9.3** contains supplemental recommendations for number and distribution of additional portable fire extinguishers on units. Where the recommendations in **Table 9.3** differ from **Pt 8, Ch 8, 202.** of **Guidance Relating to the Rules for the Classification of Steel Ships**, the provisions of **Table 9.3** is to be followed. Classes of extinguishers are to be in accordance with Res.A 951(23)

Table 9.3 Numbers and distribution of additional portable extinguishers on units

Type of spaces	Minimum number of extinguishers(1)	Class(es) of extinguisher(s)
Space containing the controls for the main source of electrical power	1 (1 additional extinguisher suitable for electrical fires when main switchboards are arranged in the space)	A and/or C
Cranes with electric motors or hydraulics	0	
Cranes with internal combustion engine	2 (1 in cab and 1 at exterior of engine compartment)	B
Helidecks	In accordance with **402.**	B
Machinery spaces of category A	In accordance with **306.**	B
Machinery spaces of category A which are periodically unattended	At each entrance in 306. in accordance with **306.**(2)	B
Main switchboards	2 in the vicinity	C

Notes :
(1) Minimum size is to be in accordance with paragraph 3.1.1 of Chapter 4 of the FSS Code.
(2) A portable extinguisher provided for that space may be located outside near the entrance to that space. A portable fire extinguisher placed outside near the entrance to that space may also be considered as satisfying the provisions for the space in which it is located.

308. Fire detection and alarm system

1. Spaces having a fire risk, in principle, are to be provided with an automatic fire detection and alarm system.

2. In selecting the type of detectors, their following features should be taken into account:
(1) Capability to detect fire at the incipient stage;
(2) Ability to avoid spurious alarm and trips; and
(3) Suitability to the located environment.

3. The fire detection main indicator board is to be at a manned control station and is to be clearly to indicate where fire has been detected.

4. An automatic fire detection and alarm system is to be provided in all accommodation and service spaces. Accommodation spaces are to be fitted with smoke detectors. Thermal detectors are to be fitted in galleys.

5. A fixed fire detection and fire alarm system should be installed in:
(1) periodically unattended machinery spaces; and
(2) machinery spaces where:
(A) the installation of automatic and remote control system and equipments has been approved in lieu of continuous manning of the spaces, and
(B) the main propulsion and associated machinery, including the main sources of electrical power, are provided with various degrees of automatic or remote control and are under continuous manned supervision from a control room.
(3) enclosed separate spaces containing incinerators

6. Smoke detectors are to be provided in all electrical rooms and control stations.

7. Sufficient manual fire alarm stations are to be installed throughout the accommodation spaces, service spaces and control stations. One manually operated call point is to be located at each exit. Manually operated call points are to be readily accessible in the corridors of each deck such that no part of the corridor is more than 20 m from a manually operated call point. Measures are to be taken to prevent inadvertent operation of the manual call alarm system.

309. Flammable gas detection and alarm system

1. A fixed automatic gas detection and alarm system is to be provided to monitor continuously all enclosed areas of the unit in which an accumulation of flammable gas may be expected to occur and capable of indicating at the main control point by aural and visual means the presence and location of an accumulation.
2. At least two portable gas monitoring devices are to be provided, each capable of accurately measuring a concentration of flammable gas.

310. Fire-fighters' outfits

1. At least two fire-fighters' outfits complying with the relevant requirements of the FSS Code are to be provided, each with portable instruments for measuring oxygen and flammable vapour concentrations acceptable to the Society.
2. Two spare charges are to be provided for each required breathing apparatus. Units that are equipped with suitably located means for fully recharging the air cylinders free from contamination need carry only one spare charge for each required apparatus.
3. The fire-fighters' outfits are to be kept ready for use in an easily accessible location that is permanently and clearly marked and, where more than one fire-fighter's outfit or more than one set of personal equipment is carried, they are to be stored in widely separated positions.

311. Recharging of air cylinders

1. The apparatus for recharging air cylinders, if provided, is to have its power supplied from the emergency supply or be independently diesel-powered, or be so constructed or equipped that the air cylinders may be used immediately after recharging.
2. The apparatus is to be suitably located in a sheltered space above main deck level on the unit.
3. Intakes for air compressors is to draw from a source of clean air.
4. The air is to be filtered after compression to eliminate compressor oil contamination.
5. The recharging capacity is to be accordance with **Pt 8, Ch 8, 902.** of **Rules for the Classification of Steel Ships**.

312. Arrangements in machinery and working spaces

1. Means are to be provided for stopping ventilating fans serving machinery and working spaces and for closing all doorways, ventilators, annular spaces around funnels and other openings to such spaces. These means are to be capable of being operated from outside such spaces in case of fire.
2. Machinery driving forced and induced draught fans, electric motor pressurization fans, oil fuel transfer pumps, oil fuel unit pumps and other similar fuel pumps are to be fitted with remote controls situated outside the space concerned so that they may be stopped in the event of a fire arising in the space in which they are located.
3. Every oil fuel suction pipe from a storage, settling or daily service tank situated above the double bottom is to be fitted with a cock or valve capable of being closed from outside the space concerned in the event of a fire arising in the space in which such tanks are situated. In the special case of deep tanks situated in any shaft or pipe tunnel, valves on the tanks are to be fitted but control in the event of fire may be effected by means of an additional valve on the pipeline or lines outside the tunnel or tunnels.

Section 4 Fire Extinguishing Systems for Helicopter Facilities

401. General

Units fitted with facilities for helicopters are to meet the following functional provisions:

(1) Helideck structure should be adequate to protect the unit from the fire hazards associated with helicopter operations;

(2) Fire fighting appliances are to be provided to adequately protect the unit from the fire hazards associated with helicopter operations;

(3) Refuelling facilities and operations are to provide the necessary measures to protect the unit from the fire hazards associated with helicopter operations; and

(4) Each helicopter facility is to have an operations manual and training is to be provided.

(5) the fire fighting systems equipment as given in **402.** are to be provided and so arranged as to adequately protect both the helicopter deck and fuel storage areas.

402. Helicopter decks and refueling facilities

1. Hoses and nozzles : at least two approved combination nozzle and applicators and hoses sufficient in length to reach any part of the helicopter deck are to be provided.

2. Portable extinguishers : at least two dry powder extinguishers of a total capacity of not less than 45 kg, but not less than 9 kg each, are to be provided.

3. Back-up fire fighting system : A back-up fire fighting system is to be provided, consisting of CO_2 extinguishers of a total capacity of not less than 18 kg or equivalent, one of these extinguishers being so equipped as to enable it to reach the engine area of any helicopter using the deck. The back-up system is to be located so that the equipment would not be vulnerable to the same damages as the primary extinguishing system.

4. Fixed foam system :

(1) A suitable foam application system, consisting of monitors or foam making branch pipes capable of delivering foam solution at a rate of not less than 6.0 ℓ/m^2-min(4.1 ℓ/m^2-min for Aqueous Film Forming Foam or Film-Forming Fluoroprotein Foam) of the areas protected(the area of a circle of diameter “D” where “D” is the distance across the main rotor and tail rotor in the fore and aft line of a helicopter) for at least 5 minutes, is to be provided.

(2) Foam delivery at the minimum application rate is to start within 30 s of system activation. The operation of the foam system is not to interfere with simultaneous operation of the fire main.

(3) The principal agent shall be suitable for use with salt water and conform to performance standards not inferior to those acceptable to the IMO Organization(Refer to the International Civil Aviation Organization Airport Services Manual, part 1, Rescue and Fire Fighting, chapter 8, Extinguishing Agent Characteristics, paragraph 8.1.5, Foam Specifications table 8-1, level ‘B’).

5. In addition to the requirement of **308.**, two fire-fighter’s outfits; and

6. At least the following equipment is to be stored in a manner that provides for immediate use and protection from the elements:

- adjustable wrench;
- blanket, fire resistant;
- cutters, bolt 60 cm;
- hook, grab or salving;
- hacksaw, heavy duty complete with 6 spare blades;
- ladder;
- lift line 5 mm diameter × 15 m in length;
- pliers, side cutting;
- set of assorted screwdrivers; and
- harness knife complete with sheath.
- crowbar

7. Drainage facilities in way of helidecks shall be constructed of steel and shall lead directly overboard independent of any other system and shall be designed so that drainage does not fall onto any part of the ship.

8. Where the unit has helicopter refuelling, the following provisions should be complied with:

(1) A designated area shall be provided for the storage of fuel tanks which are to be:
  (A) as remote as is practicable from accommodation spaces, escape routes and embarkation stations; and
  (B) isolated from areas containing a source of vapour ignition;

(2) The fuel storage area is to be provided with arrangements whereby fuel spillage may be collected and drained to a safe location;

(3) Tanks and associated equipment are to be protected against physical damage and from a fire in an adjacent space or area;

(4) Vent heads of an approved type with flame arrestors are to be fitted to vent pipes.

(5) Where portable fuel storage tanks are used, special attention shall be given to:
  (A) design of the tank for its intended purpose;
  (B) mounting and securing arrangements;
  (C) electric bonding; and
  (D) inspection procedures;

(6) Storage tank fuel pumps are to be provided with means which permit shutdown from a safe remote location in the event of a fire. Where a gravity fuelling system is installed, equivalent closing arrangements are to be provided to isolate the fuel source;

(7) The fuel pumping unit is to be connected to one tank at a time. The piping between the tank and the pumping unit is to be of steel or equivalent material, as short as possible, and protected against damage;

(8) Electrical fuel pumping units and associated control equipment are to be of a type suitable for the location and potential hazards;

(9) Fuel pumping units are to incorporate a device which will prevent over-pressurization of the delivery or filling hose;

(10) Equipment used in refuelling operations is be electrically bonded;

(11) "NO SMOKING" signs are to be displayed at appropriate locations.

403. Alarm systems

In areas of helicopter facilities, a manual fire alarm is to be provided at each of two spots properly separated each other.

Section 5 Gas cylinders

501. Storage of gas cylinders

1. Where more than one cylinder of oxygen and more than one cylinder of acetylene are carried simultaneously, such cylinders are to be arranged in accordance with the following:

(1) Permanent piping systems for oxyacetylene systems are acceptable provided that they are designed having due regard to standards and codes of practice to the satisfaction of the Administration.

(2) Where two or more cylinders of each gas are intended to be carried in enclosed spaces, separate dedicated storage rooms are to be provided for each gas.

(3) Storage rooms are to be constructed of steel, and be well ventilated and accessible from the open deck.

(4) Provision is to be made for the expeditious removal of cylinders in the event of fire.

(5) “NO SMOKING” signs are to be displayed at the gas cylinder storage rooms.

(6) Where cylinders are stowed in open locations, means are to be provided to:
  (A) protect cylinders and associated piping from physical damage;
  (B) minimize exposure to hydrocarbons; and
  (C) ensure suitable drainage.

2. Fire-extinguishing arrangements for the protection of areas or spaces where such cylinders are stored should be to the satisfaction of the Society.

Section 6 Offshore Accommodation Unit

601. General

The fire extinguishing system of the offshore accommodation unit is to be in accordance with the requirements with necessary modifications in relevant international conventions and national regulations, in addition to the requirements specified in **Sec 3** to **4.** Where, however, the fire extinguishing system on the shore is used together, the requirements may be suitably modified. ⚓

CHAPTER 10 MACHINERY INSTALLATIONS AND ELECTRICAL EQUIPMENT

Section 1 Machinery Installations and Electrical Equipment for Units

101. General

1. Application

(1) The requirements in this Section apply to engines, shaftings and power transmission gears, boilers, pressure vessels, auxiliaries, piping arrangements(hereinafter referred to as "machinery") and electrical equipment installed in units.

(2) In addition to the requirements in this Section, the requirements relevant to the machinery and electical equipment in **Ch 11** and in **Pt 5** and **Pt 6** of **Rules for the Classification of Steel Ships** are also to be complied with depending upon the service of the unit.

2. Conditions of inclinations

(1) All machinery, components and systems essential to the safe operation of a unit are to be designed to operate under the following static conditions of inclination :

(A) when column-stabilized units are upright and inclined to an angle up to 15° in any direction :

(B) when self-elevating units are upright and inclined to an angle up to 10° in any direction :

(C) when surface units are upright and level trim and when inclined to an angle of list up to 15° either way and simultaneously trimmed to an angle up to 5° by the bow or stern.

The Society may permit or require deviations from these angles, in consideration of the type, size and service conditions of the unit.

(2) The emergency generator and its prime mover and any emergency accumulator battery are to be designed to function at full rated power when upright and when inclined up to the maximum angle of heel in the intact and damaged condition, as determined in accordance with **Ch 7**. However, in no case need the equipment be designed to operate when inclined more than:

(A) 25° in any direction on a column-stabilized unit :

(B) 15° in any direction on a self-elevating unit. : and

(C) 22.5° about the longitudinal axis and/or when inclined 10° about the transverse axis on a surface unit.

3. Terminology

(1) The systems essential for the safety of the units are those listed below :

(A) Anchor handling systems

(B) Mooring systems

(C) Fire extinguishing systems

(D) Bilge systems

(E) Ballast systems

(F) Jacking systems

(G) Lighting systems

(H) Interior communication systems

(I) Ventilation systems in the compartments in which internal combustion engines or boilers are installed or other compartments required to be ventilated

(J) Feed water systems and burning systems for boilers which supply steam to any one of the systems prescribed in (A) to (I) and (K).

(K) Electric power plant and their starting arrangements (hereinafter referred to as "main source of electrical power") for the systems prescribed in (A) to (J), lighting systems required by the National or International Regulations to be installed in the units such as navigation lights, signal lights and for the radio equipment

(L) Other systems considered necessary by the Society

(2) Restricted service unit is a unit whose navigation route or service area is limited to the coastal waters, smooth waters or equivalent.

4. Alternative design and arrangements

When alternative design or arrangements deviate from the prescriptive provisions of this chapter, an engineering analysis, evaluation and approval of the design and arrangements should be carried out in accordance with SOLAS regulation II-1/55.

5. General

(1) All machinery, electrical equipment, boilers and other pressure vessels, associated piping systems, fittings and wiring is to be of a design and construction adequate for the intended service.
(2) The machinery is to be so designed, manufactured and installed as to reduce to a minimum any danger to the units and persons on board under the normal service condition.
(3) The design is to have regard to materials used in construction, and to the marine and industrial purposes for which the equipment is intended, the working conditions and the environmental conditions to which it will be subjected. Consideration is to be given to the consequences of the failure of systems and equipment essential to the safety of the unit.
(4) The moving parts, hot surfaces and the live parts of the machinery are to be arranged with suitable protections, so that persons will be kept from getting injured.
(5) The machinery is to be so constructed that any combustible or unhealthy gases will not leak out under the normal service condition.
(6) The machinery is to be located in well ventilated spaces capable of discharging the gases mentioned in (3).
(7) Adequate provisions are to be made to facilitate inspection and maintenance of the machinery including boilers and other pressure vessels.
(8) Where it is intended to burn fuels of a flash point below 60 °C, closed cup test, this fact is to be indicated clearly on the arrangement submitted. The use of fuels of a flash point lower then 43 °C, closed cup test, will require special consideration of storage and handling facilities and controls as well as the electrical installation and ventilation provisions.
(9) All boilers, all parts of machinery, all steam, hydraulic, pneumatic and other systems and their associated fittings which are under internal pressure are to be subjected to appropriate tests including a pressure test before being put into service for the first time.
(10) Where risk from overspeeding of machinery exists, means are to be provided to ensure that the safe speed is not exceeded.
(11) Where machinery including pressure vessels or any parts of such machinery are subject to internal pressure and may be subject to dangerous overpressure, means are to, where applicable, be provided which will protect against such excessive pressure.
(12) Machinery, where applicable, is to be provided with automatic shutoff arrangements or alarms in the case of failures, such as lubricating oil supply failure, which could lead rapidly to complete breakdown, damage or explosion.
(13) Means are to be provided whereby normal operation of vital systems, such as ballast systems in semi-submersible units, jacking systems in self-elevating units and blow-out preventers, can be sustained or restored even though one of the essential auxiliaries becomes inoperable.
(14) Means are to be provided to ensure that machinery can be brought into operation from the "dead ship" condition without external aid.

102. Engines, shaftings and power transmission gears

1. Internal combustion engines

(1) General construction, safety devices, installation, exhaust arrangements and fuel oil arrangements of internal combustion engines are to be in accordance with the requirements in **Pt 5, Ch 2, Sec 2** and **Ch 6, Sec 6** and **9** of **Rules for the Classification of Steel Ships** respectively. However, the requirement in **Pt 5, Ch 2, 203. 10** of **Rules for the Classification of Steel Ships** for alarming devices of lubricating oil supply is only applied for engines for the main source of electrical power and for engines for the power plant of jacking systems.
(2) Internal combustion engines used for the systems essential for the safety of the units are to be in accordance with the requirements in **Pt 5, Ch 2, Sec 2** of **Rules for the Classification of Steel Ships**.
(3) Internal combustion engines are not to be installed in the hazardous areas as delineated in **Ch 8, Sec 2.** Where they are unavoidably installed, special consideration is to be given to the arrangement to eliminate the risk of ignition of inflammable or explosive gases existing around these engines.

(4) Exhaust outlets of internal combustion engines are to be fitted with suitable spark arresting devices and to discharge outside the hazardous areas. Exhaust pipe insulation, if fitted, is to be protected against possible oil absorption.
(5) Air intakes for internal combustion engines are to be not less than 3 m from the hazardous areas as delineated in **Ch 8, Sec 2.**

2. Steam turbines

(1) Steam turbines are to be provided with overspeed protective devices to prevent the design speed from being exceeded by more than 15 %.
(2) Steam turbines used for the systems essential for the safety of the units are to be in accordance with the requirements in **Pt 5, Ch 2, Sec 3** of **Rules for the Classification of Steel Ships**.

3. Gas turbines

Gas turbines are to be in accordance with the requirements in **Pt 5, Ch 2, Sec 4** of **Rules for the Classification of Steel Ships**.

4. Stern bearings and sealings of propeller shafts

Where the units with propulsion machinery are impractical to dock, the units are to be designed to enable the measurement of weardown of the stern bearings and the inspection and repair of bearings and sealings in a floating condition.

5. Power transmission gears

All gearing, shafts and couplings used for transmission of power to machinery are to be designed and constructed so that they will withstand the maximum working stresses to which they may be subjected in all service conditions, taking into account the type of engines by which they are driven or of which they form part.

103. Boilers and pressure vessels

1. Boilers and pressure vessels are to be in accordance with the requirements in **Pt 5, Ch 5** of **Rules for the Classification of Steel Ships**.

2. Boilers are not to be installed in the hazardous areas as delineated in **Ch 8, Sec 2.**

3. Exhaust outlets of boilers are to be located outside the hazardous areas.

104. Auxiliaries and piping arrangements

1. General

(1) Auxiliaries and piping arrangements are to be in accordance with the requirements in this Article as well as those in **Pt 5, Ch 6** of **Rules for the Classification of Steel Ships**.
(2) Pipes are to be arranged inboard of the zone of assumed damage penetration in **Ch 7, 104.** unless special consideration has been taken in the damage stability review.
(3) Where valves of piping systems are arranged for remote control and are power-operated, a secondary means of operating the valves which may be manually controlled, is to be provided.
(4) Piping systems carrying non-hazardous fluids are generally to be separated from piping systems which may contain hazardous fluids. Cross connection of the piping systems may be permitted where means for avoiding possible contamination of the non-hazardous fluid system by the hazardous medium are provided.
(5) For prevention of ignition possibility, exhaust pipe insulation, if fitted, is to be encased in steel sheathing or equivalent material against possible flammable oil absorption.

2. Feed water systems and fuel oil burning systems for boilers

For boilers intended to supply steam for other than the systems or the equipment for the safety of the unit and for the propulsion of the unit (only applicable to the unit which has the main propulsion machinery), only one feed water piping and pump and fuel oil burning system for boilers may be acceptable notwithstanding the requirements in **Pt 5, Ch 6, Sec 5** and **6** of **Rules for the Classification of Steel Ships**.

3. Arrangements for oil fuel, lubricating oil and other flammable oils

(1) Arrangements for the storage, distribution and utilization of oil fuel and pressure lubrication systems are to be such as to ensure the safety of the unit and persons on board.

(2) Arrangements for the storage, distribution and utilization of other flammable oils employed under pressure in power transmission systems, control and activating systems and heat transfer systems are to be such as to ensure the safety of the unit and persons on board.

(3) In machinery spaces pipes, fittings and valves carrying flammable oils are to be of a material approved by the Society.

(4) Location and arrangement of vent pipes for fuel oil service, settling and lubrication oil tanks are to be such that, in the event of a broken vent pipe, the risk of ingress of rainwater or seawater is minimized.

(5) Two fuel oil service tanks for each type of fuel used on board necessary for propulsion and vital systems or equivalent arrangements are to be provided, each with a capacity of at least eight hours at the maximum continuous rating of the propulsion plant, if any, and normal operating load of the generator plant.

(6) High pressure fuel delivery lines

(A) All external high pressure fuel delivery lines between the high pressure fuel pumps and fuel injectors are to be protected with a jacketed piping system capable of containing fuel from a high pressure line failure. A jacketed pipe incorporates an outer pipe into which the high pressure fuel pipe is placed forming a permanent assembly. The jacketed piping system is to include a means for collection of leakages and arrangements are to be provided for an alarm to be given of a fuel line failure.

(B) All surfaces with temperatures above 220°C, which may be impinged as a result of a fuel system failure, are to be properly insulated.

(C) Oil fuel lines are to be screened or otherwise suitably protected to avoid, as far as practicable, oil spray or oil leakages onto hot surfaces, into machinery air intakes, or other sources of ignition. The number of joints in such piping systems is to be kept to a minimum.

4. Compressed air systems

(1) Pressure-relief valves are to be provided to prevent excess pressure in any part of compressed air systems and where water jackets or casings of air compressors and coolers might be subjected to dangerous excess pressure due to leakage into them from air pressure parts.

(2) The starting air arrangements for internal combustion engines are to be adequately protected against the effects of backfiring and internal explosions in the starting air pipes.

(3) Starting air pipes from the air receivers to internal combustion engines are to be entirely separate from the compressor discharge pipe system.

(4) Provision is to be made to reduce to a minimum the entry of oil into the starting air pressure systems and to drain these systems.

5. Bilge systems

(1) An efficient bilge pumping system is to be provided, capable of pumping from and draining watertight compartments other than spaces permanently appropriated for the carriage of liquid and for which other efficient means of pumping are provided, under all practical conditions whether the unit is upright or inclined, as specified in **101. 2**. Additional suctions are to be provided in large compartments or compartments of unusual form, as deemed necessary by the Society. In addition to bilge piping arrangements required by (10) below, means are to be provided to detect the presence of water in such compartments which are adjacent to the sea or adjacent to tanks containing liquids and in void compartments through which pipes conveying liquids pass. If the Society is satisfied that the safety of the unit is not impaired, the means to detect the presence of water may be dispensed with.

(2) Emergency bilge suctions may be dispensed with notwithstanding the requirements in **Pt 5, Ch 6, 403. 6** of **Rules for the Classification of Steel Ships**.

(3) For units subject to the requirements in this Section, the requirements for the direct bilge suctions prescribed in **Pt 5, Ch 6, Sec 4** of **Rules for the Classification of Steel Ships** are only applied for compartments under the load line containing the main source of electric power. Where, however, these compartments are pumped up by exclusive bilge pumps, the direct bilge suctions may be dispensed with.

(4) Notwithstanding the requirements in **Pt 5, Ch 6, Sec 4** of **Rules for the Classification of Steel Ships**, in determination of the internal diameters of the main bilge line and the branch

bilge suctions, the following requirements are to be complied:

(A) Branch bilge suction pipes from each compartment are to be of the internal diameter obtained from the following formula or the standard pipes of internal diameter nearest to the calculated diameter. In case where the internal diameter of such standard pipes is short of the calculated value by 5 mm or more, standard pipes of one grade higher diameter are to be used. The internal diameter of any bilge line is not to be less than 50 mm.

$$d = 2.15\sqrt{A} + 25 \quad (\text{mm})$$

where :

d : Internal diameters of the branch bilge suctions (mm).

A : Wetted surface of the compartment, excluding stiffening members when the compartment is half filled with water (m^2).

(B) The cross sectional area of the main bilge line is not to be less than the combined areas of the two largest branch suctions.

(5) The capacity, Q, of each bilge pumping unit or bilge pump is not to be less than that required by the following formula.

$$Q = 5.66 d_m^2 10^{-3} \quad (\text{m}^3/\text{hr})$$

where:

d_m = Required internal diameter of main bilge line (mm)

(6) Taking account of purposes and operating mode of the units, the Society may accept one bilge pump notwithstanding the requirements in **Pt 5, Ch 6, Sec 4** of **Rules for the Classification of Steel Ships**.

(7) The following additional provisions are applicable to column-stabilized units:

(A) Chain lockers which, if flooded, could substantially affect the unit's stability are to be provided with a remote means to detect flooding and a permanently installed means of dewatering. Remote indication of flooding is to be provided at the central ballast control station.

(B) At least one of the pumps referred to in (8) and pump-room bilge suction valves are to be capable of both remote and local operation.

(C) Propulsion rooms and pump-rooms in lower hulls are to be provided with two independent systems for high bilge water level detection providing an audible and visual alarm at the central ballast control station.

(8) At least two self-priming power pumps connected to each bilge main should be provided. Ballast, sanitary and general service pumps may be accepted as independent power bilge pumps if fitted with the necessary connections to the bilge pumping system. Ejectors and their associated pumps which are so arranged as to be capable of discharging bilge effectively will be considered as power bilge pumps prescribed in **Pt 5, Ch 6, Sec 4 405. 1** (3) of **Rules for the Classification of Steel Ships**.

(9) Compartments below deck containing essential equipment for operation and safety of the unit are to have a permanently installed bilge or drainage system. These compartments are to be drained with at least two bilge pumps, or equal.

(10) All distribution boxes and manually operated valves in connection with the bilge pumping arrangements are to be in positions which are accessible under normal circumstances. Where such valves are located in normally unmanned spaces below the assigned load line and not provided with high bilge water level alarms, they are to be operable from outside the spaces.

(11) Chain lockers are to be capable of being drained by a permanently installed bilge or drainage system or by portable means. Means are to be provided for removal of mud and debris from the bilge or drainage system.

(12) Void compartments adjacent to the sea or to tanks containing liquids, and void compartments through which piping conveying liquids passes, are to be drained by permanently installed bilge or drainage systems or by portable means. If portable pumps are used, two are to be provided and both pumps and arrangements for pumping are to be readily accessible. Void compartments

as defined above which are not provided with bilge or drainage systems in compliance with the above are to be accounted for the stability analysis in the unit.

(13) Drainage of hazardous areas is to be given special consideration having regard to the risk of explosion. Hazardous and non-hazardous areas are to be provided with separate drainage or pumping arrangements.

(14) A means to indicate whether a valve is open or closed is to be provided at each location from which the valve can be controlled. The indicator is to rely on movement of the valve spindle.

(15) All bilge pipes are to be of steel or other suitable material having properties acceptable to the Society. Special consideration is to be given to the design of bilge lines passing through bal last tanks taking into account effects of corrosion or other deterioration.

(16) The arrangement of the bilge pumping system is to be such as to prevent the possibility of wa ter passing from the sea into dry spaces, or inadvertently from one compartment to another.

6. Ballast systems for column-stabilized units

(1) Suitable ballast systems are to be provided to the units for which the ballasting and de-ballasting are essential for the safe operation during service and navigation.

(2) For column-stabilized units, the ballast systems are to consist of two or more adequate means by way of pumps or other suitable apparatuses, and they are to be capable of ballasting and de-ballasting all compartments even when one of them is out of service. The ballast pumps are to be of the self-priming type or be provided with a separate priming system.

(3) It is to be possible to supply each ballast pump required by (2) above from the emergency source of electrical power. The arrangements are to be such that the system is capable of restoring the unit from an inclination specified in **101. 2** (1) to a level trim and safe draught condition after loss of any single component in the power supply system.

(4) Sounding devices of approved type are to be provided in the ballast tanks in the lower hulls of the column-stabilized units. However, for the units to be used at both the high and low predetermined ballast water levels, the sounding devices may be substituted by alarming devices which will alarm at either of these levels.

(5) The system is to be capable of raising the unit, starting from a level trim condition at the deepest normal operating draft, to the severe storm draft, or a greater distance as may be specified by the Society, within three hours.

(6) The ballast system is to be arranged to prevent the inadvertent transfer of ballast water from one quadrant to any other quadrant of the unit. The system is also to be arranged so that the transfer of ballast water from one tank to any other tank through a single valve is not possible except where such a transfer could not adversely affect the stability of the unit.

(7) The ballast system is to be arranged so that even with any one pump inoperable, it is capable of restoring the unit to a level trim condition and draft acceptable to the Society with respect to stability, when subject to the damage conditions specified in **Ch 7, Sec 1**. The Society may permit counter-flooding as an operational procedure. Counter-flooding is not to be considered as a means to improve the suction head available to the ballast pumps when considering the operability of the ballast system after the damage specified in **Ch 7, Sec 1**.

(8) A central ballast control station should be provided. It is to be located above the worst damage waterline and in a space not within the assumed extent of damage referred to in **Ch 7** and adequately protected from weather. It is to be provided with the following control and indicating systems, having appropriate audible and visual alarms:
- (A) ballast pump control system;
- (B) ballast pump status-indicating system;
- (C) ballast valve control system;
- (D) ballast valve position-indicating system;
- (E) tank level indicating system;
- (F) draught indicating system;
- (G) trim and heel indicators;
- (H) power availability indicating system (main and emergency);
- (I) ballast system hydraulic/pneumatic pressure-indicating system.

(9) In addition to remote control of the ballast pumps and valves from the central ballast control station, all ballast pumps and valves are to be fitted with independent local control operable in the event of remote control failure. The independent local control of each ballast pump and of its associated ballast tank valves is to be in the same location.

her so that a failure in any one system will not affect the operation of the other systems.

(10) The control and indicating systems listed in (8) are to function independently of one another, or have sufficient redundancy, such that a failure in one system does not jeopardize the operation of any of the other systems.

(11) The ballast tank level indicating system required by (8) above is to provide means specified in the following (A) and (B).

(A) A means to indicate liquid levels in all ballast tanks. A secondary means of determining levels in ballast tanks, which may be a sounding pipe, is to be provided. Tank level sensors are to not be situated in the tank suction lines;

(B) A means to indicate liquid levels in tanks which, in view of the Society, could affect the stability of the unit. Tank level sensors are not to be situated in the tank suction lines.

(12) The draught indicating system required by (8) above is to indicate the draught at each corner of the unit or at representative positions as deemed appropriate by the Society.

(13) Each power-actuated valve is to fail to the closed position upon loss of control power. Upon reactivation of control power, each such valve is to remain closed until the reactivation of the system is assumed. The Society may accept ballast valve arrangements that do not fail to the closed position upon loss of power provided that the Society is satisfied that the safety of the unit is not impaired.

(14) A means is to be provided at the central ballast control station to isolate or disconnect the ballast pump control and ballast valve control systems from their sources of electrical, pneumatic or hydraulic power.

(15) All valves and valve control systems for their function are to be clearly marked. A means to indicate whether a valve is open or closed is to be provided at each location from which the valve can be controlled. The indicator is to rely on movement of the valve spindle.

(16) A permanently installed means of communication, independent of the unit's main source of electrical power, is to be provided between the central ballast control station and spaces that contain ballast pumps or valves, or other spaces that may contain equipment necessary for the operation of the ballast system.

(17) All ballast pipes are to be of steel or other suitable material having properties acceptable to the Society. Special consideration should be given to the design of ballast lines passing through ballast tanks, taking into account effects of corrosion or other deterioration.

7. Air pipes and sounding pipes

(1) Air pipe openings and discharge openings of overflow pipes are to be located above the final calculated immersion line in the assumed damage condition specified in **Ch 7,** and are to be positioned outside the extent of damage, as defined in **Ch 7.**

(2) Air pipes and overflow pipes which could cause progressive flooding are to be considered in the damage stability review.

(3) Where the air pipes or sounding pipes for the ballast tanks in the lower hulls of the column-stabilized units are exposed to sea water under the load water line, these pipes are to have sufficient thickness against corrosion and to be protected from mechanical damage or to have sufficient strength.

(4) One air pipe may be acceptable for certain tanks notwithstanding the requirements in **Pt 5, Ch 6, Sec 2** of **Rules for the Classification of Steel Ships** provided that the Society considered satisfactory taking account of the types and service conditions of the units.

(5) All tanks are to be provided with separate sounding pipes, or approved remote level indicating system. Where a sounding pipe exceeds 20 m in length, the minimum internal diameter is to be at least 50 mm notwithstanding the requirements in **Pt 5, Ch 6, 203. 3** (3) of **Rules for the Classification of Steel Ships**.

Sounding pipes are to be of the minimum internal diameter 38 mm. Where a sounding pipe exceeds 20 m in length, the minimum internal diameter is to be increased to at least 50 mm.

(6) Where a remote level indicating system is used, an additional sounding system is to be provided for tanks which are not always accessible.

(7) Void compartments adjacent to the sea or tanks containing liquids, and void compartments through which piping carrying liquids passes are to be fitted with separate sounding pipes, approved tank liquid level indicating apparatus or be fitted with means to determine if the void tanks contain liquids. Voids as defined above which do not comply with this requirement are to be accounted for in the unit's stability analysis.

8. Ship-side valves

For the units for which the exemption of docking survey is especially approved by the Society, special considerations are to be given to a prevention of corrosion and marine growth prevention to the valves, cocks and distance pieces fitted to the shell plating under the load water line.

9. Remote operation of sea-water inlet and discharge valves

(1) Sea-water inlet and discharge valves in spaces below the assigned load line are not be provided with remote controlled valves.
  (A) all column-stabilized units;
  (B) all other units where the space containing the valve is normally unattended and is not provided with high bilge water level detection.

(2) Where remote operation is provided by power- actuated valves for sea water inlets and discharges for operation of propulsion and power generating machinery, power supply failure of the control system is not to result in closing of open valves or in opening of closed valves.

(3) Consideration will be given to accepting bilge alarms in lieu of remote operation for surface type and self-elevating units specified in (1) (B).

10. Tests

Tests for the auxiliary machinery and piping are to be in accordance with the requirements in **109.**, notwithstanding the requirements in **Pt 5, Ch 6, Sec 13** of **Rules for the Classification of Steel Ships**.

105. Jacking systems

1. General

(1) The jacking systems are to be designed to the satisfaction of the Society with respect to their driving systems, mechanisms, strength and safety devices.

(2) The jacking system is to be designed and constructed to maintain the safety of the unit in the event of failure of a critical component and control devices or power supply during operation of the jacking system. Suitable monitoring is to be provided at a manned control station to indicate such failure.

(3) Where hydraulic or pneumatic power is used to the jacking systems, two or more hydraulic or pneumatic power sources are to be provided so that the jacking systems will be operated safely even when one of these power sources is out of service. However, for the restricted service units one hydraulic or pneumatic power source may be provided.

2. Plans and data to be Submitted

(1) A description of the jacking system, holding mechanism and associated systems

(2) Design plans showing the following arrangements and details, as applicable:
  (A) Jacking system, including mechanical and hydraulic components such as rack and pinion, bearings, reduction gears, brakes, hydraulic power units, hydraulic cylinders, etc.
  (B) Fixation system
  (C) Jackcase
  (D) Electric system diagrams
  (E) Jacking motor and brake specifications and operating characteristics
  (F) Electric and/or hydraulic controls
  (G) Monitoring and alarm systems
  (H) Lubrication methods
  (I) Heating arrangements for low temperature operation

(3) Material specifications

(4) Design calculations, including strength, fatigue, buckling, rigidity and critical speed (resonance) analyses, as applicable to the particular system

(5) Specified service temperature

3. Material

(1) The material specifications for the jacking system are to be submitted by the designer. These specifications are to include as a minimum, chemical composition, yield strength, ultimate tensile strength, percent elongation and reduction of area, and hardness for gears and coupling teeth, and where required, impact values.

(2) Load bearing/torque transmitting components in the direct load path are to be constructed of steel, or other acceptable ductile materials with an elongation not less than 12 %. Other materials suitable for the intended purpose may be specially considered.

(3) Materials for the load-bearing components of the fixation system in the direct load path are to comply with **Ch 3, Sec 2**, as applicable.

(4) For rack and pinion units, steel for the rack and rack attachments is to meet the requirements for primary application specified in **Ch 3, 202.** and impact test requirements specified in service temperature in **Pt 2, Table 2.1.7** of **Rules for the Classification of Steel Ships**.

(5) For systems actuated by hydraulic cylinders, steel for jacking pins and yoke is to meet the requirements for primary application specified in **Ch 3, 202.** and impact test requirements specified in service temperature in **Pt 2, Table 2.1.7** of **Rules for the Classification of Steel Ships**.

(6) Steel for torque transmitting parts for rack and pinion units is to meet the following impact test requirements.

Application	Average absorbed energy at Specified Service Temperature(J)		
	Forgings (Longitudinal)	Forgings (Tangential)	Castings
Climbing Pinion	27	20	20
Low Speed Gears (mesh rate MR < 100 Teeth / Minute)	20	15	15
Other (high speed gears, carriers, etc.)	Specified Service Temperature of -20°C and above : Not Required		
	Specified Service Temperature below -20°C : Subject to Special Consideration		

4. Strength Analysis

(1) Strength calculations of the jacking system and holding mechanism are to be submitted in accordance with **2** (4). Strength calculations are to consider at least the maximum loads of the following loading conditions, as applicable to the unit:
(A) Normal raising of hull
(B) Normal holding of hull
(C) Normal lowering of hull
(D) Pre-load raising
(E) Pre-load holding
(F) Pre-load lowering
(G) Normal raising of legs
(H) Normal holding of legs
(I) Normal lowering of legs
(J) Severe storm holding
Maximum rated loads associated with severe storm conditions (elevated or afloat) and pre-load holding condition are to be considered as combined loadings. Maximum rated loads associated with the normal jacking, pre-load jacking and normal holding conditions may be considered as static loadings. When establishing the loads imposed on a jacking system during lifting operations, friction losses at leg guides are to be considered. Definitions of combined loading and static loading comply with **Ch 4, 301.**.

(2) For the purpose of strength calculation of the jacking system and for designing mechanical components, the allowable stress are to comply with **Ch 4, 303.** as applicable, except that gear reducers are to comply with a recognized standard such as American Gear Manufacturers Association (AGMA) standards. Where mechanical components are designed according to the

von Mises stress criterion, the allowable stress are to comply with **Ch 4, 210. 2**.

(3) The scantlings of the load-bearing components of the fixation system in the direct load path are to be determined on the basis of the allowable stresses specified in **Ch 4, Sec 2** and **Sec 3.**

(4) For gears, both tooth surface contact and tooth root bending fatigue strength are to be considered. The calculated fatigue life is to be at least the design life of the unit, but not less than 20 years. Safety factors against maximum fatigue life in hours or cycles are to be as follows.

(A) Tooth root bending: F.S. = 1.5 for cumulative fatigue due to all lifting and lowering operations and all other applicable cyclic loads

(B) Tooth surface contact: F.S. = 1.0 for cumulative fatigue due to all lifting and lowering operations and all other applicable cyclic loads

5. Mechanical Components

In addition to the strength requirements for mechanical components in accordance with **Par 4**, the following requirements are to be complied with:

(1) Bearings are to be designed for the operational static and dynamic loads in accordance with applicable recognized standards such as the latest editions of ISO 76 and ISO 281. Design calculations are to be submitted for bearings not covered by recognized standards. Adequate bearing lubrication is to be provided. Manufacturer's documentation is to be submitted to confirm the suitability of the bearings for operation at the design temperature of the unit.

(2) Brakes are to be designed to engage automatically in the event of failure of power supply to the motor(fail-safe type). The brake holding capacity is to be at least equal to 120% of the maximum required brake torque associated with the maximum rated load applied to the climbing pinion from all loading conditions.

(3) Flexible shock pads for jackcases are to be designed for the maximum severe storm loads and suitable for operation at the design temperature of the unit. Shock pads are to be suitably protected against adverse effects of the marine and working environment which may lead to degradation. Manufacturer's technical specification is to be submitted to verify the suitability of the shock pads for the intended service.

6. Electrical Power System

Jacking gear motor installations are to be in accordance with **Ch 10**, except that group motor installations will be permitted as follows:

(1) On each leg, two or more motors of any horsepower may be connected to a single branch circuit.

(2) The branch circuit is to be provided with short circuit protection set at not greater than ten times the sum of the full load currents of the motors.

(3) A visual and audible alarm is to be given at the Jacking Control Station to indicate an overload condition in any of the jacking motors.

7. Hydraulic System

The hydraulic system for jacking units and holding mechanisms is to be in compliance with the applicable requirements of **Pt 5, Ch 7** of **Rules for the Classification of Steel Ships**. Sufficient redundancy of the hydraulic power unit or units servicing the jacking systems is to be provided to maintain continuous jacking operation in the event of a single failure in the hydraulic power system.

8. Control, Monitoring, and Alarm System

(1) The central jacking control station is to be provided with the following alarms and indications.

(A) Audible and visual alarms for:

(a) Motor overload or over temperature for each motor

(b) Unit out-of-level (elevated condition)

(c) Significant differences in the currents or torque in the motors on one rack

(d) Rack phase differential, where applicable to the design

(B) Indication of:

(a) Availability of power

(b) Current or torque in each motor (during raising and lowering operations)

(c) Brake release status

(d) Hydraulic pressure

(e) Air pressure
(f) Pin position
(g) Position of yoke
(h) Inclination of the unit, in two horizontal, perpendicular axes (elevated condition)

(2) Upon failure of the jacking system controls in the central control station, emergency controls to operate the jacking system are to be available. An emergency stop is to be provided at each jack house. Emergency stop circuits are to be independent from the jacking control circuits. A voice communication system is to be provided between the central jacking control station and a location at each leg in self-elevating units.

9. Inspection and Material Testing

(1) All jacking systems, holding mechanisms and associated systems are to be constructed and installed to the satisfaction of the Surveyor in accordance with approved plans.
(2) Welded construction is to be in compliance with the applicable requirements of **Ch 3, Sec 3** and **Pt 2, Ch 2** of **Rules for the Classification of Steel Ships**.
(3) Material tests for the components of the jacking systems, holding mechanisms and associated systems are to be carried out in accordance with **Par 3** and **Pt 2, Ch 1** of **Rules for the Classification of Steel Ships**.
(4) Gears of the climbing pinion gear train are to be examined at the plant of the manufacturer by an approved crack detection procedure and such an examination is to be witnessed by the Surveyor.

10. Load tests

(1) Shop test
(A) Type tests
For each size and type of jacking gears used in jacking systems, load tests are to be carried out at 1.5 time of preload in the presence of the Surveyor. After completion of test, gear boxes are to be opened out for examination. When deemed appropriate by the Society, methods of load tests for jacking systems other than rack and pinion type may suitably modified.
(B) Production tests
For all jacking systems, no load tests are to be carried out in the presence of the Surveyor.
(2) On board test
After installation on board, the jacking systems are to be tested with the highest specified lifting and descending load during at least one operating cycle.

106. Electrical equipment

1. General

(1) Electrical equipment is generally to be in accordance with the requirements in **Pt 6, Ch 1** of **Rules for the Classification of Steel Ships** with the exclusion of those in **Ch 16** and **18** and of those for test in each Chapter in the said Part. However, electrical equipment complying with any relevant regulation of the National Authority of the country in which the unit is to be registered or international standards may be accepted, provided that they are used solely for operating purpose. The design and installation of other equipment including that used for drilling operations are to be such that there is minimal risk of fire due to its failure.
(2) Where the requirements in **Pt 6, Ch 1** of **Rules for the Classification of Steel Ships** are applied in accordance with requirements in (1), the electrical equipment may be in accordance with the requirements in the following **Par 2** to **6** instead of the requirements in **Pt 6, Ch 1, 202.**, **203, 204. 9** (1) **to** (3), **601. 2** and **Ch 15** in the said Part. For the tests of the electrical equipment the requirements in **103.** are to be applied.
(3) All electrical services necessary for maintaining the unit in normal operational and habitable conditions are to be assured without recourse to the emergency source of power.
(4) Electrical services essential for safety are to be assured in case of failure of the main source of electrical power.
(5) Electrical and electronic equipment on the bridge are to be so installed that electromagnetic interference does not affect the proper function of navigational systems and equipment.
(6) The safety of personnel and unit from electrical hazards is to be assured.

2. Main source of electrical power

(1) The units are to be provided with at least two sets of main sources of electric power of sufficient capacity so that electric power supply to the systems essential for the safety of the units and to the equipment listed in (A) to (H) below can be maintained even when one set of these sources is out of service due to any failure of generators, driving engines and their associated auxiliaries.
   (A) Ventilation of hazardous areas and those areas maintained at an overpressure to exclude the ingress of dangerous gases.
   (B) Navigation, signal and special purpose lights.
   (C) Lights for all machinery spaces, control stations, alleyways, stairway and exits.
   (D) Fire pumps.
   (E) Propulsion equipment.
   (F) Bilge pumps.
   (G) Ballast pumps for column-stabilized units.
   (H) Radio equipment.

(2) For restricted service units, one set of the main sources of electrical power may be acceptable. Where, however, the lighting systems of these units listed in above (1) (B) are solely operated by electric power, the units are to be provided with an independent electric power source capable of operating these lightings in the event of failure of the main source of electrical power.

(3) Where a.c. generators are used as a main source of electrical power, they are to have sufficient capacity to permit the starting of the largest motor in the units without causing any other motors to stall or any other devices to fail due to excessive voltage drop on the system.

(4) The requirements in above (1) to (3) do not apply to the units which are so designed that electric power is supplied from other units or from the shore. However, the units having the lighting systems listed in above (1) (B) are to be so designed as to be capable of operating these lighting systems without supplying electric power from other units or from the shore except that two or more sets of electric power sources are provided at these suppliers.

(5) For restricted service units, where generators used mainly for operating purpose are provided in addition to the main source of electric power except the independent electrical power source required by above (2), these generators and their driving engine are to be regarded as machinery used solely for operating purpose.

3. Number and ratings of transformers for power and lighting

(1) The number and ratings of transformers for feeder circuits are to be sufficient to ensure the operation of the systems essential for the safety of the units as well as the systems or equipment listed in above **Par 2** (1) (A) to (H) even when one of these transformers is out of service. Where, however, any other suitable means are provided to ensure the operation of these services, one transformer will be acceptable.

(2) The requirement in above (1) will not be applied to the restricted service units where approved by the Society.

4. Emergency electrical equipment

(1) The units are to be provided with emergency electrical equipment according to the requirements in **Pt 6, Ch 1, 203.** of **Rules for the Classification of Steel Ships**. However, the capacity of the emergency source of power and the kind of emergency loads will be varied depending upon the type of the unit.

(2) The emergency source of power is to be located, at a sufficient distance from any hazardous area prescribed in each Chapter, in such a place that fire, flooding or other casualties in the space containing the main source of electrical power will not affect the operation of the emergency source of power.

(3) A self-contained emergency source of power is to be located on or above the uppermost continuous deck and above the worst damage waterline and inboard of the damage conditions specified in **Ch 7, Sec 1.**

(4) The requirements in above (1) to (3) will not be applied to the restricted service units.

5. Final sub-circuits

(1) In general, each motor for the systems or equipment essential for the safety of the units is to be connected to a separate final sub-circuit.

(2) Lighting circuits are to be supplied by final sub-circuit separate from those for heating and

motor. This requirement does not apply to cabin fans and electrical appliances for domestic use.
(3) Each heater is to be connected to a separate final sub-circuit except that small heaters may be connected to a single final sub-circuit of aggregate current rating not exceeding 15A.
(4) Each insulated pole of final sub-circuit is to be protected by a fuse or a circuit -breaker.

6. High voltage electrical installations

(1) Where the high voltage electrical systems or equipment exceeding the voltage of a.c. 1 kV is used for the systems or equipment essential for the safety of the units, the constructions and installations of these systems or equipment are to be in accordance with **Pt 6, Ch 1, Sec 15** of **Rules for the Classification of Steel Ships**.
(2) Other high voltage electrical equipment and cables used solely for operating purpose may comply with National or International Standards recognized by the Society.

7. Electrical equipment in hazardous areas

(1) Electrical equipment permitted in hazardous areas is to be in accordance with the requirements in **Pt 6, Ch 1, Sec 9** of **Rules for the Classification of Steel Ships** as well as those in this Article.
(2) Electrical equipment permitted in hazardous areas specified in **Ch 8** is to be as follows.
(A) Zone 0 areas :
Certified intrinsically safe circuits or equipment and associated wiring.
(B) Zone 1 areas :
(a) Certified intrinsically safe circuits or equipment and associated wiring.
(b) Certified flameproof (explosion proof) equipment.
(c) Certified increased safety equipment ; for increased safety motors, due consideration is to be given to the protection against overcurrent.
(d) Pressurized-enclosure type equipment which is acceptable to the Society.
(e) Through runs of cables.
(C) Zone 2 areas :
(a) All equipment approved for Zone 1 areas.
(b) Any equipment of a type which ensures absence of sparks or arcs and of "hot spots" during normal operation and which is acceptable to the Society.
(3) Cables permitted in hazardous areas are to be as follows.
(A) Zone 0 areas : Cables associated with intrinsically safe circuits.
(B) Zone 1 areas - all cables are to be sheathed as follows:
(a) Nonmetallic impervious sheath plus metal screening or braiding for earth detection.
(b) Copper sheath plus nonmetallic outer sheath for earth detection (for mineral insulated cable only).
(C) Zone 2 areas - all cables are to be sheathed as follows:
(a) As for Zone 1 areas.
(b) Nonmetallic sheath without metal screening or braiding, provided the cable is adequately protected against mechanical damage.
(4) Explosion proof type or equivalent essential lighting is to be supplied from at least two final sub-circuits in such a way that failure of any one of the circuits does not leave the space in darkness. For lighting (explosion proof or equivalent type) in hazardous areas or spaces, switches are to be of the two-pole type and wherever practicable located in a non-hazardous area.

107. Automatic and remote control for machinery

1. In cases where the automatic or remote control systems are adopted to the machinery installed in the units, the control devices and measuring instruments are to be such that the safe operation of the units can be made by the planned number of personnel.

2. The control system is to be designed to act, as far as possible, in fail-safe so as not to be in danger of operators or not to damage the system concerned in the event of failure of the equipment or loss of the power source. The safety devices are, if necessary, to be provided independently from control systems.

3. The apparatus belonging to the systems or equipment essential for the safety of the units is to be provided with suitable means to ensure the safe operation of the units even when their automatic or remote control systems are out of service.

4. Machinery installations of the unit which has the periodically unattended machinery spaces are to comply with the relevant requirements in **Pt 9, Ch 3, 206.** of **Rules for the Classification of Steel Ships** as well as the requirements in **101.** to **106.**

108. Spare parts, tools and instruments

1. General

Spare parts, tools and instruments prescribed in this Article are generally to be provided on the units. For the units specially approved by the Society, those may be dispensed with.

2. Spare parts

(1) Spare parts for internal combustion engines, steam turbines and boilers used for the main source of electric power are to be in accordance with the requirements in **Pt 5, Ch 1, Sec 4** of **Rules for the Classification of Steel Ships**.
(2) Spare parts for bilge pumps are to be in accordance with the requirements in **Pt 5, Ch 1, Sec 4** of **Rules for the Classification of Steel Ships**.
(3) Spare parts for ballast pumps prescribed in **104. 7** are to be provided in accordance with the requirements in **Pt 5, Ch 1, Sec 4** of **Rules for the Classification of Steel Ships**.
(4) Spare parts for starting air compressors of internal combustion engines used for the main source of electrical power are to be provided in accordance with the requirements in **Pt 5, Ch 1, Sec 4** of **Rules for the Classification of Steel Ships**.
(5) The Society may require to provide spare parts for jacking systems.

3. Tools and instruments

Tools and instruments for boilers used for the main source of electrical power and for all boilers are to be provided in accordance with the requirements in **Pt 5, Ch 1, Sec 4** of **Rules for the Classification of Steel Ships**.

4. Spare Parts, tools and instruments for restricted service units

The restricted service units are to be in accordance with the requirements in **Pt 5, Ch 1, Sec 4** of **Rules for the Classification of Steel Ships** regarding as ships of restricted service.

109. Tests

1. General

(1) The tests for the machinery are to be in accordance with the requirements in this Article.
(2) The Society may require, where considered necessary, other tests than those prescribed in this Article.
(3) Where machinery has test certificates considered satisfactory by the Society, a part or all of tests for the machinery may be dispensed with.
(4) As regards machinery manufactured by mass production system or specially controlled system, the Society may adopt test procedures suited to the production method, in place of tests stipulated in this rule, for the factory which considered suitable, upon the request of the manufacturer.
(5) The Society may adopt, where considered satisfactory, other test procedures than those stipulated in this Article.

2. Tests

(1) Boilers, pressure vessels belonging to PV -1 and PV -2, pipings and electrical equipment are to be tested in accordance with the relevant requirements in **Pt 5** and **Pt 6** of **Rules for the Classification of Steel Ships**. However, for pipings used solely for the operating purpose with the exclusion of those for inflammable or toxic media, tests may be dispensed with. For the apparatuses listed in the following (A) to (E), the testing at the manufacturer's works is to be carried out, where these apparatuses are used for the systems essential for the safety of the units. However, the high voltage tests considered suitable by the Society are to be carried out for electrical equipment with rated voltage above 3,000 V even where the equipment is not used for the systems or equipment essential for the safety of the units.

(A) Generators and motors
(B) Control gears for motors
(C) Switchboards
(D) Transformers for power and lighting
(E) Semi-conductor rectifiers for power

(2) Engines, shaftings and power transmission gears, pressure vessels belonging to PV -3 and auxiliary machinery used for the systems or equipment essential for the safety of the units are to be tested in accordance with the relevant requirements in **Pt 5** of **Rules for the Classification of Steel Ships**. However, the tests may be waived depending upon the usage of these installations where approved by the Society.
(3) The systems or equipment essential for the safety of the units are, after installation on board, to be subjected to performance tests.
(4) Remote control systems and automatic control systems for boilers and the systems or equipment essential for the safety of the units are, after installation on board, to be subjected to performance tests.
(5) Safety devices required by this rule are, after installation on board, to be tested.
(6) Running tests are, after installation on board, to be carried out for the generators stated in **106. 2** (5) and other electrical equipment not used for the systems essential for the safety of the units coming under the following (A) or (B).
(A) Where rated voltage exceeds d.c. 1,000 V or a.c. 3,000 V.
(B) Where parallel runnings (including changing over operation) are carried out with the main source of electrical power.

Section 2 Machinery Installations and Electrical Equipment for Self-propelled Units

201. General

1. Application

For the Machinery installations and electrical equipment for self-propelled units, in addition to the requirements in **Sec 1** and the relevant requirements in **Pt 5** and **Pt 6** of **Rules for the Classification of Steel Ships**, the requirements in this Section are applied.

2. Means are to be provided whereby normal operation of propulsion machinery can be sustained or restored even though one of the essential auxiliaries becomes inoperative. Special consideration is to be given to the malfunction of:

(1) a generator set which serves as a main source of electrical power;
(2) the sources of steam supply;
(3) the arrangements for boiler feedwater;
(4) the arrangements which supply fuel oil for boilers or engines;
(5) the sources of lubricating oil pressure;
(6) the sources of water pressure;
(7) a condensate pump and the arrangements to maintain vacuum in condensers;
(8) the mechanical air supply for boilers;
(9) an air compressor and receiver for starting or control purposes; and
(10) the hydraulic, pneumatic or electrical means for control in main propulsion machinery including controllable-pitch propellers.

However, the Society, having regard to overall safety considerations, may accept a partial reduction in capability from full normal operation.

3. Conditions of inclinations

In addition to the requirements in **102. 2,** main propulsion machinery and all auxiliary machinery essential to the propulsion and for the safety of the unit are, as fitted in the unit, to be capable of operating under the static conditions required by **101. 2** (1) and the following dynamic conditions :

(1) column-stabilized units : 22.5° in any direction.
(2) self-elevating units : 15° in any direction.
(3) surface units : 22.5° rolling and simultaneously pitching 7.5° by bow or stern.

The Society may permit deviation from these angles, in consideration of the type, size and service conditions of the unit.

202. Boiler

1. Water tube boilers serving turbine propulsion machinery are to be fitted with a high-water-level alarm.

2. Every steam generating system which provides services essential for the propulsion of the unit is to be provided with not less than two separate feedwater systems from and including the feed pumps, noting that a single penetration of the steam drum is acceptable. Means are to be provided which will prevent overpressure in any part of the systems.

203. Control and monitoring for propulsion machinery

Where propulsion machinery spaces are normally unattended during transit, the control and monitoring systems are to be constructed and installed in accordance with the applicable requirements in **Pt 6, Ch 2** of **Rules for the Classification of Steel Ships**.

204. Astern tests

In addition to the requirements in **109.** for machinery installations, the following tests are to be carried out.

1. In the astern trial, an order for full astern is issued while the unit is running ahead at the speed specified in **Pt 3, Ch 1, 120.** of **Rules for the Classification of Steel Ships**, whereby reversing operation from ahead run to full astern run is to be carried out as fast as possible. In this case, astern operation is to be continued until the astern speed (rotational speed in rpm) is stabilized for diesel units, or for the period of 15 minutes after the order of astern for steam turbine units, gas turbine units and electric propulsion units respectively, whereby the astern performance and stopping performance are to be verified and the test results recorded are to be available on board for the use as a guidance for unit manoeuvres.

2. In units having multiple propellers, the unit navigating and maneuvering performance with one or more propellers inoperative is to be verified, as well as the test results recorded are to be made available on board for the use as a guidance for unit manoeuvres.

3. When the units provided with supplementary means for maneuvering or stopping, performance test for such means is to be carried out, and the test results are to be available on board for the use as a guidance for unit manoeuvres. ⚓

CHAPTER 11 SPECIFIC OFFSHORE UNIT TYPES

Section 1 Offshore Crane Units

101. General

1. Application

The requirements in this Section apply to offshore work units.

2. Definition

Offshore crane unit is a unit engaged in the operation for the lifting of heavy loads in oil drilling and production operations or offshore construction.

102. Hull Construction and Equipment

1. Hull construction and equipment of the offshore crane units are to be in accordance with the requirements in **Ch 3** to **6,** depending on the type of the unit.

2. In longitudinal strength calculation of a barge type offshore crane units, where calculating Z_2 of the ship for any operating condition of the cranes, the bending moment by waves, which is the first term in $\{\ \}$ in the formula Z_2 in **Ch 4, 201. 1** of "Rules for the Classification of Steel Barges" may be taken as zero. In this case, however, the coefficient is to be taken as 8.36 instead of 6.63.

3. Details and strength calculations of crane pedestal and supporting structure are to be submitted for review. Allowable stresses are defined in **Ch 4, Sec 3.**

103. Machinery

1. The machinery of offshore crane units is, in general, to be in accordance with the requirements in **Ch 10.**

2. As for the machinery of barge-type offshore crane units, the relevant requirements in **Ch 10** may be applied, as a restricted service unit.

Section 2 Offshore Accommodation Units

201. General

1. Application

The requirements in this Section apply to offshore accommodation units.

2. Definition

Offshore accommodation unit is a unit primarily intended for the accommodation of persons who are industrial personnel, engaged in some aspect of offshore or related employment, excluding members of the crew. In addition, during jacking or moving operation of this unit, there is not to be anyone except operator for these operation on board.

202. Hull construction and equipment

1. Hull construction

(1) Hull construction is to be in accordance with the requirements in **Ch 3** to **6,** depending on the type of the unit. In this case, where approved by the Society, suitable modification may be done in accordance with the environmental condition of the areas where the unit is stationed.

(2) Decks, provided with mooring equipment such as bollards, etc., are to be sufficiently reinforced.

2. Mooring equipment

Mooring equipment, sufficiently effective for stationing the unit, is to be provided. In this case, temporary mooring equipment specified in **Ch 3, 801.** need not be provided.

203. Fire protection

1. For the unit intended for the accommodation of more than 36 persons, fire protection are to complied with the following requirements in addition to those in **Ch 9, 201**.

(1) Main vertical zones are to be complied with the following requirements.

(A) The hull, superstructure and deckhouses in way of accommodation and service spaces shall be subdivided into main vertical zones by "A" class divisions. These divisions are to have insulation values in accordance with **Table 9.1** and **9.2** in **Ch 9, 201**.

(B) As far as practicable, the bulkheads forming the boundaries of the main vertical zones above the bulkhead deck shall be in line with watertight subdivision bulkheads situated immediately below the bulkhead deck. The length and width of main vertical zones may be extended to a maximum of 48 m in order to bring the ends of main vertical zones to coincide with watertight subdivision bulkheads or in order to accommodate a large public space extending for the whole length of the main vertical zone provided that the total area of the main vertical zone is not greater than 1,600 m^2 on any deck. The length or width of a main vertical zone is the maximum distance between the furthermost points of the bulkheads bounding it.

(D) Such bulkheads shall extend from deck to deck and to the shell or other boundaries.

(2) Corridor bulkheads, where not required to be "A" class, shall be "B" class divisions which shall extend from deck to deck except:

(A) when continuous "B" class ceilings or linings are fitted on both sides of the bulkhead, the portion of the bulkhead behind the continuous ceiling or lining shall be of material which, in thickness and composition, is acceptable in the construction of "B" class divisions, but which shall be required to meet "B" class integrity standards only in so far as is reasonable and practicable in the opinion of the Society; and

(B) in the case of a ship protected by an automatic sprinkler system complying with the provisions of the Fire Safety Systems Code, the corridor bulkheads of "B" class material may terminate at a ceiling in the corridor provided such ceilings are acceptable in the construction of "B" class divisions. All doors and frames in such bulkheads shall be of non-combustible materials and shall have the same fire integrity as the bulkhead in which they are fitted.

(3) Exterior boundaries of superstructures and deckhouses enclosing accommodation and including any overhanging decks which support such accommodation, are to be an “A-60” Class boundary for the whole of the portion which faces and is within 30 m of any area in the adjacent drilling or production platform served by the accommodation unit where a hydrocarbon fire may arise. If the distance is more than 30 m, but less than 100 m, an “A-0” Class boundary is required.

204. Fire fighting

1. For the unit intended for the accommodation of more than 36 persons, fire fighting are to complied with the following requirements in addition to those in **Ch 9, Sec 3**.

(1) The arrangements for the ready availability of water supply shall be:

(A) such that at least one effective jet of water is to immediately available from any hydrant in an interior location and so as to ensure the continuation of the output of water by the automatic starting of one required fire pump; and

(B) if fitted with periodically unattended machinery spaces, the Society shall determine provisions for fixed water fire-extinguishing arrangement for such spaces equivalent to those required for normally attended machinery spaces.

(2) There shall be installed throughout each separate zone in all accommodation and service spaces and, where it is considered necessary, in control stations, except spaces which afford no substantial fire risk such as void spaces, sanitary spaces, etc., either:

(A) a fixed fire detection and fire alarm system so installed and arranged as to detect the pres-

ence of fire in such spaces and providing smoke detection in corridors, stairways and escape routes within accommodation spaces. Detectors fitted in cabins, when activated, shall also be capable of emitting, or cause to be emitted, an audible alarm within the space where they are located.; or

(B) an automatic sprinkler, fire detection and fire alarm system of an approved type complying with the relevant requirements of the Fire Safety Systems Code and so installed and arranged as to protect such spaces and, in addition, a fixed fire detection and fire alarm system and so installed and arranged as to provide smoke detection in corridors, stairways and escape routes within accommodation spaces.

Section 3 Floating Piers

301. General

1. Application

The requirements in this Section apply to floating piers of barge type.

2. Definition

Floating pier is a unit which has mooring equipment, loading apparatus, etc. for loading or unloading and has bridges for access from the shore. This unit is to be stationed at smooth water areas or sea areas equivalent to smooth water areas.

3. Alternation of the stationed areas

When the unit, of which construction and equipment are modified by considering the environmental condition of the areas where the unit is stationed, is moved to a new location, approval is to be obtained in advance.

302. Hull construction and equipment

1. Hull Construction

(1) Hull construction is to be in accordance with the requirements in **Ch 5, 303.** In this case, where approved by the Society, suitable modification may be done in accordance with the environmental condition of the areas where the unit is stationed.

(2) Deck structure is to be in accordance with the requirements in **Ch 4, Sec 2,** using loads indicated by the Owner. Moreover, the load due to cars is to be determined by considering the relative motion of the cars against hull.

(3) Deck, subject to the load due to the bridge for access from the shore, is to be sufficiently strengthened.

2. Longitudinal strength

Longitudinal strength of the unit with cranes is to be in accordance with the requirements in **102. 2.**

3. Reinforcement for contact with the ships, etc.

For contact with the ship, etc., the unit is to be equipped with sufficient fenders, and shell plates, frames, girders, etc. are to be suitably reinforced.

303. Machinery

1. General

(1) For the machinery of floating piers having their own electric power sources or being supplied with electric power of 10 kW or more from the shore, the requirements in **Ch 10** except for those in **Ch 10, 108.** are generally applied, as a restricted service unit. These requirements may be modified for floating piers designed to be moored directly to the shore.

(2) Bilge systems are to be provided for compartments below load water line continuing power sources or auxiliary machinery. In this case, one bilge pump may be acceptable.

Section 4 Offshore Plant Units

401. General

1. Application

(1) The requirements in this Section apply to offshore plant units.
(2) The requirements in this Section do not apply to the facilities for the factory installed on the unit. However, attention is to be paid to compliance with the National Regulations of the country in which the unit is stationed or operated.
(3) The Society may carry out surveys on the facilities for the factory on the unit on application from the Owners or manufacturers.

2. Definitions

Offshore plant units is a unit which is installed with equipment for the industrial factory, and stationed under floating condition or landed on the sea bed semi-permanently or for a long time at its service area.

3. General

(1) For the unit in which inflammable or toxic goods are dealt with as raw materials or products, considerations are to be given to the arrangements, ventilation and so on so that the inflammable or toxic vapours which might be produced by the storage systems and producing systems would not affect the installations or equipment essential for the safety of the units, (corresponding to the systems essential for the safety of units defined in **Ch 10,** the same being applied hereinafter), and their operators as well.
(2) Equipment for the factory is not to be operated or tested while the unit is being towed to the service area.

402. Hull construction and equipment

1. General

Hull construction and equipment are to be in accordance with the requirements in **Ch 3** to **6** depending upon the type of unit.

403. Machinery

1. General

The machinery for the unit is to be in accordance with the requirements in this Article as well as those in **Ch 10** except for **108.** in the said Chapter. However, one bilge pump for each compartment may be acceptable for the unit intended for restricted service.

2. Main source of electrical power

(1) Where the source of electric power for the facilities for the factory installed on the unit is utilized as the main source of electric power specified in **Ch 10, 106. 2,** this source of electric power is to be capable of supplying electric power to the installations or equipment essential for the safety of the unit even while necessary electric power is supplied to the facilities for the factory.
(2) For the unit for which it is deemed impracticable to utilize the main source of electrical power while being towed and the unit to which electric power is intended to be supplied from the shore, a suitable source of electric power is to be provided to supply electrical power necessary during being towed. However this source of electric power may be a temporary equipment. ⚓

2017

Guidance Relating to the Rules for the Classification of Mobile Offshore Units

GB-01-E

KR

APPLICATION OF THE GUIDANCE

This "Guidance Relating to the Rules for the Classification of Mobile Offshore Units" (hereafter called as the Guidance) is prepared with the intent of giving guidelines as to the treatment of the various provisions for items required the unified interpretations and items not specified in details in the Rules, and the requirements specified in the Guidance are to be applied, in principle, in addition to the various provisions in the Rules.

As to any technical modifications which can be regarded as equivalent to any requirements in the Guidance, their flexible application will be properly considered.

APPLICATION OF "GUIDANCE RELATING TO THE RULES FOR THE CLASSIFICATION OF MOBILE OFFSHORE UNITS"

1. Unless expressly specified otherwise, the requirements in the Rules apply to Mobile Offshore Units for which contracts for construction are signed on or after 1 July 2017.
2. The amendments to the Rules for 2016 edition and their effective date are as follows;

Effective Date 1 July 2017

CHAPTER 1 GENERAL

- newly added.

CHAPTER 7 STABILITY

- newly added.

CONTENTS

CHAPTER 1 GENERAL *(2017)*

Section 2 Definitions

206. Light ship weight

1. In application to **206.** of the Rules, the weight of mediums on board for the fixed fire-fighting systems (e.g. freshwater, CO_2, dry chemical powder, foam concentrate, etc.) shall be included in the lightweight and lightship condition. ⚓

CHAPTER 7 STABILITY *(2017)*

Section 1 General Requirements of Stability

104. Assumption of the damage extent

1. Damage extent of self-elevating units

Notwithstanding the requirements of **Ch 7, 104. 1 (7)** of the Rules, for self-elevating units without propulsion machinery, bottom damage may be omitted. ⚓

RULES AND GUIDANCE FOR THE CLASSIFICATION OF MOBILE OFFSHORE UNITS

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KR
36, Myeongji ocean city 9-ro, Gangseo-gu,
BUSAN, KOREA
TEL : +82 70 8799 7114
FAX : +82 70 8799 8999
Website : http://www.krs.co.kr