



IRCLASS
Indian Register of Shipping



RULES AND REGULATIONS FOR THE CONSTRUCTION AND CLASSIFICATION OF MOBILE OFFSHORE DRILLING UNITS

July 2024

General Information

1. This consolidated version of the 'Rules and Regulations for the Construction and Classification of Mobile Offshore Drilling Units' (July 2024) supersedes the July 2023 edition of the Rules and includes amendments published in the following :
 - a) Rules Change Notice No.1 of December 2023
2. For ease of reference by the users, a summary of additions and amendments incorporated in the various Rule Change Notices (issued since July 2023), along with their effective dates are indicated in the respective tables.

**RULES AND REGULATIONS FOR THE CONSTRUCTION AND CLASSIFICATION
OF MOBILE OFFSHORE DRILLING UNITS – July 2023**

RULES CHANGE NOTICE No. 1 – December 2023

TABLE 1 – AMENDMENTS INCORPORATED IN THIS NOTICE
These amendments will come into force as indicated in the Table

Section / Clause	Subject/ Amendments
Chapter 3: Materials	<i>The amendments are applicable from 1 January 2024.</i>
1/ 1.1.4	Amendments are made to clarify that new installations of materials which contain asbestos are not permitted in all drilling units.

Indian Register of Shipping

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Section 1

General Information

1.1 Indian Register of Shipping

1.1.1 Indian Register of Shipping (hereinafter referred to as "IRS") was incorporated in 1975 as a Public Limited Company under the Indian Companies Act for the purpose of providing amongst other things a faithful and accurate classification of mercantile shipping classed with it, to approve designs of, to survey and to issue reports on mercantile and non mercantile ships, hovercrafts, hydrofoils etc; all within the scope of classification described in the Rules. This Section contains General Regulations which have been adopted by IRS for its governance. The Classification Regulations are given in Section 3.

1.1.2 The management of the affairs of IRS are carried out by Managing Director (MD) and Jt. Managing Director (JMD) under the direction and control of the Board of Directors (hereinafter referred to as the 'Board'), in accordance with the provisions of its Memorandum and Articles of Association.

1.1.3 The Board of Directors shall consist of representative of the interests of various members of the Company and those concerned with shipping in general as under:

3 Directors representing Indian Shipowners

- | | |
|---|--|
| 2 | Directors representing Indian Shipbuilders |
| 1 | Director representing General Insurance Corporation of India and other Indian underwriters |
| 1 | Director being the Director General of Shipping, Ministry of Surface Transport, Govt. of India |
| 1 | Director representing Ship Design Research and Development Institutions |
| 1 | Director representing Manufacturers of Marine Engines/General Engineering Goods |
| 1 | Director representing Indian Navy/Coast Guard |
| 1 | Director being a person of eminence from the field of Law |
| 3 | Directors being persons of eminence from any industry allied with maritime activities |
| 1 | Managing Director being full-time employee appointed by the Board of Directors. |

- 1 Jt. Managing Director, where so appointed, being full time employee, appointed by the Board of Directors.

The composition of the Board as above is to be in accordance with the Articles of Association of IRS (as may be amended from time to time).

1.1.4 The Board shall consist of not less than six and not more than fifteen Directors. If the actual representation on the Board of Directors exceeds 15 Directors, the provisions of the Indian Companies Act would apply to approve the increase in the sanctioned strength of the Board beyond the limit specified in the Articles of Association of IRS. The Board of Directors shall elect one of its members to be Chairman of the Board of Directors. The reference to Chairman shall include Executive Chairman, where so appointed by the Board of Directors.

1.1.5 The Board is to appoint a Sub-Committee of Classification representing concerned interests.

1.1.6 The Board is to appoint the Chairman of the Sub-Committee of Classification and the Jt. Managing Director, IRS to be 'ex- officio' member of the Sub-Committee of Classification.

1.1.7 The employees of IRS are to be appointed by and be under the direction of the MD, except for Key Managerial Personnel (KMP), who would be appointed by the Board on the recommendation of the Nomination and Remuneration Committee.

1.1.8 The Surveyors of IRS are not to be permitted without the special sanction of the Board of Directors to receive any fee, gratuity or reward whatsoever, for their own use or benefit, for any service performed by them in their capacity as Surveyors to IRS, except on pain of immediate dismissal.

1.1.9 The Funds and Accounts are to be under the authority and control of the Board of Directors.

1.2 Fees

1.2.1 Fees will be charged for all surveys and for other services rendered by IRS or any of its publications in accordance with established scales. Traveling expenses incurred by the Surveyors in connection with such services are also chargeable.

1.3 Technical committee

1.3.1 The Board is to appoint a Technical Committee whose function will be to consider:-

- Formulation of Technical Rules for Classification Surveys, building of ships, their machinery and equipment.
- Important alterations to Rules once framed as may be required from time to time.

1.3.2 All decisions of the Technical Committee including amendments and/or additions to the Rules for classification surveys and building of ships' hull, their machinery and equipment to be reported to the Board of Directors.

1.3.3 The Technical Committee to be constituted as follows:

Number of Members	Nominees/Representatives of
3	Board of Directors of IRS
1	Marine Engine Unit of M/s. Garden Reach Shipbuilders and Engineers Ltd.
1	Other Marine Engine Builders
6	Shipbuilders
2	Indian Institution of Naval Architects
2	Institute of Marine Engineers (India)
1	Company of Master Mariners
2	Directorate General of Shipping
1	IMU (Earlier NSDRC)
4	Indian National Shipowners Association
1	Institution of Engineers (India)
1	Ex-Officio – Executive Chairman of IRS or his nominee
1	Indian Coastal Conference Shipping Association

1	Oil Industry Safety Directorate	by the respective body is to be considered as date of his joining the Technical Committee for purposes of his retirement by rotation.
5	Indian Navy	
2	Indian Coast Guard	1.3.9 The meeting of the Technical Committee is to be convened as often and at such time and place as may appear necessary, but there shall be at least two meetings in each year.
1	Research Institutes	
2	Indian Institute of Technology/ National Institute of Technology	1.3.10 The members desiring to propose alterations in, or additions to the Rules for the classification, survey or building of ship (hull and machinery) shall give notice of such proposals to the Secretary. Every meeting to be convened by notice from the Secretary, if possible one month before the date of the meeting and the Secretary to send to each member an Agenda paper as soon as possible thereafter.
2	Maritime Training Institutes	
3	Other Flag Administrations	
1	Inland Waterways Authority of India.	
1.3.4 In addition to the foregoing, the Technical Committee may co-opt to the main body other members of high managerial positions in Shipping, Ship Building, Marine Engineering, Naval Architecture, Marine Insurance, Steel Making, etc.		Proposals for changes to rules may also be given by Flag Administrations, shipowners, shipbuilders and other interested parties who may not be represented in the Technical Committee.
1.3.5 Nomination of all members to the Technical Committee to be subject to confirmation by the Board.		1.3.11 The quorum for any meeting of Technical committee will be six members, with at least 50% of the members present being those who do not have or represent any interest in commercial shipping.
1.3.6 The Technical Committee can appoint panels from amongst its body to which representatives of any organisation or industry or individuals specialised in relevant disciplines could be co-opted for the purpose of considering any particular Technical problem or area of Rules.		1.3.12 In the event that any matter is not decided by unanimity, the same may be decided by a majority of votes cast in favor, with each member, including co-opted members, having one vote only. In the event of a parity of votes, the Chairman of the Technical Committee would be entitled to an additional casting vote.
1.3.7 The Board of Directors to appoint biennially, the Chairman of the Technical Committee and the Technical Committee to appoint from their own body biennially a Vice-Chairman. The appointment of Vice-Chairman is to be confirmed by the Board of Directors.		1.3.13 When any discussion relates to an item of interest to those connected with commercial shipping (representatives of commercial ship owning or ship building organizations), such representatives would not be entitled to vote, if such matter is to be decided by voting.
1.3.8 The terms of office of all members is to be not more than four years, one-fourth of all members (including those co-opted) to retire at the end of each calendar year. The members so retiring being those who have been longest in office since their last nomination and such members to be eligible for re-nomination for a second term. Unless specially so authorised by the Board of Directors, no member other than Chairman and / or Vice-Chairman, who has served for two periods of nomination, to be eligible for re-nomination. In the event of any vacancy occurring before the expiration of the normal term of office, a representative to be nominated to fill the vacancy from the same group/body/institution and for such nominee the date of his nomination		1.3.14 In the event that any member of the Technical Committee absents himself for 3 consecutive meetings of the Technical Committee without seeking leave of absence, he would be deemed to have vacated office and his vacancy would be filled by seeking fresh nomination from concerned interest represented.
		1.3.15 In the absence of the Chairman & the Vice Chairman of the Technical Committee, the members of the Technical committee shall elect a Chairman, by majority vote, to preside over that particular meeting only.

1.3.16 The Board of Directors reserves to themselves the right of altering, adding to or rescinding any/or all of the above terms of reference including the dissolution of the Technical Committee.

1.4 Survey reports

1.4.1 All reports of survey are to be made by the Surveyors according to the form prescribed and submitted for consideration of the Board or the Sub-Committee of Classification, but the character and notations assigned by the latter is to be reported to the Board. The Board may, in specified instances, vest in the Managing Director / Jt. Managing Director, discretionary powers to act on its behalf, and all such actions being reported to the Board at its subsequent meeting.

1.4.2 The reports of the Surveyors shall, subject to the approval of the Managing Director / Jt. Managing Director, be open to inspection of the Owner and any other person authorised in writing by the Owner. Copies of the reports will, subject to the approval of the Managing Director / Jt. Managing Director, be supplied to Owners or their representatives

1.5 Register of ships

1.5.1 A Register of Ships is available on-line on IRLCLASS Website which contains the names of ships, character of class and notations assigned together with other relevant useful information for ships classed with IRS. This register also includes names of drilling units, the character of class notation assigned together with other relevant useful information for drilling units classed with IRS.

1.6 Liability

1.6.1 Whilst Indian Register of Shipping, a Classification Society, along with its subsidiaries and associates (hereinafter referred to as the Society) and its Board/Committees use their best endeavours to ensure that the functions of the Society are properly carried out, in providing services, information or advice, neither the Society nor any of its servants or agents warrants the accuracy of any information or advice supplied. Except as set out herein, neither the Society nor any of its servants or agents (on behalf of each of whom the Society has agreed this clause) shall be liable for any loss damage or expense whatever sustained by any person due to any act or omission or error of whatsoever nature and howsoever caused of the Society, its servants or agents or due to any inaccuracy of whatsoever nature and howsoever caused in any

information or advice given in any way whatsoever by or on behalf of the Society, even if held to amount to a breach of warranty. Nevertheless, if any person uses services of IRS, or relies on any information or advice given by or on behalf of the Society and suffers loss damage or expenses thereby which is proved to have been due to any negligent act omission or error of the Society its servants or agents or any negligent inaccuracy in information or advice given by or on behalf of the Society then the Society will pay compensation to such person for his proved loss up to but not exceeding the amount of the fee charged by the Society for that particular service, information or advice.

1.6.2 Any notice of claim for loss, damage or expense as referred to in 1.6.1 shall be made in writing to Head Office within six months of the date when the service, information or advice was first provided, failing which all the rights to any such claim shall be forfeited and the Society shall be relieved and discharged from all liabilities.

1.7 Audits and assessments by external organizations

1.7.1 The surveys required by the regulations, and conducted by IRS may be subject to Audit by an independent Accredited Certification Body (ACB) as per the requirements of ISO-9001:2008 standard and Quality Management System Certification Scheme (QSCS) of IACS. For this purpose, ACB auditors are to be given the necessary access to the drilling unit, shipyard or works when requested by IRS.

Access is also to be given to auditors or inspectors accompanying the Surveyors as required by other external organizations.

1.8 Access of Surveyor to drilling units, shipyards or works

1.8.1 The Surveyors are to be given free access to drilling units classed with IRS as well as to shipyards, works, etc. so as to perform their duties, and are to receive adequate assistance for this purpose.

1.9 Compliance with statutory requirements

1.9.1 Whilst the requirements of these Rules are considered to meet the requirements of the Code for the Construction and Equipment of Mobile Offshore Drilling Units, (MODU Code) 2009, consideration should be given to any relevant requirements of the National Authority of the country in which the drilling unit is to be registered.

The MODU Code 2009 applies to mobile offshore drilling units, the keels of which are laid or which are at a similar stage of construction on or after 1 January 2012.

1.10 Responding to Port State Control

1.10.1 When requested by Port State and upon concurrence by the vessel's owner/master IRS Surveyors would attend onboard a ship in order to assist in the rectification of reported deficiencies or other discrepancies that affect or may affect classification or the statutory

certificates issued by IRS. The owner and the vessel's flag state will be notified of such attendance and survey. IRS Surveyors will also cooperate with Port States by providing inspectors with background information.

1.11 Requirements for service suppliers

1.11.1 For requirements of approval of applicable service suppliers, refer to Part 1, Chapter 1, 1.9 of the IRS Rules and Regulations for the Construction and Classification of Steel Ships.

Section 2

Definitions

The definitions given below, in alphabetical order, shall apply for the purpose of these Rules.

1) **1974 SOLAS Convention** means the International Convention for the Safety of Life at Sea, 1974, as amended.

2) **1966 Load Line Convention** means the International Convention on Load Lines, 1966.

3) **Administration** means the Government of the State whose flag the unit is entitled to fly.

4) **Certificate** means Mobile Offshore Drilling Unit Safety Certificate.

5) **Coastal State** means the Government of the State exercising administrative control over the drilling operations of the unit.

6) **Dead ship condition** is the condition under which the main propulsion plant, boilers and auxiliaries are not in operation due to the absence of power.

7) Dimensions

a) Length (L)[m]

- For surface type drilling units L is to be taken as 96% of the total length on a waterline at 85% of the least moulded depth (D) measured from the top of the keel, or the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that be greater. In units designed with a rake of keel, the waterline on which this length is measured should be parallel to the designed waterline.

- For self-elevating drilling units L is to be taken as the distance between the inside of the shell plating at the fore and after ends.
- For Column stabilized drilling units L is to be taken as the maximum distance between the inside of the shell plating at the fore and after ends of the primary hull structure which is projected to the center line of the hull.

b) Breadth (B)[m]

- For surface type and self-elevating drilling units B is to be taken as the horizontal distance between outsides of frames at the broadest part of the hull.
- For Column stabilized drilling units B is to be taken as the horizontal distance between measured perpendicularly to the length at the broadest part of the primary hull structure.

c) Depth (D)[m]

- For surface type and self-elevating drilling units D is to be taken as the vertical distance measured from the top of the keel to the top of beam of the uppermost continuous deck at side measured at middle of L.
- For Column stabilized drilling units D is to be taken as the vertical distance between 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 middle of L.

d) Moulded draught (T)[m]

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

e) Moulded base line

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

8) **Diving system** is the plant and equipment necessary for the safe conduct of diving operations from a mobile offshore drilling unit.

9) **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.

10) Drilling Units (Types of)

a) **Self-elevating drilling units** have 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 on the seabed. Drilling 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 section or footings to reduce penetration, or may be attached to a bottom pad or mat.

b) **Column stabilized drilling units** depend 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 drilling equipment. Lower hulls or footings may be provided at the bottom of the columns for additional buoyancy or to provide sufficient are to support the unit on the seabed. Bracing members of tubular or structural sections may be used to connect the columns, lower hulls or footings and to support the upper structure. Drilling operations may be carried out in the floating condition, in which condition the unit is described as a semisubmersible, or when the unit is supported by the sea bed, in which condition the unit is described as a submersible. A semisubmersible unit may be designed of operate either floating or supported by the

sea bed, provided each type of operation has been found to be satisfactory.

c) Surface type drilling units

i) Ship type drilling units are seagoing ship-shaped units having a displacement-type hull or hulls, of the single, catamaran or trimaran types, which have been designed or converted for drilling operations in the floating condition. Such types have propulsion machinery.

ii) Barge type drilling units are seagoing units having a displacement type hulls, which have been designed or converted for drilling operations in the floating condition. These units have no propulsion machinery.

d) Other types of drilling units

Units which are designed as mobile offshore drilling units and which do not fall into the above mentioned categories will be treated on an individual basis and be assigned an appropriate classification designation.

11) Fire Test

a) **A standard fire test** is a test as defined in regulation II-2/3.2 of the 1974 SOLAS Convention.

12) **Oil fuel unit** is the equipment used for the preparation of oil fuel for delivery to an oil-fired boiler, or equipment used for the preparation for delivery of heated oil to an internal combustion engine, and includes any oil pressure pumps, filters and heaters dealing with oil at a pressure more than 1.8 bar.

13) **Gas-tight door** is a solid, close-fitting door designed to resist the passage of gas under normal atmospheric conditions.

14) **Industrial machinery and components** are the machinery and components which are used in connection with the drilling operation.

15) **Light weight** is defined as the weight of the complete unit 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 liquids in storage or reserve supply tanks, items of consumable or variable loads, stores or crew and their effects. The weight of mediums on board for the fixed fire-fighting systems (e.g. freshwater, CO₂, dry chemical powder, foam concentrate, etc.) are to be included in the light weight.

16) **Low flame spread** means that the surface thus described will adequately restrict the spread of flame, this being determined to the satisfaction of IRS by an established test procedure.

17) **Materials**

a) **Non-combustible material** means a material which neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750°C, this being determined to the satisfaction of IRS by an established test procedure. Any other material is a combustible material.

b) **Steel or equivalent materials.** Where the words "steel or equivalent material" occur, "equivalent material" means any non-combustible material which, by itself or due to insulation provided, has structural and integrity properties equivalent to steel at the end of the applicable standard fire test (e.g. aluminium alloy with appropriate insulation).

18) **Mobile offshore drilling unit or unit** as used herein is intended to mean any mobile offshore structure or drilling unit, whether designed for operation afloat or supported by the sea bed, built in accordance with the requirements and of these rules, and includes the entire structure and components covered by the requirements. The term 'drilling unit' as used herein means any unit intended for use in offshore drilling operations for the exploration or exploitation of the subsea resources. The term 'self-propelled unit' as used herein refers to a unit which is designed for unassisted passage. All other units are considered as non-self-propelled.

19) **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. Insofar as the rules are concerned, the approved modes of operation of a unit should include the following:

- a) **Operating conditions:** Conditions wherein a unit is on location for purposes of drilling or other similar operations, and combined environmental and operational loadings are within the appropriate design limits established for such operations. Unit may be either afloat or supported on the seabed, as applicable.
- b) **Severe storm conditions:** A condition during which a unit may be subjected to the most severe environmental loadings for which the unit is designed. Drilling or similar operations may have been discontinued due to the severity of the environmental loadings.

Unit may be either afloat or supported on the seabed, as applicable.

- c) **Transit conditions:** All unit movements from one geographical location to another, including the stages of retrieval and jacking.

20) **Normal operational and habitable conditions** means:

- a) conditions under which the unit as a whole its machinery, services, means and aids ensuring safe navigation when under way, safety when in the industrial mode, fire and flooding safety, internal and external communications and signals, means of escape and winches for rescue boats, as well as the means of ensuring the minimum comfortable conditions of habitability, are in working order and functioning normally; and

- b) drilling operations.

21) **Organization** means the International Maritime Organization (IMO).

22) **Rescue boat** is an easily maneuvered power boat capable of rapid launching and adequate for quick recovery of a man overboard and towing a liferaft away from immediate danger.

23) **Ship Divisions**

- a) **"A" class divisions** are those divisions as defined in regulation II-2/3.3 of the 1974 SOLAS Convention.
- b) **"B" class divisions** are those divisions as defined in regulation II-2/3.4 of the 1974 SOLAS Convention.
- c) **"C" class divisions** are divisions constructed of approved non-combustible materials. They need meet neither requirements relative to the passage of smoke and flame nor limitations relative to the temperature rise.
- d) **Continuous "B" class** ceilings or linings are those "B" class ceilings or linings which terminate only at an "A" or "B" class division.
- e) **'H' class divisions** are those divisions which meet the same requirements as 'A' class divisions, as defined in SOLAS regulations II-2/3, except that, when tested according to the Fire Test Procedures Code, the furnace control temperature curve is replaced with the furnace control curve for hydrocarbon fires defined in national or international standards. (Note: Refer to national standards

such as: BS EN 1363-2:1999 *Fire resistance tests. Alternative and additional procedures*; or ASTM 1529-14a *Standard Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies*; or ISO/DIS 20902-1 *Fire test procedures for divisional elements that are typically used in oil, gas and petrochemical industries – Part 1: General requirements*).

24) Sources of Power

- a) **Emergency source of electrical power** is a source of electrical power intended to supply the necessary services in the event of failure of the main source of electrical power.
- b) **Main source of electrical power** is a source intended to supply electrical power for all services necessary for maintaining the unit in normal operational and habitable conditions.

25) Ship Spaces

- a) **Accommodation spaces** are those used for public spaces, corridors, lavatories, cabins, offices, hospitals, cinemas, games and hobbies rooms; pantries containing no cooking appliances and similar spaces. Public spaces are those portions of the accommodation which are used for halls, dining rooms, lounges and similar permanently enclosed spaces.
- b) **Control stations** are those spaces in which the unit's radio or main navigating equipment or the emergency source of power is located or where the fire recording or fire control equipment or the dynamical positioning control system is centralized or where a fire-extinguishing system serving various locations is situated. In the case of column-stabilized units a centralized ballast control station is a "control station".
- c) **Enclosed spaces** are spaces delineated by floors, bulkheads and/or decks which may have doors or windows.
- d) **Hazardous areas** are all those areas where, due to the possible presence of a flammable atmosphere arising from the drilling operations, the use without proper consideration of machinery or electrical equipment may lead to fire hazard or explosion.
- e) **Machinery spaces of category A** are all spaces which contain internal combustion-type machinery used either:

- i) for main propulsion; or
- ii) for other purposes where such machinery has in the aggregate a total power of not less than 375 kW; or which contain any oil-fired boiler or oil fuel unit; and trunks to such spaces.

- f) **Machinery spaces** are all machinery spaces of category A and all other spaces containing propelling machinery, boilers and other fired processes, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air-conditioning machinery and similar spaces; and trunks to such spaces.
- g) **Semi-enclosed locations** are locations where natural conditions of ventilation are notably different from those on open decks due to the presence of structures such as roofs, windbreaks and bulkheads and which are so arranged that dispersion of gas may not occur.
- h) **Service spaces** are those used for galleys, pantries containing cooking appliances, lockers and store-rooms, workshops other than those forming part of the machinery spaces, and similar spaces and trunks to such spaces.
- i) **Working spaces** are those open or enclosed spaces containing equipment and processes, associated with drilling operations, which are not included in 1.3.30 or 1.3.32.

26) Speed

- a) **Maximum ahead service speed** is the greatest speed which the unit is designed to maintain in service at sea at its deepest seagoing draught.
- b) **Maximum astern speed** is the speed which it is estimated the unit can attain at the designed maximum astern power at its deepest seagoing draught.

27) Steering Gear

- a) **Main steering gear** is the machinery, the steering gear power units, if any, and ancillary equipment and the means of applying torque to the rudder stock, e.g. tiller or quadrant, necessary for effecting movement of the rudder for the purpose of steering the unit under normal service conditions.

b) **Auxiliary steering gear** is the equipment which is provided for effecting movement of the rudder for the purpose of steering the unit in the event of failure of the main steering gear.

c) **Steering gear power unit** means, in the case of:

- i) electric steering gear, an electric motor and its associated electrical equipment;
- ii) electro-hydraulic steering gear, an electric motor and its associated electrical equipment and connected pump;
- iii) other hydraulic gear, a driving engine and connected pump.

28) **Survival craft** are craft capable of removing persons from a unit to be abandoned and capable of sustaining persons until retrieval is completed.

29) **Switchboards**

a) **Emergency switchboard** is a switchboard which, in the event of failure of the main system of electrical power supply, is directly supplied by the emergency source of electrical power and/or the transitional source of emergency power and is intended to distribute electrical energy to the emergency services.

b) **Main switchboard** is a switchboard directly supplied by the main source of electrical power and intended to distribute electrical energy to the unit's services.

30) **Water depth** as used herein is the vertical distance from the sea bed to the mean low water level plus the height of astronomical and storm tides.

31) **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.

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

33) **Anniversary date** means the day and month of each year which will correspond to the date of expiry of the certificate.

34) **Column stabilized unit** is a unit with the main deck connected to the underwater hull or footings by columns or caissons.

35) **Continuous "B" class ceilings or linings** are those "B" class ceilings or linings which terminate only at an "A" or "B" class division.

36) **Control stations** are those spaces in which the unit's radio or main navigating equipment or the emergency source of power is located or where the fire recording or fire control equipment or the dynamic positioning control system is centralized or where a fire-extinguishing system servicing various locations is situated. In the case of column-stabilized units a centralized ballast control station is a "control station".

37) **Dead ship condition** is the condition under which the main propulsion plant, boilers and auxiliaries are not in operation due to the absence of power.

38) **Depth for freeboard** has the same meaning as defined in regulation 3 of the 1988 LL Protocol.

39) **Freeboard** is the distance measured vertically downwards amidships from the upper edge of the deck line to the upper edge of the related load line.

40) **FSS Code** means the International Code for Fire Safety Systems, adopted by the Maritime Safety Committee of the Organization by resolution MSC.98(73), as amended.

41) **FTP Code** means the International Code for Application of Fire Test Procedures, adopted by the Maritime Safety Committee of the Organization by resolution MSC.61(67), as amended.

42) **Helideck** is a purpose-built helicopter landing platform located on a mobile offshore drilling unit (MODU).

43) **Self-elevating unit** is a unit with movable legs capable of raising its hull above the surface of the sea and lowering it back into the sea.

44) **Surface unit** is a unit with a ship or barge-type displacement hull of single or multiple hull construction intended for operation in the floating condition.

Section 3

Classification Regulations

3.1 General

3.1.1 The objective of unit classification is to verify the structural strength and integrity of essential parts of the unit's hull and its appendages; stability of the unit; the reliability and function of the propulsion and steering systems; power generation and those other features and auxiliary systems which have been built into the unit in order to maintain essential services on board.

3.1.2 Although these Rules are primarily intended for the classification of drilling units, they may also be used for classification of units engaged in activities such as production.

3.1.3 When a drilling unit is assigned a specific Character of Class by Indian Register of Shipping, it implies that IRS has been satisfied that the said drilling unit meets, for this particular class, with these Rules and Regulations or requirements equivalent thereto for both hull and machinery. The drilling unit will continue to be classed with IRS so long as she is found, upon examination at the prescribed annual and periodical surveys, to be maintained in a fit and efficient condition and in accordance with the Periodical Survey requirements of these Rules. Classification will be conditional upon compliance with IRS requirements for both hull and machinery.

3.1.4 The Rules are framed on the understanding that drilling units will be properly handled; they do not, unless stated in the class notation, provide for special distributions or concentrations of loading and that drilling units will not be operated in environmental conditions more severe than those agreed for design basis and approval.

3.1.5 Compliance to applicable International Conventions and National requirements is a prerequisite of classification.

3.1.6 Where a drilling unit holds dual classification with IRS and the periodical survey requirements of the corresponding Society differ from those of the Rules of IRS, IRS may permit the requirements of the corresponding Society being applied, in so far as they are equivalent in purpose or are no less stringent than the IRS rule requirement.

3.1.7 The classification of a drilling unit with IRS does not exempt the owners from compliance with any additional and/or more stringent requirements issued by the Administration of the state whose flag the drilling unit is entitled to fly and provision for their application.

3.1.8 It is the responsibility of the Owners to ensure that the operating and maintenance instructions/manuals for the drilling unit's machinery equipment essential to the safe operation of the drilling unit are available in a language understandable by those officers and crew members who are required to understand such information/instructions in the performance of their duties.

3.2 Application of Rules

3.2.1 Unless directed otherwise by IRS, no new Regulations or amendments to the Rules relating to the character of classification or class notation is to be applied to the existing drilling units.

3.2.2 Unless directed otherwise by IRS, no new Rules and Regulations or amendments to the existing Rules & Regulations become applicable within 6 months after the date of issue nor after the approval of original midship section or equivalent structural plans. Where it is proposed to use existing previously approved plans for a new contract, written application is to be made to IRS.

3.3 Scope and process of classification

3.3.1 Classification covers drilling unit's hull, appendages and machinery including electrical systems to the extent as specified in these Rules & Regulations. Classification does not guarantee the design or performance of a drilling unit except for those aspects covered by the Rule requirements and subject to the conditions of operation of the drilling unit mentioned in 3.1.3.

3.3.2 The classification process consists of:

- A technical review of the design plans and related documents for a new drilling unit to verify compliance with the applicable Rules;
- Attendance at the construction of the drilling unit in the shipyard by IRS surveyor(s) to verify that the vessel is constructed in

accordance with the approved design plans and classification Rules;

- Attendance by IRS surveyor(s) at the relevant production facilities that provide key components such as the steel, engine, generators and castings to verify that the component conforms to the applicable Rule requirements;
- Attendance by IRS surveyor(s) at the sea trials and other trials relating to the drilling unit and its equipment prior to delivery to verify conformance with the applicable Rule requirements;
- Upon satisfactory completion of the above, the builder's/ owner's request for the issuance of a class certificate will be considered by IRS and, if deemed satisfactory, the assignment of class may be approved and a certificate of classification issued;
- Once in service, the owner is to submit the drilling unit to a clearly specified programme of periodical class surveys, carried out onboard the vessel, to verify that the drilling unit continues to meet the relevant Rule requirements for continuation of class. A classification survey is a visual examination that normally consists of an overall examination of the items identified in the Rules for survey, detailed check of selected parts on a sampling basis and witnessing tests, measurements and trials where applicable.
- When a Surveyor identifies corrosion, structural defects or damage to hull, machinery and/ or equipment which, based on the Rules and in the opinion of the Surveyor, affects the unit's class, remedial measures and/ or appropriate conditions of class are specified in order to retain class. Conditions of class are requirements to the effect that specific measures, repairs, surveys etc. are to be carried out within a specified time limit in order to retain class.


3.4 Interpretations of the Rules


3.4.1 The correct interpretation of the requirements contained in the Rules and other Regulations is the sole responsibility and at the sole discretion of IRS.


3.5 Character of classification

3.5.1 The following Characters and symbols are assigned by IRS to indicate classification of Steel Drilling Units.

3.5.2 **Character SUL** assigned to sea-going drilling units indicates that the drilling unit, its machinery and equipment (i.e. anchors, chain cable and hawsers) meet the Rule requirements for assignment of this Character of Class.

3.5.3 **The distinguishing mark**  inserted before Characters of Class or Class Notation(s) is assigned to new drilling units constructed under special survey of IRS in compliance with the Rules to the satisfaction of IRS.

3.5.4 The distinguishing mark  inserted before a Character of Class (SUL, SU (-), SU, IY as appropriate), is assigned to drilling units admitted in to IRS Class during the course of construction and surveyed by an IACS Society.

3.5.5 The distinguishing mark  inserted before a Character of Class (SUL, SU (-), SU, IY as appropriate), is assigned to drilling units admitted into IRS Class at the time of delivery of the vessel and constructed under the survey of an IACS Society.

3.6 Class notations - Hull

3.6.1 When requested by an Owner and agreed to by IRS or when considered necessary by IRS, class notation(s) as detailed below will be appended to the character of classification.

3.6.2 Type Notation: Depending on the type of the unit, one of the following type notations will be assigned:

SELF ELEVATING UNIT

COLUMN STABILISED UNIT

SURFACE UNIT

3.6.3 Additional Qualifier Notations: Following additional qualifier notations will be appended to the above type notations, as applicable:

Additional Qualifier Notations	Description
DRILLING	This additional notation may be assigned to a unit which is capable of performing drilling operations and complying with the relevant requirements of these Rules.
PRODUCTION	This additional notation may be assigned to a unit, other than surface unit, which is capable of performing hydrocarbon production operations. In addition to meeting the relevant requirements of these Rules, such units are to comply with the requirements related to hydrocarbon production facilities in the <i>IRS Rules and Regulations for the Construction and Classification of Floating Offshore Units</i> .
SELF PROPELLED	This additional notation would be assigned to a unit which is self-propelled.
NON SELF PROPELLED	This additional notation would be assigned to a unit which not self-propelled and requires towing support.
Note: 1. The surface units with production capabilities are covered in <i>IRS Rules and Regulations for the construction and Classification of Floating Offshore Units</i> .	


3.6.4 Service Restriction Notation: In case of units which are not designed to meet the full criteria for unrestricted service, an appropriate service restriction notation will be appended to the class notation.

3.6.5 Position Mooring Equipment and Systems Notation Class notation **PM** would be assigned when the position mooring equipment and systems provided on the drilling unit comply with the rules.

3.6.6 Description: In some cases, there may be a need to assign a 'description' to amplify the purpose or role of a unit. In general, there would be no specific rule requirements to be complied with for assignment of a description.

3.7 Class notations - Machinery

3.7.1 The class notation **IY** assigned to drilling units indicates that its machinery as covered by Chapters 12 to 14 and its installation meet the applicable Rule requirements.

3.7.2 The distinguishing mark  inserted before the class notation **IY** is assigned to new drilling units where the machinery as covered by Chapters 12 to 14 has been manufactured and installed under special survey of IRS.

3.8 Materials, components, equipment and machinery

3.8.1 The materials used in the construction of hull and machinery intended for classification, or in the repair of drilling unit already classed, are to be of good quality and free from defects and are to be tested in accordance with the relevant Rules. The steel is to be manufactured by an approved process at works recognized* by IRS. Alternatively, tests to the satisfaction of IRS will be required to demonstrate the suitability of the steel.

* Consideration may be given by IRS to accept the works approved by IACS Member Societies with whom IRS currently has Cooperation Agreements for this purpose.

3.8.2 Certification of materials, components, equipment and machinery is carried out on basis of following. Considering IRS and/or IMO requirements, as applicable:

- Type approval carried out by IRS
- Unit certification by IRS, or
- Alternative Certification Scheme by IRS (Refer to *IRS Rules and Regulations for the Construction and Classification of Steel Ships, Pt 1, Ch 1, Sec 4*), or

3.8.3 Mutual recognition of certificates, if type approved by an IACS Member Society or European Union recognized organization based on commonly agreed design requirements under Mutual Recognition Scheme between IRS and the recognized organization, may also be used as basis for certification of materials, components, equipment and machinery.

3.9 Request for surveys

3.9.1 It is the responsibility of the Builders or Owners, as applicable, to inform the Surveyors of IRS in the port at which the surveys for

supervision during new construction or drilling units in service are to be undertaken and to ensure that all surveys for issue of class certificate for new construction, and maintenance of class for drilling units in service are carried out.

3.10 Repairs

3.10.1 Any repairs to the hull, machinery and equipment either as a result of damage or wear and tear which are required for the maintenance of drilling unit's class are to be carried out under the inspection of and to the satisfaction of the Surveyors.

3.10.2 Where a drilling unit is damaged to an extent resulting in towage outside port limits, it shall be the Owners' responsibility to notify IRS at the first practicable opportunity.

3.10.3 Where such repairs are effected at a port where there is no Surveyor of IRS, the drilling unit is to be surveyed by one of its Surveyors at the earliest opportunity.

3.10.4 Where repairs to hull, machinery or equipment, which affect or may affect classification, are to be carried out by a riding crew, they are to be planned in advance. A complete repair procedure including the extent of proposed repairs and the need for Surveyor's attendance during the voyage is to be submitted to and agreed upon by the Surveyor reasonably in advance. Failure to notify IRS, in advance of the repairs, may result in suspension of the drilling unit's class.

3.11 Alterations

3.11.1 Any alterations proposed to be carried out to approved scantlings and arrangements of the hull, machinery or equipment are to meet with the approval of IRS and for this purpose plans and technical particulars are to be submitted for approval in advance. Such approved alterations are to be carried out under the inspection of, and to the satisfaction of, the Surveyors.

3.12 Date of build

3.12.1 The date of completion of the special survey inspection will normally be taken as the date of build to be entered in the Register Book.

Where there is a substantial delay between completion of construction survey and the drilling unit commencing service, the date of commissioning may be specified on the classification certificate.

When modifications are carried out on a drilling unit, the initial date of build remains assigned to the drilling unit.

3.13 Appeal from Surveyors' recommendations

3.13.1 If the recommendations of the Surveyors are considered in any case to be unnecessary or unreasonable, appeal may be made to IRS, who may direct a special examination to be held.

3.14 Certificates

3.14.1 Certificates of Class will be issued to Builders or Owners when the required reports on completion of Special Surveys of new drilling units or of existing drilling units submitted for classification have been received from the Surveyors and approved by IRS.

3.14.2 Certificates of class maintenance in respect of completed periodical special surveys of hull and machinery will also be issued to Owners.

3.14.3 The Surveyors are permitted to issue Interim Certificates to enable a drilling unit, classed with IRS, to proceed on her voyage provided that, in their opinion, she is in a fit and efficient condition. Such Certificates will contain Surveyors' recommendations for continuance of Class, but in all cases are subject to confirmation by IRS.

3.14.4 Individual Certificates can also be issued for propelling machinery, boilers, equipments and fittings which have been manufactured under IRS Survey and in accordance with these Regulations.

3.15 Suspension, withdrawal and deletion of class

3.15.1 When the class of a drilling unit holding IRS class, is withdrawn by IRS in consequence of a request from the Owners, the notation "Class withdrawn at Owners' request" (with date) will be made in the Supplement and the notation "Class withdrawn - Owners' request" (with date) will be made in the next reprint of the Register Of Drilling Units. After one year, the notation will be altered to "Classed IRS until" (with date).

3.15.2 When the Regulations as regards surveys on the hull or equipment or machinery have not been complied with and the drilling unit thereby is not entitled to retain her class, the class will be withdrawn and the notation "Class withdrawn"

(with date) will be made in the Supplement and the notation "IRS Class withdrawn" (with date) will be made in the next reprint of the Register Of Drilling Units. After one year, the notation will be altered to "Classed IRS until" (with date).

3.15.3 The class of a drilling unit is liable to be withheld or, if already granted, may be withdrawn in case of any non-payment of fees or expenses chargeable for the service rendered.

3.15.4 Where any drilling unit proceeds to sea with a less freeboard than that approved by IRS or when the freeboard marks are placed higher on the drilling unit's sides than the position assigned or approved by IRS, the drilling unit's class will be liable to be withdrawn.

3.15.5 When it is found that a drilling unit is being operated in a manner contrary to that agreed at the time of classification, or is being operated in conditions or in areas more onerous than those agreed, the class is liable to be suspended or withdrawn.

3.15.6 The class of a drilling unit which has maintained class would be deleted on receipt of information that it has been scrapped or ceases to exist, and an appropriate entry would be made in the Register of Ships.

3.15.7 In cases where the class has been suspended by IRS and it becomes apparent that the owners are not interested in maintaining IRS class, the notation will be amended to withdrawn status.

3.16 Reclassification of drilling units

3.16.1 When Owners request for reclassification of a drilling unit for which the class previously assigned has been withdrawn, IRS will require a Special Survey for Reclassification to be held by the IRS Surveyors. The extent of the survey will depend upon the age of the drilling unit and the circumstances of each case.

3.16.2 If the drilling unit is found or placed in good and efficient condition in accordance with the requirements of the Rules and Regulations at the Special Survey for Reclassification, IRS may decide to reinstate her original class or assign such other class as considered appropriate.

3.16.3 The date of reclassification will appear in the supplement to the Register Of Drilling Units and the subsequent issue of Register Of Drilling Units.

Section 4

Classification of Drilling Units Built under the Survey of Indian Register of Shipping

4.1 Classification of new constructions

4.1.1 The request for classification of new constructions is to be submitted to IRS by the shipyard or shipowner in the form provided by IRS. The request is to include complete details regarding class notation and statutory certificates required, where applicable.

4.1.2 Where orders for major machinery and equipment are placed on manufacturer or suppliers, IRS will have to be informed. Responsibility for compliance with IRS Rules and Regulations shall be with the manufacturers/suppliers.

4.1.3 Plans and particulars as specified in the Rules will have to be submitted to IRS in triplicate sufficiently in advance of commencement of construction. One copy with stamp of approval will be returned. Any deviation from approved drawings will require to be approved by IRS prior to execution of work.

IRS reserves the right to request for additional plans, information or particulars to be submitted. Approval of plans and calculations by IRS does not relieve the Builders of their responsibility for the design, construction and installation of the various parts, nor does it absolve the Builders from their duty of carrying out any alterations or additions to the various parts on board deemed necessary by IRS during construction or installation on board or trials.

4.1.4 IRS will assess the production facilities and procedures of the shipyard and other manufacturers as to whether they meet the requirements of the construction Rules.

4.1.5 During construction of a drilling unit, IRS will ensure by surveys that parts of hull and machinery requiring approval have been constructed in compliance with approved drawings, all required tests and trials are performed satisfactorily, workmanship is in compliance with current engineering practices

and welded parts are produced by qualified welders.

4.1.6 All hull, machinery and electrical installations will be subjected to operational trials in the presence of IRS Surveyor.

4.1.7 On completion of the drilling unit, copies of as fitted plans showing the drilling unit as built, essential certificates and records, loading manual etc. are to be submitted by the Builder generally prior to issuance of the Interim Certificate of Class.

4.2 Scope

4.2.1 The items listed below, where applicable, are covered by these requirements and are subject to approval by IRS :

- Materials
- 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

4.2.2 These Requirements do not cover structural details of industrial items used exclusively in drilling or related operations. The assessment of the required holding capacity, arrangement and operation is 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 these requirements.

4.3 Plans and design data

4.3.1 Plans showing the scantlings, arrangements and details of the principal parts of the structure of each unit to be built under IRS Class are to be submitted for approval before construction commences. These plans are to clearly indicate the scantlings, types and grades of materials, joint details and welding, or other methods of connection. These plans are to include the following, where applicable:

- General arrangement;
- Inboard and outboard profile;
- Summary of distributions of fixed and variable weights;
- Plan indicating design loading for all decks;
- Transverse sections showing scantlings;
- Longitudinal sections showing scantlings;
- Decks, including helicopter deck;
- Framing;
- Shell plating;
- Watertight bulkheads and flats;
- Structural bulkheads and flats;
- Tank boundaries with location of overflows;
- Pillars and girders;
- Diagonals and struts;
- Legs;
- Structure in way of jacking or other elevating arrangements;
- Stability columns and intermediate columns;
- Hulls, pontoons, footings, pads or mats;
- Superstructures and deck houses;
- Arrangement and details of watertight doors and hatches;

- Anchor handling arrangements;
- Welding details and procedures;
- Lines or offsets;
- Curves of form or equivalent data;
- Cross curves of stability or equivalent data;
- Wind heeling moment curves or equivalent data;
- Capacity plan;
- Tank sounding tables;
- Corrosion control arrangements;
- Methods and locations for non-destructive testing;
- Cable details and grouping criteria
- Circuit breaker setting and fuse ratings
- Electrical installations in hazardous locations
- Elevating system material specifications
- Emergency shutdown procedures
- Generator ratings
- Information required by the IRS steel vessels rules for propulsion machinery, main and emergency generators and vital motors 100 [kW] and over
- Main and emergency generators and vital motors below 100 [kW] rating
- Propulsion controls, main and emergency switchboards, distribution panels and panel boards

4.3.2 In addition to be above, an arrangement plan of watertight compartmentation is to be submitted as early in the design stage as possible, for review of damage stability. This drawing is to indicate the watertight bulkheads, decks, and flats and all openings therein. Doors, hatches, ventilators, etc., and their means of closure, are to be indicated. Piping and ventilation systems are to be shown in sufficient details to evaluate their effects on the watertight integrity of the drilling unit after incurring damage.

Machinery

- Plans are to be submitted showing the arrangements and details of all propulsion and auxiliary machinery, steering gear, boilers and pressure vessels, electrical systems, jacking or other self-elevating systems, bilge and ballast systems, fire extinguishing systems and other pumps and piping systems as described in Chapters 12 to 14.
- Electrical systems and components
- A one line diagram of the power system
- A plan showing hazardous locations and electrical equipment in these locations together with a listing of equipment manufacturers and model numbers and evidence of certification
- Battery data and gas emissions calculations
- Booklet of standard (cable and wiring) details
- Motor and motor control data
- Panels and switchboards
- Short-circuit analysis and supporting data
- Steering gear, including control circuits
- Wiring diagrams and details for
 - emergency generator starting
 - fire alarm
 - interior communication systems required by the MODU Rules
 - intrinsically safe systems
- Navigation lights

Mechanical systems/components

- Diagrammatic drawing of each system accompanied by lists of material giving size, wall thickness, maximum working pressure and material of valves and fittings
- General arrangement of pumps and piping
- Where superheated steam is used, temperature is to also be given
- A description of the ballast control system for column stabilized units

- A description and diagrammatic plans of all piping systems used solely for drilling operations, including cross connections where applicable with other non-drilling related systems
- All group I piping systems not covered above except for those which form part of an independently manufactured unit
- Ballasting calculations for column stabilized units
- Bilge and ballast systems
- Boiler-feed systems
- Booklet of standard piping details
- Compressed air systems
- Essential control air systems
- Essential sea-water and fresh-water service systems
- Exhaust piping for internal combustion engines and boilers
- Fire-main and fire-extinguishing systems
- Fuel-oil-filling, transfer and service systems
- General arrangement of pumps and piping
- Hydraulic power piping systems
- Non-standard fittings: specifications, calculations and material tests
- Non standard materials, bronze
- Pumps - performance data and calculations
- Starting air systems
- Systems conveying toxic liquids, low flash point (below 60°C, 140°F) liquids or flammable gas
- Sanitary systems
- Specific additional information for:
 - flexible expansion joints in seawater systems
 - fuel flash point data
 - hydraulic cylinders

- hydraulic system and components
- non-standard materials, bronze
- non-standard fittings

- Steam and exhaust piping
- Vent, sounding and overflow pipe capacity calculations

4.4 Materials

4.4.1 Unless otherwise specified, these Requirements are intended for drilling units to be constructed of hull structural steel, manufactured and having the properties as specified in Part 2 of the Rules and Regulations for the Construction and Classification of Steel Ships. Where it is proposed to use steel or other material having properties differing from those specified in the foregoing Rules, the specification and properties of such materials are to be submitted to IRS 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.

4.5 Scantlings

4.5.1 Scantlings of the major structural elements of the unit are to be determined in accordance with the Requirements as set forth herein. Scantlings of structural elements which are subject to local load only, and which are not considered to be effective components of the primary structural frame of the unit, shall comply with the applicable requirements of the Rules and Regulations for the Construction & Classification of Steel Ships.

4.5.2 Scantlings of surface type drilling units are to comply with the requirements of Rules and Regulations for the Construction & Classification of Steel Ships. See also Chapter 6.

4.5.3 Where the drilling unit is fitted with an acceptable corrosion protection system, the scantlings may be determined in accordance with 3.3 in conjunction with allowable stresses given in Sec. 3, and in which case no corrosion allowance is required. If scantlings are determined from the Rules and Regulations for the Construction & Classification of Steel Ships, reductions for corrosion protection may be as permitted by the foregoing Rules.

Where no corrosion protection system is fitted or where the system is considered by IRS to be inadequate, an appropriate corrosion allowance

will be required on scantlings determined from Sec. 3, and no reduction will be permitted on scantlings determined by the use of the foregoing Rules.

4.6 Operating Manuals

4.6.1 Operating manuals or equivalent are to be placed on board each drilling unit. The manuals are to be approved by IRS from the point of view of classification requirements covered by these rules and by the flag Administration / IRS for all statutory aspects. The manuals are to be readily available. They are to include information applicable to the particular drilling unit, so as to provide suitable guidance to the operating personnel with regard to safe operation of the unit for both normal and envisaged emergency conditions. The manuals are to, in addition to providing the necessary general information about the unit, contain guidance on and procedures for the operations that are vital to the safety of personnel and the unit. The manuals are to be concise and be compiled in such a manner that they are easily understood. Each manual is to be provided with a contents list, an index and wherever possible be cross-referenced to additional detailed information which is to be readily available on board.

The operating manual for normal operations is to include all the information specified in chapter 14 of the MODU Code (IMO Resolution A1023(26)) or as specified by the Administration.

For the purpose of classification requirements given in these rules, the operating manual should contain at least the information mentioned in 4.6.2 to 4.6.4.

4.6.2 The operating manual for normal operations is to include the following general descriptive information:

- General description and particulars of the unit
- Pertinent data for each approved mode of operation, including design and variable loading, air gap, wave height, wave period, wind, current, sea and air temperatures assumed seabed conditions and any other applicable environmental conditions such as icing assumed seabed conditions, draft, etc.
- Minimum anticipated atmospheric and sea temperatures.
- General arrangement showing watertight and weathertight boundaries, watertight and weathertight closures, vents, allowable deck

loadings, and the location of downflooding points etc. If permanent ballast is to be used, location, type, quantities and substance used are to be clearly indicated.

- Hydrostatic curves or equivalent data.
- Tank sounding tables or curves showing capacities, the vertical, longitudinal and transverse centres of gravity in graduated intervals and the free surface data of each tank;
- For self-elevating units, information regarding the preparation of the unit to avoid structural damage during the setting or retraction of legs on or from the seabed or during extreme weather conditions while in transit, including the positioning and securing of legs, cantilever drill floor structures and drilling equipment or materials which might shift position;
- Capacity plan showing capacities and the vertical, longitudinal and transverse centres of gravity of tanks and bulk material stowage spaces, free surface corrections, etc.
- Instructions for operation, including precautions to be taken in adverse weather, changing mode of operations, any inherent limitations of operations for each mode of operation and for each change in mode of operation, etc.
- Plans and description of the ballast system and instructions for ballasting.
- Identification and classification of hazardous areas on the unit.
- Light ship data based on the results of an inclining experiment together with a comprehensive listing of the inclusions and exclusions of semi-permanent equipment, etc.
- Acceptable structural deck loadings
- Stability information in the form of maximum KG-draught curve, or other suitable parameter based upon compliance with the required intact and damaged stability criteria.
- Description and limitations of any on-board computer used in operations such as ballasting, anchoring, dynamic positioning and in trim and stability calculations
- Description of towing arrangements and limiting conditions of operation

- Description of the main power system and limiting conditions of operation
- Identification of the helicopters used for the design of the helideck and any limiting conditions of operation.
- A list of key plans and schematics

4.6.3 The operating manual for normal operations is to also include, where applicable:

.1 guidance for the maintenance of adequate stability and the use of the stability data;

.2 guidance for the routine recording of lightweight alterations;

.3 examples of loading conditions for each mode of operation and instructions for developing other acceptable loading conditions, including the vertical components of the forces in the anchor cables;

.4 for column-stabilized units, a description, schematic diagram and guidance for the operation of the ballast system and of the alternative means of ballast system operation, together with a description of its limitations, such as pumping capacities at various angles of heel and trim;

.5 a description, schematic diagram, guidance for the operation of the bilge system and of the alternative means of bilge system operation, together with a description of its limitations, such as draining of spaces not directly connected to the bilge system;

.6 fuel oil storage and transfer procedures;

.7 procedures for changing modes of operation;

.8 guidance on severe weather operations and time required to meet severe storm conditions, including provisions regarding lowering or stowage of equipment, and any inherent operational limitations;

.9 description of the anchoring arrangements and anchoring or mooring procedures and any limiting factors;

.10 description of the dynamic positioning systems and limiting conditions of operation;

4.6.4 The operating manual for emergency operations is to include, where applicable:

.1 description of fire-extinguishing systems and equipment;

.2 description of means of escape;

.3 description of the emergency power system and limiting conditions of operation;

.4 a list of key plans and schematics which may be useful during emergency situations;

.5 general procedures for deballasting or counterflooding and the closure of all openings which may lead to progressive flooding in the event of damage;

.6 guidance for the person in charge in determining the cause of unexpected list and trim and assessing the potential effects of corrective measures on unit survivability, i.e. strength, stability, buoyancy, etc.;

.7 special procedures in the event of an uncontrolled escape of hydrocarbons or hydrogen sulphide, including emergency shutdown; and

.8 guidance on the restoration of mechanical, electrical and ventilation systems after main power failure or emergency shutdown.

4.6.5 The information provided in the operating manuals is to be supported, where necessary, by additional material provided in the form of plans, manufacturers' manuals and other data necessary for the efficient operation and maintenance of the unit. Detailed information provided in manufacturers' manuals need not be repeated in the operating manuals. The information is to be referenced in the operating manual, readily identified, located in an easily accessible place on the unit and be available at all times.

4.7 Construction booklet

4.7.1 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.

4.8 Records

4.8.1 The following information or records are to be maintained on board:

.1 survey record under Ch.2;

.2 inspection and maintenance records related to means of access;

.3 light ship data alterations log as per Ch.5;

.4 testing records and equipment changes for anchors and related equipment as per Ch.10;

.5 maintenance, inspection and testing records relating to fire-fighting equipment as per Ch.14.

.6 the electrical equipment register as per Ch.13, 2.3

.7 maintenance and repair of all electrical equipment in hazardous areas for continued certification in accordance with the international standards as per Ch.13, 2.1.

Section 5

Classification of Drilling Units not Built under the Survey of Indian Register of Shipping

5.1 General procedure for classification of drilling units not built under survey of IRS

5.1.1 Plans of hull and machinery together with torsional vibration calculations, where applicable, are to be submitted for approval. It is preferable to have the plans approved before the classification survey is commenced.

5.1.2 Full special classification surveys would require to be carried out by IRS Surveyors in order to satisfy themselves regarding the workmanship and to verify the approved scantlings and arrangements. The scope of these surveys may, however, be modified in the case of vessels built under the Special Survey and holding valid certificates of class of classification societies subject to verification of compliance with IACS QSCS and drilling units are in full compliance with all applicable and relevant IACS resolutions. Prior to commencement of survey by IRS, documentary evidence of all hull and machinery classification surveys held by the other society subsequent to last special survey carried out are to be produced. In such cases, a special survey notation will not be assigned in conjunction with the classification survey. The next special survey therefore would become due five years from the special survey held by the other society and not five years from classification with IRS.

In cases of transfer of class from another society to single class of IRS, the interim certificate of class or any other documents enabling the drilling unit to trade, can be issued only after all overdue surveys and conditions of class issued by the previous society are satisfactorily completed.

5.1.3 For drilling units not built under survey of IRS but subsequently taken in class with the above procedure, the mark signifying the survey during construction will be omitted.

5.1.4 Once a drilling unit has been taken into IRS class, periodical surveys are subsequently to be held as per these rules.

5.2 Plans and data to be furnished as required in 5.1.1

5.2.1 Plans of hull and equipment showing the main scantlings and arrangements of the actual drilling unit and any proposed alterations are to be submitted for approval. These are to normally comprise of the following plans:

- General arrangement
- Inboard and outboard profile
- Summary of distributions of fixed and Variable weights
- Plan indicating design loading for all decks
- Transverse sections showing scantlings
- Decks, including helicopter deck
- Framing
- Shell plating
- Watertight bulkheads and flats
- Structural bulkheads and flats
- Tank boundaries with location of overflows
- Pillars and girders
- Diagonals and Struts
- Legs
- Structure in way of jacking or other elevating arrangements
- Stability columns and intermediate columns
- Hulls, pontoons, footings, pads or mats
- Superstructures and deck houses

-
- | | |
|--|---|
| <ul style="list-style-type: none"> - and hatches - Anchor handling arrangements - Welding details and procedures - Lines or offsets - Curves of form or equivalent data - Cross curves of stability or equivalent data - Wind heeling moment curves or equivalent data - Capacity plan - Tank sounding tables - Operating Manuals as per 4.6 - Corrosion control arrangements - Methods and locations for non-destructive testing - Jacking system - Propulsion machinery, including shafts and propellers - Steering gear and rudders - Auxiliary machinery | <ul style="list-style-type: none"> - Pumping and piping systems, including valves - Boilers and Pressure Vessels - Electrical installations - Protection against fire and explosion. <p>5.2.2 Calculations of torsional vibration characteristics of the main propelling machinery are to be furnished specially for drilling units which have been in service for less than about 2 years.</p> <p>5.2.3 In addition to the requirements of 5.2.1, additional plans would require to be submitted in accordance with applicable Chapters of Part 5, of Rules & Regulations for the Construction & Classification of Steel Ships for drilling units with additional class notations.</p> <p>5.2.4 In cases where the drilling unit has been previously classed by IRS or a Classification Society subject to verification of compliance with IACS QSCS and the unit is in full compliance with all applicable and relevant IACS resolutions, the approval of plans may be specially considered subject to confirmation of no alteration / modification to the unit. In such cases, it is to be also verified that the drilling unit complies with any retroactively applicable classification or statutory requirements which came into effect subsequently.</p> |
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End of Chapter

Chapter 2

Periodical Surveys

Contents	
Section	
1	General Requirements
2	Annual Surveys
3	Survey of the Outside of the Unit's Bottom and Related Items
4	Special Surveys - Hull
5	Special Surveys – Machinery and Electrical Equipment
6	Surveys of Screw Shafts, Tube Shafts and Propellers
7	Boiler Surveys

Section 1

General Requirements

1.1 General

1.1.1 All drilling units are to be subjected to Periodical Surveys for the purpose of maintenance of class. Survey notations and Survey intervals are given in Table 1.1.1 for main class Surveys. Where additional class notations have been assigned, Surveys are to be carried out at intervals given in Table 1.1.2.

1.1.2 Vessels with additional class notations for which there are no specific Survey requirements defined in this Chapter are to have the equipment and/or construction related to this additional class notation examined to the Surveyor's satisfaction at each Special Survey. However, at the time of Annual Surveys the continued effectiveness, of operational features, safety devices and control systems are to be verified.

1.1.3 Definitions:

- a) *Ballast Tank* is a tank which is used primarily for salt water ballast.
- b) *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 Tanks.
- c) *Spaces* are separated compartments.

d) *Coating Condition* is defined as follows:

- GOOD - condition with only minor rusting
- 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
- POOR - condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

e) *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.

f) *Transverse Section (Girth Belt)* includes all all continuous longitudinal members such as plating, longitudinals and girders at a given section of the unit.

g) *Remote Inspection Techniques (RIT)* is a means of survey that enables visual examination of any part of the structure without the need for direct physical access of the surveyor.

Table 1.1.1 : Periodical survey intervals for main class survey notations		
(Any specific requirements of the flag Administration are also to be complied with)		
Survey	Main class survey notation	Survey interval in years
Hull : Special Survey	SSH	5
Hull : Continuous Survey	CSH	5
Machinery : Special Survey	SSM	5
Machinery : Continuous Survey	CSM	5
Annual Survey	AS	1 ¹
Unit Bottom Survey	BS	See Note 2
Shaft Survey		
Oil Lubricated	SH (OL)	See Notes 3 & 5
Fresh Water Lubricated Closed Loop System	SH (S-FW-C)	
Single Shaft Fresh Water Lubricated Open System	SH (S-FW-O)	
Single Shaft Corrosion Protected or Corrosion Resistant Material, Water Lubricated Open System	SH (S-CP-O)	
Multiple Shaft, Water Lubricated Open System	SH (M-O)	
Single Shaft, Water Lubricated Open System	SH (S-O)	See Note 6
Tailshaft Condition Monitoring	TCM	
Main boilers	MBS	2.5 ⁴
Auxiliary boilers	ABS	2.5 ⁴
Exhaust gas steam generators and economisers	EGES	2.5 ⁴
Notes: 1. Survey may be carried out within 3 months on either side of the due date. 2. At least 2 Surveys of the Unit's bottom and related items are to be carried out within any 5 years but the interval between two consecutive surveys is not to exceed 3 years, and one of these two surveys should coincide with the Special Survey in accordance with the requirements of Section 3. . 3. Upon request, IRS may extend the survey period to harmonise with docking Survey and in accordance with the requirements of Pt.1, Ch.2, Sec.11 of the <i>Rules and Regulations for Construction and Classification of Steel Ships</i> . 4. At least 2 Surveys are to be carried out within any 5 years but the interval between two consecutive surveys is not to exceed 3 years. 5. The pre-requisites to be satisfactorily verified and methods applicable for shaft surveys, based on the type of propeller coupling and lubrication system used, (as detailed in Pt.1, Ch.2, Sec.11 of the <i>Rules and Regulations for Construction and Classification of Steel Ships</i>), are to be complied with. 6. Condition monitoring records are to be verified at the time of annual surveys. Survey intervals are to be as per Pt.1, Ch.2, Sec.11, Table 11.2.3 of the <i>Rules and Regulations for Construction and Classification of Steel Ships</i>		

Table 1.1.2 : Periodical survey intervals for additional class survey notations

Survey of	Additional class notation	Survey interval in years
Diving system	DIV-SAT, DIV-SURF	
Annual Survey	AS(DIV)	1 ¹
Special Survey	SS(DIV)	5
Note:		
1 May be carried out within 3 months on either side of due date		

h) *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.

i) *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.

j) *Suspect Areas* are locations showing substantial corrosion and/or are considered by the Surveyor to be prone to rapid wastage.

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

l) *Excessive Diminution* is an extent of corrosion beyond allowable limits.

m) *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.

n) *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.

o) *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.

p) *Units with Propulsion Assist* are non-self-propelled Units fitted with thrusters intended to assist in manoeuvring or propelling while under tow.

q) *Anniversary date* means the day and month of each year corresponding to the expiry date of the classification certificate.

1.2 Survey pre-planning and record keeping

1.2.1 Plans and procedures for Special Surveys, Special Continuous Surveys, and survey of the outside of the Unit's bottom and related items 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 Surveyor(s), will be subject to revision if found to be necessary in light of experience.

1.3 Lay-up and Reactivation surveys

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

1.3.2 A Reactivation Survey is required for Units which have been laid up and are returning to active service, regardless of whether IRS has been previously informed that the vessel has been in lay-up. The requirements for the Reactivation Survey are to be specially considered in each case, with 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 vessel has been maintained during that period.

1.4 Surveys for damage and repairs

1.4.1 It is the responsibility of the owner/ operator of the unit to report to IRS 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 IRS Surveyor(s). All repairs found necessary by the Surveyor are to be carried out to his satisfaction.

1.4.2 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 IRS reasonably in advance. Failure to notify IRS, 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.

1.4.3 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 IRS 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.

1.4.4 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 1.1.3 (I)) repaired.

For locations 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.

1.4.5 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.

1.4.6 Where the damage mentioned in 1.4.4 is isolated and of a localized 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 Condition of Class in accordance with IRS Rules, with a specific time limit.

1.5 Alterations

1.5.1 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 IRS 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 Rules and to the satisfaction of the Surveyor(s).

1.6 Unscheduled surveys

1.6.1 In the event that IRS has reason to believe that its Rules and Regulations are not being complied with, IRS reserves the right to perform unscheduled surveys of the hull or machinery.

1.7 Provision for hull surveys

1.7.1 The Surveyors are to be provided with necessary facilities for a safe execution of survey by the owner. In order to enable the attending surveyors to carry out the survey, provisions for proper and safe access, are to be agreed between the owner and IRS in accordance with confined space safe entry procedure of IRS and IMO Resolution A1050(27) 'Revised recommendations for entering enclosed spaces aboard ships', as amended.

1.7.2 Tanks and spaces are to be safe for access, i.e. gas freed, ventilated, etc. Tanks and spaces are to be reasonably clean and free from water, scale, dirt, oil residues, etc. to reveal significant corrosion, deformation, fractures, damages and other structural deterioration.

1.7.3 Adequate illumination is to be provided to reveal significant corrosion, deformation, fractures, damages or other structural deterioration.

1.7.4 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 de-scaled to the extent necessary to determine the limits of the areas to be renewed.

1.7.5 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.

1.7.6 Means are to be provided to enable the Surveyor to examine the structure in a safe and practical way. 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:

- Permanent staging and passages through structures;
- Temporary staging and passages through structures;
- Lifts and movable platforms;
- Boats or rafts;
- Other equivalent means.

1.7.7 Thickness measurements are to be carried out by a firm approved by IRS. 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.

1.7.8 One or more of the following fracture detection procedures may be required if deemed necessary by the Surveyor:

- radiographic equipment;
- ultrasonic equipment;
- magnetic particle equipment;
- dye penetrant.

Other acceptable NDT techniques.

1.7.9 Remote Inspection Techniques (RIT) for Surveys

1.7.9.1 RITs may be used for surveys in accordance with the provisions of Pt. 1, Ch. 2, Sec. 1, 1.7.18 of the *Rules and Regulations for the Construction and Classification of Steel Ships*.

1.7.9.2 For surveys conducted by use of a remote inspection technique, one or more of the following means of access, acceptable to the Surveyor is to be provided:

- Unmanned robot arm
- Remote Operated Vehicles (ROV)
- Unmanned Aerial Vehicles/ Drones
- Other means acceptable to IRS.

1.8 Survey Offshore or at Anchorage

1.8.1 The surveys at sea or at anchorages may be carried out provided necessary precautions are taken while carrying out the survey and adequate assistance is provided by the personnel onboard.

1.8.2 These are to be carried out in accordance with the provisions of Pt. 1, Ch. 2, Sub-section 1.8 of the *Rules and Regulations for the Construction and Classification of Steel Ships*.

1.9 Welding and replacement of materials

1.9.1 Welding of steels, including high strength structural steel, is to be to the satisfaction of the Surveyor(s).

1.9.2 Welding of 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 Surveyors considering the special materials involved. Substitution of steels differing from those originally installed is not to be made without approval by IRS.

Section 2

Annual Surveys

2.1 General

2.1.1 Annual Class Surveys are to be made within three months either way of each annual anniversary date of the completion of the previous Special Survey of Hull, or of the original construction date. These are to be held concurrently with statutory annual or other relevant statutory surveys, where practicable.

2.1.2 The survey is to consist 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.

2.1.3 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.

2.1.4 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 areas of substantial corrosion. Table 4.3.3 (d) 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.

2.2 Survey requirements - All types of drilling units

2.2.1 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 parts listed below, as applicable, are to be generally examined and placed in satisfactory condition as found necessary and :

- 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, including hatchcovers, doors check valves, together with their respective securing devices, dogs, sill, coamings and supports;
- g) Freeing ports together with bars, shutters and hinges;
- h) Windlass and attachment of anchor racks and anchor cables;
- i) Protection of the crew, guard rails, lifelines, gangways, and deck houses accommodating crew;
- j) General examination of the machinery installation including main and auxiliary engines, boilers, steering gear, control systems, etc.
- k) A general examination of the automatic and remote-control system is to be made to the Surveyor's satisfaction. The machinery-space fire-detecting and bilge water-level alarms are to be checked for performance.
- l) A general examination of electrical machinery, the emergency sources of electrical power, the switchgear and other electrical equipment, including operation of the 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.
- m) Propulsion assist and dynamic positioning equipment are to be surveyed based on requirements of Pt.1 Ch.2 of the *IRS Rules and Regulations for Construction and Classification of Steel Ships*.
- n) A general examination of hazardous areas, remote shutdown arrangements, fire fighting systems, piping systems and bilge systems.
- o) Watertight cable transit seal systems register is to be reviewed to confirm it is being maintained and as far as practicable the

transits are to be examined to confirm their satisfactory condition. Where there are records entered since last annual survey of any disruption to the cable transits or installation of new cable transits, the satisfactory condition of those transits is to be confirmed by review of records and, if deemed necessary, by examination. The results are to be recorded in the Register against the specific cable transit.

- p) In case the cable transits have been examined by an approved service supplier, the attending surveyor is to review the Register in order to ascertain that it has been properly maintained by the owner and correctly endorsed by the service supplier.

2.3 Survey requirements - Surface-type units

2.3.1 In addition to the requirements of 2.2, the following are to be examined :

- The hull and deck structure around the drilling well (moon-pool) and in vicinity of any other structural changes-in-section, slots, steps, or openings in the deck or hull and the back-up structure in way of structural members or sponsors connecting to the hull.

2.4 Survey requirements- Self-elevating units

2.4.1 In addition to the requirements of 2.2, the following are to be examined :

- Jack-house structures and attachments to upper hull or platform;
- Jacking or other elevating systems and leg guides, externally.
- Legs as accessible above the waterline, plating and supporting structure in way of leg wells.

2.5 Survey requirements - Column-stabilized units

2.5.1 In addition to the requirements of 2.2, the following 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.

Note : At the first 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 IRS. If IRS deems such survey to be necessary, the extent should be agreed to by the Surveyors and the owner or operator prior to commencement of the Survey.

Section 3

Survey of the Outside of the Unit's Bottom and Related Items

3.1 General

3.1.1 There is to be a minimum of two examinations 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 two such examinations is not to exceed 36 months. For units operating in salt water for less than six (6) months each year, consideration may be given for increase in the survey interval by IRS. Proposals for alternative means of examining the unit's bottom and related items, in lieu of Survey in dry dock will be considered provided they are in general agreement with the intent of 3.3. Consideration will be given to special circumstances justifying an extension of the intervals

3.2 Parts to be examined

3.2.1 For Surface-type Units (ship or barge type units)

- 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 guide on securing arrangements, sea chest and strainers, and their fastenings.
- Propeller shaft bearing, rudder bearing and steering nozzle clearances are to be ascertained and recorded upon.

3.2.2 For Self-Elevating Units

- 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.
- At each survey in dry-dock (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 Survey in dry-dock. Non-destructive testing may be required of areas considered to be critical by the Surveyor or found to be suspect by the Surveyor.

3.2.3 For Column-Stabilized Units

- External surfaces of the upper hull or platform, footings, pontoons or lower hulls, underwater areas of columns, bracing and their connections, and propulsion units as applicable, are to be selectively cleansed and examined to the satisfaction of the attending Surveyor. Non-destructive testing may be required of areas considered to be critical by the Surveyor or found to be suspect by the Surveyor.

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

a) For Surface-type Units

One peak tank and at least two other representative ballast tanks between the peak bulkheads used primarily for water ballast.

b) For Self-Elevating Units

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

c) For 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.

3.2.5 Non-metallic expansion joints in piping systems, if located in a system which penetrates the unit's side and both the penetration and the non-metallic expansion joint are located below the deepest load waterline, are to be inspected and replaced as necessary, or at an interval recommended by the manufacturer.

3.3 Underwater-inspection in lieu of survey in dry-dock

3.3.1 Where physical features as given in 3.3.2 are incorporated in unit's design a properly conducted underwater inspection may be credited as equivalent to a survey in dry-dock, subject to compliance with the conditions and procedures given below in 3.3.3 and 3.3.4 respectively.

3.3.2 Physical features

The following physical features are to be incorporated into the unit's design in order to facilitate the underwater inspection. When verified they will be noted in the unit's classification for reference at subsequent surveys.

a) 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.

b) Rudder bearing

- 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 and secure. This may require bolted access plates and a measuring arrangement.

c) Sea suction

- 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.

d) Sea valves

- For the survey in dry-dock (Underwater Inspection) associated with the Special Survey, means must be provided to examine any sea valve.

3.3.3 Conditions

a) Limitation

- Underwater Inspection in lieu of survey in dry-dock 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.

b) Thickness Gauging and Non-Destructive Testing

- Underwater or internal thickness gaugings of suspect areas may be required in conjunction with the underwater inspection. Means for underwater non-destructive testing may also be required for fracture detection.

c) Plans and data

- Plans and procedures for the Survey in dry-dock (Underwater Inspection) 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. The approved plans and procedures are to be made available on board for the purpose of preplanning of the survey.

d) 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. IRS/ the attending surveyor 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.

3.3.4 Procedures

a) Exposed areas

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

b) Underwater areas

- 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(s) as required, or photographic documentation, or both, depending on the age and type of unit. This is to be supplemented by the Diver's Report describing and attesting to the conditions found. A copy of this diver's report and pertinent photographs are to be submitted to the attending Surveyor for forwarding to IRS, together with his report. Copies are also to be retained onboard, together with any video tapes, reference.

c) Damage area

- 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.

3.3.5 Alternatives

Alternatives to the above guidelines including remotely operated vehicles may be accepted, provided the means and details for accomplishing results are no less effective.

Section 4

Special Surveys - Hull

4.1 General

4.1.1 A survey planning meeting is to be held prior to the commencement of the survey.

4.1.2 For mobile offshore drilling units, the first Special Survey becomes due five years after the date of build. Subsequent Special Surveys become due five years after the crediting date of the previous Special Survey. Extensions of class beyond the 5th year may be granted in exceptional circumstances (Exceptional circumstances means non-availability of dry docking or repair facilities, essential materials, equipment or spare parts, or delays due to action taken to avoid severe weather conditions). In this case the next period of class will start from the expiry date of the Special Survey before the extension was granted. Special survey requirements for units of unusual design, in lay-up or in unusual circumstances will be determined on an individual basis.

4.1.3 The interval between the Special Surveys may be reduced at the request of the parties concerned or by IRS if considered appropriate.

4.1.4 For surveys 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 surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date.

4.1.5 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 fourth annual survey, the entire survey is to be completed within 15 months if such work is to be credited to the special survey and in this case the next period of class will start from the survey completion date.

4.1.6 The special survey is to ensure that the hull, structure, equipment and machinery are in satisfactory condition and that the unit is fit for its intended purpose for the new period of class of 5 years to be assigned subject to proper maintenance and operation and surveys carried out at the due dates.

4.2 Special continuous surveys

4.2.1 At the request of the Owner, a system of Continuous Survey may be accepted whereby the Special Survey requirements are carried out in regular rotation in accordance with the Rules 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 upon and dealt with to the satisfaction of the Surveyor.

4.3 Special Survey No.1

4.3.1 Special Survey No.1 of Hull is to include verification of compliance with the foregoing Annual Survey requirements.

4.3.2 The examinations of the hull are to be supplemented by thickness measurements and testing as required, to verify 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.

4.3.3 Thickness measurements are to be carried out in accordance with Tables 4.3.3 (a), (b) or (c) 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 4.3.3 (d) 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.

4.3.4 The Special Survey is to include examination of unit's bottom and related parts as per Section 3.

4.3.5 In addition, the following requirements as listed below are to be carried out as applicable, the parts examined, placed in satisfactory condition, and reported upon :

a) General - All Drilling Units

- i) The hull or platform structure including tanks, watertight bulkheads and deck, cofferdams, void spaces, sponsons, chain lockers, duct 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 may be required where wastage is evident or suspected.
- ii) All tanks, compartments and free-flooding spaces throughout the drilling unit are to be examined externally and internally for excess wastage or damage. Sea chests, strainers and any underwater propulsion units and pipes are to be selectively cleaned and examined. Internal examinations of spud cans and mats may be specially considered. Watertight integrity of tanks, bulkheads, hull, decks and other compartments is to be verified by visual inspection. Suspect areas and critical structural areas are to be examined and may be required to be tested for rightness, non-destructive tested or thickness gauged. All special and primary application structures (as defined in note of Table 4.3.3 (b)) and identified critical structural areas are to be subjected to Close up survey. 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. 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-corrosion 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.
- iii) Attachments of anchor racks and anchor cable fairleads. Anchors, cables and their respective handling means are to be examined.
- iv) Structures such as derrick substructure and supporting structure, jack-houses, deck houses, superstructures, helicopter landing areas and their respective attachments to the deck or hull.
- v) Foundations and supporting headers, brackets, and stiffeners for drilling related apparatus, where attached to hull, deck, superstructure or deck house.
- vi) Survey of parts of the unit which are underwater and inaccessible to the Surveyor may be accepted on the basis of an examination by a qualified diver carried out in the presence of the Surveyor. Alternative means, approved by IRS, may be considered. Video or photo records, non-destructive testing and thickness gauging may be required in addition to the diver's report.
- vii) At each Special Periodical Survey, thickness gaugings are to be carried out where wastage is evident or suspect.
- viii) 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 a frequency in accordance with IRS procedures. Thickness measurements are to be carried out as deemed necessary by the Surveyor.
- ix) The foundations of machinery are to be examined.
- x) Watertight Cable Transits
 - The requirements for Special Survey may be undertaken by the attending Surveyor or by a firm approved as a service supplier according to IRS Classification Note "Approval of Service Suppliers".
 - All transits are to be examined to confirm their satisfactory condition and the Cable Transit Seal System Register is to be reviewed to confirm it is being maintained. The Special Survey is to be recorded in the Register, in which a single record entry will be sufficient to record the survey of all transits.
 - From review of the Register, where there are records entered since the last special survey of any disruption to the cable transits or installation of new cable transits (except which are reviewed and examined at previous annual surveys), the satisfactory condition of those

transits is to be confirmed by the attending Surveyor by review of records and examination of the transits; the results are to be recorded in the Register against each of those cable transits.

- In case the cable transits have been examined by an approved service supplier, the attending surveyor is to review the Register in order to ascertain that it has been properly maintained by the owner and correctly endorsed by the service supplier.

b) Surface-type Units

In addition to the requirements of 4.3.5 (a), the following items are to be examined :

- Structural appendages and ducts for positioning units.

c) Self-elevating units

In addition to the requirements of 4.3.5 (a), the following items are to be examined:

- 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.
- Structure in, around and under jack-house and leg wells. Non-destructive testing of these areas may be required.
- Leg jacking or other elevating systems externally.

- Leg connections to bottom mats or spud cans, including non-destructive testing of leg connections to mats or spud cans.
- Jetting piping systems or other external piping, particularly where penetrating mats or spud cans.
- 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 the examinations until the next Rig move.

d) Column-stabilized units

In addition to the requirements of 4.3.5 (a), the following items are to be examined:

- 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 may be required of these areas.

4.4 Special Survey No.2 and subsequent special surveys

4.4.1 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. Representative gauging will be required as per Tables 4.3.3 (a), (b), (c) and (d). Special attention will be paid to splash zones on hulls, legs or related structure, and in ballast tanks, pre-loaded tanks, free-flooding spaces, spud cans and mats.

Table 4.3.3 (a) Minimum Requirements for Thickness Measurements for Surface-Type Units at Special Survey			
Special Survey No. I Age ≤ 5	Special Survey No. II 5 < Age ≤ 10	Special Survey No. III 10 < Age ≤ 15	Special Survey No. IV and subsequent Age > 15
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) One transverse section of deck plating abreast the moon pool opening within the amidships 0.6L, together with internals in way as deemed necessary. Where unit is configured with side ballast tanks, the plating and internals of the tanks are also to be gauged in way of the section chosen.	2) Two Transverse Sections (Girth Belts) of deck, bottom and side plating abreast the moon pool and one hatch opening within the amidships 0.6L together with internals in way as deemed necessary. Where unit is configured with side ballast tanks, the plating and internals of the tanks to be gauged in way of the required belts, Remaining internals in ballast tanks to be gauged as deemed necessary.	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 the amidships 0.6L, together with internals in way (including in perimeter ballast tanks, where fitted in way of belts).
	3) Moon pool boundary bulkhead plating	3) Moon pool boundary bulkhead plating	3) Moon pool boundary bulkhead plating
		4) Internals in forepeak tank and aft peak tank as deemed necessary.	4) Internals in forepeak tank and aft peak tank as deemed necessary.
			5) Lowest strake of all transverse bulkheads in hold spaces. Remaining bulkhead plating to be gauged as deemed necessary.
			6) All plates in two wind and water strakes, port and starboard, full length.
			7) All exposed main deck plating full length and all exposed first-tier super-structure 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) Duct keel or pipe tunnel plating or pipe tunnel plating and internals as deemed necessary.
			10) Plating of sea chests. Shell plating in way of overboard discharges as considered necessary by the attending surveyor.
Notes: <ol style="list-style-type: none"> 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 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 4.3.3 (b) Minimum Requirements for Thickness Measurements for Self-Elevating Units at Special Survey

Special Survey No. I Age ≤ 5	Special Survey No. II 5 < Age ≤ 10	Special Survey No. III 10 < Age ≤ 15	Special Survey No. IV and subsequent Age > 15
1) Suspect areas throughout the unit (particular attention to be paid to the legs in way of the Splash Zone).	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) Legs in way of Splash Zone	2) Legs in way of Splash Zone
	3) Primary application structures where wastage is evident	3) Representative gaugings, throughout of special and primary application structures	3) Comprehensive gaugings, throughout of special and primary application structures
	4) Representative gauging of upper hull deck and bottom plating and internals of one preload (ballast) tank	4) Leg well structure	4) Leg well structure
		5) Representative gaugings of deck, bottom, and side shell plating of hull and mat.	5) Representative gaugings of deck, bottom, and side shell plating of hull and mat.
		6) Representative gauging of upper hull deck and bottom plating and internals of at least two preload (ballast) tanks	6) Substructure of derrick as deemed necessary
			7) Representative gauging of internals of all preload (ballast) tanks

Note :

Definition of structural application designation is as follows:

1. **Special:** Those portions of primary structural elements which are in way of critical load transfer points, stress concentrations, etc.
2. **Primary:** Structural elements essential to the overall integrity of the unit.
3. **Secondary:** Structural elements of minor importance, failure of which is unlikely to affect the overall integrity of the unit.

4. Some specific examples of structural elements of Self-Elevating Units, which would fall into the aforementioned categories are as follows:

(i) **Special**

- (a) vertical columns in way of intersection with the mat structure.
- (b) intersections of lattice type leg structure which incorporate novel construction, including the use of steel castings.

(ii) **Primary**

- (a) external plating of cylindrical legs
- (b) plating of all components of lattice type legs
- (c) combination of bulkhead, deck, side and bottom plating within the upper hull which form "Box" or "I" type main supporting structure
- (d) jack-house supporting structure and bottom footing structure which receives initial transfer of load from legs
- (e) Internal bulkheads, shell and deck of bottom mat supporting structure which is designed to distribute major loads, either uniform or concentrated, into the mat structure.

(iii) **Secondary**

- (a) internal framing, including bulkheads and girders, in cylindrical legs
- (b) internal bulkheads and framing members of upper hull structure
- (c) internal bulkheads of bottom mat supporting structure except where the structure is considered primary or special application
- (d) deck, side and bottom plating of upper hull except where the structure is considered primary application

Table 4.3.3 (c) Minimum Requirements for Thickness Measurements for Column-Stabilized Units at Special Survey			
Special Survey No. I Age ≤ 5	Special Survey No. II 5 < Age ≤ 10	Special Survey No. III 10 < Age ≤ 15	Special Survey No. IV and subsequent Age > 15
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) Representative gauging of columns and bracings in Splash Zone together with internals in way as deemed necessary.	2) Representative gaugings, throughout of special and primary application structures.	2) Comprehensive gaugings, throughout of special and primary application structures.
	3) Special and primary application structure where wastage is evident.	3) One Transverse Section (Girth Belt) of each of 2 columns and 2 bracings in Splash Zone together with internals in way as deemed necessary.	3) One Transverse Section (Girth Belt) of each of one-half of the columns and bracings in Splash Zone and internals in way as deemed necessary (i.e., gauge half of the unit's columns and bracings in Splash Zone).
		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 gaugings of substructure of drilling derrick.
Note : Definition of structural application designation is as follows: 1. Special: Those portions of primary structural elements which are in way of critical load transfer points, stress concentrations, etc. 2. Primary: Structural elements essential to the overall integrity of the unit. 3. Secondary: Structural elements of minor importance, failure of which is unlikely to affect the overall integrity of the unit. 4. Some specific examples of structural elements of Column-Stabilized Units, which would fall into the aforementioned categories are as follows: (i) Special (a) external shell structure in way of intersections of vertical columns, decks and lower hulls (b) portions of deck plating, heavy flanges, and bulkheads within the upper hull or platform which form "Box" or "I" type supporting structure which receive major concentrated loads (c) major intersections of bracing members (d) external brackets, portions of bulkheads, flats, and frames which are designed to receive concentrated loads at intersections of major structural members (e) "through" material used at connections or vertical columns, upper platform decks, and upper or lower hulls which are designed to provide proper alignments and adequate load transfer. (ii) Primary (a) external shell structure of vertical columns, lower and upper hulls, and diagonal and horizontal braces (b) deck plating, heavy flanges, and bulkhead within the upper hull or platform which form "Box" or "I" type supporting structure which do not receive major concentrated loads (c) bulkheads, flats or decks and framing which provide local reinforcement or continuity of structure in way of intersections except areas where the structure is considered special application. (iii) Secondary (a) internal structure including bulkheads and girders in vertical columns, decks, lower hulls, and diagonal and horizontal bracing, and framing members (b) upper platform decks, or decks of upper hulls except areas where the structure is considered primary or special application (c) certain large diameter vertical columns with low length to diameter ratios, except at intersections.			

Table 4.3.3 (d) Guidance for Additional Thickness Measurements in way of Substantial Corrosion		
Structural member	Extent of measurement	Pattern of measurement
Plating	Suspect areas and adjacent plates	5 point pattern over 1 square meter
Stiffeners	Suspect area	3 measurements each in line across web and flange

Section 5

Special Surveys – Machinery and Electrical Equipment

5.1 General

5.1.1 In addition to the requirements for Annual Surveys, the requirements for Special Surveys - Machinery/Continuous Survey - Machinery given in Part 1 of *Rules and Regulations for the Construction & Classification of Steel Ships* are to be complied with.

5.1.2 In addition, mobile offshore drilling 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. These items to be especially examined and reported upon at all Special Surveys as follows:

a) Hazardous Areas

- Enclosed hazardous areas such as those containing open active mud tanks, shale shakers, degassers and desanders are to be examined and doors and closures in boundary bulkheads verified as effective. Electric lighting, electrical fixtures, and instrumentation are to be examined, proven satisfactory and verified as explosion-proof or intrinsically safe. Ventilating systems including ductwork, fans, intake and exhaust locations for enclosed restricted areas are to be examined, tested and proven satisfactory. Ventilating-air alarm systems to be proven satisfactory. Electrical motors are to be examined including closed-loop ventilating systems for large d-c motors. Automatic power disconnect to motors in case of loss of ventilating air to be proved satisfactory.

b) Remote Shutdown Arrangements

- Remote shutdown for fuel-oil transfer service pumps and ventilating equipment, together with oil tank outlet valves where required to be able of being remotely closed are to be provided satisfactory. Emergency switch(s) 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:
 - Fire hoses, nozzles and spanners at each fire station.
 - Servicing of all portable extinguishers.
 - Weighing and re-charging as necessary of all dry chemical and CO₂ extinguishers.
 - Fire pumps and piping including operation and capacity.
 - Alarm systems including fire and gas detection.

d) Self Elevating Systems

- On self elevating type drilling 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) Piping Systems

- Piping systems used solely for drilling operations and complying either with the requirements or a recognized standard are to be examined, as far as practical, operationally or hydrostatically tested to working pressure, to the satisfaction of the Surveyor.

f) Miscellaneous

- 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.

- Propulsion-assist and dynamic positioning equipment is to be surveyed
- All mechanical, hydraulic and pneumatic control actuators and their power systems for control systems are to be examined and tested as considered necessary.

– 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.

– Bilge alarm systems, if fitted to be tested and proven satisfactory.

– Emergency power systems are to be examined and tested.

Section 6

Surveys of Screw Shafts, Tube Shafts and Propellers

6.1 General

6.1.1 The requirements for surveys given in Part 1, Chapter 2 of Rules and Regulations for the Construction & Classification of Steel Ships are to be complied with.

6.1.2 Due to low running hours on propulsion shafts in case of drilling units, extended intervals between shaft surveys may be considered based on:

- a) Satisfactory diver's external examination of stern bearing and outboard seal area including wear-down check as far as is possible.

b) Internal examination of the shaft area (inboard seals) in propulsion room(s).

c) Confirmation of satisfactory lubricating oil records (oil loss rate, contamination).

d) Shaft seal elements are examined/replaced in accordance with seal manufacturer's recommendations.

6.1.3 Survey requirements for other propulsion systems will be in accordance with Part 1, Chapter 2 of *Rules and Regulations for the Construction & Classification of Steel Ships*.

Section 7

Boiler Surveys

7.1 General

7.1.1 The requirements for surveys given in Part 1, Chapter 2 of Rules and Regulations for the Construction & Classification of Steel Ships are to be complied with.

End of Chapter

Chapter 3

Materials

Contents	
Section	
1	Manufacture, Survey and Certification
2	Materials for Construction

Section 1

Manufacture, Survey and Certification

1.1 General

1.1.1 Materials, used for the construction or repair of the hull and machinery of drilling units which are classed or intended to be classed with IRS, are to be manufactured, tested and inspected in accordance with the requirements of Part 2 of the *Rules and Regulations for the Construction and Classification of Steel Ships*.

1.1.2 Materials complying with recognized national or international standards with

specifications equivalent to above may also be accepted.

1.1.3 Consideration is to be given to the minimization of hazardous substances used in the construction of the unit and is to facilitate recycling and removal of hazardous materials.

1.1.4 For all drilling units, new installation of materials which contain asbestos are not permitted.

Section 2

Materials for Construction

2.1 Hull steel grades

2.1.1 For surface type units the materials for hull construction are to be in accordance with the requirements of Pt.3, of Rules and Regulations for the Construction and Classification of Steel Ships depending on the air temperature in area of operation, thickness of material and the stress pattern associated with its location.

2.1.2 For self-elevating and column stabilized units the material for hull construction are to be selected considering the defined minimum service temperature, influencing factors and application as given in 2.1.3 to 2.1.5 below.

2.1.3 Minimum service temperature of material

The minimum service temperature of the steel is to be assumed equal to the lowest of the average daily atmospheric temperatures, based on meteorological data, for any anticipated area of

operation. If data giving the lowest daily average temperature is not available and some other criterion is used (such as lowest monthly average temperature), then such data will be specially considered by IRS.

2.1.4 Influencing Factors

A particular application in association with a defined minimum service temperature depends on toughness parameters, taking the following influencing factors into account:

- **Stress Relieving** : A lower service temperature than stipulated in the Table 2.1.4 for the relevant steel grade may be considered when a stress relieving heat treatment is employed.
- **Cold Forming** : When cold forming subjects the extreme fiber to greater than about 3 per cent strain consideration is to be given to applying a suitable heat treatment.

- **Steel Manufacturing Process** : When a steel manufacturing process, such as normalizing, controlled or TM rolling, or grain refinement, is utilized when not specifically required by Part 2 of Rules and Regulations for the Construction & Classification of Steel Ships, a lower service temperature may be used subject to agreement of IRS.

- **Special** : Those portions of primary structural elements which are in way of critical load transfer points, stress concentrations, etc.
- Some specific examples of structural elements which would fall into the aforementioned categories are given in Table 2.1.5:

2.1.5 Application

For the purpose of these rules, structural members have been grouped into three application categories of increasing importance as follows:

- **Secondary** : Structural elements of minor importance, failure of which is unlikely to affect the overall integrity of the unit.
- **Primary** : Structural elements essential to the overall integrity of the unit.

2.1.6 Thickness limitations and grade

2.1.6.1 Table 2.1.4 provides thickness limitations in function of the application category, steel grade and minimum design temperature of the considered structural element.

2.2 Material selection for machinery

2.2.1 Materials to be used for construction of machinery are to be selected in accordance with Pt.4, of Rules and Regulations for the Construction and Classification of steel Ships.

Table 2.1.4 : Thickness limitations [mm] of hull structural steel according to various application categories and design temperatures

Category	Minimum Design Temperature						
	Grade	0°C	-10°C	-20°C	-30°C	-40°C	-50°C
Secondary	A	30	20	10	X	X	X
	B	40	30	20	10	X	X
	D	50	50	45	35	25	15
	E	50	50	50	50	45	35
	AH32 to AH40	40	30	20	10	X	X
	DH32 to DH40	50	50	45	35	25	15
	EH32 to EH40	50	50	50	50	45	35
	FH32 to FH40	50	50	50	50	50	50
	AH420 to AH690	40	25	10	X	X	X
	DH420 to DH690	50	45	35	25	15	X
	EH420 to EH690	50	50	50	45	35	25
	FH420 to FH690	50	50	50	50	50	45

Table 2.1.4 : (Contd.)							
Category	Minimum Design Temperature						
	Grade	0°C	-10°C	-20°C	-30°C	-40°C	-50°C
Primary	A	20	10	X	X	X	X
	B	25	20	10	X	X	X
	D	45	40	30	20	10	X
	E	50	50	50	40	30	20
	AH32 to AH40	25	20	10	X	X	X
	DH32 to DH40	45	40	30	20	10	X
	EH32 to EH40	50	50	50	40	30	20
	FH32 to FH40	50	50	50	50	50	40
	AH420 to AH690	20	X	X	X	X	X
	DH420 to DH690	45	35	25	15	X	X
	EH420 to EH690	50	50	45	35	25	15
	FH420 to FH690	50	50	50	50	45	35
Special	A	X	X	X	X	X	X
	B	15	X	X	X	X	X
	D	30	20	10	X	X	X
	E	50	45	35	25	15	X
	AH32 to AH40	15	X	X	X	X	X
	DH32 to DH40	30	20	10	X	X	X
	EH32 to EH40	50	45	35	25	15	X
	FH32 to FH40	50	50	50	50	40	30
	AH420 to AH690	X	X	X	X	X	X
	DH420 to DH690	25	15	X	X	X	X
	EH420 to EH690	50	40	30	20	10	X
	FH420 to FH690	50	50	50	40	30	20

Table 2.1.4 : (Contd.)

Notes:

1. Thicknesses greater than shown in the Table will be specially considered by IRS.
2. Substitutions of materials considered to be equivalent to the Grades shown, or steels of different strength levels, will be specially considered by IRS.
3. Interpolation of thicknesses for intermediate temperatures may be considered.
4. "X" indicates no application.
5. Material delivery conditions as specified in Pt.2, Ch. 3 of the *Rules and Regulations for the Construction and Classification of Steel Ships*

Table 2.1.5 : Examples of structural elements falling in different application categories

Types of mobile offshore drilling units		
Category	Column stabilised units	Self elevating units
Secondary	a) Internal structure including bulkheads and girders in vertical columns, decks, lower hulls and diagonal and horizontal bracing and framing members	i) Internal framing, including bulkheads and girders, in cylindrical legs
	b) Upper platform decks, or decks of upper hulls except areas where the structure is considered primary or special application	ii) Internal bulkheads and framing members of upper hull structure
	c) Certain large diameter vertical columns with low length to diameter ratios, except at inter-sections	iii) Internal bulkheads of bottom mat supporting structure except where the structure is considered primary or special application
		iv) deck, side and bottom plating of upper hull except where the structure is considered primary application
Primary	a) External shell structure of vertical columns, lower and upper hulls and diagonal and horizontal braces	i) External plating of cylindrical legs
	b) Deck plating, heavy flanges and bulkhead within the upper hull or platform which form "Box" or "I" type supporting structure which do not receive major concentrated loads	ii) Plating of all components of lattice type legs
	c) Bulkheads, flats or decks and framing which provide local re-inforcement or continuity of structure in way of intersections except areas where the structure is considered special application	iii) Combination of bulkhead, deck, side and bottom plating within the upper hull which form "Box" or "I" type main supporting structure
		iv) Jack-house supporting structure and bottom footing structure which receives initial transfer of load from legs
		v) Internal bulkheads, shell and deck of bottom mat supporting structure which are designed to distribute major loads, either uniform or concentrated, into the mat structure

Special	a) External shell structure in way of intersections or vertical columns, decks and lower hulls	i) Vertical columns in way of intersection with the mat structure
	b) Portions of deck plating, heavy flanges and bulkheads within the upper hull or platform which from "Box" or "I" type supporting structure when receive major concentrated loads	ii) Intersections of lattices type leg structure which incorporate novel construction, including the use of steel castings
	c) Major intersections of bracing members	
	d) External brackets, portions of bulkheads, flats and frames which are designed to receive concentrated loads at intersections of major structural members	

End of Chapter

Chapter 4

Design Loads

Contents	
Section	
1	<i>General</i>
2	<i>Wind Loads</i>
3	<i>Wave Loads</i>
4	<i>Current Loads</i>
5	<i>Vortex Shedding</i>
6	<i>Deck Loads</i>
7	<i>Other Loadings</i>

Section 1

General

1.1 General

1.1.1 Various modes of operation of a drilling unit are to be investigated using realistic loading conditions, including gravity loadings together with relevant environmental loadings due to the effects of wind, waves, currents, ice and, where deemed necessary by the owner/designer, the effects of earthquake, sea bed supporting capabilities, temperature, fouling, etc. Where applicable, the design loadings indicated herein are to be adhered to for all types of mobile offshore drilling units.

1.1.2 The owner/designer will specify the

environmental conditions for which the unit is to be approved. Where possible, the design environmental criteria determining the loads on the unit and its individual elements is to be based upon significant statistical information and are to have a return period (period of recurrence) of at least 50 years for the most severe anticipated environment. If a unit is restricted to seasonal operations in order to avoid extremes of wind and wave, such seasonal limitations are to be specified.

1.1.3 Limiting design data for each mode of operation is to be stated in the operating manual.

Section 2

Wind Loads

2.1 Wind velocities

2.1.1 Sustained and gust velocities, as relevant, are to be considered when determining wind loadings. These may be specified by the owner/designer but the wind velocities measured at a reference height of 10 m above sea level are not to be taken less than those given in 2.1.2.

2.1.2 The design wind velocity for units intended

for unrestricted offshore service is not to be less than 36 [m/sec] (70 knots) for all normal operating conditions and not less than 51.5 [m/sec] (100 knots) for the severe storm condition.

For units intended for restricted service lesser wind velocities as specified by the owner/designer may be considered, but they are not to be less than 25.8 [m/sec] (50 knots).

2.2 Wind pressures and forces

2.2.1 Pressures and resultant forces are to be calculated as per 2.2.2 below. Where wind tunnel data obtained from tests on a representative model of the unit by a recognized laboratory are submitted, these data will be considered for the determination of pressures and resulting forces.

2.2.2 The wind pressure P , is to be obtained from the following formula:

$$P = 6.11 C_h C_s V^2 \times 10^{-4} \text{ [kN/m}^2\text{]}$$

where,

C_s = the shape coefficient, see Table 2.2.2(a)

C_h = the height coefficient, see Table 2.2.2(b)

V = the wind velocity [m/s]

Table 2.2.2(a) : Values of C_s	
Shape	C_s
Spherical	0.4
Cylindrical	0.5
Hull (surface type),	1.0
Deck house	1.0
Large flat surface	1.0
Drilling derrick (each face),	1.25
Exposed underdeck beams and girders	1.3
Isolated structural shapes	1.5
Note: Shapes or combinations of shapes which do not readily fall into the specified categories will be subject to special consideration by IRS.	

2.2.3 Wind force

$$F = PA \text{ [kN]}$$

A = the projected area of all exposed surfaces in either the upright or the heeled condition [m²]

In calculating the wind forces, the following procedures are recommended:

- a) In the case of units with columns, the projected areas of all columns are to be included; i.e. no shielding allowance is to be taken.

- b) Areas exposed due to heel, such as underdecks, etc., are to be included using the appropriate shape coefficients.
- c) The block projected area of a clustering of deckhouses may be used in lieu of calculating each individual area. In this case, the shape coefficient may be taken as 1.1.

Table 2.2.2(b) : Values of C_h		
Height* in metres		C_h
Over	Not Exceeding	
0	15.3	1.0
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
Above 259		1.80
* The height of the centre of the wind exposed area from sea level		

- d) Isolated houses, structural shapes, cranes, etc., are to be calculated individually, using the appropriate shape coefficient.
- e) Open truss work commonly used for derrick towers, booms and certain types of masts may be approximated by taking 30% of the projected block area of each side, e.g. 60% of the projected block area of one side for double-sided truss work. An appropriate shape coefficient is to be taken from the table.

Section 3

Wave Loads

3.1 Wave criteria

3.1.1 Design wave criteria specified by the owner/designer may be described either by means of design wave energy spectra or by deterministic design waves having appropriate shape, size and period. Consideration is to be given to waves of less than maximum height where, due to their period, the effects on various structural elements may be greater.

3.2 Determination of wave loads

3.2.1 The determination of wave loads for use in structural design is to be based on acceptable calculations, model tests or full scale measurements. For structures comprised of slender members which do not significantly alter the incident wave field, semi-empirical formulations such as Morison's equation (see 3.3.1) may be used. For calculations of wave loads on structural configurations which significantly alter the incident wave field, diffraction methods are to be used which account for both the incident wave force (i.e. Froude-Krylov force) and the forces resulting from wave diffraction and radiation.

3.2.2 The wave forces utilized in the design analysis are to include the effects of immersion, heeling and accelerations due to motion.

3.2.3 In general, Morison's equation may be used for structures comprised of slender members having diameters (or equivalent diameters giving the same cross-sectional areas parallel to the flow) less than 20% of the wave lengths being considered and are small in relation to the distances between structural members subject to wave loading (e.g. self-elevating units in the elevated condition and most column-stabilized units).

3.2.4 For each combination of wave height, wave period and water depth being considered, a range of wave crest positions relative to the structure is to be investigated to ensure an accurate determination of the maximum wave force on the structure.

3.3 Hydrodynamic forces

3.3.1 **Morison's Equation** : The hydrodynamic force acting normal to the axis of a cylindrical member, as given by Morison's equation, is

expressed as the sum of the force **vectors** indicated in the following equation:

$$F_w = F_D + F_I$$

F_w = hydrodynamic force vector per unit length along the member, acting normal to the axis of the member

F_D = drag force vector per unit length, see 3.3.2

F_I = inertia force vector per unit length, see 3.2.3.

3.3.2 The drag force vector per unit length, F_D , for a stationary, rigid member is given by

$$F_D = (C/2) D C_D u_n |u_n| \text{ [kN/m]}$$

$C = 1.025$

D = projected width [m] of the member in the direction of the cross-flow component of velocity (in the case of a circular cylinder, D denotes the diameter)

C_D = drag coefficient (dimensionless), see 3.3.6

u_n = component of the velocity vector, normal to the axis of the member [m/s], see 3.3.6

$|u_n|$ = absolute value of u_n [m/s];

3.3.3 The inertia force vector per unit length, F_I , for a stationary, rigid member is given by

$$F_I = C (\pi D^2 / 4) C_M a_n \text{ [kN/m]}$$

C_M = inertia coefficient based on the displaced mass of fluid per unit length (dimensionless), see 3.3.6

a_n = component of the fluid acceleration vector normal to the axis of the member [m/s²], see 3.3.6.

3.3.4 For structures which exhibit substantial rigid body oscillations due to wave action, the modified form of Morison's equation given below may be used to determine the hydrodynamic force per unit length.

$$F_w = F_D + F_I$$

$$= (C/2) D C_D (u_n - u'_n) |u_n - u'_n|$$

$$+ C (\pi D^2 / 4) [a_n + C_m (a_n - a'_n)]$$

u'_n = component of the velocity vector of the structural member normal to its axis, [m/s]

C_m = added mass coefficient i.e. $C_m = C_M - 1$

a'_n = component of the acceleration vector of the structural member normal to its axis, [m/s²].

3.3.5 For structural shapes other than circular cylinders, the term $(\pi D^2/4)$ in 3.3.3 and 3.3.4 above is to be replaced by the actual cross-sectional area of the shape.

3.3.6 Values of u_n and a_n for use in Morison's equation are to be determined using wave theories appropriate to the wave heights, wave periods and water depths being considered. Drag and inertia coefficients vary considerably with section shape, Reynold's number, Keulegan-Carpenter number and surface roughness. They are to be based on reliable data obtained from literature, model or full scale tests. For circular cylindrical members at Reynold's numbers greater than 1×10^6 , C_D and C_M may be taken at 0.62 and 1.8 respectively provided that marine fouling is prevented or periodically removed.

Section 4

Current Loads

4.1 Current associated with waves

4.1.1 When determining loads due to the simultaneous occurrence of waves and current using Morison's equation, the current velocity is to be added vectorially to the wave particle velocity before the total force is computed. When diffraction methods are used for calculating wave force the drag force due to current should be calculated in accordance with 4.2.1 and added vectorially to the calculated wave force.

4.1.2 The current velocity is to include components due to tidal current, storm surge current and wind driven current. In lieu of defensible alternative methods, the vertical distribution of current velocity in still water and its modification in the presence of waves as shown in Fig. 4.1.2 are recommended,

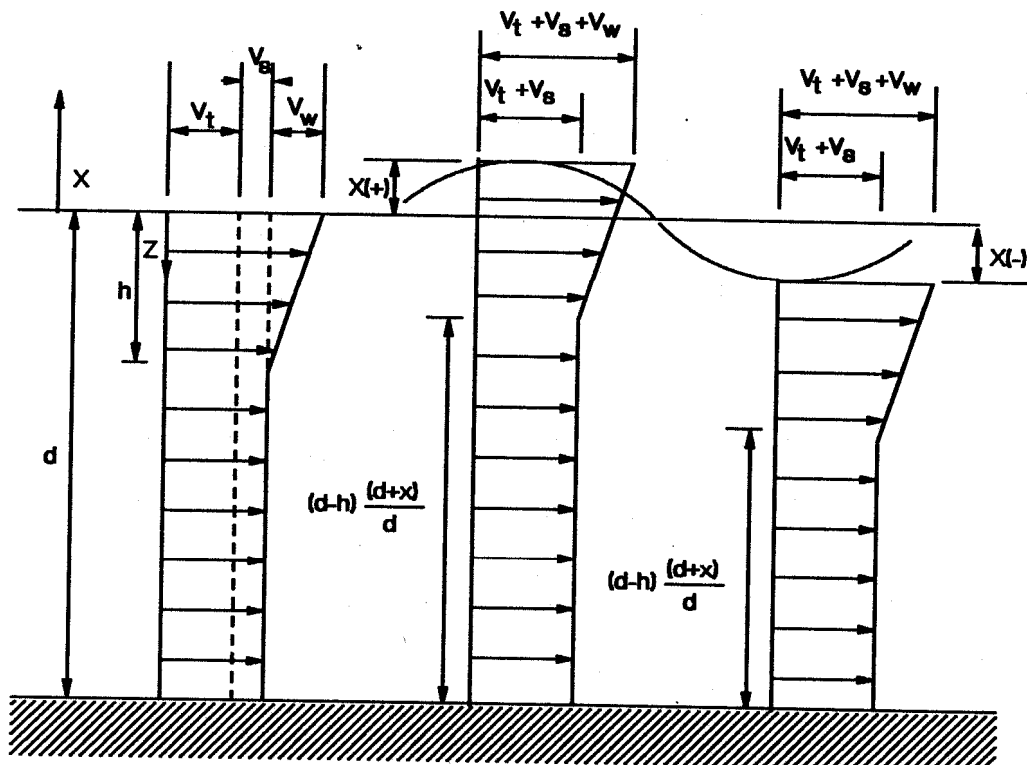


Fig. 4.1.2 : Current velocity profile

where ,

$$V_c = V_t + V_s + V_w [(h - z)/h], \quad \text{for } z \leq h$$

$$V_c = V_t + V_s \quad \text{for } z > h$$

and

V_c = current velocity [m/s]

V_t = component of tidal current velocity in the direction of the wind [m/s]

V_s = component of storm surge current [m/s]

V_w = wind driven current velocity [m/s]

h = reference depth for wind driven current [m] (in the absence of other data h may be taken as 5 [m])

z = distance below still water level under consideration [m]

d = still water depth [m].

In the presence of waves, the current velocity profile is to be modified, as shown in Fig.4.1.2,

such that the current velocity at the instantaneous free surface is a constant.

4.2 Drag force

4.2.1 When calculating the drag force on submerged parts of the structure due to current alone, the following equation may be used:

$$f_D = C/2 D C_D u_c |u_c|$$

f_D = current drag force vector per unit length along the member, acting normal to the axis of the member [kN/m]

u_c = component of the current velocity vector, V_c , normal to the axis of the member

C, D, C_D = as defined in 3.3.2

Drag coefficients in steady flow vary considerably with section shape, Reynold's number and surface roughness and are to be based on reliable data obtained from literature, model or full scale tests.

4.2.2 Consideration is to be given to the possibility of wave induced vibration.

Section 5

Vortex Shedding

5.1 Loadings due to vortex shedding

5.1.1 Consideration is to be given to the possible dynamic effects induced in structural members due to vortex shedding.

Section 6

Deck Loads

6.1 General

6.1.1 A loading plan is to be prepared for each design. This plan is to show the maximum design uniformly distributed and concentrated loading for all areas for each mode of operation. The values of design loadings are not to be less than:

Space	Min. design loading
Crew spaces (walkways, general traffic areas, etc.),	4.5 [kN/m ²]
Work areas	9 [kN/m ²]
Storage areas	13 [kN/m ²]
Helicopter platform	2 [kN/m ²]

Section 7

Other Loadings

7.1 Other relevant loadings are to be determined in a manner to the satisfaction of IRS. (For example, operational loads due to drilling derrick

and riser tensioners, seismic loads, ice loads etc.).

End of Chapter

Chapter 5

Stability, Watertight/Weathertight Integrity and Loadline

Contents	
Section	
1	Stability
2	Watertight / Weathertight Integrity
3	Loadline

Section 1

Stability

1.1 General

1.1.1 Stability afloat

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. In addition, all units are to meet the stability requirements set forth in this section, for all applicable conditions.

For the purpose of calculations 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.

1.1.2 Units resting on the sea bed

Units designed to rest on the sea bed are to have sufficient positive downward gravity loadings on the support footings or mat to withstand the overturning moment of the combined environmental forces from any direction, with a reserve against the loss of positive bearing of any footing or segment of the area thereof, for each design loading condition. Variable loads are to be considered in a realistic manner, to the satisfaction of IRS.

1.1.3 Inclining test

1.1.3.1 An inclining test is to be conducted for the first unit of a design, when the unit is as near to completion as possible, to determine accurately the light ship data (weight and position of center

of gravity). An inclining test procedure is to be submitted for review prior to the test, which is to be witnessed by a Surveyor of IRS.

1.1.3.2 For successive units which are identical by design, the light ship data of the first unit of the series may be accepted by IRS in lieu of an inclining test, provided the difference in light ship displacement or position of center of gravity due to weight changes for minor differences in machinery, outfitting or equipment, confirmed by the results of a lightweight survey, is less than 1% of the values of the light ship displacement or principal horizontal dimensions respectively as determined for the first of the series.

Extra care to be given to the detailed weight calculation and comparison with the original unit of a series of column-stabilized, semi-submersible types as these, even though identical by design, are recognized as being unlikely to attain an acceptable similarity of weight or center of gravity to warrant a waiver of the inclining test.

1.1.3.3 The results of the inclining test, or lightweight survey and inclining experiment adjusted for weight difference, are to be reviewed by IRS prior to inclusion in the-operating Manual.

1.1.3.4 A record of all changes to machinery, structure, outfitting and equipment that affect the light ship data, is to be maintained in the operating manual or in a light ship data alteration log and is to be taken into account in the daily operations.

1.1.3.5 For column-stabilized units:

- a) A lightweight survey or inclining test is to be conducted at the first renewal survey. If a lightweight survey is conducted and it indicates a change from the calculated light ship displacement in excess of 1% of the operating displacement, an inclining test is to be conducted, or the difference in weight is to be placed in an indisputably conservative vertical center of gravity and approved by IRS.
- b) If the survey or test at the first renewal survey demonstrated that the unit was maintaining an effective weight control programme and at succeeding renewal surveys this is confirmed by the records under paragraph 1.1.3.4 light ship displacement may be verified in operation by comparison of the calculated and observed draught. Where the difference between the expected displacement and the actual displacement based upon draught readings exceed 1% of the operating displacement, a lightweight survey is to be completed in accordance with paragraph 1.1.3.5a).

1.1.3.6 The inclining test or lightweight survey is to be carried out in the presence of Surveyor of IRS,

1.1.4 Righting moment and heeling moment curves

1.1.4.1 Curves of righting moments and of wind heeling moments similar to Fig. 1.1.4.1 with supporting calculations are to be prepared covering the full range of operating draughts, including those in transit conditions, taking into account the maximum loading of materials in the most unfavourable position applicable. The righting moment curves and wind heeling moment curves are to be related to the most critical axes. Account is to be taken of the free surface of liquids in tanks.

1.1.4.2 Where equipment is of such a nature that it can be lowered and stowed, additional wind heeling moment curves may be necessary and such data are to clearly indicate the position of such equipment. Provisions regarding the lowering and effective stowage of such equipment are to be included in the operating manual.

1.1.4.3 The curves of wind heeling moments are to be drawn for wind forces calculated by the following formula:

$$F = 0.5C_s C_H \rho V^2 A$$

where,

F = the wind force [N]

C_s = shape coefficient depending on the shape of the structural member exposed to the wind as per Table 2.2.2(a) of Ch.4, Sec.2.

C_H = height coefficient depending on the height above sea level of the structural member exposed to wind as per Table 2.2.2(b) of Ch.4, Sec.2.

ρ = mass density of air [1.222 kg/m³]

V = wind velocity [m/s]

A = projected area [m²] of all exposed surfaces in either the upright or the heeled condition

1.1.4.4 Wind forces are to be considered from any direction relative to the unit and the value of the wind velocity is to be as follows:

a) In general a minimum wind velocity of 36 [m/s] (70 knots) for offshore services are to be used for normal operating conditions and a minimum wind velocity of 51.5 [m/s] (100 knots) is to be used for the severe storm conditions.

b) Where a unit is to be limited in operation to sheltered locations (protected inland waters such as lakes, bays, swamps, rivers, etc.) consideration is to be given to a reduced wind velocity of not less than 25.8 [m/s] (50 knots) for normal operating conditions.

1.1.4.5 In calculating the projected areas to the vertical plane, the area of surfaces exposed to wind due to heel or trim, such as under-deck surfaces, etc., are to be included using the appropriate shape factor. Open truss work may be approximated by taking 30% of the projected block area of both the front and back section, i.e. 60% of the projected area of one side.

1.1.4.6 In calculating the wind heeling moments, the lever of the wind overturning forces are to be taken vertically from the center of pressure of all surfaces exposed to the wind to the center of lateral resistance of the underwater body of the unit. The unit is to be assumed floating free of mooring restraint.

1.1.4.7 The wind heeling moment curve is to be calculated for a sufficient number of heel angles to define the curve. For ship shaped hulls the

curve may be assumed to vary as the cosine function of vessel heel.

1.1.4.8 Wind heeling moments derived from wind tunnel tests on a representative model of the unit

may be considered as alternative to the method given in 1.1.4.3 to 1.1.4.7. Such heeling moment determination is to include lift and drag effects at various applicable heel angles.

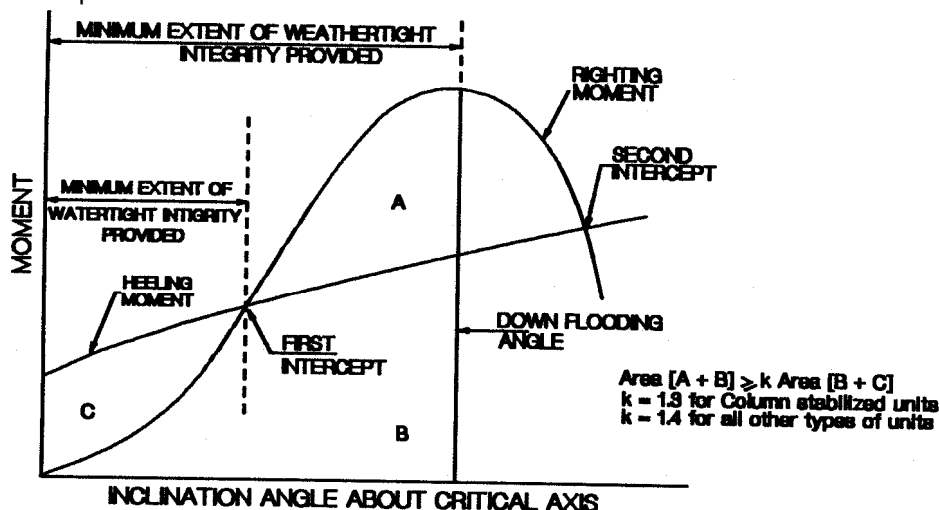


Fig. 1.1.4.1 : Righting moment and heeling moment curves

1.2 Intact stability criteria

1.2.1 The stability of a unit in each mode of operation is to meet the following criteria (Also see Fig.1.1.4.1):

1.2.1.1 For self-elevating and surface type units, the area under the righting moment curve to the second intercept or downflooding angle, whichever is less, is not to be less than 40% in excess of the area under the wind heeling moment curve to the same limiting angle.

i.e. $\text{Area (A+B)} \geq 1.4 \times \text{Area (B+C)}$

1.2.1.2 For column stabilized units, the area under the righting moment curve to the angle of downflooding is not to be less than 30% in excess of the area under the wind heeling moment curve to the same limiting angle.

i.e. $\text{Area (A+B)} \geq 1.3 \times \text{Area (B+C)}$

1.2.1.3 In all cases, the righting moment curve is to be positive over the entire range of angles from upright to the second intercept.

1.2.2 Each unit is to be capable of attaining a severe storm condition in a period of time consistent with the meteorological conditions. The procedures recommended and the approximate length of time required, considering

both operating conditions and transit conditions, are to be contained in the operating manual. It should be possible to achieve the severe storm condition without the removal or relocation of solid consumables or other variable load. However, IRS may permit loading a unit past the point at which solid consumables would have to be removed or relocated to go to severe storm condition under the following conditions, provided the allowable KG is not exceeded:

1.2.2.1 in a geographic location where weather conditions annually or seasonally do not become sufficiently severe to require a unit to go to severe storm condition; or

1.2.2.2 Where a unit is required to support extra deck load for a short period of time that falls well within a period for which the weather forecast is favourable.

The geographic locations, weather conditions and loading conditions in which this is permitted is to be identified in the operating manual.

1.2.3 **Alternative stability criteria** may be considered by IRS, provided an equivalent level of safety is maintained and if it is demonstrated to afford adequate positive initial stability. In determining the acceptability of such criteria, at least the following is to be taken into account, as appropriate:

1.2.3.1 environmental conditions representing realistic winds (including gusts) and waves appropriate for world-wide service in various modes of operation.

1.2.3.2 dynamic response of a unit. Analysis is to include the results of wind tunnel tests, wave tank model tests, and non-linear simulation, where appropriate. Any wind and wave spectra used are to cover sufficient frequency ranges to ensure that critical motion responses are obtained.

1.2.3.3 potential for flooding taking into account dynamic responses in a seaway;

1.2.3.4 susceptibility to capsizing considering the unit's restoration energy and the static inclination due to the mean wind speed and the maximum dynamic response;

1.2.3.5 an adequate safety margin to account for uncertainties.

1.3 Damage stability

1.3.1 The unit is to have sufficient freeboard and be subdivided by means of watertight decks and bulkheads to provide sufficient buoyancy and stability to withstand:

1.3.1.1 In general, the flooding of any single compartment or any combination of compartments in any operating or transit condition consistent with the damage assumptions set out in 1.4;

1.3.1.2 For a self-elevating unit, the flooding of any single compartment while meeting the following criterion (See Fig.1.3.1.2):

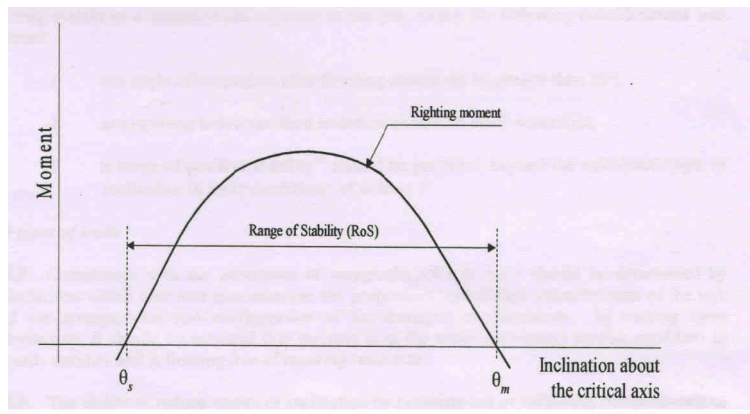


Fig.1.3.1.2 : Residual stability for self-elevating units

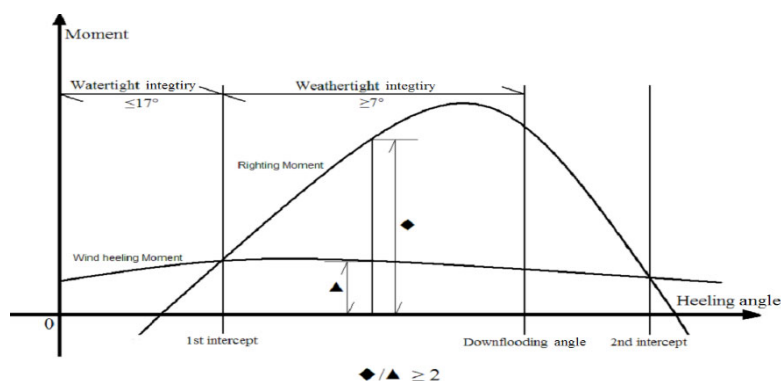


Fig.1.3.3.3 Residual damage stability requirements for column stabilized units

$$\text{RoS} = \theta_m - \theta_s \geq \text{Max} \left\{ \left(7^\circ + 1.5\theta_s \right), 10^\circ \right\}$$

θ_m = maximum angle of positive stability, [degree]

where,

θ_s = static angle of inclination after damage, [degree]

RoS = range of stability, [degree]

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

1.3.2 The unit should have sufficient reserve stability in a damaged condition to withstand the wind heeling moment based on a wind velocity of 25.8 [m/s] (50 knots) superimposed from any direction. In this condition the final waterline, after flooding, are to be below the lower edge of any down flooding opening.

1.3.3 Column-stabilized units – The unit should have sufficient freeboard and be subdivided by means of watertight decks and bulkheads to provide sufficient buoyancy and stability to withstand a wind heeling moment induced by a wind velocity of 25.8 [m/s] (50 knots) superimposed from any direction in any operating or transit condition, taking the following considerations into account:

1.3.3.1 the angle of inclination after the damage set out in 1.4.10.2 is not to be greater than 17°;

1.3.3.2 any opening below the final waterline is to be made watertight and openings within 4 [m] above the final waterline is to be made weathertight;

1.3.3.3 the righting moment curve, after the damage set out above, to have, from the first intercept to the lesser of the extent of weathertight integrity under 1.3.3.2 and the second intercept or down flooding angle, 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 curve, both being measured at the same angle. (See Fig.1.3.3.3).

1.3.4 The unit is to provide sufficient buoyancy and stability 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, taking the following considerations into account:

1.3.4.1 the angle of inclination after flooding is not to be greater than 25°;

1.3.4.2 any opening below the final waterline is to be made watertight;

1.3.4.3 a range of positive stability of at least 7° is to be provided, beyond the calculated angle of inclination in these conditions.

1.3.5 All types of units – Compliance with the provisions of 1.3.1 to 1.3.4 are to be determined

by calculations which take into consideration the proportions and design characteristics of the unit and the arrangements and configuration of the damaged compartments. In making these calculations, it is assumed that the unit is in the worst anticipated service condition as regards stability and is floating free of mooring restraints.

1.3.6 The ability to reduce angles of inclination by pumping out or ballasting compartments or application of mooring forces, etc., are not to be considered as justifying any relaxation of these provisions.

1.3.7 Alternative subdivision and damage stability criteria may be considered for approval by IRS provided an equivalent level of safety is maintained. In determining the acceptability of such criteria, at least the following and take into account:

1.3.7.1 extent of damage as set out in section 1.4;

1.3.7.2 on column-stabilized units, the flooding of any one compartment as set out in paragraph 1.3.4;

1.3.7.3 the provision of an adequate margin against capsizing.

1.4 Extent of damage

1.4.1 Surface units - In assessing the damage stability of surface units, the following extent of damage is to be assumed to occur between effective watertight bulkheads:

1.4.1.1 horizontal penetration: 1.5 m; and

1.4.1.2 vertical extent: from the base line upwards without limit.

1.4.2 The distance between effective watertight bulkheads or their nearest stepped portions which are positioned within the assumed extent of horizontal penetration are not to be less than 3 m; where there is a lesser distance, one or more of the adjacent bulkheads are to be disregarded.

1.4.3 Where damage of a lesser extent than in 1.4.1 results in a more severe condition, such lesser extent is to be assumed.

1.4.4 All piping, ventilation systems, trunks, etc., within the extent of damage referred to in 1.4.1 is to be assumed to be damaged. Positive means of closure are to be provided at watertight boundaries to preclude the progressive flooding of other spaces which are intended to be intact.

1.4.5 **Self-elevating units** - In assessing the damage stability of self-elevating units, the following extent of damage is to be assumed to occur between effective watertight bulkheads:

1.4.5.1 horizontal penetration: 1.5 m; and

1.4.5.2 vertical extent: from the base line upwards without limit.

1.4.6 The distance between effective watertight bulkheads or their nearest stepped portions which are positioned within the assumed extent of horizontal penetration are not to be less than 3 m; where there is a lesser distance, one or more of the adjacent bulkheads are to be disregarded.

1.4.7 Where damage of a lesser extent than in 1.4.5 results in a more severe condition, such lesser extent is to be assumed.

1.4.8 Where a mat is fitted, the above extent of damage is to be applied to both the platform and the mat simultaneously, only when the highest draught allows any part of the mat to fall within 1.5 [m] (5 ft) vertically of the waterline and the difference in horizontal dimension of the upper hull and the mat is less than 1.5 [m] (5 ft) in any area under consideration.

1.4.9 All piping, ventilation systems, trunks, etc., within the extent of damage referred to in 1.4.5 is to be assumed to be damaged. Positive means of closure are to be provided at watertight boundaries to preclude the progressive flooding of other spaces which are intended to be intact.

1.4.10 **Column-stabilized units** - In assessing the damage stability of column-stabilized units, the following extent of damage is to be assumed:

1.4.10.1 Only those columns, underwater hulls and braces on the periphery of the unit is to be

assumed to be damaged and the damage is to be assumed in the exposed portions of the columns, underwater hulls and braces.

1.4.10.2 Columns and braces are to be assumed to be flooded by damage having a vertical extent of 3 m occurring at any level between 5 m above and 3 m below the draughts 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 to the satisfaction of IRS, taking into account the actual operating conditions. However, the required damage region is to extend at least 1.5 m above and below the draught specified in the operating manual.

1.4.10.3 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.

1.4.10.4 Horizontal penetration of damage is to be assumed to be 1.5 m.

1.4.10.5 Underwater hull or footings are to be assumed to be damaged when operating in a transit condition in the same manner as indicated in paragraphs 1.4.10.1, 1.4.10.2, 1.4.10.4 and either paragraph 1.4.10.3 or 1.4.6, having regard to their shape.

1.4.10.6 All piping, ventilation systems, trunks, etc., within the extent of damage is to be assumed to be damaged. Positive means of closure are to be provided at watertight boundaries to preclude the progressive flooding of other spaces which are intended to be intact.

Section 2

Watertight/Weathertight Integrity

2.1 Watertight boundaries

2.1.1 All drilling units are to be provided with watertight bulkheads necessary to meet the damage stability criteria and their scantlings are to be in accordance with the requirements given in Chapter 6. In the case of column stabilized drilling units, the scantlings of the watertight flats and bulkheads are to be made effective to that point necessary to meet the requirements of damage stability and are to be indicated on the appropriate plans. In all cases, the plans submitted are to clearly indicate the location and extent of the bulkheads.

2.1.2 All surface type drilling units are to be fitted with a collision bulkhead as may be required by the *Rules and Regulations for the Construction & Classification of Steel Ships*. Sluice valves, cocks, manholes, watertight doors, etc; are not to be fitted in the collision bulkhead. Elsewhere, watertight bulkheads are to be fitted as necessary to provide transverse strength and subdivision.

2.2 Boundary penetrations

2.2.1 Where watertight boundaries are required for damage stability, they are to be made watertight throughout, including piping, ventilation, shafting, electrical penetrations, etc. Where individual lines, ducts or piping systems serve more than one compartment or are within the extent of damage, satisfactory arrangements are to be provided to preclude the possibility of progressive flooding through the system to other spaces in the event of damage, to ensure compliance with the requirements of damage stability given in 1.3.

2.2.2 Piping systems and ventilation ducts designed to watertight standards of the type mentioned in 2.2.1 are to be provided with valves in each compartment served. These valves are to be capable of being remotely operated from the weather deck, pump room or other normally manned space. Valve position indicators are to be provided at the remote control stations.

2.2.3 Non-watertight ventilation ducts as mentioned in 2.2.1 are to be provided with watertight valves at the subdivision 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. For self-elevating drilling units, ventilating systems which are not used during the

transit operations may be secured by alternative methods, subject to special consideration by IRS.

2.3 Closures

2.3.1 General

External closing appliances are to be as prescribed by applicable load line requirements. Special consideration will be given to openings in the upper deck of column stabilized units.

2.3.2 General requirements related to watertight integrity

- a) 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 while afloat

These are not to submerge when the drilling unit is inclined to the first intercept of the righting moment and wind heeling moment curves in any intact or damaged condition. See Fig. 1.2.2 and 1.3.3(a) respectively.

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, except in case of the column of column stabilized drilling 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.

- b) Internal openings fitted with appliances to ensure watertight integrity

These are to comply with the following:

- i) Doors or hatch covers which are used during the operation of the unit while afloat is to be remotely controlled from the central ballast control station and is to also be operable locally from each side. Open/shut indicators are to 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 is to be provided with an individual hand operated mechanism. It is to be possible to open and close the door by hand at the door itself from both sides.

- ii) Doors or hatch covers in self-elevating units, or doors placed above the deepest loadline draft in column stabilized and surface units, which are normally closed while the unit is afloat may be of the quick acting type and are to 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 is to be affixed to each such door or hatch cover stating that it is not to be left open while the unit is afloat.
- iii) 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.
- c) Internal and external openings kept permanently closed while afloat

These are to comply with the following:

- i) A signboard stating that the opening is always to be kept closed while afloat is to be fitted on the closing appliance in question.
- ii) Opening and closing of such closure devices are to be noted in the drilling unit's logbook, or equivalent.

- iii) Manholes fitted with bolted covers need not be dealt with as under (i).
- iv) 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.

2.3.3 General requirements related to weathertight integrity

a) 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 (i) or (ii) below, is to be fitted with a weathertight closing appliance to ensure the weathertight integrity, when:

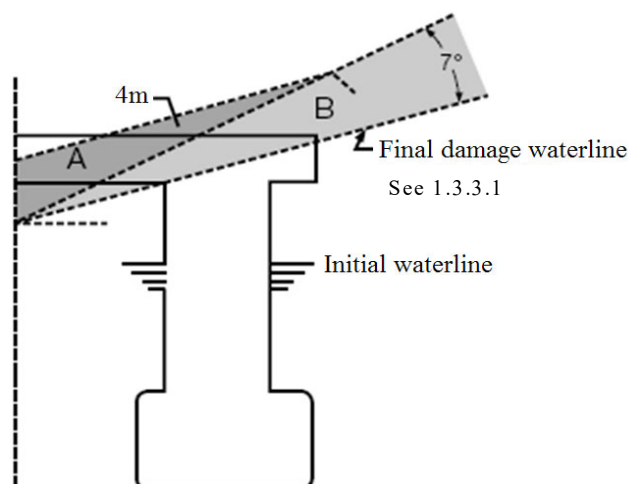
i) a unit is inclined to the range between the first intercept of the righting moment curve and the wind heeling moment curve and the angle necessary to comply with the requirements of 1.3 during the intact condition of the unit while afloat; and

ii) a column stabilized unit is inclined to the range:

- necessary to comply with the requirements of 1.3.3.3 and with a zone measured 4.0 [m] perpendicularly above the final damaged waterline per 1.3.3.1 referred to Fig.2.3.3 and
- necessary to comply with the requirements of 1.3.4.3.

b) External openings fitted with appliances to ensure weathertight integrity, which are kept permanently closed while afloat, are to comply with the requirements of 2.3.2c).

c) External openings fitted with appliances to ensure weathertight integrity, which are secured while afloat are to comply with the requirements of 2.3.3b).



A - 4m zone of weathertightness

B - 7 degrees zone of weathertightness

Fig.2.3.3 : Minimum weathertight integrity requirements for column stabilized units

Section 3

Load Line

3.1 General

3.1.1 The requirements of the International Convention on Load Lines, 1966 (ILLC, 1966), including those relating to certification, apply to all drilling units. The minimum freeboard of units which due to their configuration cannot be computed by the normal methods laid down by the Load Line Convention is to be determined on the basis of meeting applicable intact stability, damage stability and structural requirements for transit and drilling operating conditions while afloat. In no case is the draught to exceed that permitted by the International Convention on Load Lines, where applicable.

3.1.2 The requirements of ILLC, 1966, in respect of weather tightness and watertightness of decks, superstructures, deckhouses, doors, hatchway covers, other openings, ventilators, air pipes, scuppers, discharges, etc; are to be taken as a basis for all drilling units in afloat condition.

Sill heights of hatch coamings, ventilator coamings, air pipes, doors, etc; in exposed positions and their means of closing are also to be based on both the intact stability and damage stability requirements given in 1.2 and 1.3 respectively.

Load line markings including such seasonal allowances as may be determined, are to be

placed at suitable visible locations on the structure, to the satisfaction of IRS. These marks, where practicable, are to be visible to the person in charge of mooring, lowering or otherwise operating the unit.

3.1.3 All down flooding openings which may become submerged before the angle of inclination at which the required area under the intact righting arm curve is achieved are to be fitted with weathertight closing appliances.

3.1.4 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.

3.2 Self elevating and surface type drilling units

3.2.1 Where it is necessary to assign a greater than minimum freeboard to meet intact or damage stability requirements or on any other restriction imposed by the Administration, regulation 6(6) of ILLC, 1966, is to be applied. In such cases, seasonal marks above the centre of the ring should not be marked and any seasonal marks below the centre of ring should be marked. However, when a unit is assigned a greater than minimum freeboard at the request of the owner, regulation 6(6) need not be applied.

3.2.2 Moonpools, open wells and recesses etc.

- a) Where moonpools are arranged within the hull in open communication with the sea, the volume of the moonpool is not to be included in the calculation of any hydrostatic properties. If 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 for the excess portion above the 85% of the depth for freeboard waterline is to be made as prescribed below for wells or recesses. If an enclosed superstructure contains part of the moonpool, deduction is to be made for the effective length of the superstructure.

Where open wells or recesses are arranged in the freeboard deck, a correction equal to the volume of the well or recess to the freeboard deck divided by the waterplane area at 85% of the depth for freeboard is to be added to the freeboard obtained after all other corrections, except bow height correction, have been applied. Free surface effects of the flooded well/recess are to be taken into account in stability calculations.

- b) The procedure described in (a) above is also to apply in cases of small notches or relatively narrow cut-outs at the stern of the unit.
- c) Narrow wing extensions at the stern of the unit are to be considered as appendages and excluded for the determination of length (L) and for the calculation of freeboards. IRS will determine the effect of such wing extensions with regard to the requirements for the strength of the unit based upon length (L).

3.2.3 Self-elevating units - Load lines are to be assigned to self-elevating units as calculated under the terms of the 1988 LL Protocol. When floating, or when in transit from one operational area to another, units are to be subjected to all the conditions of assignment of that Protocol unless specifically excepted. However, these units are not to be subject to the terms of that Protocol while they are supported by the seabed or are in the process of lowering or raising their legs.

3.2.4 The minimum freeboard of units which due to their configuration cannot be computed by the normal methods laid down by the 1988 LL Protocol is to be determined on the basis of meeting applicable provisions regarding intact stability, damage stability and structure in the afloat condition.

3.2.5 Self-elevating units with large mat/similar supporting structures

In case of a self-elevating unit utilising a large mat or similar supporting structures for contribution to buoyancy in afloat conditions, the mat or similar supporting structure is to be ignored while calculating the freeboard. However, as their vertical position relative to the upper hull may be critical, they are to be taken into account in the evaluation of the stability of the unit while afloat.

3.2.6 In case of a self-elevating unit which may be manned when under tow, any required exemption or relaxation of the applicable bow height requirement, is to be authorised by the Administration.

3.3 Column stabilized units

3.3.1 The hull form of column stabilized units makes the calculations of geometric freeboard in accordance with the provisions of the Load Line Convention impracticable. Therefore, the minimum freeboard of each column stabilized unit is to be determined by meeting the applicable requirements for:

- i) the strength of unit's structure
- ii) the minimum clearance between passing wave crests and deck structure and
- iii) intact and damage stability requirements.

3.3.2 Windows, side scuttles and portlights, including those of non-opening type or other similar openings are not to be located below the deck structure of column stabilised units. The position of openings which cannot be closed in emergencies, such as air intakes for emergency generators will be specially considered having regards to the intact righting arm curves and the final waterline after assumed damage.

3.3.3 The minimum freeboard is to be marked in appropriate locations on the structure.

3.3.4 The enclosed deck structure of each column-stabilized unit is to be made weathertight.

End of Chapter

Chapter 6

Structures

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Section	
1	<i>General</i>
2	<i>Common Structures</i>
3	<i>Structural Analysis</i>
4	<i>Welding, Workmanship and Inspection</i>
5	<i>Means of Access for Inspections</i>
6	<i>Towing Arrangements</i>

Section 1

General

1.1 Materials

1.1.1 The scantling requirements specified in this chapter are intended for drilling units constructed of steel which has been manufactured and tested according to the requirements given in Ch. 3.

Where it is intended to use other approved materials, the scantlings will be specially considered.

1.2 General requirements for scantlings

1.2.1 In general, the scantlings of major structural elements of all units are to comply with the applicable requirements of the *Rules & Regulations For The Construction & Classification of Steel Ships*, except as noted

below and in Chapters 7, 8 and 9 relating to the special requirements for individual types of drilling units.

The scantling requirements of some structural elements which are common feature of all drilling units are given in Sec.2.

1.2.2 The primary structures of all units are to be analysed as detailed in Sec.3.

Where a unit is not fitted with an acceptable corrosion protection system, the scantlings determined on the basis of the structural analysis are to be increased by corrosion additions appropriate to the environmental conditions and usage of the relevant spaces.

Section 2

Common Structures

2.1 Structures supporting the drilling derrick

2.1.1 Substructures

Substructures supporting the drilling derrick, drill floor and associated equipment are to be analysed as required by Sec.3. Stresses are not to exceed those permitted by Sec.3.

- a) **Individual Loads** : Individual loads to be considered are the operating loads specified by the owner or designer and should include, but are not limited to the following, as applicable:

- Dead load (steel weight, fixed equipment)
- Floor load (personnel, moveable equipment, material)
- Snow or ice load
- Hook, setback, rotary table and riser tensioner loads.

- b) **Combined Loads** : Environmental loads due to wind, including severe storm wind load, are to be combined with the individual loads indicated in a) to reflect the applicable operational requirements for the range of anticipated conditions. Loads due to unit motions are to be considered for all afloat conditions.

2.1.2 Substructure Supporting Arrangement

Moveable cantilevers¹⁾ and skid beams²⁾ supporting substructures are to be analyzed as required by Sec.3. Stresses are not to exceed those permitted by Sec.3. Loads imposed on the hull structure are to include maximum reactions from the cantilever or skid beam.

Notes :

1) *Moveable cantilever structures are those which extend beyond the hull structure during drilling operations.*

2) *Moveable skid beam structures are those which are fully supported by hull structure during drilling operations.*

2.1.3 Moveable cantilever and skid beam testing

Prior to placing the unit in service, a functional test of the longitudinal skidding arrangements of the moveable cantilever and skid beam as well as any transverse skidding arrangements such as the sub-base (drill floor) is to be carried out by skidding the completed drilling structures with derrick assembly to the maximum limits of travel.

2.2 Helicopter deck

2.2.1 General

- a) Plans showing the arrangement, scantlings and details of the helicopter deck are to be submitted for approval. The arrangement plan is to show the overall size of the helicopter deck and the designated landing area. If the arrangement provides for the securing of a helicopter or helicopters to the deck, the predetermined position(s) selected to accommodate the secured helicopter, in addition to the location of deck fittings for securing the helicopter, are to be shown. The helicopter for which the deck is designed is to be specified, and calculations for the relevant loading conditions are to be submitted. The particulars of helicopter used for design purposes are to be included in the Operating Booklet.

2.2.2 Structural design

- a) Scantlings of helicopter decks and supporting structure are to be determined on the basis of the following design loading conditions in association with the allowable stresses shown in Table 2.2.1.
- b) Overall distributed loading: A minimum distributed loading of 2 kN/m² is to be taken over the entire helicopter deck.

σ_y = specified minimum tensile yield stress of the material

* For members subjected to axial compression, the yield stress or critical buckling stress, whichever is less, is to be considered.

Table 2.2.1 : Allowable stresses for helicopter decks			
Loading condition	Allowable stress		
	Plating	Beams	Girders, stanchions, truss supports, etc
Overall distributed loading	0.6 σ_y (See Note 1)	0.6 σ_y	0.6 σ_y^*
Helicopter landing impact loading	#	σ_y	0.9 σ_y^*
Stowed helicopter loading	σ_y	0.9 σ_y	0.8 σ_y^*

To the satisfaction of IRS, in association with the method of analysis presented. IRS may consider an allowable stress that exceeds y , provided the rationale of the analysis is sufficiently conservative.

Notes :

- 1) The thickness of plating for the overall distributed loading condition is not to be less than the minimum required by the *Rules & Regulations For The Construction & Classification of Steel Ships*
 - 2) Helicopters fitted with landing gear other than wheels shall be specially considered by IRS.
 - 3) Wind loadings and possible wave impact loadings on helicopter decks are to be considered in a realistic manner, to the satisfaction of IRS.
- c) Stowed helicopter loading: If provisions are made to accommodate helicopters secured to the deck in a predetermined position, the structure is to be designed for a local loading equal to the manufacturer's recommended wheel loadings at maximum take-off weight, multiplied by a dynamic amplification factor

based on the predicted motions of the unit for this condition. In addition, a uniformly distributed loading of 0.5 [kN/m²], representing wet snow or ice, is to be considered, if applicable. For the design of girders, stanchions, truss supports, etc., the structural weight of the helicopter deck is also to be considered.

2.3 Bulwarks and guard rails

2.3.1 Except for helicopter landing decks and areas not normally occupied, the unprotected perimeter of all floor or deck areas and openings is to be protected with efficient guard rails or bulwarks of height not less than 1 [m] above the deck. Where this height would interfere with the normal operation of the unit, a lesser height may be considered. The clear opening below the lowest course of the guard rails is not to exceed 230 [mm]. The other courses are not to be more than 380 [mm] apart. In the case of units with rounded gunwales the guard rail supports are to be placed on the flat of the deck.

2.4 Anti-fouling systems

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

2.5 Protective coatings of dedicated seawater ballast tanks

2.5.1 All dedicated seawater ballast tanks are to be coated during construction. 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.

2.5.2 Maintenance of the protective coating system is to be included in the overall unit's maintenance scheme. The effectiveness of the protective coating system is to be verified during the life of a unit through periodical surveys.

Section 3

Structural Analysis

3.1 General

3.1.1 The primary structure of the drilling unit is to be analysed using the design loads given in Chapter 4 and loading conditions stipulated below for determination of the resultant stresses. Sufficient conditions, representative of all modes of operation, are to be considered, to enable critical design cases to be determined. Calculations for relevant conditions are to be submitted for review. The analysis is to be performed using an appropriate calculation method and is to be fully documented and referenced.

For each loading condition considered, the following stresses are to be determined and these are not to exceed the appropriate allowable stresses given in 3.2 or 3.3:

- a) Stresses due to static loadings only, in calm water conditions, where the static loads include service load such as operational gravity loadings and weight of the unit, with the unit afloat or resting on the sea bed, as applicable.
- b) Stresses due to combined loadings, where the applicable static loads in (a) are combined with relevant design environmental loadings, including acceleration and heeling forces.

3.1.2 Consideration of local stresses : Local stresses, including those due to circumferential loading on tubular members, are to be added to the primary stresses to determine total stress levels.

3.1.3 Combination of stress components : The scantlings are to be determined on the basis of a recognized method which combines, in a rational manner, the individual stress components acting on the various structural elements of the unit.

3.1.4 Consideration of buckling : The critical buckling stress of structural elements is to be considered, where appropriate, in relation to the computed stresses.

3.1.5 Determination of bending stresses :

- a) Effective flange area - When computing bending stresses, the effective flange areas are to be determined in accordance with Part 3,

Chapter 3 Sec.4 of the *Rules & Regulations for the Construction & Classification of Steel Ships*.

- c) Eccentric axial loading - Where appropriate, elastic deflections are to be taken into account when determining the effects of eccentricity of axial loading and the resulting bending moments superimposed on the bending moments computed for other types of loadings.

3.1.6 Determination of shear stress : When computing shear stresses in structural members, only the effective shear area of the web is to be considered. In this regard, the total depth of the girder may be considered as the web depth.

3.1.7 Equivalent stress criteria for plated structure

For plated structures, members may be designed according to the von Mises equivalent stress criterion, where the equivalent stress σ_e is defined as follows:

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

where,

σ_x = stress in the x direction

σ_y = stress in the y direction

τ_{xy} = shear stress in the x-y plane.

3.1.8 Stress concentration : The effect of notches, stress raisers, and local stress concentrations are to be taken into account in the design of load carrying elements.

3.1.9 Analysis and details of structural connections : Unless connections of structural members are specifically detailed as hinged joints, proper consideration is to be given in the structural analysis to the degree of restraint at such connections. Structural connections are to be detailed in such a manner as to ensure full transmission of stresses between members joined, and to minimize stress concentrations. The following details are to be considered, as may be appropriate.

- a) Shear web plates, continuous through the joint to transmit tension and compression

loads between members by means of shear in the web plate.

- b) Flaring or transitioning of the joint, to lower stress levels or to minimize concentrations of stress or both.
- c) Thicker joint material, high strength steel, or both, consistent with good weldability, to reduce the effect of high stress levels.
- d) Brackets or other supplemental transition members, with scallops and proper end attachment details to minimize high stress concentrations.

Critical connections that depend upon the transmission of tensile stresses through the thickness of the plating of one of the members may result in lamellar tearing and are to be avoided wherever possible. Where unavoidable, plate material with suitable through thickness (Z direction) properties may be required with appropriate inspection procedures.

3.1.10 Fatigue analysis - The possibility of fatigue damage due to cyclic loading is to be considered in the design of self-elevating and column stabilized units.

The type and extent of the fatigue analysis will be dependent on the intended mode and area of operations to be considered in the unit's design. An appropriate loading spectrum in accordance with accepted theories is to be used in the fatigue analysis.

The fatigue life is to be based on a period of time equal to the specified design life of the structure. The period is normally not to be taken as less than 20 years.

3.1.11 Plastic analysis - Plastic analysis methods will be subject to special consideration.

3.2 Allowable stresses

3.2.1 General

The scantlings of effective structural elements of the primary frame of the unit, analysed in accordance with 3.1, are to be determined on the basis of the allowable stresses specified herein.

3.2.2 Individual stresses

- a) Individual stress components and where applicable, direct combinations of such stresses, are not to exceed the allowable stresses specified in Table 3.2.2.

Table 3.2.2 : Allowable stresses for static loading and combined loading

Type of Stress	Static loading (see 3.1.1 (a))	Combined loading (see 3.1.1 (b))
Tensile	$0.6 \times \sigma_y$	$0.8 \times \sigma_y$
Bending	$0.6 \times (\sigma_y \text{ or } \sigma_{cr}, \text{ whichever is smaller})$	$0.8 \times (\sigma_y \text{ or } \sigma_{cr}, \text{ whichever is smaller})$
Shearing	$0.4 \times \sigma_y \text{ or } 0.6 \times \tau_{cr}, \text{ whichever is smaller}$	$0.53 \times \sigma_y \text{ or } 0.8 \times \tau_{cr}, \text{ whichever is smaller}$
Compressive	$0.6 \times (\sigma_y \text{ or } \sigma_{cr}, \text{ whichever is smaller})$	$0.8 \times (\sigma_y \text{ or } \sigma_{cr}, \text{ whichever is smaller})$

Where,

σ_y = specified minimum tensile yield stress of the material [N/mm²]

σ_{cr}, τ_{cr} = critical compressive and shear buckling stress, respectively, [N/mm²] depending on the dimensions, stiffening, boundary conditions, loading pattern and material of the structural member under consideration. Reference may be made to Part 3, Chapter 3 Sec.6 of the *Rules & Regulations for the Construction & Classification of Steel Ships*.

- b) The equivalent stress in plate elements clear of discontinuities is generally not to exceed 0.7 and 0.9 of the yield strength of the material, for the loading conditions given in 3.1.1(a) and (b), respectively.

3.3 Members subjected to combined axial load and bending

- a) When structural members are subjected to axial compression in combination with compression due to bending, the computed stresses are to comply with the following requirements:

When $\sigma_a/F_a \leq 0.15$, $\sigma_a/F_a + \sigma_b/F_b < 1.0$

When $\sigma_a/F_a > 0.15$, $\sigma_a/F_a + \frac{C_{mo} \sigma_b}{(1 - \sigma_a / F'_a) F_b} < 1.0$

and in addition, at ends of members:

$\sigma_a/(0.6\sigma_y) + \sigma_b/F_b < 1.0$

- for static loadings as defined 3.1.1 a), and

$$\sigma_a / (0.8 \sigma_y) + \sigma_b / F_b < 1.0$$

- for combined loadings as defined in 3.1.1 b)
- b) When structural members are subjected to axial tension in combination with tension due to bending, the computed stresses are to comply with the following requirements:

$$\sigma_a + \sigma_b \leq 0.6 \sigma_y$$

- for static loadings as defined 3.1.1 a), and

$$\sigma_a + \sigma_b \leq 0.8 \sigma_y$$

- for combined loadings as defined in 3.1.1 b)

However, the computed bending compressive stress, σ_b , taken alone shall not exceed F_b

where,

σ_a = computed axial compressive or tensile stress

σ_b = computed compressive or tensile stress due to bending

F_a = allowable axial compressive stress, which is to be the least of the following:

- 1) Allowable axial stress as per Table 3.2.2
- 2) Overall buckling stress multiplied by factor of safety specified in 3.4 a)
- 3) Local buckling stress multiplied by factor of safety for axial stress.

F_b = allowable axial compressive stress due to bending, as per Table 3.2.2. (Only local buckling related σ_{cr} to be considered).

$F'_e = \sigma_E / 1.92$, the limiting Euler buckling stress. May be increased by 1/3 for combined loadings as defined in 3.1.1 b)

$$\sigma_E = \frac{\pi^2 E}{(K l/r)^2}$$

E = Modulus of elasticity [N/mm²]

l = unsupported length of column

K = effective length factor which accounts for support conditions at ends of length l . For cases where lateral deflection of end supports may exist, K is not be considered less than 1.0.

r = radius of gyration (l, r to be in the same units)

C_{mo} = a coefficient as follows:

- 1) For compression members in frames subject to joint translation (sideways)

$$C_{mo} = 0.85$$

- 2) For restrained compression members in frames braced against joint translation and not subject to transverse loading between their supports, in the plane of bending:

$$C_{mo} = 0.6 - 0.4 (M_1 / M_2)$$

but not less than 0.4, where M_1/M_2 is the ratio of the smaller to larger moments at the ends of that portion of the member un-braced in the plane of bending under consideration. M_1/M_2 is positive when the member is bent in reverse curvature and negative when it is bent in single curvature.

- 3) For compressive members in frames braced against joint translation in the plane of loading and subject to transverse loading between their supports, the value of C_m may be determined by rational analysis. However, in lieu of such analysis the following values may be used:

- a) for members whose ends are restrained, $C_{mo} = 0.85$;
- b) for members whose ends are unrestrained, $C_{mo} = 1$.

3.4 Column buckling stresses

- a) **Overall buckling** : For compression members which are subject to overall column buckling, the critical buckling stress is to be obtained from the following equations:

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

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

where σ_E is as defined in 3.3 b)

The factor of safety, η , for overall column buckling is to be as follows:

For static loading as defined in 3.1.1 a)

$$\eta = 0.52, \text{ when } \sigma_E < 0.5 \sigma_y$$

$$\eta = \frac{0.6}{1 + 0.15 \sqrt{\sigma_y / 2\sigma_E}}, \text{ when } \sigma_E \geq 0.5 \sigma_y$$

and, for combined loadings as defined in 3.1.1b)

$$\eta = 0.70, \text{ when } \sigma_E < 0.5 \sigma_y$$

$$\eta = \frac{0.8}{1 + 0.15 \sqrt{\sigma_y / 2\sigma_E}}, \text{ when } \sigma_E < 0.5 \sigma_y$$

- b) **Local buckling** : Members which are subjected to axial compression or compression due to bending, are to be investigated for local buckling, as appropriate, in addition to overall buckling as specified in a) above.

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.

$$\frac{D}{t} > \frac{E}{9\sigma_y}$$

where,

D = mean diameter [mm]

t = wall thickness [mm]

Section 4

Welding, Workmanship and Inspection

4.1 General

4.1.1 The welding, workmanship and inspection are in general to be as required by *Rules & Regulations For The Construction & Classification of Steel Ships*, however, following special requirements are to be complied with.

4.2 Thickness in excess of 50 mm

4.2.1 Special precautions, with regard to joint preparation, pre-heat, welding sequence, heat input and interpass temperature, are to be taken for welding thick sections. Ultrasonic inspection to insure the absence of injurious laminations may be required for material used where through-thickness (Z direction) properties are important. Stress relieving, when specified, is to be carried out using an approved method.

4.3 Extent of inspection of welds

4.3.1 All welds are to be subject to visual inspection. Representative nondestructive testing is to be carried out to the satisfaction of the Surveyor. Such testing is to be carried out after all forming and post weld heat treatment. Welds which are inaccessible or difficult to inspect in service may be subjected to increased

levels of nondestructive inspection. A plan for nondestructive testing is to be submitted.

4.3.2 As a minimum the following welds are to be subjected to 100% nondestructive testing (Radiographic, ultrasonic, magnetic particle, dye-penetrant, or equivalent). In addition to surface nondestructive testing, at least 20% of full penetration welded joints in primary structure and all full penetration welded joints in special application structure are to be subjected to 100% radiographic or ultrasonic inspection. Additional nondestructive testing may be required by the Surveyor.

- a) Self-elevating units - Weld joints of lattice-type leg structure (including chords, braces, racks, and rack attachments), circumferential joints of cylindrical-type legs, structure in way of leg guides and jack house attachments to deck, and attachments of legs to spud cans or mat.
- b) Column stabilised units - Weld attachments of columns to pontoons or lower hulls, braces to column, columns to upper hull, braces to upper hull, brace-to-brace intersections, and in way of any temporary access closures or inserts in main structures.

Section 5

Means of Access for Inspections

5.1 General

5.1.1 Each space within the unit is to 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 IRS, the unit's personnel and others as necessary. Such means of access are to comply with the provisions of 5.4 and with the technical provisions for means of access for inspections, adopted by the Maritime Safety Committee by Resolution MSC.133(76), as amended.

5.1.2 Where permanent means of access may be susceptible to damage during normal operations or where it is impracticable to fit permanent means of access, IRS 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 is to be capable of being readily erected or deployed by the unit's personnel.

IR5.1.2 Some possible alternative means of access are listed under Cl.5.4.10 of the Technical Provisions. Always subject to acceptance as equivalent by the Administration, alternative means such as an unmanned robot arm, ROV's with necessary equipment of the permanent means of access for overall and close-up inspections and thickness measurements of the deck head structure such as deck transverses and deck longitudinals of ballast tanks and other tanks, holds and other spaces where gas hazardous atmosphere may be present, are to be capable of:

- safe operation in ullage space in gas-free environment;
- introduction into the place directly from a deck access.

When considering use of alternative means of access as addressed by Cl. 5.4.10 of the Technical Provisions, refer to Classification Notes "Guidelines for Approval/Acceptance of Alternative Means of Access in Oil Tankers, Bulk Carriers, Ore Carriers and Combination Carriers".

5.2 Safe access to holds, tanks, ballast tanks and other spaces

5.2.1 Safe access to holds, cofferdams, tanks and other spaces are to 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.

IR5.2.1 This requirement is only applicable to integral tanks. Independent tanks may be excluded. Also, spud cans and jack cases of self-elevating units can be excluded.

The wording "not intended for the carriage of oil or hazardous materials" applies only to "similar compartments", i.e. safe access can be through a pump-room, deep cofferdam, pipe tunnel, cargo hold or double hull space.

5.2.2 Tanks and subdivisions of tanks, having a length of 35 [m] or more, are to be fitted with at least two access hatchways and ladders, as far apart as practicable. Tanks less than 35 [m] in length is to 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 are to be fitted.

IR5.2.2 A tank of less than 35 [m] length without a swash bulkhead requires only one access hatch.

Where rafting is indicated in the access manual as the means to gain ready access to the under deck structure, the term "similar obstructions" referred to in the regulation includes internal structures (e.g., webs >1.5 [m] deep) which restrict the ability to raft (at the maximum water level needed for rafting of under deck structure) directly to the nearest access ladder and hatchway to deck. When rafts or boats alone, as an alternative means of access are allowed, permanent means of access are to be provided to allow safe entry and exit. This means:

- a) access direct from the deck via a vertical ladder and small platform fitted approximately 2 [m] below the deck in each bay; or

b) access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform is to, (for the full length of the tank), be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level is to be assumed not more than 3 [m] from the deck plate measured at the mid span of deck transverses and in the middle length of the tank. A permanent means of access from the longitudinal permanent platform to the water level indicated above is to be fitted in each bay (e.g. permanent rungs on one of the deck webs inboard of the longitudinal permanent platform).

5.2.3 Each hold is to be provided with at least two means of access as far apart as practicable. In general, these accesses are to 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.

5.3 Access Manual

5.3.1 A unit's means of access (MA) to carry out overall and close-up inspections and thickness measurements are to be described in an access manual which may be incorporated in the unit's operating manual. The manual is to be updated as necessary and an updated copy maintained onboard. The structure access manual is to include the following for each space:

.1 Plans showing the MA to the space, with appropriate technical specifications and dimensions;

.2 Plans showing the MA within each space to enable an overall inspection to be carried out, with appropriate technical specifications and dimensions. The plans are to indicate from where each area in the space can be inspected;

.3 Plans showing the MA within the space to enable close-up inspections to be carried out, with appropriate technical specifications and dimensions. The plans are to be indicated with 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 MA 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 MA in a safe manner;

.7 An inventory of all portable MA; and

.8 Records of periodical inspections and maintenance of the unit's MA.

IR5.3.1.1 The access manual is to be provided in English. The access manual is to address spaces listed in 5.2. The access manual is to contain at least the following two parts:

Part 1: Plans, instructions and inventory required by 5.3.1.1 to 5.3.1.7. This part is to be approved by IRS/ the Administration.

Part 2: Form of record of inspections and maintenance, and change of inventory of portable equipment due to additions or replacement after construction. This part is to be approved for its form only at new building.

IR.2 The access manual is to address the following:

(a) The access manual is to clearly cover scope as specified in the regulations for use by crews, surveyors and port state control officers;

(b) Approval / re-approval procedure for the manual, i.e. any changes of the permanent, portable, movable or alternative MA within the scope of the Rules and the Technical Provisions are subject to review and approval by IRS/ the Administration;

(c) Verification of MA is to be part of safety construction survey for continued effectiveness of the MA in that space which is subject to the statutory survey;

(d) Inspection of MA by the crew and/or a competent inspector of the company as a part of regular inspection and maintenance (see IR 5.3.2);

(e) Actions to be taken if MA is found unsafe to use.

(f) In case of use of portable equipment plans showing the MA within each space

indicating from where and how each area in the space can be inspected.

5.3.2 MODUs are to be designed and built with due consideration as to how they will be surveyed by flag State inspectors and surveyors during their in-service life and how the crew will be able to monitor the condition of the MODU. Without adequate access, the structural condition of the MODU can deteriorate undetected and major structural failure can arise. A comprehensive approach to design and maintenance is required to cover the whole projected life of the MODU. In order to address this issue, Technical Provisions for means of access for inspections have been developed, intended to facilitate close-up inspections and thickness measurements of the MODU's structure (see 5.4). The construction and materials of all MA and their attachment to the unit's structure is to be to the satisfaction of IRS/ the Administration. The MA is to be subject to inspection prior to, or in conjunction with, its use in carrying out periodical surveys.

IR5.3.2 The MA arrangements, including portable equipment and attachments, are to be periodically inspected by the crew or competent inspectors as and when it is going to be used to confirm that the MAs remain in serviceable condition.

IR.1 Any Company authorized person using the MA is to assume the role of inspector and check for obvious damage prior to using the access arrangements. Whilst using the MA the inspector is to verify the condition of the sections used by close up examination of those sections and note any deterioration in the provisions. Should any damage or deterioration be found, the effect of such deterioration is to be assessed as to whether the damage or deterioration affects the safety for continued use of the access. Deterioration found that is considered to affect safe use is to be determined as "substantial damage" and measures are to be put in place to ensure that the affected section(s) are not to be further used prior effective repair.

IR.2 Statutory survey of any space that contains MA is to include verification of the continued effectiveness of the MA in that space. Survey of the MA shall not be expected to exceed the scope and extent of the survey being undertaken. If the MA is found deficient the scope of survey is to be extended if this is considered appropriate.

IR.3 Records of all inspections are to be established based on the requirements detailed in the MODU's Safety Management System. The records are to be readily available to persons using the MAs and a copy attached to the MA Manual. The latest record for the portion of the MA inspected is to include as a minimum the date of the inspection, the name and title of the inspector, a confirmation signature, the sections of MA inspected, verification of continued serviceable condition or details of any deterioration or substantial damage found. A file of permits issued is to be maintained for verification.

5.3.3 Permanent means of access which are designed to be integral parts of the structure itself are preferred and IRS/ the Administration may allow 'reasonable deviations' to facilitate such designs.

IR5.3.3 The above 'deviation' is to be applied only to distances between integrated PMA that are the subject of 2.1.2 of Table 5.4.2. Deviations are not to be applied to the distances governing the installation of underdeck longitudinal walkways and dimensions that determine whether permanent access are required or not, such as height of the spaces and height to elements of the structure (e.g. cross ties).

5.3.4 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.

IR5.3.4 Critical structural areas are to be identified by advanced calculation techniques for structural strength and fatigue performance, if available, and feedback from the service history and design development of similar or sister units.

5.4 Technical Provisions

5.4.1 **Definitions:** For the purpose of these technical provisions, the following definitions apply:

- a) **Rung** means the step of a vertical ladder or step on the vertical surface;
- b) **Tread** means the step of an inclined ladder or step for the vertical access opening;

- c) **Flight of an inclined ladder** means the actual stringer length of an inclined ladder. For vertical ladders, it is the distance between the platforms;
- d) **Stringer** means:
- i) the frame of a ladder; or
 - ii) the stiffened horizontal plating structure fitted on the side shell, transverse bulkheads and/ or longitudinal bulkheads in the space. For the purpose of ballast tanks of less than 5[m] width, the horizontal plating structure is credited as a stringer and a longitudinal permanent means of access, if it provides a continuous passage of 600 [mm] or more in width past frames or stiffeners on the side shell or longitudinal or transverse bulkhead. Openings in stringer plating utilized as permanent means of access shall be arranged with guard rails or grid covers to provide safe passage on the stringer or safe access to each transverse web.
- e) **Vertical ladder** means a ladder of which the inclined angle is 70° and over up to 90°. A vertical ladder is not to be skewed by more than 2°.
- f) **Overhead obstructions** mean the deck or stringer structure including stiffeners above the means of access.
- g) **Distance below deck head** means the distance below the plating.
- h) **Cross deck** means the transverse area of the main deck which is located inboard and at both sides of a transverse bulkhead. Between large hatches/holds or between moonpool opening and hatches/ holds of a drillship or column stabilized unit.
- i) **Hold** means any dry space other than a machinery space located within the hull of surface units and self-elevating units or within the upper hull, columns or pontoons of column-stabilized units. Dry storage spaces and void spaces are considered holds.
- 5.4.2 Structural members subject to the close-up inspections and thickness measurements of the MODU's structure referred to in 5.1, except those in double bottom spaces, are to be provided with a permanent means of access to the extent as specified in Table 5.4.2. Approved alternate methods may be used in connection with the fitted permanent means of access, provided that the structure allows for its safe and efficient use.
- IR 5.4.2 The permanent means of access to a space can be credited for the permanent means of access for inspection.

Table 5.4.2 : Means of Access

1 Water ballast tanks, other than those specified in the right column, and other tanks	2 Water ballast tanks of less than 5 [m] width
Access to the under-deck and vertical structure	
1.1 For tanks of which the height is 6 [m] and over containing internal structures, permanent means of access is to be provided in accordance with 1.1.1 to 1.1.6 ¹ :	2.1 For water ballast tanks of less than 5 [m] width (including double side spaces above the upper knuckle point of the bilge hopper sections in surface units), permanent means of access are to be provided in accordance with 2.1.1 to 2.1.3 ⁵ :
1.1.1 Continuous athwartship permanent access is to be arranged at each transverse bulkhead on the stiffened surface, at a minimum of 1.6 [m] to a maximum of 3 [m] below the deck head;	2.1.1 Where the vertical distance between horizontal uppermost stringer and deck head is 6 [m] or more, one continuous longitudinal permanent means of access is to be provided for the full length of the tank with a means to allow passing through transverse webs installed at a minimum of 1.6 [m] to a maximum of 3 [m] below the deck head with a vertical access ladder at each end of the tank ⁶ ;
1.1.2 At least one continuous longitudinal permanent means of access at each side of the tank is to be provided. One of these accesses is to be at a minimum of 1.6 [m] to a maximum of 6 [m] below the deck head and the other is to be at a minimum of 1.6 [m] to a maximum of 3 [m] below the deck head ² ;	2.1.2 Continuous longitudinal permanent means of access, which are integrated in the structure, at a vertical distance not exceeding 6 [m] apart; and ⁷

1.1.3 Access between the arrangements specified in 1.1.1 and 1.1.2 and from the deck above the tanks to either 1.1.1 or 1.1.2 ³ ;	2.1.3 Plated stringers are to be, as far as possible, in alignment with horizontal girders of transverse bulkheads.
1.1.4 Continuous longitudinal permanent means of access which are integrated in the structural member on the stiffened surface of a longitudinal bulkhead, in alignment, where possible, with horizontal girders of transverse bulkheads are to be provided for access to the transverse webs unless permanent fittings are installed at the uppermost platform for use of alternative means, as defined in Cl. 5.4.10 of Technical Provisions, for inspection at intermediate heights ⁴ ;	2.2 For pre-load tanks in self-elevating units, reference is made to 1.3.
1.1.5 For MODUs having cross-ties which are 6 [m] or more above tank bottom, a transverse permanent means of access on the cross-ties providing inspection of the tie flaring brackets at both sides of the tank, with access from one of the longitudinal permanent means of access in 1.1.4; and	2.3 For ballast tanks in columns of column stabilized units of which the vertical distance between each watertight flat or between horizontal stringers/non-tight flats is 6 [m] and over, one permanent means of access is to be provided for the full length of the tank in accordance with 2.1. (Note: In columns, longitudinal means the perimetral direction of the column and transversal means the radial direction of the column)
1.1.6 Alternative means as defined in Cl. 5.4.10 of the Technical Provisions may be provided as an alternative to 1.1.4 for tanks other than ballast tanks of which the height is less than 17 [m].	For surface units (ship- or barge-type) and pontoons in column-stabilized units: 2.4 For bilge hopper sections of which the vertical distance from the tank bottom to the upper knuckle point is 6 [m] and over, one longitudinal permanent means of access is to be provided for the full length of the tank. It is to be accessible by vertical permanent means of access at each end of the tank ⁸ .
1.2 For tanks of which the height is less than 6 [m], alternative means as defined in Cl. 5.4.10 of the Technical Provisions or portable means may be utilized in lieu of the permanent means of access.	2.4.1 The longitudinal continuous permanent means of access may be installed at a minimum 1.6 [m] to maximum 3 [m] from the top of the bilge hopper section. In this case, a platform extending the longitudinal continuous permanent means of access in way of the web frame may be used to access the identified structural critical areas.
1.3 Pre-load tanks in self-elevating units are normally kept empty for a long duration when the unit is in elevated mode. For such tanks if due to their shape it is not practicable to fit permanent means of access mentioned in 1.1 above, IRS may permit the provision of alternative means defined in Cl. 5.4.10 of the Technical Provisions provided that the tank height is less than 17 [m].	2.4.2 Alternatively, the continuous longitudinal permanent means of access may be installed at a minimum of 1.2 [m] below the top of the clear opening of the web ring allowing a use of portable means of access to reach identified structural critical areas.
1.4 For ballast tanks in columns of column stabilized units, longitudinal means the perimetral direction of the column and transversal means the radial direction of the column.	2.5 Where the vertical distance referred to in 2.4 is less than 6 [m], alternative means as defined in Cl. 5.4.10 of the Technical Provisions or portable means of access may be utilized in lieu of the permanent means of access. To facilitate the operation of the alternative means of access, inline openings in horizontal stringers are to be provided. The openings are to be of an adequate diameter and are to have suitable protective railings.

<p>Fore and aft peak tanks in surface units</p> <p>1.5 For fore and aft peak tanks with a depth of 6 [m] or more at the centre line of the collision and aft end bulkheads, a suitable means of access is to be provided for access to critical areas such as the under deck structure, stringers, collision and aft end bulkheads and side shell structure.</p>	
<p>1.5.1 Stringers of less than 6 [m] in vertical distance from the deck head or a stringer immediately above are considered to provide suitable access in combination with portable means of access.</p>	
<p>1.5.2 In case the vertical distance between the deck head and stringers, stringers or the lowest stringer and the tank bottom is 6 [m] or more, alternative means of access as defined in Cl. 5.4.10 of the Technical Provisions is to be provided.</p>	
<p>3 Holds</p>	<p>4 Critical Structural Areas</p>
<p>Access to underdeck structure</p> <p>3.1 For holds under main deck of which the height is 6 [m] and over, permanent means of access is to be fitted to provide access to the overhead structure at both sides of the cross deck and in the vicinity of the centerline. Each means of access is to be accessible from the hold access or directly from the main deck and installed at a minimum of 1.6 [m] to a maximum of 3 [m] below the deck ⁹.</p>	<p>4.1 Permanent means of access are to be fitted to provide access to overhead and vertical structures identified as critical structural areas as defined in Cl. 5.3.2 and located at a height of 6 [m] or more from the bottom of the space.</p>
<p>3.2 An athwartship permanent means of access fitted on the transverse bulkhead at a minimum 1.6 [m] to a maximum 3 [m] below the cross-deck head is accepted as equivalent to 3.1.</p>	<p>4.1.1 When permanent means of access to critical structural areas are not covered by Sections 1, 2 and 3 above, continuous permanent access arranged at the bulkhead on the stiffened surface is to be provided at a maximum of 3 [m] below the critical structural area, but not higher than 1.6 [m] below the deck, throughout the extent of the critical structural area.</p>
<p>3.3 Access to the permanent means of access to overhead structure of the cross deck may also be via the uppermost stringer ¹⁰.</p>	<p>4.2 For critical structural areas located at a height of less than 6 [m] from the bottom of the space, alternative means of access as defined in Cl. 5.4.10 of the Technical Provisions are to be provided.</p>
<p>3.4 Alternatively, movable means of access as defined in Cl. 5.4.10 of the Technical Provisions, may be utilized for access to the overhead structure of the cross deck if its vertical distance is 17 [m] or less above the bottom of the hold ¹¹.</p>	<p>4.3 Suitable means of access into the interior of the horizontal braces in column stabilized units are to be provided. For access through vertical openings, the requirements of Cl. 5.4.10 of the Technical Provisions are to be applied.</p>
<p>Notes :</p> <p>1. (a) For tanks containing products considered corrosive (e.g. brine, drilling mud), 1.1 is to be applied. For tanks containing oil products other than crude oil (e.g. fuel oil, diesel oil, base oil) where lower corrosion is expected, 1.1 of Table 5.4.2 is not to be applied. (b) 1.1.1, 1.1.2 and 1.1.3 of Table 5.4.2 define access to under-deck structure, access to the uppermost sections of transverse webs and connection between these structures. (c) 1.1.4, 1.1.5 and 1.1.6 of Table 5.4.2 define access to vertical structures only and are linked to the presence of transverse webs on longitudinal bulkheads. (d) If there are no under deck structures (deck longitudinals and deck transverses) but there are vertical structures in the tank supporting transverse and longitudinal bulkheads, access in</p>	

accordance with 1.1.1 to 1.1.6 of is to be provided for inspection of the upper parts of vertical structure on transverse and longitudinal bulkheads.

(e) If there is no structure in the tank, 1.1 of Table 5.4.2 is not to be applied.

(f) The vertical distance below the overhead structure is to be measured from the underside of the main deck plating to the top of the platform of the means of access at a given location.

(g) The height of the tank is to be measured at each tank. For a tank the height of which varies at different bays, 1.1 is to be applied to such bays of a tank that have height 6 [m] and over.

2. There is need to provide continuous longitudinal permanent means of access when the deck longitudinals and deck transverses are fitted on deck but supporting brackets are fitted under the deck.

3. Means of access to tanks may be used for access to the permanent means of access for inspection.

4. The permanent fittings required to serve alternative means of access such as wire lift platform, that are to be used by crew and surveyors for inspection are to provide at least an equal level of safety as the permanent means of access stated by the same paragraph. These means of access are to be carried on board the unit and be readily available for use without filling of water in the tank. Therefore, rafting is not to be acceptable under this provision.

Alternative means of access are to be part of Access Manual which is to be approved on behalf of the flag State.

5. 2.1.1 represents requirements for access to underdeck structures, while 2.1.2 is a requirement for access for survey and inspection of vertical structures on longitudinal bulkheads (transverse webs).

6. (a) For a tank, the vertical distance between horizontal upper stringer and deck head of which varies at different sections, 2.1.1 is to be applied to such sections that fall under the criteria.

(b) The continuous permanent means of access may be a wide longitudinal, which provides access to critical details on the opposite side by means of platforms as necessary on web frames. In case the vertical opening of the web frame is located in way of the open part between the wide longitudinal and the longitudinal on the opposite side, platforms are to be provided on both sides of the web frames to allow safe passage through the web frame.

(c) Where two access hatches are required by Cl. 5.2.2, access ladders at each end of the tank are to lead to the deck.

7. The continuous permanent means of access may be a wide longitudinal, which provides access to critical details on the opposite side by means of platforms as necessary on web frames. In case the vertical opening of the web is located in way of the open part between the wide longitudinal and the longitudinal on the opposite side, platforms are to be provided on both sides of the web to allow safe passage through the web.

A "reasonable deviation", as indicated in Cl. 5.3.3, of not more than 10% may be applied where the permanent means of access is integral with the structure itself.

8. (a) Permanent means of access between the longitudinal continuous permanent means of access and the bottom of the space is to be provided.

(b) The height of a bilge hopper tank located outside of the parallel part of the unit is to be taken as the maximum of the clear vertical distance measured from the bottom plating to the hopper plating of the tank.

(c) The foremost and aft most bilge hopper ballast tanks with raised bottom, of which the height is 6 [m] and over, a combination of transverse and vertical MA for access to the upper knuckle point for each transverse web is to be accepted in place of the longitudinal permanent means of access.

9. (a) Means of access are to be provided to the cross deck structures of the foremost and aftermost part of the each hold.

(b) Interconnected means of access under the cross deck for access to three locations at both sides and in the vicinity of the centre line is to be acceptable as the three means of access.

(c) Permanent means of access fitted at three separate locations accessible independently, one at each side and one in the vicinity of the centreline is to be acceptable.

(d) Special attention is to be paid to the structural strength where any access opening is provided in the main deck or cross deck.

10. Particular attention is to be paid to preserve the structural strength in way of access opening provided in the main deck or cross deck.
11. The movable means of access to the under deck structure of cross deck need not necessarily be carried on board the unit. It is sufficient if it is made available when needed.

5.4.3 Permanent means of access should as far as possible be integral to the structure of the MODU, thus ensuring that they are robust and at the same time contributing to the overall strength of the structure of the MODU.

5.4.4 Elevated passageways forming sections of a permanent means of access, where fitted, are to have a minimum clear width of 600 [mm], except for going around vertical webs where the minimum clear width may be reduced to 450 [mm], and have guard rails over the open side of their entire length. Sloping structures providing part of the access are to be of a non-skid construction. Guard rails are to be 1000 [mm] in height and consist of a rail and an intermediate bar 500 [mm] in height and of substantial construction. Stanchions are not to be more than 3 [m] apart.

IR5.4.4.1 Sloping structures are structures that are sloped by 5 or more degrees from horizontal plane when a unit is in upright position at even-keel.

IR.2 Guard rails are to be fitted on the open side. For standalone passageways guard rails are to be fitted on both sides of these structures.

IR.3 Discontinuous top handrails are allowed, provided the gap does not exceed 50 [mm]. The same maximum gap is to be considered between the top handrail and other structural members (i.e. bulkhead, web frame, etc.). The maximum distance between the adjacent stanchions across the handrail gaps is to be 350 [mm] where the top and mid handrails are not connected together and 550 [mm] when they are connected together. The maximum distance between the stanchion and other structural members is not to exceed 200 [mm] where the top and mid handrails are not connected together and 300 [mm] when they are connected together. When the top and mid handrails are connected by a bent rail, the outside radius of the bent part is not to exceed 100 [mm] (Fig. 5.4.4.3).

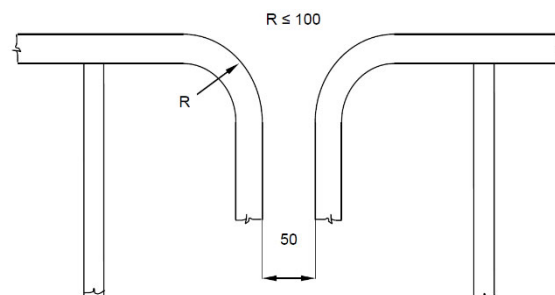


Fig.5.4.4.3

IR.4 Non-skid construction is such that the surface on which personnel walks provides sufficient friction to the sole of boots even if the surface is wet and covered with thin sediment.

IR.5 "Substantial construction" is taken to refer to the designed strength as well as the residual strength during the service life of the unit. Durability of passageways together with guard rails is to be ensured by the initial corrosion protection and inspection and maintenance during services.

IR.6 For guard rails, use of alternative materials such as GRP is to be subject to compatibility with the liquid carried in the tank. Non-fire resistant materials are not to be used for means of access to a space with a view to securing an escape route at a high temperature.

IR.7 Requirements for resting platforms placed between ladders are equivalent to those applicable to elevated passageways.

5.4.5 Access to permanent means of access and vertical openings from the MODU's bottom are to be provided by means of easily accessible passageways, ladders or treads. Treads are to be provided with lateral support for the foot. Where the rungs of ladders are fitted against a vertical surface, the distance from the centre of the rungs to the surface is to be at least 150 [mm]. Where

vertical manholes are fitted higher than 600 [mm] above the walking level, access shall be facilitated by means of treads and hand grips with platform landings on both sides.

IR5.4.5 Where the vertical manhole is at a height of more than 600 [mm] above the walking level, it is to be demonstrated that an injured person can be easily evacuated.

5.4.6 Permanent inclined ladders are to be inclined at an angle of less than 70°. There are to be no obstructions within 750 [mm] of the face of the inclined ladder, except that in way of an opening this clearance may be reduced to 600 [mm]. Resting platforms of adequate dimensions are to be provided, normally at a maximum of 6 [m] vertical height. Ladders and handrails are to be constructed of steel or equivalent material of adequate strength and stiffness and securely attached to the structure by stays. The method of support and length of stay is to be such that vibration is reduced to a practical minimum. In holds, ladders are to be designed and arranged so that stores handling difficulties are not increased and the risk of damage from stores handling gear is minimized.

5.4.6.1 Means of access to ballast tanks and other tanks:

.1 For tanks and subdivisions of tanks having a length of 35 [m] or more with two access hatchways:

(a) First access hatchway: Inclined ladder or ladders are to be used.

(b) Second access hatchway:

(i) A vertical ladder may be used. In such a case where the vertical distance is more than 6 [m], vertical ladders are to comprise one or more ladder linking platforms spaced not more than 6 [m] apart vertically and displaced to one side of the ladder. The uppermost section of the vertical ladder, measured clear of the overhead obstructions in way of the tank entrance, is not to be less than 2.5 [m] but not exceed 3.0 [m] and is to comprise a ladder linking platform which is to be displaced to one side of a vertical ladder. However, the vertical distance of the upper most section of the vertical ladder may be reduced to 1.6 [m], measured clear of the overhead obstructions in way of the tank entrance, if the ladder lands on a longitudinal or athwartship permanent means of access fitted within that range; or

(ii) Where an inclined ladder or combination of ladders is used for access to the space, the uppermost section of the ladder, measured clear of the overhead obstructions in way of the tank entrance, is to be vertical for not less than 2.5 [m] but not exceed 3.0 [m] and is to comprise a landing platform continuing with an inclined ladder. However, the vertical distance of the upper most section of the vertical ladder may be reduced to 1.6 [m], measured clear of the overhead obstructions in way of the tank entrance, if the ladder lands on a longitudinal or athwartship permanent means of access fitted within that range. The flights of the inclined ladders are normally to be not more than 6 [m] in vertical height. The lowermost section of the ladders may be vertical for the vertical distance not exceeding 2.5 [m].

.2 For tanks less than 35 [m] in length and served by one access hatchway an inclined ladder or combination of ladders are to be used to the space as specified in 5.4.6.1.1 (b) (ii) above.

.3 In double hull spaces of less than 2.5 [m] width the access to the space may be by means of vertical ladders that comprises one or more ladder linking platforms spaced not more than 6 [m] apart vertically and displaced to one side of the ladder. The uppermost section of the vertical ladder, measured clear of the overhead obstructions in way of the tank entrance, is not to be less than 2.5 [m] but not exceed 3.0 [m] and is to comprise a ladder linking platform which is to be displaced to one side of a vertical ladder. However, the vertical distance of the upper most section of the vertical ladder may be reduced to 1.6 [m], measured clear of the overhead obstructions in way of the tank entrance, if the ladder lands on a longitudinal athwartship permanent means of access fitted within that range. Adjacent sections of the ladder are to be laterally offset from each other by at least the width of the ladder.

.4 Access from deck to a double bottom space may be by means of vertical ladders through a trunk. The vertical distance from deck to a resting platform, between resting platforms or a resting platform and the tank bottom is not to be more than 6 [m] unless otherwise approved by IRS/ Administration.

5.4.6.2 Means of access for inspection of the vertical structure

.1 Vertical ladders provided for means of access to the space may be used for access for inspection of the vertical structure. Unless stated otherwise in Table 5.4.2, vertical ladders that are fitted on vertical structures for inspection are to comprise one or more ladder linking platforms spaced not more than 6 [m] apart vertically and displace to one side of the ladder. Adjacent sections of ladder are to be laterally offset from each other by at least the width of the ladder.

.2 The minimum distance between the inclined ladder face and obstructions, i.e. 750 [mm] and, in way of openings, 600 [mm] specified in 5.4.6 is to be measured perpendicular to the face of the ladder.

5.4.7 The width of inclined ladders between stringers is not to be less than 400 [mm]. The treads are to be equally spaced at a distance apart, measured vertically, of between 200 [mm] and 300 [mm]. When steel is used, the treads are to be formed of two square bars of not less than 22 [mm] by 22 [mm] in section, fitted to form a horizontal step with the edges pointing upward. The treads are to be carried through the side stringers and attached thereto by double continuous welding. All inclined ladders are to be provided with handrails of substantial construction on both sides, fitted at a convenient distance above the treads.

IR5.4.7.1 Vertical height of handrails is not to be less than 890 [mm] from the centre of the step and two course handrails are to be provided.

IR.2 Cl. 5.4.5 allows for single rungs fitted to vertical surfaces, which is considered for a safe grip. For vertical ladders, when steel is used, the rungs are to be formed of single square bars of not less than 22 [mm] by 22 [mm] for the sake of safe grip.

IR.3 The width of inclined ladders for access to a hold is to be at least 450 [mm].

IR.4 The width of inclined ladders other than an access to a hold is to be not less than 400 [mm].

IR.5 The minimum width of vertical ladders is to be 350 [mm] and the vertical distance between the rungs is to be equal and is to be between 250 [mm] and 350 [mm].

IR.6 A minimum climbing clearance in width is to be 600 [mm] other than the ladders placed between the hold frames.

IR.7 The vertical ladders are to be secured at intervals not exceeding 2.5 [m] apart to prevent vibration.

5.4.8 For vertical ladders or spiral ladders, the width and construction is to be in accordance with international or national standards.

5.4.9 No free-standing portable ladder is to be more than 5 [m] long.

5.4.10 Alternative means of access include, but are not limited to, such devices as:

- .1 hydraulic arm fitted with a stable base;
- .2 wire lift platform;
- .3 staging;
- .4 rafting;
- .5 robot arm or remotely operated vehicle (ROV);
- .6 portable ladders more than 5 [m] long are only to be utilized if fitted with a mechanical device to secure the upper end of the ladder;

IR5.4.10 A mechanical device such as hooks for securing at the upper end of a ladder is to be considered as an appropriate securing device if a movement fore/ aft and sideways can be prevented at the upper end of the ladder.

5.4.11 For access through horizontal openings, hatches or manholes, the dimensions are to 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 is not to be less than 600 [mm] x 600 [mm]. When access to a hold is arranged through a flush manhole in the deck or a hatch, the top of the ladder is to be placed as close as possible to the deck or hatch coaming. Access hatch coamings having a height greater than 900 [mm] is to also have steps on the outside in conjunction with the ladder.

IR5.4.11 The minimum clear opening of 600 [mm] x 600 [mm] may have corner radii up to 100 [mm] maximum. The clear opening is specified to keep the opening fit for passage of personnel wearing a breathing apparatus. In such a case where as a consequence of structural analysis of a given design the stress is to be reduced around the opening, it is considered appropriate to take measures to reduce the stress such as making the opening larger with increased radii, e.g. 600 x 800 [mm] with 300 [mm] radii, in which a clear opening of 600 x 600 [mm] with corner radii up to 100 [mm] maximum fits.

5.4.12 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 is to be not less than 600 [mm] x 800 [mm] at a height of not more than 600 [mm] from the bottom shell plating unless gratings or other footholds are provided.

IR5.4.12.1 The minimum clear opening of not less than 600 [mm] x 800 [mm] may also include an opening with corner radii of 300 [mm]. An opening of 600 [mm] in height x 800 [mm] in width may be accepted as access openings in vertical structures where it is not desirable to make large

opening in the structural strength aspects, i.e. girders and floors in double bottom tanks.

IR.2 Subject to verification of easy evacuation of injured person on a stretcher the vertical opening 850 [mm] x 620 [mm] with wider upper half than 600 [mm], while the lower half may be less than 600 [mm] with the overall height not less than 850 [mm] is considered an acceptable alternative to the traditional opening of 600 [mm] x 800 [mm] with corner radii of 300 [mm]. See Fig.5.4.12.2.

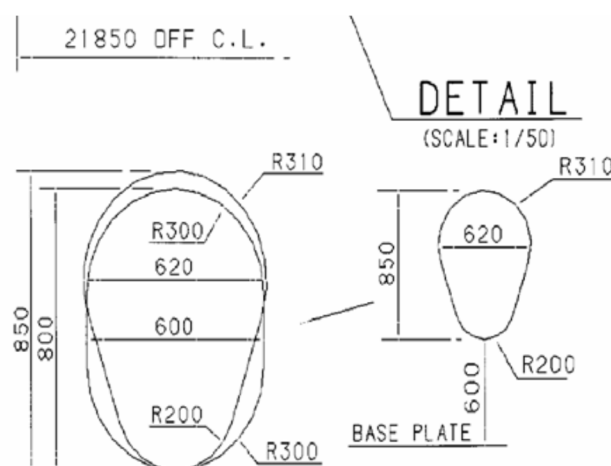


Fig.5.4.12.2

IR.3 If a vertical opening is at a height of more than 600 [mm], steps and handgrips are to be provided. In such arrangements it is to be demonstrated that an injured person can be easily evacuated.

5.4.13 Smaller dimensions for the openings referred to in 5.4.11 and 5.4.12 may be approved by IRS in special circumstances, if the ability to traverse such openings or to remove an injured person can be proved to the satisfaction of IRS.

5.4.14 Access ladders to large holds and other similar spaces are to be:

.1 Either a vertical ladder or an inclined ladder, where the vertical distance between the upper surface of adjacent decks or between deck and the bottom of the hold is not more than 6 [m].

IR5.4.14.1 Either a vertical or an inclined ladder or a combination of them may be used for access to a large hold where the vertical distance is 6 [m] or less from the deck to the bottom of the hold.

5.4.14.2 Where the vertical distance between the upper surface of adjacent decks or between deck and the bottom of the hold is more than 6 [m], an inclined ladder or series of inclined ladders at one end of the hold, except the uppermost 2.5 [m] of a hold measured clear of overhead obstructions and the lowest 6 [m] may have vertical ladders, provided that the vertical extent of the inclined ladder or ladders connecting the vertical ladders is not less than 2.5 [m].

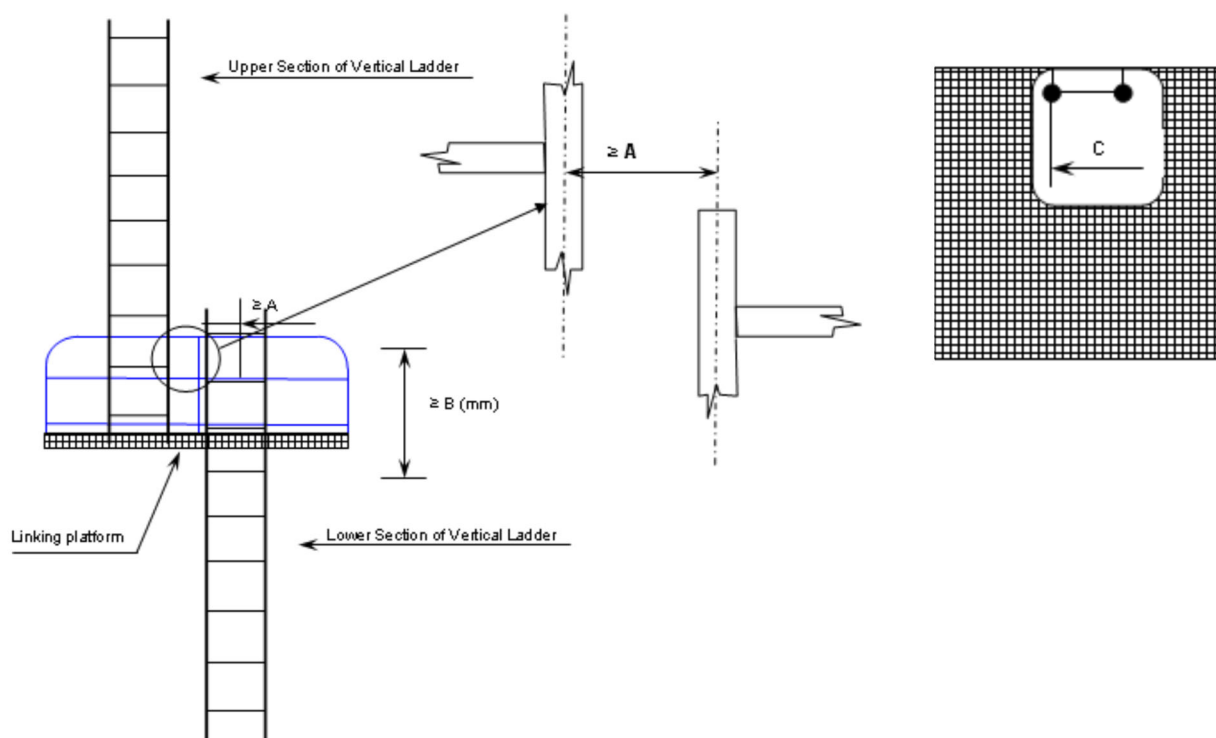
The second means of access at the other end of the hold may be formed of a series of staggered vertical ladders, which are to comprise of one or more ladder linking platforms spaced not more than 6 [m] apart vertically and displaced to one side of the ladder. Adjacent sections of ladder are to be laterally offset from each other by at least the width of the ladder. The uppermost entrance section of the ladder directly exposed to a hold is to be vertical for a distance of 2.5 [m] measured clear of overhead obstructions and connected to a ladder-linking platform.

IR.5.4.14.2 Adjacent sections of vertical ladder need to be installed so that the following provisions are complied with (refer to Fig.5.4.14.2 (a) and (b)):

- The minimum "lateral offset" between two adjacent sections of vertical ladder, is the distance between the sections, upper and lower, so that the adjacent stringers are spaced at least 200 [mm], measured from half thickness of each stringer.

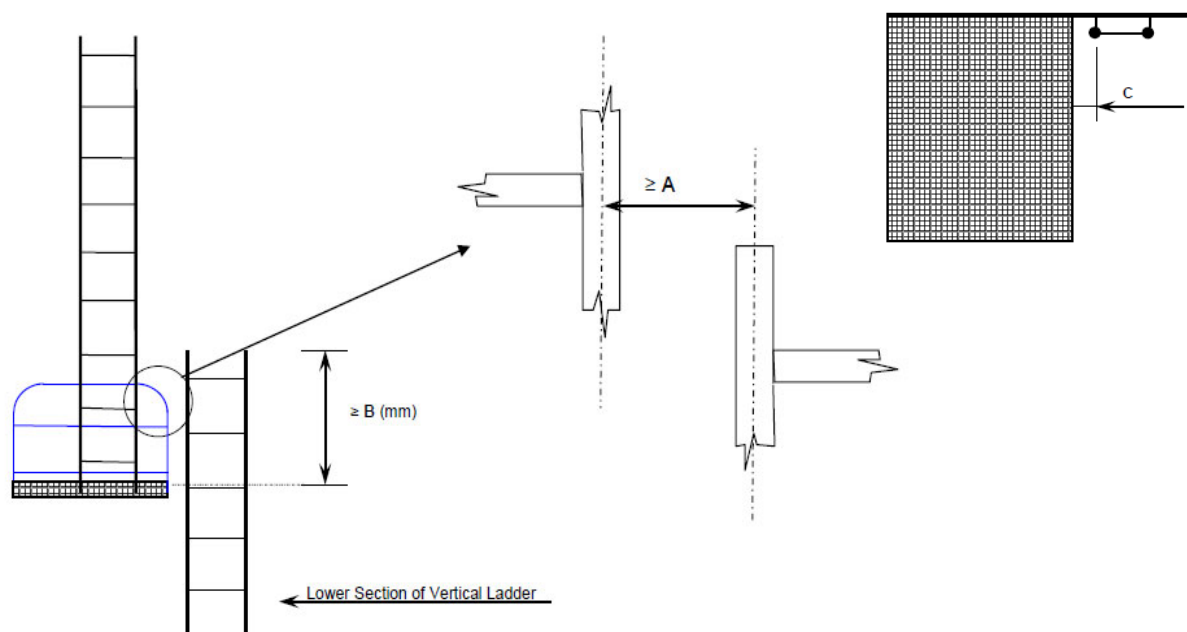
- Adjacent sections of vertical ladder are to be installed so that the upper end of the lower section is vertically overlapped, in respect to the lower end of the upper section, to a height of 1500 [mm] in order to permit a safe transfer between ladders.

- No section of the access ladder is to be terminated directly or partly above an access opening.



Dimension		
A	Horizontal separation between two vertical ladders, stringer to stringer	≥ 200 [mm]
B	Stringer height above landing or intermediate platform	$\geq 1500^*$ [mm]
C	Horizontal separation between ladder and platform	100 [mm] $\leq C < 300$ [mm]
*Note: the minimum height of the handrail of resting platform is of 1000 mm (Technical Provision, resolution MSC.158(78), Para 3.3)		

Fig.5.4.14.2 (a) : Vertical Ladder – Ladder through Linking Platform



Dimension		
A	Horizontal separation between two vertical ladders, stringer to stringer	≥ 200 [mm]
B	Stringer height above landing or intermediate platform	$\geq 1500^*$ [mm]
C	Horizontal separation between ladder and platform	100 [mm] $\leq C < 300$ [mm]
*Note: the minimum height of the handrail of resting platform is of 1000 mm (Technical Provision, resolution MSC.158(78), Para 3.3)		

Fig.5.4.14.2 (b) : Vertical Ladder – Side Mount

5.4.15 The uppermost entrance section from deck of the vertical ladder providing access to a tank is to be vertical for a distance of 2.5 [m] measured clear of overhead obstructions and comprise a ladder linking platform, displaced to one side of a vertical ladder. The vertical ladder

may be between 1.6 [m] and 3 [m] below deck structure if it lands on a longitudinal or athwartship permanent means of access fitted within that range.

IR5.4.15 Deck is defined as 'weather deck'.

Section 6

Towing Arrangements

6.1 The design and arrangement of towing fittings are to have regard to both normal and emergency conditions.

6.2 Arrangements, equipment and fittings provided in accordance with 5.1 are to meet the requirements of the Part 3, Chapter 15, Sec. 6.3

of the Rules and Regulations for the Construction and Classification of Steel Ships,

6.3 Each fitting or item of equipment is to be clearly marked with any restrictions associated with its safe operation, taking into account the strength of its attachment to the unit's structure.

End of Chapter

Chapter 7

Self-Elevating Drilling Units

Contents	
Section	
1	General
2	Structural Considerations

Section 1

General

1.1 Application

1.1.1 This Chapter applies to self-elevating drilling units as defined in Ch. 1, Sec. 2.10 a).

1.2 Wave clearance

1.2.1 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 less, 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.

1.3 Sea bed conditions

1.3.1 Classification will be based upon the designer's assumptions regarding sea bed conditions. These assumptions are to be recorded in the Operating Booklet. It is the responsibility of the operator to ensure that actual conditions do not impose more severe loadings on the unit.

1.4 Safety against overturning

1.4.1 Safety against overturning : Units which are to rest on the sea bed are to have sufficient positive downward gravity loadings on the support footings or mat to withstand the overturning moment due to the combined environmental loads from any direction with the lateral deflection of the legs taken into consideration.

The safety against overturning is to be assessed using the most unfavourable direction and combination of environmental, gravity, variable

and drilling loads in both normal drilling and severe storm conditions as follows:

- Normal Drilling Condition : Units are assumed to have minimum design variable loads and the cantilever in the most unfavourable position with the associated design drilling load.
- Severe Storm Condition : Units are assumed to have minimum design variable loads and the cantilever in the design position.

1.4.2 Units with individual footings are to have righting moments calculated about the most unfavourable axis through the center of one or more footings and are to have a minimum factor of safety of 1.1 for the conditions defined above.

1.4.3 Units with a mat, are to have righting moments calculated about the most highly stressed edge of the mat and are to have a minimum factor of safety of 1.3 for the conditions defined above.

1.5 Preload capability

1.5.1 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 is to be included in the Operating Booklet.

1.6 Field transit moves

1.6.1 Field transit moves may only be undertaken when the predicted weather is such that the anticipated motions of the unit will not exceed the design condition. The duration of a field transit move may be for a considerable period of time

and should be related to the accuracy of weather forecasting in the area concerned. Such a move should not normally exceed a twelve hour voyage between protected locations, or locations where the unit may be safely elevated; however, during

any portion of the move, the unit is not normally to be more than a six hour voyage to a protected location or a location where the unit may be safely elevated. The approved condition is to be included in the Operating Manual.

Section 2

Structural Considerations

2.1 General

2.1.1 The hull is to be considered as a complete structure having sufficient strength to resist all induced stresses while in the elevated position and supported by all legs. All fixed and variable loads are to be distributed, using an accepted method of rational analysis, from the various points of application to the supporting legs. The scantlings of the hull are then to be determined consistent with this load distribution, in accordance with Chapter 6.

2.1.2 The conditions valid for towing/conveyances, for the elevating and lowering procedures and for the operating phases, while standing on the sea floor, shall be clearly indicated in the Operating Manual (see Ch.1, Sec.2).

2.1.3 For the elevated position, special attention is to be paid to the distribution of the loads from the supporting points (legs) into the hull structure, taking account also of possible load redistributions resulting from lack of support at one leg.

2.1.4 Deckhouses located near the side shell of a unit may be required to have scantlings similar to those of an unprotected house front. Other deckhouses are to have scantlings suitable for their size, function and location.

2.2 Legs

2.2.1 Leg types - Legs may be either shell type or truss type. Shell type legs may be designed as either stiffened or unstiffened shells. In addition, individual footing may be fitted or legs may be permanently attached to a bottom mat.

2.2.2 Legs without mats - Where footings or 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.

2.2.3 Legs in the field transit condition - The legs are to have sufficient strength for the bending moment 'M' obtained from the following formula:

$$M = M_1 + 1.2 M_2 \text{ [N-m]}$$

M_1 = Dynamic bending moment caused by a 6-degree single amplitude of roll or pitch at the natural period of the unit [N-m]

M_2 = Static bending moment due to gravity caused by a 6-degree legs' angle of inclination [N-m].

Special consideration, based on submitted data, will be given to angles of inclination less than 6 degrees when the separation between the bottom of the hull and the top of the mat or the lower tip of the spud can exceeds 15% of the maximum separation.

The legs are to be investigated for any proposed leg arrangement with respect to vertical position during field transit moves, and the approved positions are to be specified in the Operating Booklet. Such investigation is to include strength and stability aspects.

2.2.4 Legs in the ocean transit condition - Legs are to be designed for acceleration and gravity moments resulting from the motions in the most severe anticipated environmental transit conditions, together with corresponding wind moments.

Alternatively, legs are to have sufficient strength for the bending moment 'M' obtained from the following formula:

$$M = M_3 + 1.2 M_4 \text{ [N-m]}$$

M_3 = Dynamic bending moment caused by a 15-degree single amplitude of roll or pitch at a 10-second period [N-m]

M_4 = Static bending moment due to gravity caused by a 15-degree legs' angle of inclination [N-m]

For ocean transit conditions, it may be necessary to reinforce or support the legs, or to remove sections of them. The approved condition is to be included in the Operating Booklet.

2.2.5 Condition - while lowering to bottom: Legs are to be designed to withstand the dynamic loads which may be encountered by their unsupported length just prior to touching bottom, and also to withstand the shock of touching bottom while the unit is afloat and subject to wave and wind motions.

The maximum design motions, bottom conditions and sea state while lowering legs are to be clearly indicated in the Operating Booklet, and the legs are not to be permitted to touch bottom when the site conditions exceed the allowable.

2.2.6 The effect of possible scouring action (loss of bottom support) is to be considered. The effect of skirt plates, where provided, is to be given special consideration.

2.2.7 Condition while elevating the unit - the legs are to be designed to withstand the loads acting on both, the unit's hull and the legs themselves, during the elevating procedure. The environmental conditions are the same as foreseen for lowering of the legs. The analysis may have to be done for several intermediate positions of the hull.

2.2.8 Unit in the elevated position - when computing the stresses in legs, the maximum overturning load on the unit, using the most adverse combination of applicable variable loadings together with the loading as outlined in Ch. 4, is to be considered. Forces and moments due to lateral frame deflections of the legs are to be taken into account.

2.2.9 Leg scantlings: Leg scantlings are to be determined in accordance with the requirements of Chapter 6.

2.3 Structure in way of jacking or other elevating arrangements

2.3.1 Load carrying members which transmit loads from the legs to the hull are to be designed for the maximum design loads and are to be so arranged that loads transmitted from the legs are properly diffused into the hull structure.

2.3.2 The structure surrounding the legs (points of support) shall be designed with particular regard to the introduction of local concentrated forces; main load bearing elements should be continuous in the vertical direction. Regarding the maximal force to be transmitted, preloading of the legs shall be considered.

2.3.3 For loose elements, e.g. bars, rods, bolts, pins, serving for transmission of forces to support the unit, special requirements may be imposed regarding dimensioning safety factors and testing.

2.4 Bottom mat

2.4.1 When the bottoms of the legs are attached to a mat, particular attention is to be given to the attachment and the framing and bracing of the mat, in order that the loads transmitted between the legs and the mat are properly distributed. The boundary plating of tanks which are not vented freely to the sea is not to be less in thickness than would be required by the Rules for tanks, using a head to the design water level, taking into account the astronomical and storm tides. The mat is to be further investigated while resting on the sea bed with 20% of the bottom earing area washed away due to scouring. The effects of skirt plates, where provided, will be specially considered. Mats are to be designed to withstand the shock of touching bottom while the unit is afloat and subject to wave motions.

End of Chapter

Chapter 8

Column Stabilized Drilling Units

Contents	
Section	
1	General
2	Structural Considerations

Section 1

General

1.1 Application

1.1.1 This Chapter applies to the unit type as defined in Ch. 1, Sec. 2, Cl. 10(b).

taking into account the predicted motion of the unit relative to the surface of the sea. Calculations, model test results, or prototype experiences are to be submitted for consideration.

1.2 Wave clearance

1.2.1 Afloat condition

- a) Unless deck structures are designed for wave impact, reasonable clearance between the deck structures and the wave crests is to be ensured for all afloat modes of operation,

1.2.2 On-bottom condition

- a) For on-bottom modes of operation, clearances are to be in accordance with those specified in Ch. 7 for self-elevating units.

Section 2

Structural Considerations

2.1 General

2.1.1 Special considerations regarding stresses - For unit of this type, the highest stresses in some members may be associated with less severe environmental conditions than the maximum specified by the owner (designer). Where considered necessary, account is to be taken of the consequent increased possibility of encounter of significant stress levels, by either or both of the following:

- a) Suitable reduction of the allowable stress levels for combined loadings given in Ch. 6, Sec.3.
- b) Detailed investigation of the fatigue properties in order to evaluate the possibility of high stresses in association with probability of occurrence.

- c) Where a column, lower hull or footing is a part of the overall structural frame of a unit, consideration is also to be given to stresses resulting from deflections due to the applicable combined loading.

Particular attention is also to be given to the details of structural design in critical areas such as bracing members, joint connections, etc.

2.1.2 For units designed to be supported by the seabed the clearance in paragraph Chapter 7, 1.2.1 is to be maintained.

2.1.3 Local structures in way of fairleads, winches, etc., forming part of the position mooring system, are to be designed to withstand forces equivalent to the breaking strength of the mooring line.

2.1.4 Where a bridge is provided for access from the shore, the jointed part of the hull with the bridge is to be sufficiently strengthened.

2.1.5 For contact with other ships, the unit is to be equipped with sufficient fenders and particular attention is to be given to the reinforcement of shell plating, frames, girders, etc.

2.1.6 Conditions for towing/conveyances, for ballasting/deballasting procedures and mooring operations shall be clearly indicated in the Operating Manual.

2.2 Upper structure

2.2.1 The scantlings of the upper structure are not to be less than those required by the Rules and Regulations for the Construction & Classification of Steel Ships in association with the loadings indicated on the deck loading plan. (which are not to be less than the minimum specified in Ch.4, Sec.6). In addition, 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 given in Ch.6, Sec.3.

2.2.2 When the upper structure is designed to be waterborne in any mode of operation or damaged condition, or to meet stability requirements, it will be subject to special consideration.

2.2.3 Special attention is to be paid to the foundations (supporting structure) and fastening of drilling derrick(s) (see also Ch.6, Sec.2), cranes and similar installations.

2.2.4 The upper structure, including the opening parts of the well, etc., is to be good in the continuity of longitudinal strength and transverse strength. Scantlings of structural elements are to be as per Pt.3, Ch.9 of Rules and Regulation for the Construction and Classification of Steel Ships.

2.2.5 Deckhouses fitted to the upper structure are to be designed in accordance with the Rules and Regulations for the Construction & Classification of Steel Ships, with due consideration given to their location and to the environmental conditions in which the unit will operate.

2.2.6 Upper structure not subjected to wave loading

Where it can be shown that the upper structure is not subject to wave loading or is required in any mode of operation to be watertight or

weathertight, there need be no overall consideration of tightness or buoyant load forces.

2.2.7 Buoyant upper structure

Where the upper structure is designed to be buoyant in any mode of operation or damaged condition or to meet any stability requirement, it will be subject to special consideration.

2.2.8 Storage tanks on upper decks

Storage tanks built into or on upper decks are to have scantlings as required for ship's integral tanks.

2.3 Columns, lower hulls and footings

2.3.1 Main stability columns, lower hulls or footings may be designed as either framed or unframed shells. In either case, framing, ring stiffeners, bulkheads or other suitable diaphragms which are used are to be sufficient to maintain shape and stiffness under all the anticipated loadings in association with established shell analysis methods.

Portlights or windows including those of the non-opening type, or other similar openings, are not to be fitted in columns.

2.3.2 Where columns, lower hulls or footings are designed with stiffened plating, the minimum scantlings of plating, framing, girders, etc., may be determined in accordance with the requirements of ship's integral tanks.

- a) Tank spaces : Where the internal space is a tank, the head h is to be taken to a point located at two-thirds of the distance from the top of the tank to the top of the overflow, or to a point 0.91 [m] above the top of the tank, whichever is greater. For tanks intended to carry contents with a specific gravity in excess of 1.05, the head is to be increased by a factor equal to the ratio of the specified gravity to 1.0.
- b) Void compartment spaces : Where an internal space is a void compartment, the design head used in association with the above is not to be less than that corresponding to the maximum allowable waterline of the unit in service.
- c) Areas subjected to wave immersion : For all areas subject to wave immersion, a minimum head of 6.0 m is to be used.
- d) Minimum scantling : In general, the scantlings are not to be less than required for

watertight bulkheads in association with a head equivalent to the maximum damaged waterline.

2.3.3 Where columns, lower hulls or footings do not incorporate framing members and are designed as shells, either unstiffened or ring stiffened, the minimum scantlings of shell plating and ring stiffeners are to be determined on the basis of established shell analysis using the appropriate factor of safety and the design heads as given in 2.3.2.

2.3.4 Additional structural requirements

- a) Provision for wave and current loadings : Scantlings of columns, lower hulls or footing as determined by 2.3.2 and 2.3.3 are minimum requirements for hydrostatic pressure loads. Where wave and current forces are superimposed, the local structure of the shell is to be increased in scantlings as necessary, to meet the strength requirements of Ch.6, Sec.3.
- b) Provision for frame action : When the column, lower hull or footing is an effective member of the overall structural frame of the unit, the scantlings are to be sufficient to meet these requirements plus any additional stresses superimposed due to frame action, within the stress limitations of Ch.6, Sec.3.
- c) Consideration for high local loading : Particular consideration is to be given to structural details, reinforcement, etc., in areas subject to high local loadings, or to such loadings that may cause shell distortion; for example:
 - bottom bearing loads, where applicable;
 - partially filled tanks;
 - local strength against external damage;
 - continuity through joints;
 - wave impacts.
- d) Scouring consideration : For units designed to rest on the sea bed, the effect of scouring action (partial loss of bottom support) is to be considered as follows:
 - for a broad mat type (lower hull) support, 20% of the bottom bearing area is to be considered unsupported.
 - when there are individual footings or pads, any one such support is to be

considered unsupported on 50% of its bottom bearing area.

- other configurations will be specially considered.

Where skirt plates are provided their effectiveness in preventing loss of bottom support due to scouring will be specially considered.

2.3.5 Bracing members

- a) Stresses in bracing members due to all anticipated loadings are to be determined in accordance with the following requirements in conjunction with the relevant requirements of Ch.6, Sec.3.
- b) Arrangement of braces : Where braces are essential for the structural integrity of the unit, they should be so arranged that they are protected as far as possible against boat impact (collisions) and other forces resulting from normal operations.
- c) Loading conditions : Bracing members are to be designed to transmit loadings and to make the structure effective against environmental forces and, when the unit is supported by the seabed, against the possibility of uneven bearing loads. Although designed primarily as brace members of the overall structure under the designated loadings, the bracing must also be investigated, if applicable, for superimposed local bending stresses due to buoyancy, wave and current forces.
- d) Effect of wave impact : Where relevant, consideration is to be given to local stresses due to wave impact.
- e) Reinforcement of tabular bracing members : When bracing members are of tubular section, ring frames may be required to maintain stiffness and roundness of shape.
- f) Watertight bracing members : Underwater bracing members are normally to be made watertight. When bracings are watertight, they are to be suitably designed to prevent collapse from external hydrostatic pressure. They are to be accessible for internal inspection, or else adequate means are to be provided in order to detect leakages at an early stage.

Openings in columns : Portlights or other similar openings are not to be fitted to columns.

2.4 Structural redundancy

2.4.1 When assessing structural redundancy for column stabilized units, the following assumed damage conditions apply:

- a) The unit's structure is to be able to withstand the loss of any slender bracing member without causing overall collapse of the unit's structure.
- b) Structural redundancy is to be based on the applicable design load requirements of Ch.4 except:
 - i) When considering environmental loads such as wind force, wave forcing etc. minimum one year return period may be assumed for intended operations.
 - ii) When considering environmental factors, the applied loads are not to be less than 80% of the loads associated with severe storm condition.

- iii) Notwithstanding the kind of stress, the allowable stress at the combined loads condition is to be following formula:

$$\sigma_a = \sigma_y$$

σ_a = allowable stress [N/mm²]

σ_y = specified yield stress of materials [N/mm²]

- iv) When taking into consideration redistribution of forces due to yielding or buckling and overall strength is to be satisfied with (a), the criteria of allowable stress may be exceeded for local stress.

2.4.2 The structural arrangement of the upper hull is to be considered with regard to the structural integrity of the unit after the failure of any primary girder.

End of Chapter

Chapter 9

Surface Type Drilling Units

Contents	
Section	
1	General
2	Structural Considerations

Section 1

General

1.1 Application

1.1.1 This Chapter applies to the surface type drilling units as defined in Ch. 1, Sec. 2.10 c).

Section 2

Structural Considerations

2.1 General

2.1.1 Scantlings of the hull structure of both ship type and barge type drilling units are, in general, to comply with the applicable requirements of *Rules and Regulations for the Construction & Classification of Steel Ships* as mentioned in Chapter 6. Special consideration will be given in respect of the following items which may require some deviation or additions to the Rules.

2.2 Strength in way of drilling well and large hatches

2.2.1 The required strength of the drilling unit is to be maintained in way of the drilling well, and particular attention is to be paid to the transition of fore and aft members so as to maintain continuity of the longitudinal material. In addition, the plating of the well is to be suitably stiffened to

prevent damage due to foreign objects which may become trapped in the well while the drilling unit is under way.

2.2.2 The deck area in way of large hatches is to be suitably compensated where necessary to maintain the strength of the drilling unit.

2.3 Concentrated loads

2.3.1 The structure in way of heavy concentrated loads resulting from the drilling derrick, pipe rack, set back, drilling mud storage, etc., is to be suitably reinforced.

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

End of Chapter

Chapter 10

Temporary Mooring Equipment and Position Keeping Systems and Equipment

Contents	
Section	
1	General
2	Temporary Mooring Equipment
3	Position Keeping Systems and Equipment - Anchoring Systems

Section 1

General

1.1 Application

1.1.1 All drilling units are to be provided with equipment necessary for their temporary mooring in accordance with the requirements of Section 2.

1.1.2 Drilling units provided with position keeping systems and equipment in accordance with the requirements of Section 3 will be eligible for the optional class notation PM.

Section 2

Temporary Mooring Equipment

2.1 Anchors, chain cables, wire ropes and windlass

2.1.1 Anchors, chain cables, wire ropes and windlass necessary for temporary mooring of the units are to be provided in accordance with the requirements of Part 3, Chapter 15 of *Rules and Regulations for the Construction & Classification of Steel Ships*.

2.1.2 Where equipment is provided for keeping position during operations, the same may be accepted in lieu of the equipment specified in 2.1.1 provided it can be released in an emergency during any transit condition and its mooring effect can be considered equivalent or more.

Section 3

Position Keeping Systems and Equipment - Anchoring Systems

3.1 General

3.1.1 The anchors, cables, shackles and other associated connecting equipment should be designed, manufactured and tested in accordance with the requirements of Part 2, Chapter 10 of *Rules and Regulations for the Construction & Classification of Steel Ships*. Documentation of testing, where applicable, should be maintained on board the unit.

Provisions should be made on board for the recording of changes to and inspection of the equipment.

3.1.2 Plans showing the arrangement and complete details of the anchoring system, including anchors, shackles, anchor line 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 for approval.

3.2 Design

3.2.1 An analysis of the anchoring arrangements expected to be utilized in the units' operation is to be submitted for approval. Among the items to be addressed are:

- i) Design environmental conditions of waves, winds, currents, tides and ranges of water depth.
- ii) Air and sea temperature.
- iii) Ice conditions (if applicable).
- iv) Description of analysis methodology

3.2.2 The anchoring system is to be designed so that a sudden failure of any single component will not cause progressive failure of remaining anchoring arrangements.

3.2.3 Anchoring system components are to be designed utilizing adequate factors of safety (FOS) and a design methodology suitable to identify the most severe loading condition for each component. In particular, sufficient number 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.

3.2.4 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 3.2.5, combining the following steady and dynamic responses of the Unit.

- i) steady mean offset due to the defined wind, current, and steady wave forces;
- ii) 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 for drilling units when the magnitudes of such motions are considered to be significant.

3.2.5 When the Quasi-Static Method outlined in 3.2.4 above is applied, the following minimum factor of safety at the maximum excursion of the unit for a range of headings is to be considered:

Design Condition	FOS
Operating	2.7
Severe storm	1.8
Operating - one line failed	1.8
Severe storm - one line failed	1.25

where,

$$FOS = \frac{PB}{T_{max}}$$

T_{max} = characteristic tension in the anchor line, equal to the maximum value obtained according to 3.9.2(e)

PB = minimum rated breaking strength of the anchor line

Operating condition : the most severe design environmental condition for normal operations as defined by the owner or designer

Severe Storm condition: the most severe design environmental condition for severe storm as defined by the owner or designer

Operating, One line failed: following the failure of any one mooring line in the operating condition

Severe storm, One line failed: following the failure of any one mooring line in the severe storm condition

When a dynamic analysis is employed, other safety factors may be specially considered by IRS.

The defined Operating and Severe Storm conditions are to be the same as those identified for the design of the unit, unless IRS is satisfied

that lesser condition may be applicable to specific sites.

3.2.6 In general, the maximum wave induced motions of the moored unit about the steady mean offset is to be obtained by means of model tests. Analytical calculations may be accepted provided that the proposed method is based on a sound methodology validated by model tests.

In the consideration of column stabilized drilling units, the value of CS and CH, as given in Chapter 4 may be used in the analysis for position keeping mooring systems.

3.2.7 IRS may accept different analysis methodologies provided that it is satisfied that a level of safety equivalent to the one obtained by 3.2.4 and 3.2.5 above is ensured.

3.2.8 IRS may give special consideration to an arrangement where the anchoring systems are used in conjunction with thrusters to maintain the unit on station.

3.2.9 Dynamic positioning systems

Dynamic positioning systems used as a sole means of position keeping are to provide a level of safety equivalent to that provided for anchoring arrangements (Refer to Guidance for dynamic position system (DP) operator training (MSC.1/Circ.738/Rev.1) and Guidelines for vessels and units with dynamic positioning systems (MSC.1/Circ.1580)).

3.3 Equipment

3.3.1 Windlasses

- i) 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.
- ii) 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 deemed appropriate by IRS, one of the brakes may be replaced by a manually operated brake.

- iii) On loss of power to the windlasses, the power operated braking system is to be automatically applied and be capable of holding against 50 percent of the total static braking capacity of the windlass.
- iv) Each windlass is to be capable of being controlled from a position which provides a good view of the operation.

3.3.2 Fairleads and Sheaves

- i) Fairleads and sheaves are to 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.

3.3.3 Anchor line

- i) The anchor lines are to be of a type that will satisfy the design conditions of the anchoring system and may be of wire, rope, chain or any combination thereof. Details are to be submitted.

Chains and accessories are to be in accordance with the requirements of Part 2, Chapter 10, Sec. 5 of *Rules and Regulations for the Construction & Classification of Steel Ships*.

- ii) Means are to be provided to enable the anchor lines to be released from the unit after loss of main power.
- iii) Means are to be provided for measuring anchor line tensions and windlass power load and to indicate the amount of cable paid out.
- iv) Anchor lines are to be of adequate length to prevent uplift of the anchors under the maximum design condition for the anticipated areas(s) of operation.

3.3.4 Anchors

- i) The type and design of anchors are to be submitted for approval together with the documentation estimating their holding down power in various types of soil.
- ii) All anchors are to be suitably stowed to prevent movement during transit.

3.3.5 Control Stations

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

An alarm for maximum limit of anchor line tension is to be provided at the control station with facility for remote release of anchor line tension.
- ii) Reliable means are to be provided to communicate between locations critical to the anchoring operation.
- iii) 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.

End of Chapter

Chapter 11

Hazardous Areas

Contents	
Section	
1	General
2	Classification of Areas
3	Ventilation
4	Dangerous Goods

Section 1

General

1.1 General

1.1.1 For the purpose of machinery and electrical installations, hazardous areas are to be classified in accordance with 2.1. Hazardous areas not covered (such as, but not limited to, well test equipment areas, helicopter fuel storage areas, acetylene cylinder storage areas, battery rooms, paint lockers, flammable gas or vapour vents and diverter line outlets) in 2.1 are to be classified as in 1.1.3.

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

1.1.3 Hazardous areas are subdivided into Zones 0, 1 or 2, the definitions of each category being as follows:

- Zone 0

is an area in which flammable gases or vapours of such concentrations which are liable to get ignited are continuously present or present for long periods.
- Zone 1

is an area in which flammable gases or vapours of such concentrations which are liable to get ignited are likely to occur in normal operation.

Zone 2

is an area in which flammable gases or vapours of such concentrations which are liable to get ignited are not likely to occur, or in which such a mixture, if it does occur, it will only exist for a short time.

1.1.4 The hazardous areas defined in 2.1.1 - 2.1.3 are those which normally apply to offshore drilling units for oil and gas exploration. Equipment for well testing if present is to be specially considered.

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 (e.g. low deck head), etc.

1.1.5 For the purpose of this section:

- i)

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

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.

Section 2

Classification of Areas

2.1 General

2.1.1 Hazardous areas of Zone 0 include:

The internal spaces of closed tanks and piping for containing:

- i. active non-degassed drilling mud, or,
- ii. oil that has a closed-cup flashpoint below 60°C, or,
- iii. flammable gas and vapour, or,
- iv. produced oil and gas, in which oil/gas/air mixture is continuously present or present for long periods.

2.1.2 Hazardous areas of Zone 1 include:

- i) Enclosed spaces containing any part of the mud-circulating system that has an opening into the spaces and is between the well and the final degassing discharge.
- ii) In outdoor or semi-enclosed locations except as provided for in (iv), the area within 1.5 m of the boundaries of any openings to equipment which is part of the mud system as specified in (i), any ventilation outlets of Zone 1 spaces, or any access to Zone 1 spaces.
- iii) Pits, ducts or similar structures in locations which otherwise would be Zone 2 but which are arranged so that the dispersion of gas may not occur.
- iv) Enclosed spaces or semi-enclosed locations that are below the drill floor and contain a possible source of release such as the top of a drilling nipple.
- v) Outdoor locations below the drill floor and within a radius of 1.5 [m] from a possible source of release such as the top of a drilling nipple.
- vi) Enclosed spaces that are on the drill floor and which are not separated by a solid floor from the spaces in (iv).

2.1.3 Hazardous areas of Zone 2 include:

- i) Enclosed spaces which contain open sections of the mud circulating system

from the final degassing discharge to the mud pump suction connection at the mud pit.

- ii) Outdoor locations within the boundaries of the drilling derrick upto a height of 3 m above the drill floor.
- iii) Semi-enclosed derricks to the extent of their enclosures above the drill floor or to a height of 3 m above the drill floor, whichever is greater.
- iv) Semi-enclosed locations below and continuous with the drill floor and to the boundaries of the derrick or to the extent of any enclosure which is liable to trap gases.
- v) Outdoor locations below the drill floor, within a radius of 1.5 [m] area beyond the zone 1 area as specified in paragraph 2.1.2(v).
- vi) The areas 1.5 m beyond the Zone 1 areas specified in 2.1.2(ii) and beyond the semi-enclosed locations specified in 2.1.2(iv).
- vii) Outdoor spaces within 1.5 m of the boundaries of any ventilation outlet from or access to a Zone 2 space.
- viii) Air locks between a Zone 1 and a non-hazardous areas.

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

2.2.1 Except for operational reasons access doors or other openings are not to be provided between:

- a non-hazardous space and a hazardous zone;
- a Zone 2 space and a Zone 1 space.

Where a sub access doors or other openings are provided, any enclosed space not referred to under 2.1.2 or 2.1.3 and having a direct access to any Zone 1 location or Zone 2 location becomes the same zone as the location except that:

- | | |
|--|---|
| <p>a) an enclosed space with direct access to any Zone 1 location can be considered as Zone 2 if:</p> <ul style="list-style-type: none"> i) the access is fitted with a self-closing gas-tight door opening into the Zone 2 space, and ii) ventilation is such that the air flow with the door open is from the Zone 2 space into the Zone 1 location, and iii) loss of ventilation is alarmed at a manned station; <p>b) an enclosed space with direct access to any Zone 2 location is not considered hazardous if:</p> <ul style="list-style-type: none"> i) the access is fitted with a self-closing gas-tight door that opens into the non-hazardous location, and ii) ventilation is such that the air flow with the door open is from the non-hazardous space into the Zone 2 locations, and iii) loss of ventilation is alarmed at a manned station; | <p>c) an enclosed space with direct access to any Zone 1 location is not considered hazardous if:</p> <ul style="list-style-type: none"> i) the access is fitted with two gas-tight self-closing doors forming an air lock, and ii) the space has ventilation overpressure in relation to the hazardous space, and iii) loss of ventilation overpressure is alarmed at a manned station. <p>2.2.2 Where ventilation arrangements of the intended safe space are considered sufficient by IRS 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.</p> <p>2.2.3 Piping systems are to be designed to preclude direct communication between hazardous areas of different classifications and between hazardous and non-hazardous areas.</p> <p>2.2.4 Hold-back devices are not to be used on self-closing gastight doors forming hazardous area boundaries.</p> |
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Section 3

Ventilation

3.1 General

3.1.1 Attention is to be given to ventilation inlet and outlet location and airflow in order to minimize the possibility of cross contamination. Inlets are to be located in non-hazardous areas as high and as far away from any hazardous area as practicable. All air inlets for hazardous enclosed spaces are to be located in non-hazardous areas. 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. Ventilation for hazardous areas is to be completely separate from that used for non-hazardous areas. Where passing through hazardous areas of a higher level, the ventilation duct is to have overpressure in relation to this area; Where the ventilation duct passes through a hazardous area of a lower level, the ventilation duct is to have underpressure in relation to this area.

3.2 Ventilation of hazardous areas

3.2.1 Enclosed hazardous spaces are to be provided with adequate ventilation with under pressure in relation to the less hazardous space or zone. Hazardous enclosed mud processing spaces are to be ventilated at a minimum rate of 12 air changes per hour. Where mechanical ventilation is applied it is to be such that the hazardous enclosed spaces are maintained with underpressure in relation to the less hazardous spaces or areas and non-hazardous enclosed spaces are maintained in overpressure in relation to adjacent hazardous locations. 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.

3.2.2 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. Air

inlet ducts designed for constant relative underpressures are to be rigidly constructed to avoid air leaks. Fans are to be designed so as to reduce the risk that sparks may occur.

Section 4

Dangerous goods

4.1 Dangerous goods are to be stored safely and appropriately according to the nature of the goods. Incompatible goods are to be segregated from one another.

4.2 Explosives which present a serious risk are to be stored in a suitable magazine which is to be kept securely closed. Such explosives are to be segregated from detonators. Electrical apparatus and cables in any compartment in which it is intended to store explosives are to be designed and used so as to minimize the risk of fire or explosion.

4.3 Flammable liquids which give off dangerous vapours and flammable gases are to be stored in a well-ventilated space or on deck.

4.4 Substances which are liable to spontaneous heating or combustion are not to be carried unless adequate precautions have been taken to prevent the outbreak of fire.

4.5 Radioactive substances are to be stored and handled in a safe manner.

End of Chapter

Chapter 12

Machinery

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Section 1

General

1.1 Scope

1.1.1 The following requirements apply to the machinery essential to the safe operation of the drilling unit. These requirements do not apply to equipment and systems used solely for the drilling operation, except in so far as safety is concerned.

1.1.2 Systems and equipment that are used solely for drilling and that may affect the safety of the drilling unit on which they are installed may be designed to the alternative requirements of recognized standards acceptable to IRS. Codes and standards of practice which have been proven to be effective by actual application by the offshore drilling industry which are not in conflict with the Rules, and which are acceptable to IRS, may be applied in addition to these provisions.

1.1.3 All propulsion and auxiliary machinery including shafting and propellers, steering arrangements, boilers and other pressure vessels, control systems, jacking systems, pumping and piping systems necessary for the safe operation of the drilling unit are to satisfy the requirements specified in this chapter. Other applicable requirements for construction and installation in accordance with the Rules and Regulations for the Construction & Classification of Steel Ships are also to be complied with.

The above machinery are to be of a design and construction adequate for the intended service and are to be so installed and protected as to reduce to a minimum any danger to persons on board, due regard being paid to moving parts, hot surfaces and other hazards. 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.

1.1.4 When alternative design or arrangements deviate from the provisions of the Rules, an engineering analysis, evaluation and approval of the design and arrangements is to be carried out in accordance with MODU Code 2009 (IMO Resolution A1023(26)) Chapter 4, Sec.4.2.

1.2 Machinery installations - Inclinations

1.2.1 For non-self-propelled drilling units

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

- i) when column stabilized drilling units are upright and inclined to an angle upto 15 in any direction:
 - ii) when self-elevating drilling units are upright and inclined to an angle upto 10 in any direction:
 - iii) when surface drilling units are upright and level trim and when inclined to an angle of list upto 15 either way and simultaneously trimmed to an angle upto 5 by the bow or stern.
- b) IRS may permit or require deviations from these angles, taking into consideration the type, size and service conditions of the drilling unit.

1.2.2 For self-propelled drilling units

- a) Main propulsion machinery and all auxiliary machinery essential to the propulsion and the safety of the drilling unit are to be capable of operating under the static conditions required by 1.2.1 and the following dynamic conditions:
- i) in case of column stabilized type drilling units, inclination upto 22.5 in any direction;
 - ii) in case of self-elevating type drilling units, inclination upto 15 in any direction;
 - iii) in case of surface type drilling units, inclination upto 22.5 rolling and simultaneously pitching 7.5 by bow or stern.
- b) IRS may permit deviation from these angles, taking into consideration the type, size and service conditions of the drilling unit.

1.2.3 Emergency source of power on all drilling units

- a) The emergency generator and its prime mover and any emergency accumulator battery are to be capable of supplying the power required by Chapter 13, Sec.3 of these Rules when upright and when inclined to the greater of the first intercept angles at which compliance with the intact and damage stability criteria of Ch. 5 are satisfied. However, in no case need the equipment be designed to operate when inclined more than:

- i) 25 in any direction on a column stabilized drilling unit;
- ii) 15 in any direction on a self-elevating drilling unit; and
- iii) 22.5 about the longitudinal axis and/or when inclined 10 about the transverse axis on surface drilling unit.

1.3 Jacking systems

1.3.1 The jacking system is to be designed and constructed to maintain the safety of the drilling unit in the event of failure of a critical component during operation of the jacking system. Suitable monitoring is to be provided at a manned control station to indicate such failure.

1.3.2 Jacking mechanisms are to be:

- i. arranged so that a single failure of any component does not cause an uncontrolled descent of the unit;
- ii. designed and constructed for the maximum lowering and lifting loads of the unit as specified in the unit's operation manual in accordance with chapter 1.
- iii. able to withstand the forces imposed on the unit from the maximum environmental criteria for the unit; and
- iv. constructed such that the elevation of the leg relative to the unit can be safely maintained in case of loss of power (e.g., electric, hydraulic, or pneumatic power).

1.3.3 The elevating system is to be operable from a central jacking control station. The jacking control station is to have the following:

.1 audible and visual alarms for jacking system overload and out-of-level. Units whose jacking systems are subject to rack phase differential are also to have audible and visual alarms for rack phase differential; and

.2 instrumentation to indicate:

.2.1 the inclination of the unit on two horizontal perpendicular axes;

.2.2 power consumption or other indicators for lifting or lowering the legs, as applicable; and

.2.3 brake release status.

.3 A communication system is to be provided between the central jacking control and a location at each leg.

1.4 Machinery for non-self-propelled drilling units

1.4.1 Machinery arrangements

1.4.1.1 Adequate provisions and arrangements are to be made to facilitate safe access, cleaning, inspection and maintenance of machinery including boilers and pressure vessels.

1.4.1.2 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.

1.4.1.3 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. IRS may accept provisions for overriding automatic shutoff devices.

1.4.1.4 As far as possible, fitting of internal combustion engines in hazardous areas is to be avoided. When this cannot be avoided, special consideration may be given to the proposed arrangement.

1.4.1.5 Internal combustion engines of a cylinder diameter of 200 [mm] or a crankcase volume of 0.6 [m³] and above are to be provided with crankcase explosion relief valves of an approved type with sufficient relief area. The relief valves are to be arranged or provided with means to ensure that discharge from them is directed so as to minimize the possibility of injury to personnel. Crankcase explosion relief valves are to be type tested in a configuration that represents the installation arrangements that will be used on an engine, in accordance with IRS Classification Notes: "Guidance for Type Testing of Crankcase Explosion Relief Valves".

Internal combustion engines of 2,250 kW and above or having cylinders of more than 300 [mm] bore are to be provided with crankcase oil mist detectors or engine bearing temperature monitors or equivalent devices.

1.4.1.6 Where risk from overspeeding of machinery exists, means are to be provided to ensure that the safe speed is not exceeded.

1.4.1.7 Exhaust outlets of internal combustion engines are to be fitted with efficient spark arresting devices and are to discharge outside the hazardous areas. Exhaust outlets of fired boilers are to discharge outside hazardous areas.

1.4.1.8 Air intakes for internal combustion engines are not to be less than 3 [m] from the hazardous areas.

1.4.1.9 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.

1.4.1.10 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 be provided where applicable, which will protect against such excessive pressure.

1.4.1.11 Boilers and steam generators are to be fitted with not less than two safety valves, each having a minimum internal diameter of 25 [mm], but those having a total heating surface of less than 50 [m²] may have one valve not less than 50 [mm] diameter.

1.4.1.12 Every oil-fired boiler which is intended to operate without manual supervision is to have safety arrangements which shut off the fuel supply and give an alarm at an attended location in the case of low water level, air supply failure or flame failure.

1.4.1.13 Every steam generating system which could be rendered dangerous by the failure of its feedwater supply 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. For those services not essential for the safety of the unit, only one feedwater system is required if automatic shutdown of the steam generating system upon loss of the feedwater supply is provided. Means are to be provided which will prevent overpressure in any part of the feedwater system.

1.4.1.14 Boilers are to be provided with means to supervise and control the quality of the feedwater. As far as practicable, means are to be provided to preclude the entry of oil or other contaminants which may adversely affect the boiler.

1.4.1.15 Every boiler essential for the safety of the unit and which is designed to have a water

level is to be provided with at least two means for indicating its water level, at least one of which is to be a direct-reading gauge glass.

1.4.1.16 Fired boilers are not to be installed in hazardous areas.

1.4.1.17 Means are to be provided to ensure that machinery can be brought into operation from the "dead ship" condition without external aid.

1.4.1.18 Means are to be provided whereby normal operation of vital systems, such as ballast systems in semisubmersible 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.

1.4.1.19 The control systems and indicators required in 2.3.1 (b) of Ch 5 are to be operable in both normal conditions and in the event of main power failure. Where stored energy is provided for this purpose, its capacity is to be to the satisfaction of IRS.

1.4.2 Machinery controls

1.4.2.1 Machinery essential for the safety of the unit is to be provided with effective means for its operation and control.

1.4.2.2 Automatic starting, operational and control systems for machinery essential for the safety of the unit are to, in general, include provisions for manually overriding the automatic controls. Failure of any part of the automatic and remote control system is not to prevent the use of the manual override. Visual indication is to be provided to show whether or not the override has been actuated.

1.5 Machinery for self-propelled drilling units

1.5.1 General

1.5.1.1 The provisions of subsection 1.5 apply to units which are designed to undertake self-propelled passages without external assistance and are not applicable to units which are fitted only with means for the purpose of positioning or of assistance in towing operations. These provisions are additional to those in 1.4 and 1.7.

1.5.1.2 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 cooling 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, a partial reduction in capability from full normal operation may be accepted, having regard to overall safety considerations.

1.5.1.3 Special consideration is to be given to the design, construction and installation of propulsion machinery systems so that any mode of their vibrations will not cause undue stresses in this machinery in the normal operating ranges.

1.5.2 Means of going astern

1.5.2.1 Units are to have sufficient power for going astern to secure proper control of the unit in all normal circumstances.

1.5.2.2 The ability of the machinery to reverse the direction of thrust of the propeller in sufficient time and so to bring the unit to rest within a reasonable distance from maximum ahead service speed is to be demonstrated.

1.5.2.3 The stopping times, unit headings and distances recorded on trials, together with the results of trials to determine the ability of units having multiple propellers to navigate and manoeuvre with one or more propellers inoperative, are to be available on board for the use of the master or other designated personnel. (Refer to the IMO resolution A.601(15) "Recommendation on the provision and display of manoeuvring information on board ships").

1.5.2.4 Where the unit is provided with supplementary means for manoeuvring or stopping, these are to be demonstrated and recorded as referred to in 1.5.2.2 and 1.5.2.3.

1.5.3 Steam boilers and boiler feed systems

1.5.3.1 Water tube boilers serving turbine propulsion machinery are to be fitted with a high-water-level alarm.

1.5.3.2 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.

1.5.4 Machinery controls

1.5.4.1 Main and auxiliary machinery essential for the propulsion of the unit are to be provided with effective means for its operation and control. All control systems essential for the propulsion, control and safety of the unit are to be independent or designed such that failure of one system does not degrade the performance of another system. A pitch indicator is to be provided on the navigating bridge for controllable-pitch propellers.

1.5.4.2 Where remote control of propulsion machinery from the navigating bridge is provided and the machinery spaces are intended to be manned, the following are to apply:

.1 the speed, direction of thrust and, if applicable, the pitch of the propeller are to be fully controllable from the navigating bridge under all sailing conditions, including manoeuvring;

.2 the remote control is to be performed, for each independent propeller, by a control device so designed and constructed that its operation does not require particular attention to the operational details of the machinery. Where more than one propeller is designed to operate simultaneously, these propellers may be controlled by one control device;

.3 the main propulsion machinery is to be provided with an emergency stopping device on the navigating bridge and independent from the bridge control system;

.4 propulsion machinery orders from the navigating bridge are to be indicated in the main machinery control station or at the manoeuvring platform as appropriate;

.5 remote control of the propulsion machinery is to be possible from only one station at a time; at one control station interconnected control units are permitted. There is to be at each station an indicator showing which station is in control of the propulsion machinery. The transfer of control between navigating bridge and machinery spaces is to be possible only in the machinery space or machinery control room;

The system is to include means to prevent the propelling thrust from altering significantly when transferring control from one location to another.

.6 it is to be possible to control the propulsion machinery locally, even in the case of failure in any part of the automatic or remote control system;

.7 the design of the remote control system is to be such that in case of its failure an alarm will be given at the navigating bridge and at the main machinery control station and the preset speed and direction of thrust is maintained until local control is in operation, unless it is considered impracticable;

.8 indicators are to be fitted on the navigating bridge for:

.8.1 propeller speed and direction in case of fixed-pitch propellers;

.8.2 propeller speed and pitch position in case of controllable-pitch propellers;

.9 an alarm is to be provided at the navigating bridge and in the machinery space to indicate low starting air pressure set at a level which still permits main engine starting operations. If the remote control system of the propulsion machinery is designed for automatic starting, the number of automatic consecutive attempts which fail to produce a start are to be limited to safeguard sufficient starting air pressure for starting locally; and

.10 automation systems are to be designed in a manner which ensures a threshold warning of impending or imminent slowdown or shutdown of the propulsion system is given to the officer in charge of the navigational watch in time to assess navigational circumstances in an emergency. In particular, the systems are to control, monitor, report, alert and take safety action to slow down or stop propulsion while providing the officer in charge of the navigational watch an opportunity to manually intervene, except for those cases where manual intervention will result in total failure of the engine and/or propulsion equipment within a short time, for example in the case of overspeed.

1.5.4.3 Where the main propulsion and associated machinery including sources of main electrical supply are provided with various degrees of automatic or remote control and are under continuous manned supervision from a control room, this control room is to be designed, equipped and installed so that the machinery operation will be as safe and effective as if it were under direct supervision; for this purpose sections 1.6.3 to 1.6.5, 4.10, Chapter 14 sections 5.1.2, 6.5 and 7.8 are to apply as appropriate. Particular consideration is to be given to protection against fire and flooding.

1.5.5 Steering

1.5.5.1 Except as provided in 1.5.5.18, units are to be provided with a main steering gear and an auxiliary steering gear to the satisfaction of IRS. The main steering gear and the auxiliary steering gear are to be so arranged that a single failure in one of them, so far as is reasonable and practicable, will not render the other one inoperative.

1.5.5.2 The main steering gear is to be of adequate strength and sufficient to steer the unit at maximum service speed and this is to be demonstrated. The main steering gear and rudder stock are to be so designed that they will not be damaged at maximum astern speed but this design requirement need not be proved by trials at maximum astern speed and maximum rudder angle.

1.5.5.3 The main steering gear is to, with the unit at its deepest seagoing draught, be capable of putting the rudder over from 35° on one side to 35° on the other side with the unit running ahead at maximum service speed. The rudder is to be capable of being put over from 35° on either side to 30° on the other side in not more than 28 [s], under the same conditions.

1.5.5.4 The main steering gear is to be operated by power where necessary to fulfill the provisions of 1.5.5.3 and in any case in which a rudder stock of over 120 [mm] diameter is required in way of the tiller.

1.5.5.5 The main steering gear power unit or units are to be arranged to start automatically when power is restored after a power failure.

1.5.5.6 The auxiliary steering gear is to be of adequate strength and sufficient to steer the unit at navigable speed and capable of being brought speedily into action in an emergency.

1.5.5.7 The auxiliary steering gear is to be capable of putting the rudder over from 15° on one side to 15° on the other side in not more than

60 [s] with the unit at its deepest seagoing draught while running at one half of its maximum speed ahead or seven knots, whichever is the greater.

1.5.5.8 The auxiliary steering gear is to be operated by power where necessary to fulfill the provisions of 1.5.5.7, and in any case in which a rudder stock of over 230 [mm] diameter is required in way of the tiller.

1.5.5.9 Where the main steering gear comprises two or more identical power units an auxiliary steering gear need not be fitted if the main steering gear is capable of operating the rudder in accordance with the provisions of 1.5.5.3 while operating with all power units. As far as is reasonable and practicable the main steering gear is to be so arranged that a single failure in its piping or in one of the power units will not impair the integrity of the remaining part of the steering gear.

1.5.5.10 Control of the main steering gear is to be provided both on the navigating bridge and in the steering gear compartment. If the steering gear control system which provides for control from the navigating bridge is electric, it is to be supplied from the steering gear power circuit from a point within the steering gear compartment.

1.5.5.11 When the main steering gear is arranged according to 1.5.5.9 two independent control systems are to be provided, each of which can be operated from the navigating bridge. Where the control system comprises a hydraulic telemotor, waiver of the provisions for a second independent control system may be considered.

1.5.5.12 Where the auxiliary steering gear is power operated, it is to be provided with a control system operated from the navigating bridge and this is to be independent of the control system for the main steering gear.

1.5.5.13 Means are to be provided in the steering gear compartment to disconnect the steering gear control system from the power circuit.

1.5.5.14 A means of communication is to be provided between the navigating bridge and:

- .1 the steering gear compartment; and
- .2 the emergency steering position, if provided.

1.5.5.15 The exact angular position of the rudder, if power operated, is to be indicated on the navigating bridge. The rudder angle indication is to be independent of the steering gear control system.

1.5.5.16 The angular position of the rudder is to be recognizable in the steering gear compartment.

1.5.5.17 An alternative power supply, sufficient at least to supply a steering gear power unit which complies with the provisions of 1.5.5.7 and also its associated control system and the rudder angle indicator, is to be provided, automatically, within 45 [s], upon failure of main power supply, either from the emergency source of electrical power or from another independent source of power located in the steering gear compartment. This independent source of power is to be used only for this purpose and is to have a capacity sufficient for 10 min of continuous operation.

1.5.5.18 Where a non-conventional rudder is installed, or where a unit is steered by means other than a rudder, special consideration may be given to the steering system so as to ensure that an acceptable degree of reliability and effectiveness, which is based on 1.5.5.1, is provided (Also refer Pt. 4, Ch. 6, 2.2 of the *Rules and Regulations for Construction and Classification of Steel Ships*).

1.5.6 Electric and electrohydraulic steering gear

1.5.6.1 Indicators for running of the motors of electric and electrohydraulic steering gear are to be installed on the navigating bridge and at a suitable machinery control position.

1.5.6.2 Each electric or electrohydraulic steering gear comprising one or more power units is to be served by at least two circuits fed from the main switchboard. One of the circuits may pass through the emergency switchboard. An auxiliary electric or electrohydraulic steering gear associated with a main electric or electrohydraulic steering gear may be connected to one of the circuits supplying this main steering gear. The circuits supplying an electric or electrohydraulic steering gear are to have adequate rating for supplying all motors which can be simultaneously connected to it and have to operate simultaneously.

1.5.6.3 Short-circuit protection and an overload alarm are to be provided for these circuits and motors. Protection against excess current, if provided, is to be for not less than twice the full load current of the motor or circuit so protected, and is to be arranged to permit the passage of the appropriate starting currents. Where a three-phase supply is used, an alarm is to be provided that will indicate failure of any one of the supply phases. The alarms required above are to be both audible and visual and be situated in a

position on the navigating bridge where they can be readily observed.

1.5.7 Communication between the navigating bridge and the engine-room

Units are to be provided with at least two independent means for communicating orders from the navigating bridge to the position in the machinery space or control room from which the engines are normally controlled, one of which is to provide visual indication of the orders and responses both in the engine-room and on the navigating bridge. Consideration will be given to providing a means of communication to any other positions from which the engines may be controlled.

1.5.8 Engineers' alarm

An engineers' alarm is to be provided to be operated from the engine control room or at the manoeuvring platform, as appropriate, and clearly audible in the engineers' accommodation.

1.6 Periodically unattended machinery spaces for all types of units

1.6.1 General

The provisions of 1.6, 4.10 and Chapter 14 are additional to those of 1.4 and 1.5 and apply to periodically unattended machinery spaces specified herein. The arrangements are to ensure that the safety of the unit in the marine mode, including manoeuvring, and in machinery spaces of category A during drilling operations, where applicable, is equivalent to that of a unit having manned machinery spaces.

1.6.2 Application

1.6.2.1 The provisions of sections 1.6.3 to 1.6.8, 4.10, Chapter 14 sections 5.1.2, 6.5 and 7.8 apply to units which are designed to undertake self-propelled passages without external assistance.

1.6.2.2 Units other than those designed for unassisted passages, having periodically unattended spaces in which machinery associated with the marine mode is located, are to comply with the applicable parts of sections 1.6.3, 1.6.6, 1.6.7, 1.6.8, 4.10, Chapter 14 sections 5.1.2, 6.5 and 7.8.

1.6.2.3 Where in any unit, machinery spaces of category A for drilling purposes are intended to be periodically unattended, sections 1.6.3, 1.6.8, Chapter 14 sections 5.1.2, 6.5 and 7.8 would be applied to machinery spaces of category A, due

consideration being given to the characteristics of the machinery concerned and to the supervision envisaged to ensure safety.

1.6.2.4 Measures are to be taken to the satisfaction of IRS to ensure that the equipment of every unit is functioning in a reliable manner and that satisfactory arrangements are made for regular inspections and routine tests to ensure continuous reliable operation.

1.6.2.5 Every unit is to be provided with documentary evidence, to the satisfaction of IRS, of its fitness to operate with periodically unattended machinery spaces.

1.6.3 Fire prevention

1.6.3.1 Where necessary, oil fuel and lubricating oil pipes are to be screened or otherwise suitably protected to avoid, as far as practicable, oil spray or oil leakages on to hot surfaces or into machinery air intakes. The number of joints in such piping systems are to be kept to a minimum and, where practicable, leakages from high-pressure oil fuel pipes are to be collected and arrangements provided for an alarm to be given.

1.6.3.2 Where daily service oil fuel tanks are filled automatically, or by remote control, means are to be provided to prevent overflow spillages. Other equipment which treats flammable liquids automatically, e.g., oil fuel purifiers, which, whenever practicable, are to be installed in a special space reserved for purifiers and their heaters, are to have arrangements to prevent overflow spillages.

1.6.3.3 Where daily service oil fuel tanks or settling tanks are fitted with heating arrangements, a high-temperature alarm is to be provided if the flashpoint of the oil fuel can be exceeded.

1.6.3.4 Means are to be provided in case of fire:

.1 in boiler air supply casings and exhausts (uptakes); and

.2 in scavenging air belts of propulsion machinery,

to detect fires and give alarms at an early stage, unless it is considered unnecessary in a particular case by IRS.

1.6.4 Bridge control of propulsion machinery

1.6.4.1 Remote control of propellers from the navigating bridge should also ensure automatic

performance of all associated services, including, where necessary, means of preventing overload of the propulsion machinery.

1.6.5 Communication

A reliable means of vocal communication is to be provided between the main machinery control station or the propulsion machinery control position as appropriate, the navigating bridge, the engineer officers' accommodation and, on column-stabilized units, the central ballast control station.

1.6.6 Alarm system

1.6.6.1 An alarm system is to be provided in the main machinery control station giving audible and visual indication of any fault requiring attention. It is to also:

.1 activate an audible and visual alarm at another normally manned control station;

.2 activate the engineers' alarm provided in accordance with section 1.5.8, or an equivalent alarm acceptable to IRS, if an alarm function has not received attention locally within a limited time;

.3 as far as is practicable be designed on the fail-to-safety principle; and

.4 when in the marine mode, activate an audible and visual alarm on the navigating bridge for any situation which requires action by the officer on watch or which is to be brought to the attention of the officer on watch.

1.6.6.2 The alarm system is to be continuously powered and is to have an automatic change-over to a stand-by power supply in case of loss of normal power supply.

1.6.6.3 Alarm is to be provided for failure of the normal power supply of the alarm system.

1.6.6.4 The alarm system is to be able to indicate at the same time more than one fault and the acceptance of any alarm is to not inhibit another alarm.

1.6.6.5 Acceptance at the position mentioned in 1.6.6.1 of any alarm condition is to be indicated at the positions where it has been shown. Alarms are to be maintained until they are accepted and the visual indications are to remain until the fault has been corrected, when the alarm system is to automatically reset to the normal operating condition.

1.6.7 Special provisions for machinery, boiler and electrical installations

1.6.7.1 The special provisions for the machinery, boiler and electrical installations are to be to the satisfaction of IRS and are to include at least the requirements of this section.

1.6.7.2 Change-over function:

Where stand-by machines are required for other auxiliary machinery essential to propulsion, automatic change-over devices are to be provided. An alarm is to be activated on automatic change-over.

1.6.7.3 Automatic control and alarm systems:

.1 The control systems are to be such that the services needed for the operation of the main propulsion machinery and its auxiliaries are ensured through the necessary automatic arrangements.

.2 Means are to be provided to keep the starting air pressure at the required level where internal combustion engines are used for main propulsion.

.3 An alarm system complying with section 1.6.6 is to be provided for all important pressures, temperatures and fluid levels and other essential parameters.

1.6.8 Safety systems

A safety system is to be provided to ensure that serious malfunction in machinery or boiler operations, which presents an immediate danger, is to initiate the automatic shutdown of that part of the plant and that an alarm is to be given at the locations determined in accordance with 1.6.6.1. Shutdown of the propulsion system is not to be automatically activated except in cases which could lead to serious damage, complete breakdown, or explosion. Where arrangements for overriding the shutdown of the main propelling machinery are fitted, these are to be such as to

preclude inadvertent operation. Visual means are to be provided to indicate when the override has been activated.

1.7 Machinery installations in hazardous areas

1.7.1 Mechanical equipment is to be limited to that necessary for operational purposes.

1.7.2 Mechanical equipment and machinery in hazardous areas are to be so constructed and installed as to reduce the risk of ignition from sparking due to the formation of static electricity or friction between moving parts and from high temperatures of exposed parts due to exhausts or other emissions (Refer Ch. 11 for Zone classification of Hazardous Areas)

1.7.3 The installation of internal combustion machinery may be permitted in zone 1 and zone 2 hazardous areas, provided IRS is satisfied that sufficient precautions have been taken against the risk of dangerous ignition (Refer "ASTM F2876-10 Standard Practice for Thermal Rating and Installation of Internal Combustion Engines Packages for use in Hazardous Locations in Marine Applications").

1.7.4 The installation of fired equipment may be permitted in zone 2 hazardous areas, provided that IRS is satisfied that sufficient precaution has been taken against the risk of dangerous ignition.

1.8 Diving systems

1.8.1 Diving systems, if provided, are to be installed, protected and maintained so as to minimize, so far as practicable, any danger to personnel or the unit, due regard being paid to fire, explosion or other hazards.

1.8.2 Diving systems are to be designed, constructed, maintained and certified in accordance with a national or international standard or code acceptable to IRS, which may be employed for fixed diving systems, if provided.

Section 2

Piping Systems

2.1 General

2.1.1 Pipes are to be arranged inboard of the zone of assumed damage penetration unless special consideration has been taken in the damage stability review.

2.1.2 Piping systems carrying non-hazardous fluids are generally to be separate 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.

2.1.3 Where air or steam is used to atomize well bore fluids prior to flaring, a non-return valve is to be fitted in the air or steam line. This valve is to be part of the permanently installed piping, readily accessible and as close as possible to the burner boom. Alternative arrangements shown to provide an equivalent level of safety may be accepted by IRS.

2.2 Valve arrangements

2.2.1 Where valves of piping systems are

arranged for remote control and are power operated, a secondary means of operating the valves which may be manual control, is to be provided.

2.2.2 Remote operation of sea-water inlet and discharge valves -

a) Inlet and discharge valves in compartments situated below the assigned load line (normally unattended compartments) are to be provided with remote controlled valves operable from an accessible position outside the space. 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:

- i) closing of open valves
- ii) opening of closed valves.

b) Consideration will be given to accepting bilge alarms in lieu of remote operation for surface type and self-elevating drilling units only.

Section 3

Ballast Systems for Column Stabilized Drilling Units

3.1 General

3.1.1 Each ballast tank is to be capable of being pumped out by at least two independent power-driven pumps so that the system remains operational in the event of failure of any one such pump and arranged so that tanks can be drained at all normal operating and transit conditions. Alternatively, controlled gravity ballasting may be accepted by IRS.

The ballast pumps are to be of the self-priming type or be provided with a separate priming system. The pumps provided need not be dedicated ballast pumps, but are to be readily available for such use at all times.

3.1.2 All ballast pipes are to be of steel or other suitable material having properties acceptable to IRS. Special consideration is to be given to the design of ballast lines passing through ballast

tanks, taking into account effects of corrosion or other deterioration.

3.2 Capacity

3.2.1 The system is to be capable of raising the drilling unit, while in an intact condition, starting from a level trim condition at deepest normal operating draft, to the severe storm draft, or a greater distance as may be specified by IRS, within three hours.

3.3 System arrangement

3.3.1 The ballast system is to be arranged and operated so as to prevent the inadvertent transfer of ballast water from one tank or hull to another of the drilling unit, which could result in moment shifts leading to excessive angles of heel or trim. 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 would not adversely affect the stability of the drilling unit.

3.3.2 Air pipes are to be provided on each ballast tank sufficient in number and cross-sectional area to permit the efficient operation of the ballast pumping system under the conditions referred to in this section.

In the case of all tanks which can be pumped up either by ship's pumps or by shore pumps through a filling main, the total cross-sectional area of the vent pipes to each tank, or of the overflow pipes where an overflow system is provided, is to be not less than 25 per cent greater than the effective area of the respective filling pipes. Where tanks are fitted with cross flooding connections, the vent pipes are to be of adequate area for these connections. Vent pipes are not to be less than 50 [mm] bore.

In order to allow deballasting of the ballast tanks intended to be used to bring the unit back to normal draught and to ensure no inclination after damage, air pipe openings for these tanks are to be above the worst damage waterline specified in chapter 5. Such air pipes are to be positioned outside the extent of damage, as defined in chapter 5.

3.4 Operation in damaged condition

3.4.1 The ballast system is to be arranged so that even with any one pump inoperable, the remaining pumps are capable of restoring the drilling unit to a level trim condition and draft acceptable to IRS with respect to stability, where necessary without taking on additional ballast, when subject to the damage conditions specified in Ch. 4 5. IRS may accept 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 Chapter 5.

3.5 Control features

3.5.1 Ballast pumps, ballast tank valves and sea chest valves are to be provided with a means of remote control from a central ballast control station. Pumps are also to be provided with a means of local control in the pump room operable in the event of remote control failure. A manually operated independent means of control of the valves is also to be provided. The independent local control of each ballast pump and of its associated ballast tank valves is to be in the same location. This ballast control station and any back-up stations are to be readily accessible,

located above the worst damage waterline and protected from the weather when the drilling unit is subject to the assumed conditions of severe storm and damage. Additionally, these stations are not to be located within the assumed damaged penetration zone. The central ballast control station is to include the following control and indicating systems, having appropriate audible and visual alarms, where applicable:

ballast pump control system;

ballast pump suction and discharge pressure;

ballast pump status-indicating system;

ballast valve control system;

A valve position indicating system. All valves and operating controls are to be clearly marked to identify the function they serve. Means is to be provided locally to indicate whether a valve is open or closed.

A tank level indicating system.

A draft indicating system.

heel and trim indicators;

power availability indicating system (main and emergency);

ballast control system hydraulic/pneumatic pressure-indicating system.

A permanently installed means of communication independent of the unit's main source of electrical power, between the central ballast control station and those spaces containing the alternative means of control for the ballast pumps and valves or other spaces that may contain equipment necessary for the operation of the ballast system.

The tank level indicating system listed above is to provide means to:

.1 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 not to be situated in the tank suction lines;

.2 indicate liquid levels in other tanks, such as fuel oil, fresh water, drilling water or liquid storage tanks, the filling or emptying of which, in the view of IRS, could affect the stability of the unit. Tank level sensors are not to be situated in the tank suction lines.

The draught indicating system is to display the draught as measured at each corner of the unit or at representative positions as required by IRS.

Enclosures housing ballast system electrical components, the failure of which would cause unsafe operation of the ballast system upon liquid entry into the enclosure, are to comply with Ch. 13, 5.21.

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 indicators are to rely on movement of the valve spindle, or be otherwise arranged with equivalent reliability.

Means are 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.

3.5.2 The control and indicating systems are to function independently of each other so that a

failure in any one system will not affect the operation of the other systems. The ballast pump and ballast valve control systems are to be arranged so that the loss of any one of their components will not cause the loss of operation to the other pumps or valves.

3.5.3 To ensure that uncontrolled transfer of ballast water will not continue upon loss of power, ballast tank valves are to close automatically upon loss of power or be provided with an arrangement considered equivalent to the satisfaction of IRS. Upon reactivation of control power, each such valve is to remain closed until the ballast control operator assumes control of the reactivated system.

3.5.4 It is to be possible to supply each ballast pump provided to meet 3.1.1 from the emergency source of power. The arrangements are to be such that the system is capable of restoring the unit from an inclination specified in 1.2.1 to a level trim and safe draught condition after loss of any single component in the power supply system.

Section 4

Bilge System

4.1 General

4.1.1 In general, the bilge system is to be in accordance with the *Rules and Regulations for the Construction & Classification of Steel Ships*, Pt. 4, Ch. 3. 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 fresh water, water ballast, oil fuel or liquid cargo and for which other efficient means of pumping are provided, under all practical conditions whether the unit is upright or inclined, as specified in 1.2.1. These compartments are to be drained with at least two self-priming power bilge pumps, or equivalent means. Sanitary, ballast and general service pumps may be accepted as independent power bilge pumps if fitted with the necessary connections to the bilge pumping system.

Additional suction is to be provided in large compartments or compartments of unusual form, as deemed necessary by IRS. Arrangements are to be made whereby water in the compartment may find its way to the suction pipes. Compartments not provided with a bilge suction may be drained to other spaces provided with bilge pumping capability. Means is 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 IRS is satisfied that the safety of the unit is not impaired the bilge pumping arrangements and the means to detect the presence of water may be dispensed with in particular compartments.

All bilge pipes are to be of steel or other suitable material having properties acceptable to IRS. Special consideration is to be given to the design of bilge lines passing through ballast tanks taking into account effects of corrosion or other deterioration.

The arrangement of the bilge pumping system is to be such as to prevent the possibility of water passing from the sea into dry spaces, or inadvertently from one compartment to another.

4.1.2 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 space. 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.

4.2 Size of bilge main

4.2.1 The cross-sectional area of the main bilge line is not to be less than the combined areas of the two largest branch suction.

4.3 Size of bilge branch suction

4.3.1 The internal diameter of branch suction from each compartment is not to be less than stipulated by the following formula, rounded to the nearest 5 [mm] size:

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

where

A is wetted surface [m²] of the compartment, excluding stiffening members when the compartment is half filled with water. The internal diameter of any bilge line is not to be less than 50 mm.

4.4 Size of bilge pumps

4.4.1 Each bilge pump is to be capable of giving a speed of water through the bilge main of not less than 2 [m] per second. When more than two pumps are connected to the bilge system, their aggregate capacity is not to be less effective.

4.5 Chainlockers

4.5.1 Chainlockers 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.

4.6 Void compartments

4.6.1 Void compartments adjacent to the sea or to tanks containing liquids, and void compartments through which piping conveying liquids passes, are to be capable of being drained by permanently installed bilge or drainage systems or by portable means. If portable pumps are used, two pumps 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 in the drilling unit's stability analysis.

4.7 Bilge alarm

4.7.1 Propulsion rooms or pump rooms in lower hulls of column stabilized drilling units which normally are unattended are to be provided with two independent systems of high bilge level detection.

4.8 Bilge suction from hazardous areas

4.8.1 Piping systems are to be designed to preclude direct communication between hazardous areas of different classifications and between hazardous and non-hazardous areas.

4.9 Additional requirements for column stabilized drilling units

4.9.1 Chain lockers which, if flooded, could substantially affect the drilling 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.

4.9.2 At least one of the pumps referred to in 4.1.1 and all pump-room bilge suction valves are to be capable of both remote and local operation.

4.9.3 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.

4.10 Additional requirements for periodically unattended machinery spaces

4.10.1 High bilge-water level in periodically unattended machinery spaces below the assigned load line is to activate an audible and visual alarm at the locations determined in accordance with 1.6.6.1.

4.10.2 Bilge wells are to be provided, where practicable, in periodically unattended machinery spaces and are to be large enough to accommodate easily the normal drainage during unattended periods. They are to be located and monitored in such a way that the accumulation of liquids is detected at pre-set levels, at normal angles of inclination.

4.10.3 Where the bilge pumps are capable of being started automatically, means are to be provided to indicate at the locations determined in accordance with 1.6.6.1 when the influx of liquid is greater than the pump capacity or when the pump is operating more frequently than would normally be expected. In these cases, smaller

bilge wells to cover a reasonable period of time may be permitted. Where automatically controlled bilge pumps are provided, special

attention is to be given to oil pollution prevention requirements.

Section 5

Tank Vents, Overflows and Sounding Arrangements

5.1 General

5.1.1 Tank vents and overflows are to be located giving due regard to damage stability and the location of the final calculated immersion line in the assumed damage condition. Tank vents and overflows which could cause progressive flooding are to be avoided unless special consideration has been taken in the damage stability review. 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.

5.1.2 In cases where tank vents and overflows terminate externally or in spaces assumed flooded, the vented tanks are to be also considered flooded. In cases where tanks are considered damaged, the spaces in which their vents or overflows terminate are also to be considered flooded.

5.1.3 Vents and overflows from tanks not considered flooded as a result of damage and located above the final calculated immersion line may require to be fitted with automatic means of closing.

5.2 Vent size

5.2.1 The size of the vents is to be in accordance with the *Rules and Regulations for the Construction & Classification of Steel Ships* with

due consideration being given to the design pressure of the tank.

5.3 Vent pipes protection

5.3.1 Location and arrangement of vent pipes serving fuel oil tanks and lubrication tanks are to be done in a way providing protection against ingress of seawater or rain water in case of accidental vent pipes damage.

5.4 Sounding arrangements

5.4.1 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 to at least 50 [mm].

5.4.2 Where a remote level indicating system is used, an additional sounding system is to be provided for tanks which are not always accessible.

5.4.3 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 drilling unit's stability analysis.

Section 6

Flammable Oils

6.1 General

6.1.1 Use of oil fuels of a flash point below 60°C but not less than 43°C, closed cup test, may be accepted in the following cases :

- Drilling units classed for restrictive service within areas where the ambient temperature of spaces, where such fuel is stored, will not rise to within 10°C of the flash point of the oil fuel; and
- For emergency generators.

6.1.2 Units carrying oil fuel, as defined in regulation 1 of Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, are to be provided with material safety data sheets, based on the IMO resolution MSC 286(86), prior to the bunkering of oil fuel.

6.2 Fuel storage for helicopter facilities

6.2.1 Areas where such fuel tanks are situated and fueling operations conducted are to be suitably isolated from enclosed spaces or other areas which contain a source of vapour ignition. Fuel storage tanks are to be of approved metallic construction and are to be adequate for the installation. Special attention is to be given to the design, mounting and securing arrangements and electrical bonding of the tank and fuel transfer system. The storage and handling area is to be permanently marked. Coamings or other arrangements are to be provided to contain fuel-oil spills.

6.3 Arrangements for oil fuel, lubricating oil and other flammable oils

6.3.1 Arrangements for the storage, distribution and utilization of oil fuel, oil used in pressure

lubrication systems, 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.

6.3.2 In machinery spaces pipes, fittings and valves carrying flammable oils are to be of a material approved by IRS, having regard to the risk of fire.

6.3.3 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.

6.3.4 High pressure fuel delivery lines

.1 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.

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

.3 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 are to be kept to a minimum.

Section 7

Steam Pipe Systems

7.1 General

7.1.1 Every steam pipe and every fitting connected thereto through which steam may pass is to be so designed, constructed and installed as to withstand the maximum working stresses to which it may be subjected.

7.1.2 Efficient means are to be provided for draining every steam pipe where dangerous water hammer action might otherwise occur.

7.1.3 If a steam pipe or fitting may receive steam from any source at a higher pressure than that for which it is designed, a suitable reducing valve, relief valve and pressure gauge are to be fitted.

Section 8

Air Pressure Systems

8.1 General

8.1.1 In every unit means 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. Suitable pressure-relief arrangements are to be provided for all systems.

8.2 Starting air systems

8.2.1 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.

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

8.2.3 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.

End of Chapter

Chapter 13

Electrical Installations

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5	Precautions against Shock, Fire and other Hazards of Electrical Origin
6	Emergency Shutdown Facilities
7	Alarms and Internal Communication

Section 1

General

1.1 Scope

1.1.1 The following requirements apply to electrical equipment essential to the safe operation of the drilling unit. These requirements do not apply to electrical equipment and systems used solely for the drilling operation except in so far as safety is concerned. Attention is, however, to be given to any relevant statutory regulation of the National Authority of the country in which the drilling unit is to be registered.

1.2 Design and construction

1.2.1 Electrical propelling machinery and associated equipment together with auxiliary services essential for the safety of the drilling unit are to be constructed and installed in accordance with the relevant requirements of the Rules and Regulations for the Construction & Classification of Steel Ships and as specified herein.

The following equipment is regarded as essential:

- i) Ventilation of hazardous areas and those areas maintained at an overpressure to exclude the ingress of dangerous gases.

- ii) Navigation and special purpose lights, lights for all machinery spaces, control stations, alleyways, stairway and exits.
- iii) Fire pumps.
- iv) Propulsion equipment.
- v) Power generation equipment.
- vi) Bilge pumps.
- vii) Ballast pumps for column stabilized drilling units.

1.2.2 The design and installation of other equipment including that used for drilling operations is to be such that there is minimal risk of fire due to its failure. It must, as a minimum, comply with an acceptable specification, standard or code, revised where necessary, for the ambient conditions.

1.2.3 For lighting in hazardous areas or spaces, switches are to be of the two-pole type and wherever practicable located in a non-hazardous area.

1.2.4 Electrical installations are to be such that:

- .1 all electrical services necessary for maintaining the unit in normal operational and habitable conditions will be assured without recourse to the emergency source of power;
- .2 electrical services essential for safety will be assured in case of failure of the main source of electrical power;
- .3 electromagnetic compatibility of electrical and electronic equipment is assured; and
- .4 the safety of personnel and unit from electrical hazards will be assured.

1.3 Cathodic protection

1.3.1 Details of impressed-current cathodic protection systems, including installation and locations, are to be submitted for approval when such systems are installed.

1.4 Alternative design and arrangements

When alternative design or arrangements deviate from the provisions of the rules an engineering analysis, evaluation and approval of the design and arrangements is to be carried out in accordance with MODU Code 2009 (IMO Resolution A1023(26)) Chapter 4, Sec.4.2.

Section 2

Cables and Electrical Equipment in Hazardous Areas

2.1 Electrical equipment and wiring installed in hazardous areas are to be limited to that necessary for operational purposes. Only the cables and types of equipment described in this section may be installed. Selection and installation of equipment and cables in hazardous areas are to be in accordance with international standards. (Refer to the list of recommendations 'A' by the International Electrotechnical Commission given at Annex 1 to this chapter).

2.2 In selection of electrical apparatus for use in hazardous areas, consideration is to be given to:

2.2.1 the zone in which the apparatus will be used;

2.2.2 the sensitivity to ignition of the gases or vapours likely to be present, expressed as a gas group; and

2.2.3 the sensitivity of the gases or vapours likely to be present to ignition by hot surfaces, expressed as a temperature classification.

2.3 Electrical apparatus used in hazardous areas is to be manufactured, tested, marked and installed in accordance with international standards and certified by an independent testing laboratory recognized by the IRS. (Refer to the list of recommendations 'B' by the International Electrotechnical Commission given at Annex 1 to this chapter). Equipment classified in accordance with the Table 2.1 protection classes may be used:

Table 2.1 : Electrical protection type

Type	Protection method
ia and ib	Intrinsic safety
d	Flameproof enclosures
e	Increased safety
m	Encapsulation
n	Non incendive
o	Oil immersion
p	Pressurized enclosures
q	Powder filling
s	Special

Repairs, maintenance and overhaul of hazardous area certified equipment are to be performed by suitably qualified personnel in accordance with appropriate international standards. (Refer to the list of recommendations 'C' by the International Electrotechnical Commission given at Annex 1 to this chapter for appropriate personnel qualification criteria)

A register of electrical equipment installed in the designated hazardous areas, including a description of the equipment, applicable degree of protection and ratings, is to be maintained.

2.4 Types of electrical equipment permitted are to be determined according to the electrical hazardous area classification of the location in which the equipment is to be installed. Permissible equipment is shown by an "x" in Table 2.2. The use of type "o" (oil immersion) is to be limited. For transportable apparatus, protection type "o" is to not be used.

Table 2.2 : Type of electrical apparatus used in hazardous zones

Protection Type	ia	ib	d	e	m	n	o	p	q	s
Zone 0	x									
Zone 1	x	x	x	x	x		x	x	x	
Zone 2	x	x	x	x	x	x	x	x	x	x

2.5 Group selection for electrical equipment is to be as follows:

2.5.1 Group II is to be selected for types “e”, “m”, “n”, “o”, “p”, “q” and “s” apparatus.

2.5.2 Group IIA, IIB or IIC is to be selected for types “i”, “d”, and certain types of “n” apparatus according to Table 2.3.

Table 2.3 : Relationship between gas/vapour group and permitted	
Gas/vapour	Electrical equipment group
IIC	
	IIB or IIC
IIA	IIA, IIB or IIC

2.6 Electrical apparatus is to be so selected that its maximum surface temperature will not reach ignition temperature of any gas/vapour possibly presenting in the hazardous areas in which the electrical apparatus is located. The relationship among equipment temperature class, equipment maximum surface temperature, gas/vapour ignition temperature is shown in Table 2.4.

Table 2.4 : Relationship among temperature class, maximum surface		
Electrical apparatus Temperature class	Electrical apparatus maximum surface temperature (°C)	Gas/vapour ignition temperature (°C)
T1	450	>450
T2	300	>300
T3	200	>200
T4	135	>135
T5	100	>100
T6	85	>85

2.7 Electrical apparatus located in hazardous drilling well and mud processing areas is to meet at least Group IIA and temperature class T3.

2.8 Electrical cables are to meet the following:

2.8.1 Only cables associated with type “ia” equipment are to be permitted in zone 0 areas.

2.8.2 Thermoplastic sheathed cables, thermosetting sheathed cables or elastomeric sheathed cables are to be used for fixed wiring in zone 2 areas.

2.8.3 Flexible and portable cables, where necessary, used in zone 1 and zone 2 areas are to be to the satisfaction of IRS.

2.8.4 Permanently installed, fixed cable passing through zone 1 hazardous areas is to be fitted with conductive covering, braiding or sheathed for earth detection.

2.9 Watertight Cable transits

2.9.1 Watertight cable transits are to be installed and maintained in accordance with the manufacturer’s requirements and in accordance with the requirements of the relevant type approval certification.

2.9.2 A Cable Transit Seal Systems Register is to be provided by the builder for all watertight cable transits fitted on-board the vessel. For an example of a register see Table 2.9.2. The Register can be in either a hard copy or digitized media. It is to include a marking / identification system, documentation referencing manufacturer manual(s) for each type of cable transit installed, the Type Approval certification for each type of transit system, applicable installation drawings, and a recording of each installed transit documenting the as built condition after final inspection in the shipyard. It is to include sections to record any inspection, modification, repair and maintenance.

2.9.3 During new construction the Register is to be reviewed by the attending Surveyor to confirm it contains a list of the watertight cable transits, applicable cable transit information and sections to maintain in-service maintenance and survey records.

2.9.4 For manned unit, the Register is to be held onboard the vessel. For unmanned units, if a suitable storage location does not exist onboard, the Register may be held ashore. The Register is to be readily available to the attending surveyor.

2.9.5 The owner is to maintain the Register to record any disruption (repair, modification or opening out and closing) to a cable transit or to record the installation of a new cable transit.

2.9.6 At new construction it is to be confirmed by the surveyor that:

- Cable transits have been installed, and where disrupted have been reinstated, in accordance with the manufacturer's

requirements and in accordance with the requirements of Type Approval.

- Where specified, appropriate specialized tools have been used.

Table 2.9.2 : Recommended format for Cable Transit Seal System Register

Name of Ship: Sample		IMO No: 12345		Place: Hamburg		Date: XX/XX/2017								
Inspected by: Smith														
				Transits 4		Total Openings 4								
TRANSIT			Inspected side		FRAME	Type Approved	CONDITION (G.F.P.)	INSPECTED	REPAIRED	MODIFIED	MAINTAINED	NOTES:	Checked by	DATE
Drawing number	ID	Location	F	B										
GIA-07-1047-000-883	TT-MCT-011				C d= 50	x						NVD	PTO	26/02/2015
GIA-07-1047-000-883	TT-MCT-012				C 450x200	x						NVD	PTO	26/02/2015
GIA-07-1047-000-883	TT-MCT-013				C 550x200	x						NVD	PTO	26/02/2015
GIA-07-1047-000-883	TT-MCT-014				C 750x200	x						Open, drilled hole not closed	PTO	26/02/2015

Section 3

Main Source of Power

3.1 For non-self-propelled drilling units

3.1.1 Every unit is to be provided with a main source of electrical power which is to include at least two generating sets.

3.1.2 The power of these sets is to be such that it is still possible to ensure the functioning of the services referred to in 1.2.4.1, except for power servicing drilling operations, in the event of any one of these generating sets being stopped.

3.1.3 Where transformers or converters constitute an essential part of the supply system, the system is to be so arranged as to ensure the same continuity of the supply as stated in 3.1.2.

3.1.4 A main electrical lighting system which is to provide illumination throughout those parts of the unit normally accessible to and used by personnel is to be supplied from the main source of power.

3.1.5 The arrangement of the main lighting system is to be such that a fire or other casualty in the space or spaces containing the main source of power, including transformers or converters, if any, will not render the emergency lighting system under section 4 inoperative.

3.1.6 The arrangement of the emergency lighting system is to be such that a fire or other casualty in the space or spaces containing the emergency source of power, including transformers or converters, if any, will not render the main lighting system required by this section inoperative.

3.1.7 The main source of electrical power is to comply with the following:

.1 Where the electrical power can normally be supplied by one generator, suitable load-shedding arrangements are to be provided to ensure the integrity of supplies to services required for propulsion and steering as well as

the safety of the unit. In the case of loss of the generator in operation, adequate provision is to be made for automatic starting and connecting to the main switchboard of a stand-by generator of sufficient capacity to ensure safe navigation when underway and to ensure the safety of the unit with automatic restarting of the essential auxiliaries including, where necessary, sequential operations. IRS may dispense with these provisions where the power necessary to ensure the functioning of the service referred to in 1.2.4.1, except for power servicing drilling operations, is 250 kW or less.

.2 If the electrical power is normally supplied by more than one generator simultaneously in parallel operation, provision is to be made, for instance, by load shedding to ensure that, in case of loss of one of these generating sets, the remaining ones are kept in operation without overload to ensure safe navigation when underway and to ensure the safety of the unit.

3.2 For self-propelled drilling units

3.2.1 In addition to complying with section 3.1, the main source of electrical power is to comply with the following:

.1 The arrangement of the unit's main source of power is to be such that the services referred to in 1.2.4.1 can be maintained regardless of the speed and direction of the main propelling engines or shafting.

.2 The generating plant is to be such as to ensure that with any one generator or its primary source of power out of operation, the remaining generator or generators will be capable of providing the electrical services necessary to start the main propulsion plant from a dead ship

condition. The emergency generator may be used for the purpose of starting from a dead ship condition if its capability either alone or combined with that of any generator is sufficient to provide at the same time those services required by 4.1.10 unless an independent supply from an accumulator battery suitably located for use in an emergency and sufficient for the period of 18 h is installed.

.3 For electrically self-propelled units the application of 3.1.2 need only include for propulsion sufficient power to ensure safe navigation when underway.

.4 Where electrical power is necessary to restore propulsion, the capacity is to be sufficient to restore propulsion to the unit in conjunction with other machinery, as appropriate, from a dead ship condition within 30 min after blackout.

3.2.2 The main switchboard is to be so placed relative to one main generating station that, as far as is practicable, the integrity of the normal supply may be affected only by a fire or other casualty in one space. An environmental enclosure for the main switchboard, such as may be provided by a machinery control room situated within the main boundaries of the space, is not to be considered as separating the switchboards from the generators.

3.2.3 Where the main source of electrical power is necessary for propulsion of the unit, the main busbar is to be subdivided into at least two parts which are to normally be connected by circuit breakers or other approved means; so far as is practicable, the connection of generating sets and other duplicated equipment is to be equally divided between the parts

Section 4

Emergency Source of Power

4.1 For non-self-propelled drilling units

4.1.1 Every unit is to be provided with a self-contained emergency source of power

4.1.2 The emergency source of power is to be installed in a non-hazardous space. The emergency source of power, the transitional source of emergency power and the emergency switchboard 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. 5 and be readily accessible. They are to not be forward of the collision bulkhead, if any.

4.1.3 The location of emergency source of power and its arrangement in relation to the main source of electric power is to be such as to ensure that a fire, flooding or other failure in the space containing the main source or in any machinery space of category A will not interfere with the supply or distribution of emergency power. As far as practical, the space containing the emergency source of power, the transitional source of emergency power and the emergency switchboard are to not be contiguous to boundaries of machinery spaces of category A or of those spaces containing the main source of electrical power. Where the emergency source of power, the transitional source of emergency power, and the emergency switchboard are contiguous to the boundaries of machinery spaces of category A or to those spaces containing the main source of electrical power, or to spaces of zone 1 or zone 2, the contiguous boundaries are to be in compliance with Ch.14, 1.5

4.1.4 Provided that suitable measures are taken for safeguarding independent emergency operation under all circumstances, the emergency switchboard may be used to supply non-emergency circuits, and the emergency generator may be used exceptionally and for short periods to supply non-emergency circuits.

4.1.5 For units where the main source of electrical power is located in two or more spaces which have their own systems, including power distribution and control systems, completely independent of the systems in the other spaces and such that a fire or other casualty in any one of the spaces will not affect the power distribution from the others, or to the services under 4.1.6, the provisions of 4.1.1 may be

considered satisfied without an additional emergency source of electrical power, provided that IRS is satisfied that:

.1 there are at least two generating sets, meeting the provisions of 4.1.15 and each of sufficient capacity to meet the provisions of 4.1.6, in each of at least two spaces;

.2 the arrangements under 4.1.5.1 in each such space are equivalent to those under 4.1.8 and 4.1.11 to 4.1.14 and 4.3 so that a source of electrical power is available at all times to the services under 4.1.6;

.3 the location of each of the spaces referred to in 4.1.5.1 is in compliance with 4.1.2 and the boundaries meet the provisions of 4.1.3 except that contiguous boundaries are to consist of an "A-60" bulkhead and a cofferdam, or a steel bulkhead insulated to class "A-60" on both sides.

4.1.6 The power available is to be sufficient to supply all services necessary for the safety of all on board in an emergency due regard being paid to such services as may have to be operated simultaneously. The emergency source of power is to be capable, having regard to starting currents and the transitory nature of certain loads, of supplying simultaneously at least the following services for the periods specified hereinafter, if they depend upon an electrical source for their operation.

.1 For a period of 18 hours the following lighting:

- i. Navigation lights, special purpose lights, warning system, other lights and sound signals, required by the International Regulations for the Prevention of Collisions at Sea, in force
- ii. Emergency lighting for machinery spaces and main generating stations including their control positions, control stations and in all machinery control rooms, at every embarkation station on deck and over sides, all service and accommodation alleyways, personnel lift cars, and personnel lift trunks, stairways and exits.
- iii. Emergency lighting for personnel lift cars and personnel lift trunks.

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- iv. Emergency lighting in all spaces from which control of the drilling process is performed and where controls of machinery essential for this process, or devices for emergency switching-off of the power plant are located.
 - v. Emergency lighting at the storage position(s) for firemen's outfits.
 - vi. Emergency lighting at the sprinkler pump if any, at one of the fire pumps if dependent upon the emergency generator for its source of power, at the emergency bilge pump if any, and at their starting positions.
 - vii. Emergency lighting on helicopter decks to include perimeter and helideck status lights, wind direction indicator illumination, and related obstruction lights, if any.
- .2 For a period of 18 hours the following equipment:
- i. General alarm and communications systems that is required in an emergency.
 - ii. Fire and gas detection systems and their alarms, intermittent operation of the manual fire alarms and all internal signals that are required in an emergency
 - iii. Fire extinguishing systems.
 - iv. One of the fire pumps, if dependent upon the emergency generator for its source of power.
 - v. Permanently installed diving equipment necessary for the safe conduct of diving operations, if dependent upon the drilling unit's electrical power.
 - vi. Abandonment systems dependent on electric power
 - vii. The capability of closing the blow-out preventer and of disconnecting the drilling unit from the well head arrangement, if electrically controlled, unless it has an independent supply from an accumulator battery suitably located for use in an emergency and sufficient for the period of 18 hours.
 - viii. On Column Stabilized Drilling Units: Ballast valve control system, ballast valve position indicating system, draft level indicating system, tank level indicating system, and the largest single ballast pump required by Ch. 12.
- .3 For a period of half an hour:
- i. power to operate the watertight doors as provided under Ch. 5, 2.3.1(b), but not necessarily all of them simultaneously, unless an independent temporary source of stored energy is provided; and
 - ii. power to operate the controls and indicators provided under Ch. 5, 2.3.1(b).
- .4 For a period of four days signalling lights and sound signals required for marking of offshore structures
- 4.1.7 The emergency source of power may be either a generator or an accumulator battery.
- 4.1.8 Where the emergency source of power is a generator it is to be:
- .1 driven by a suitable prime mover with an independent supply of fuel, having a flashpoint of not less than 43°C;
 - .2 started automatically upon failure of the normal electrical supply unless a transitional source of emergency power in accordance with 4.1.8.3 is provided; where the emergency generator is automatically started, it is to be automatically connected to the emergency switchboard; those services referred to in 4.1.10 are to then be connected automatically to the emergency generator; and unless a second independent means of starting the emergency generator is provided, the single source of stored energy is to be protected to preclude its complete depletion by the automatic starting system; and
 - .3 provided with a transitional source of emergency power, as specified in 4.1.10, unless the emergency generator is capable of supplying the services mentioned in 4.1.10 and of being automatically started and supplying the required load as quickly as is safe and practicable but in not more than 45 [s].
- 4.1.9 Where the emergency source of power is an accumulator battery it is to be capable of:
- .1 carrying the emergency load without recharging while maintaining the voltage of the battery throughout the discharge period within plus or minus 12% of its nominal voltage;

.2 automatically connecting to the emergency switchboard in the event of failure of the main power supply; and

.3 immediately supplying at least those services specified in 4.1.10.

4.1.10 The transitional source or sources of emergency power, under 4.1.8.3, are to consist of an accumulator battery suitably located for use in an emergency, which is to operate without recharging whilst maintaining the voltage of the battery throughout the discharge period within plus or minus 12% of its nominal voltage, and be of sufficient capacity and so arranged as to supply automatically, in the event of failure of either the main or the emergency source of power, the following services for half an hour at least if they depend upon an electrical source for their operation:

.1 the lighting under 4.1.6.1. For this transitional phase, the required emergency lighting, in respect of the machinery space and accommodation and service areas, may be provided by permanently fixed, individual accumulator lamps which are automatically charged and operated;

.2 all essential internal communication equipment under 4.1.6.2.i and 4.1.6.2.ii; and

.3 intermittent operation of the services referred to in 4.1.6.2.vii,

unless, in the case of 4.1.10.2 and 4.1.10.3, they have an independent supply from an accumulator battery suitably located for use in an emergency and sufficient for the period specified.

4.1.11 The emergency switchboard is to be installed as near as is practicable to the emergency source of power and, where the emergency source of power is a generator, the emergency switchboard is to preferably be located in the same space.

4.1.12 No accumulator battery fitted to meet the provisions for emergency or transitional power supply is to be installed in the same space as the emergency switchboard, unless appropriate measures to the satisfaction of IRS are taken to extract the gases discharged from the said batteries. An indicator is to be mounted in a suitable place on the main switchboard or in the machinery control room to indicate when the batteries constituting either the emergency source of power or the transitional source of power, referred to in 4.1.10 or 4.1.11, are being discharged.

4.1.13 The emergency switchboard is to be supplied in normal operation from the main switchboard by an interconnector feeder which is to be adequately protected at the main switchboard against overload and short circuit. The arrangement at the emergency switchboard is to be such that the interconnector feeder is disconnected automatically at the emergency switchboard upon failure of the main power supply. Where the system is arranged for feedback operation, the interconnector feeder is to also be protected at the emergency switchboard at least against short circuit.

4.1.14 In order to ensure ready availability of emergency supplies, arrangements are to be made where necessary to disconnect non-emergency circuits automatically from the emergency switchboard to ensure that power is available automatically to the emergency circuits.

4.1.15 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 chapter 5. In no case need the equipment be designed to operate when inclined more than:

.1 25° in any direction on a column-stabilized unit;

.2 15° in any direction on a self-elevating unit; and

.3 22.5° about the longitudinal axis and/or when inclined 10° about the transverse axis on a surface unit.

4.1.16 Provision is to be made for the periodic testing of the complete emergency system. This is to include the testing of transitional sources and automatic starting arrangements.

4.2 For self-propelled drilling units

In addition to complying with section 4.1, the emergency source of power is to provide:

.1 For a period of 18 hours, emergency lighting at the steering gear;

.2 For a period of 18 hours:

.2.1 navigational aids as required by MODU Code 2009 (IMO Resolution A1023(26)) Chapter 7, Sec.7.10;

.2.2 intermittent operation of the daylight signalling lamp and the unit's whistle; unless they have an independent supply from an accumulator battery suitably located for use in an emergency and sufficient for the period of 18 hours;

.3 For the period of 30 min or a lesser period as permitted by MODU Code 2009 (IMO Resolution A1023(26)) Chapter 7, Sec.7.10, the steering gear.

4.3 Starting arrangements for emergency generators

4.3.1 Emergency generators are to be capable of being readily started in their cold condition down to a temperature of 0°C. If this is impracticable, or if lower temperatures are likely to be encountered, consideration is to be given to the provision and maintenance of heating arrangements, acceptable to IRS, so that ready starting will be assured.

4.3.2 Each emergency generator which is arranged to be automatically started is to be equipped with starting arrangements acceptable to IRS with a storage energy capability of at least three consecutive starts. A second source of energy is to be provided for an additional three starts within 30 min unless hand (manual) starting can be demonstrated to be effective.

4.3.3 Provision is to be made to maintain the stored energy at all times.

4.3.4 Electrical and hydraulic starting systems are to be maintained from the emergency switchboard.

4.3.5 Compressed air starting systems may be maintained by the main or auxiliary compressed air receivers, through a suitable non-return valve or by an emergency air compressor energized by the emergency switchboard.

4.3.6 All of these starting, charging and energy storing devices are to be located in the emergency generator room; these devices are to not be used for any purpose other than the operation of the emergency generator set. This does not preclude the supply to the air receiver of the emergency generator set from the main or auxiliary compressed air system through a non-return valve fitted in the emergency generator room.

4.3.7 When automatic starting is not required by these provisions and where it can be demonstrated as being effective, hand (manual) starting is permissible, such as manual cranking, inertia starters, manual hydraulic accumulators, or powder cartridges.

4.3.8 When hand (manual) starting is not practicable, the provisions in 4.3.2 and 4.3.3 to 4.3.6 are to be complied with, except that starting may be manually initiated.

Section 5

Precautions against Shock, Fire and other Hazards of Electrical Origin

5.1 Exposed metal parts of electrical machines or equipment which are not intended to be live but which are liable under fault conditions to become live are to be earthed (grounded) unless the machines or equipment are:

.1 supplied at a voltage not exceeding 55 V direct current or 55 V, root mean square between conductors; auto-transformers are to not be used for the purpose of achieving this voltage; or

.2 supplied at a voltage not exceeding 250 V by safety isolating transformers supplying only one consuming device; or

.3 constructed in accordance with the principle of double insulation.

5.2 IRS may require additional precautions for portable electrical equipment for use in confined or exceptionally damp spaces where particular risks due to conductivity may exist.

5.3 All electrical apparatus are to be so constructed and so installed that it does not cause injury when handled or touched in the normal manner.

5.4 Where not obtained through normal construction, arrangements are to be provided to effectively earth (ground) all permanently installed machinery, metal structures of derricks, masts and helicopter decks.

5.5 Switchboards are to be so arranged as to give easy access, where needed, to apparatus

and equipment, in order to minimize danger to personnel. The sides and backs and, where necessary, the fronts of switchboards are to be suitably guarded. Exposed live parts having voltages to earth (ground) exceeding 50V are not to be installed on the front of such switchboards. There are to be non-conducting mats or gratings at the front and rear, where necessary.

5.6 Distribution systems with hull return are to not be installed, but this does not preclude, under conditions approved by IRS, the installation of:

.1 impressed current cathodic protective systems;

.2 limited and locally earthed systems (e.g., engine starting systems);

.3 limited and locally earthed welding systems; where IRS is satisfied that the equipotential of the structure is assured in a satisfactory manner, welding systems with hull return may be installed without this restriction; and

.4 insulation level monitoring devices provided the circulation current does not exceed 30 mA under the most unfavourable conditions.

5.7 When a distribution system, whether primary or secondary, for power, heating or lighting, with no connection to earth is used, a device capable of continuously monitoring the insulation level to earth and of giving an audible or visual indication of abnormally low insulation values is to be provided.

5.8 Except as permitted by IRS in exceptional circumstances, all metal sheaths and armour of cables are to be electrically continuous and are to be earthed (grounded).

5.9 All electric cables and wiring external to equipment are to be at least of a flame-retardant type and are to be so installed as not to impair their original flame-retarding properties. Where necessary for particular applications, IRS may permit the use of special types of cables such as radio frequency cables, which do not comply with the foregoing.

5.10 Cables and wiring serving essential or emergency power, lighting, internal communications or signals are to, so far as practicable, be routed clear of galleys, machinery spaces of category A and their casings and other high fire risk areas. Cables connecting fire pumps to the emergency switchboard are to be of a fire-resistant type where they pass through high fire risk areas.

Where practicable all such cables are to be run in such a manner as to preclude their being rendered unserviceable by heating of the bulkheads that may be caused by a fire in an adjacent space.

5.11 Cables and wiring are to be installed and supported in such a manner as to avoid chafing or other damage. Refer to the recommendations published by the International Electrotechnical Commission concerning flame-retarding properties of bunched cables and characteristics of cables of a fire-resistant type.

5.12 Terminations and joints in all conductors are to be so made that they retain the original electrical, mechanical, flame-retarding and, where necessary, fire-resisting properties of the cable.

5.13 Each separate circuit is to be protected against short circuit and against overload, except as permitted in Ch. 12, 1.5.6, or where IRS may exceptionally otherwise permit.

5.14 The rating or appropriate setting of the overload protection device for each circuit is to be permanently indicated at the location of the protection device.

5.15 Lighting fittings are to be so arranged as to prevent temperature rises which could damage the cables and wiring, and to prevent surrounding material from becoming excessively hot.

5.16 Accumulator batteries are to be suitably housed, and compartments used primarily for their accommodation are to be properly constructed and efficiently ventilated.

5.17 Electrical or other equipment which may constitute a source of ignition of flammable vapours are to not be permitted in these compartments except as permitted in 5.19.

5.18 Accumulator batteries, except for batteries of self-contained battery-operated lights, are to not be located in sleeping quarters. IRS may grant exemptions from or equivalencies to this provision where hermetically sealed batteries are installed.

5.19 In paint lockers, acetylene stores, and similar spaces where flammable mixtures are liable to collect as well as any compartment assigned principally to accumulator batteries, no electrical equipment is to be installed unless IRS is satisfied that such equipment is:

.1 essential for operational purposes;

.2 of a type which will not ignite the mixture concerned;

.3 appropriate to the space concerned; and

.4 appropriately certified for safe usage in the vapours or gases likely to be encountered.

5.20 Electrical apparatus and cables are to, where practicable, be excluded from any compartment in which explosives are stored. Where lighting is required, the light is to come

from outside, through the boundaries of the compartment. If electrical equipment cannot be excluded from such a compartment it is to be so designed and used as to minimize the risk of fire or explosion.

5.21 Where spillage or impingement of liquids could occur upon any electrical control or alarm console, or similar electrical enclosure essential to the safety of the unit, such equipment is to have suitable protection against the ingress of liquids.

Section 6

Emergency Shutdown Facilities

6.1 Emergency conditions due to drilling operations

6.1.1 In view of exceptional conditions in which the explosion hazard may extend outside the areas defined in Ch. 11, special arrangements are to be provided to facilitate the selective disconnection of shutdown of:

- Ventilating system except fans necessary for supplying combustion air to prime movers for the production of electrical power;
- All electrical equipment outside Zone 1 areas, except where of a certified safe type for Zone 1 applications
- Main electrical generators and prime movers including the ventilation systems for these;
- Emergency equipment except those items listed in 6.2
- Emergency generators prime movers .

6.1.2 Initiation of the foregoing shutdown of facilities will be the operator's responsibility. The initiated action may vary according to the nature of the emergency. A recommended sequence of shutdowns is to be included in the Operating Booklet.

6.1.3 In the case of units using dynamic positioning systems disconnection or shutdown of machinery and equipment necessary for maintaining the operability of the dynamic positioning system is to be based on a shutdown logic system designed to preserve the capability to maintain operational control over the integrity of the well and station keeping capability. Shutdown of generators and related power supply equipment needed for the operation of

the dynamic positioning system is to be divided into independent groups to allow response to gas detection alarms while maintaining position keeping.

6.1.4 Disconnection or shutdown is to be possible from at least two strategic locations, one of which should be outside hazardous areas.

6.1.5 Shutdown systems that are provided to comply with paragraph 6.1.1 are to be so designed that the risk of unintentional stoppages caused by malfunction in a shutdown system and the risk of inadvertent operation of a shutdown are minimized.

6.2 Equipment remaining operational after emergency shutdown

6.2.1 At least the following facilities are to be operable after an emergency shutdown. Equipment which is located in spaces other than enclosed spaces and arranged to be operated after complete shutdown as given in 4.1 is to be suitable for installation in Zone 2 locations. Such equipment, when located in enclosed spaces, is to be suitable for its intended application to the satisfaction of IRS:

- Emergency lighting required by 4.1.6.1 for half an hour;
- blow-out preventer control system;
- General alarm system;
- Public address system; and
- Battery supplied radio communication installations.

Adequate power supply from a separate UPS is to be provided for the above.

Section 7

Alarms and Internal Communication

7.1 Alarms and indicators are to be installed in accordance with the recommendations of IRS.

7.2 Each unit is to be provided with a general alarm system so installed as to be clearly perceptible in all normally accessible parts of the unit, including open decks. Control stations for activating the alarm are to be installed to the satisfaction of IRS. The signals used are to be limited to: general emergency, toxic gas (hydrogen sulphide), combustible gas, fire alarm, and abandon unit signals. These signals are to be described in the muster list and operations manual.

7.3 A public address system is to be provided. The system is to be clearly audible in all spaces that are normally accessible to personnel during routine operations. It is to be possible to make announcements at the following locations (if

provided): Emergency response centre, navigation bridge, engine control room, ballast control station, jacking control station, and a location near the drilling console.

7.4 The signals given over the general alarm system are to be supplemented by instructions over the public address system.

7.5 Internal means of communication are to be available for transfer of information between all spaces where action may be necessary in case of an emergency.

7.6 Audible signals in high noise areas are to be supplemented with visual signals. Internal means of communication are to be available for transfer of information between all spaces where action may be necessary in case of an emergency.

Annex-1

List of IEC Standards

List of recommendations 'A' by the International Electrotechnical Commission:

IEC 61892-1:2001 Mobile and fixed offshore units – Electrical installations – Part 1: General requirements and conditions.
IEC 61892-2:2005 Mobile and fixed offshore units – Electrical installations – Part 2: System design.
IEC 61892-3:2007 Mobile and fixed offshore units – Electrical installations – Part 3: Equipment.
IEC 61892-4:2007 Mobile and fixed offshore units – Electrical installations – Part 4: Cables.
IEC 61892-5:2000 Mobile and fixed offshore units – Electrical Installations – Part 5: Mobile units.
IEC 61892-6:2007 Mobile and fixed offshore units – Electrical installations – Part 6: Installation.
IEC 61892-7:2007 Mobile and fixed offshore units – Electrical installations – Part 7: Hazardous areas.

List of recommendations 'B' by the International Electrotechnical Commission:

IEC 60079-4: 1975 Electrical apparatus for explosive gas atmospheres – Part 4: Method of test for ignition temperature.
IEC 60079-4A: 1970 Electrical apparatus for explosive gas atmospheres – Part 4: Method of test for ignition temperature – First supplement.
IEC 60079-10: 2002 Electrical apparatus for explosive gas atmospheres – Part 10: Classification of hazardous areas.
IEC/TR 60079-12: 1978 Electrical apparatus for explosive gas atmospheres – Part 12: Classification of mixtures of gases of vapours with air according to their maximum experimental safe gaps and minimum igniting currents.
IEC/TR 60079-13: 1982-01 Electrical apparatus for explosive gas atmosphere – Part 13: Construction and use of rooms or buildings protected by pressurization.
IEC 60079-14: 2007-12 Explosive atmospheres – Part 14: Electrical installations design, selection and erection.
IEC/TR 60079-16: 1990 Electrical apparatus for explosive gas atmospheres – Part 16: Artificial ventilation for the protection of analyser(s) houses.
IEC 60079-17: 2007 Explosive atmospheres – Part 17: Electrical installations inspection and maintenance.
IEC 60079-19: 2006-10 Explosive atmospheres – Part 19: Equipment repair, overhaul and reclamation.
IEC/TR 60079-20: 1996 Electrical apparatus for explosive gas atmospheres – Part 20: Data for flammable gases and vapours, relating to the use of electrical apparatus.
IEC 60079-25: 2003 Electrical apparatus for explosive gas atmospheres – Part 25: Intrinsically safe systems.
IEC 60079-27: 2008 Explosive atmospheres – Part 27: Fieldbus intrinsically safe concept (FISCO).
IEC 60079-28: 2006 Explosive atmospheres – Part 28: Protection of equipment and transmission systems using optical radiation.
IEC 60079-29-1: 2007 Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases.
IEC 60079-29-2: 2007 Explosive atmospheres – Part 29-2: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen.
IEC 60079-30-1: 2007 Explosive atmospheres – Part 30-1: Electrical resistance trace heating – General and testing requirements.
IEC 60079-30-2: 2007 Explosive atmospheres – Part 30-2: Electrical resistance trace heating – Application guide for design, installation and maintenance.

List of recommendations 'C' by the International Electrotechnical Commission:

IEC 60079-14:2007 Explosive atmospheres – Part 14: Electrical installations design, selection and erection.
IEC 60079-17:2007 Explosive atmospheres – Part 17: Electrical installations inspection and maintenance.
IEC 60079-19: 2006 Explosive atmospheres – Part 19: Equipment repair, overhaul and reclamation.

End of Chapter

Chapter 14

Safety Features

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Section 1

General

1.1 Fire Safety

1.1.1 Fire protection arrangements and fire extinguishing systems are to be in accordance with the requirements in sections 2 to 10 of this chapter.

1.1.2 Attention is drawn to the appropriate governmental authority in each case, as there may be additional requirements, depending on the size, type and intended service of the drilling units as well as other particulars and details. Consideration will be given to fire protection arrangements and fire extinguishing systems which comply with the published requirements of the governmental authority of the country in which the drilling unit is to be registered.

Also, attention is directed to IMO Resolution A.1023(26) regarding Code for the Construction and Equipment of Mobile Offshore Drilling Units, 2009 (2009 MODU CODE).

1.1.3 Fire safety systems are to be in accordance with *Rules & Regulations For The Construction & Classification of Steel Ships*, Pt. 6, Ch. 8, as applicable.

1.1.4 When fire safety design or arrangements deviate from the provisions of the Rules, engineering analysis, evaluation and approval of the alternative design and arrangements is to be carried out in accordance with *Rules & Regulations For The Construction & Classification of Steel Ships* Pt. 6, Ch. 6.

1.2 Fire control plan

1.2.1 A fire control plan complying with *Rules & Regulations For The Construction & Classification of Steel Ships* Pt. 6, Ch. 5, Sec 2.2.4 is to be submitted for review and permanently exhibited on board on which the following as a minimum, should be clearly shown:

- (1) Locations of fire control stations;
- (2) Various fire sections enclosed by various classes of fire divisions;
- (3) Arrangement of fire detectors and manual fire alarm stations;
- (4) Arrangement of combustible gas detectors;

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| <p>(5) Arrangement of hydrogen sulphide gas detectors;</p> <p>(6) Locations of respiratory protection equipment for hydrogen sulphide;</p> <p>(7) General alarm actuating positions;</p> <p>(8) Arrangement of various fire-extinguishing appliances;</p> <p>(9) Locations of Fire-fighter's Outfits;</p> <p>(10) Location of Helicopter Crash Kit;</p> <p>(11) Arrangement of water spray nozzles and sprinklers (if fitted);</p> <p>(12) Locations of emergency shutdown (such as oil fuel source shutdown, engine shutdown, etc.) stations;</p> <p>(13) The Ventilating system including Fire dampers positions, Ventilating Fans</p> | <p>control positions with indication of identification numbers of Ventilating Fans serving each section;</p> <p>(14) Arrangement of fire/watertight doors and their remote control positions;</p> <p>(15) Blowout preventer control positions;</p> <p>(16) Escape route and means of access to different compartments, decks, etc.;</p> <p>(17) Locations of Emergency Escape Breathing Devices (EEBD); and</p> <p>(18) Arrangement of emergency muster stations and life-saving appliances.</p> |
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1.3 Other safety arrangements

1.3.1 Alarms for the safety of the unit are to be as given in section 11.

Section 2

Structural Fire Protection

2.1 General

2.1.1 These provisions have been formulated principally for units having their hull superstructure, structural bulkheads, decks and deckhouses constructed of steel.

2.1.2 Units constructed of other materials may be accepted, provided that, in the opinion of IRS, they provide an equivalent standard of safety.

2.1.3 Structural fire protection details, materials and methods of construction are to be in accordance with the FTP Code, as applicable, and *Rules & Regulations For The Construction & Classification of Steel Ships* Pt. 6, Ch. 2, Sec 2.3 and Sec. 3, as applied to cargo ships.

2.2 Fire integrity of bulkheads and decks

2.2.1 In addition to complying with the specific provisions for fire integrity of bulkheads and decks in this section and in section 2.3, the minimum fire integrity of bulkheads and decks is to be as prescribed in tables 2.1 and 2.2. Exterior boundaries of superstructures and deckhouses enclosing accommodation, including any overhanging decks which support such accommodation, are to be constructed to "H-60" standard for the whole of the portion which faces and is within 30 [m] of the centre of the rotary

table. For units that have a movable substructure the 30 [m] is to be measured with the substructure at its closest drilling position to the accommodation. IRS may accept equivalent arrangements

2.2.2 The following provisions are to govern application of the tables:

.1 Tables 2.1 and 2.2 are to apply respectively to the bulkheads and decks separating adjacent spaces.

.2 For determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces, such spaces are classified according to their fire risk, as shown in categories (1) to (11) below. The title of each category is intended to be typical rather than restrictive. The number in parenthesis preceding each category refers to the applicable column or row in the tables:

(1) *Control stations* are spaces as defined in Ch. 1, Sec. 2, Cl. 25.

(2) *Corridors* means corridors and lobbies.

(3) *Accommodation spaces* are spaces as defined in Ch. 1, Sec. 2, 25), 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 spaces as defined in Ch. 1, Sec. 2, Cl. 25

(7) *Other machinery spaces* are spaces as defined in Ch. 1, Sec. 2, Cl. 25 other than machinery spaces of category A.

(8) *Hazardous areas* are areas as defined in Ch. 1, Sec. 2, Cl. 25

(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, baths, 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.

2.2.3 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.

2.2.4 In approving structural fire protection details, IRS will consider 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].

2.2.5 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 permits rapid closure. IRS may accept windows and sidescuttles outside hazardous areas to be of the opening type.

2.2.6 The fire resistance of doors is to, as far as practicable, be equivalent to that of the division in which they are fitted. External doors in superstructures and deckhouses are to be constructed to at least "A-0" class standard and be self-closing, where practicable.

2.2.7 Self-closing doors in fire rated bulkheads are not to be fitted with hold-back hooks. However, hold-back arrangements incorporating remote release fittings of the fail-safe type may be utilized.

2.2.8 Windows and sidescuttles in boundaries which are required to meet an "A-60" standard which face the drill floor area are to be:

.1 constructed to an "A-60" standard; or

.2 protected by a water curtain; or

.3 fitted with shutters of steel or equivalent material.

2.3 Protection of accommodation spaces, service spaces and control stations

2.3.1 In general, accommodation spaces, service spaces, control stations and spaces containing vital machinery and equipment (refer Note 1) are to not be located adjacent to hazardous areas. However, where this is not practicable, an engineering evaluation is to be performed in accordance with national or international standards (refer Note 2) 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. Where it is shown that these spaces may be exposed to a radiant heat flux in excess of 100 kw/m², the bulkhead or deck is to be constructed to at least an "H-60" standard.

Note 1: Vital machinery and equipment are those that are essential to the safety of the MODU and all personnel on board. They include, but are not limited to, fire pumps, emergency sources of power, dynamic positioning systems, remote blowout preventer activation controls, and other operational or safety systems the sudden failure of which may result in hazardous situations. This

does not include spaces (e.g. the driller's cabin) located on the drill floor.

Note 2: Refer to standards such as: ISO 13702:2015, or API RP 2 FB.

2.3.2 All bulkheads that are to be "A" class divisions are to extend from deck to deck and to the deckhouse side or other boundaries.

2.3.3 All bulkheads forming "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 [m²]. 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.

2.3.4 Stairs are to be constructed of steel or equivalent material.

2.3.5 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.

2.3.6 Air spaces enclosed behind ceilings, panellings or linings are to be divided by close fitting draught stops spaced not more than 14 [m] apart. In the vertical direction, such enclosed air spaces, including those behind linings of stairways, trunks, etc., are to be closed at each deck.

Table 2.1: 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 ^(e)	A-60	*	A-0
Corridors (2)		C	B-0	B-0 A-0 ^(b)	B-0	A-60	A-0	A-0 ^(e)	A-0	*	B-0
Accommodation spaces (3)			C	B-0 A-0 ^(b)	B-0	A-60	A-0	A-0 ^(e)	A-0	*	C
Stairways (4)				B-0 A-0 ^(b)	B-0 A-0 ^(b)	A-60	A-0	A-0 ^(e)	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 decks (10)										—	*
Sanitary and similar spaces (11)											C

See notes under table 2.2.

Table 2.2: Fire integrity of decks separating adjacent spaces

Space below ↓ Space above →	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control stations (1)	A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0 ^(e)	A-0	*	A-0
Corridors (2)	A-0	*	*	A-0	*	A-60	A-0	A-0 ^(e)	A-0	*	*
Accommodation spaces (3)	A-60	A-0	*	A-0	*	A-60	A-0	A-0 ^(e)	A-0	*	*
Stairways (4)	A-0	A-0	A-0	*	A-0	A-60	A-0	A-0 ^(e)	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 ^(e)	A-0 ^(e)	A-0 ^(e)	A-0 ^(e)	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-60	A-0	A-0	A-0 ^(c)	*	A-0
Open decks (10)	*	*	*	*	*	*	*	—	*	—	*
Sanitary and similar spaces (11)	A-0	A-0	*	A-0	*	A-0	A-0	A-0	A-0	*	*

Notes: to be applied to tables 2.1 and 2.2, as appropriate.

- (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) For clarification as to which note applies see 2.3.3 and 2.3.5.
- (c) Where spaces are of the same numerical category and superscript "c" appears, a bulkhead or deck of the rating shown in the tables 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 "B-0" rating.
- (e) Additional provisions for fire boundaries are to be assessed in accordance with 2.3.1. In no case the bulkhead or deck rating is to be less than the value indicated in the tables.

- * Where an asterisk appears in the tables, the division is to be of steel or equivalent material, but need not be of "A" class standard. However, where a deck is penetrated for the passage of electric cables, pipes and vent ducts, such penetrations are to be made tight to prevent the passage of flame and smoke.

Section 3

Prevention of Fire

3.1 Fire protection materials

3.1.1 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.

3.1.2 The framing, including grounds and the joint pieces of bulkheads, linings, ceilings and draught stops, are to be of non-combustible material.

3.1.3 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.

3.1.4 Bulkheads, linings and ceilings may have combustible veneers provided that the thickness of such veneers are not to exceed 2.5 [mm] within any space other than corridors, stairway enclosures and control stations where the thickness are not to exceed 1.5 [mm]. Combustible materials used on these surfaces are to have a calorific value not exceeding 45 [MJ/m²] of the area for the thickness used.

3.2 Smoke generation and Toxicity

3.2.1 Primary deck coverings, if applied within accommodation and service spaces and control stations, are to be of approved material which will not readily ignite, this being determined in accordance with the FTP Code.

3.2.2 Paints, varnishes and other finishes used on exposed interior surfaces are not to be capable of producing excessive quantities of smoke and toxic products, this being determined in accordance with the FTP Code.

3.3 Ventilation

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

3.3.2 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 outside 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 ventilation serving machinery spaces or hazardous areas is to be entirely separate from the means provided for stopping ventilation of other spaces.

3.3.3 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 smoke from surrounding areas.

3.3.4 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.

3.4 Arrangements in machinery and working spaces

3.4.1 Machinery driving forced and induced draught fans, electric motor pressurization fans, oil fuel transfer pumps, oil fuel unit pumps and other similar fuel pumps is 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.

3.4.2 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.

3.5 Storage of gas cylinders

3.5.1 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 IRS.

.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:

.6.1 protect cylinders and associated piping from physical damage;

.6.2 minimize exposure to hydrocarbons; and

.6.3 ensure suitable drainage.

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

Section 4

Fire Protection of Ventilation Ducts

4.1 Materials

4.1.1 Ventilation ducts are to be of non-combustible material. Short ducts, however, not generally exceeding 2 [m] in length and with a cross-sectional area not exceeding 0.02 [m²] need not be non-combustible, subject to the following conditions:

.1 these ducts are to be of a material which, in the opinion of IRS, has a low fire risk;

.2 they may only be used at the end of the ventilation device;

.3 they are not to be situated less than 600 [mm], measured along the duct, from where it penetrates any "A" or "B" class division including continuous "B" class ceilings.

4.2 Duct penetrations

4.2.1 Where a thin plated duct with a free cross-sectional area equal to, or less than, 0.02 [m²] passes through "A" class bulkhead 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 deck pierced. Where ventilation ducts with a cross-sectional area exceeding 0.02 [m²] pass through class "A" bulkheads or decks, the opening is to be lined with a steel sheet sleeve unless the ducts passing through the bulkheads or decks are of steel in the vicinity of penetrations through the deck or bulkhead; the ducts and sleeves at such places are to comply with the following:

.1 The ducts or 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 is to be divided preferably into 450 [mm] on each side of the bulkhead. These ducts, or sleeves lining such ducts, are to be provided with fire insulation. The insulation is to have at least the same fire integrity as the bulkhead or deck through which the duct passes. Equivalent penetration protection may be provided to the satisfaction of IRS.

.2 Ducts with a cross-sectional area exceeding 0.075 [m²], except those serving hazardous areas, are to be fitted with fire dampers in addition to meeting the provisions of paragraph

4.2.1.1. The fire damper is to operate automatically but is also to be capable of being closed manually from both sides of the bulkhead or deck. The damper is to 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. Operation of the damper only from one side of a division may be specially considered, having regard to the risk of fire in the spaces on each side of the division.

4.2.2 Ventilation ducts with a cross-sectional area exceeding 0.02 [m²] passing through "B" class bulkheads are to be lined with steel sheet sleeves of 900 [mm] in length divided preferably into 450 [mm] on each side of the bulkhead unless the duct is of steel for this length.

4.3 Arrangements of ducts

4.3.1 In general, ventilation systems for machinery spaces of category A, galleys and hazardous areas are to be separated from each other and from the ventilation systems serving other spaces. Ducts serving hazardous areas are not to pass through accommodation spaces, service spaces, or control spaces. Ducts provided for the ventilation of machinery spaces of category A and galleys are not to pass through accommodation spaces, control stations or service spaces unless:

.1 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;

.2 the ducts are suitably supported and stiffened;

.3 the ducts are fitted with automatic fire dampers close to the boundaries penetrated; and

.4 the ducts are insulated to "A-60" class standard from the machinery spaces or galleys to a point at least 5 [m] beyond each fire damper; or

.5 the ducts are constructed of steel in accordance with 4.3.1.1 and 4.3.1.2; and

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

4.3.2 Ducts provided for the ventilation of accommodation spaces, service spaces or control stations are not to pass through machinery spaces of category A, galleys or hazardous areas. However, IRS may allow relaxation from these provisions, except for the ducts passing through hazardous areas, provided that:

.1 the ducts where they pass through a machinery space of category A or a galley are constructed of steel in accordance with 4.3.1.1 and 4.3.1.2;

.2 automatic fire dampers are fitted close to the boundaries penetrated; and

.3 the integrity of the machinery space or galley boundaries is maintained at the penetrations; or

.4 the ducts where they pass through a machinery space of category A or a galley are constructed of steel in accordance with 4.3.1.1 and 4.3.1.2; and

.5 are insulated to "A-60" standard within the machinery space or galley.

4.4 Exhaust ducts from galley ranges

4.4.1 Where they pass through accommodation spaces or spaces containing combustible materials, the exhaust ducts from galley ranges are to be of equivalent fire integrity to "A" class divisions.

4.4.2 Each galley exhaust duct is to be fitted with:

.1 a grease trap readily removable for cleaning;

.2 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;

.3 arrangements, operable from within the galley, for shutting off the exhaust fans; and

.4 fixed means for extinguishing a fire within the duct.

Section 5

Fire and Gas Detection and Alarm Systems

5.1 Fire Detection and Alarm Systems

5.1.1 General

5.1.1.1 Spaces having identifiable fire risk are to be provided with an automatic fire detection and alarm system.

5.1.1.2 In selecting the type of detectors, their following features should be taken into account:

- (a) Capability to detect fire at the incipient stage;
- (b) Ability to avoid spurious alarm and trips; and
- (c) Suitability to the located environment.

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

5.1.2 Machinery spaces

5.1.2.1 A fixed fire detection and alarm system is to be fitted in:

.1 periodically unattended machinery spaces containing propulsion equipment, fired boilers, internal combustion engines, oil purifiers and similar equipment and so located that all potential fire outbreak points are effectively guarded.

.2 machinery spaces where:

2.1 the installation of automatic and remote control system and equipments has been approved in lieu of continuous manning of the spaces, and

2.2 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.

The fire detection system is subject to approval in each case and is to be based on the self-monitoring principle and include facilities for periodical testing. The fire detection main indicator board is to be at a manned control station.

5.1.2.2 The fire detection system is to comply with the following.

.1 This fire detection system is to be so designed and the detectors so positioned as to detect rapidly the onset of fire in any part of those spaces and under any normal conditions of operation of the machinery and variations of ventilation as required by the possible range of ambient temperatures. Except in spaces of restricted height and where their use is specially appropriate, detection systems using only thermal detectors are not permitted. The detection system is to initiate audible and visual alarms distinct in both respects from the alarms of any other system not indicating fire, in sufficient places to ensure that the alarms are heard and observed at the locations determined in accordance with Ch.12, 1.6.6.1

.2 After installation the system is to be tested under varying conditions of engine operation and ventilation.

.3 The fire detection system, where electrically supplied, is to be fed automatically from an emergency source of power by a separate feeder if the main source of power fails.

5.1.3 Accommodation and service spaces

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

5.1.4 Electrical rooms and control stations

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

5.1.5 Drilling and mud processing areas

Flame or thermal detectors are to be installed in open drilling and/or mud processing areas. Smoke detectors may be used in enclosed mud processing areas.

5.1.6 Manually operated alarm system

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.

5.2 Combustible gas detection and alarm systems

5.2.1 Areas for protection

Fixed automatic combustible gas detection and alarm systems are to be provided to the satisfaction of IRS so arranged as 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. At least the following areas are to be monitored :

- a) Cellar deck
- b) Drill floor
- c) Ventilation intake of positive pressure driller's cabin
- d) Mud pit area
- e) Shale shaker area
- f) Enclosed spaces containing the open components of mud circulation system from the bell nipple to the mud pits
- g) Ventilation intakes of accommodation spaces
- h) Ventilation intakes of enclosed machinery spaces contiguous to hazardous areas and containing internal combustion engines, boilers, or non-explosion proof electrical equipment
- i) Air intakes to all combustion engines or machinery, including internal combustion engines, boilers, compressors or turbines, located outside of an enclosed machinery space
- j) At each access door to accommodation spaces
- k) Near other openings, including emergency egress, of accommodation spaces, regardless if these openings are fitted with self-closing and gastight closing appliances

5.2.2 Area where protection is not required

Fixed automatic combustible gas detection and alarm systems are not required in the following areas:

- a) Near access doors to accommodation spaces

where these form part of an air-lock which is provided with a gas detection and alarm system between the two doors of the air-lock

b) Near emergency egress doors which are fitted with a mechanism to prevent use other than in an emergency (e.g. doors fitted with security seals acting as a deterrent but easily breakable in a real emergency)

c) Near other openings which are provided with closing appliances of non-opening type, e.g. bolted closed maintenance ways etc.

5.2.3 Alarms

The gas detectors are to be connected to an audible and visual alarm system with indicators on the drill floor and in the main control station. The alarm system is to clearly indicate the location and concentration of the gas hazard. The combustible gas detectors are to alarm at not more than 25% and at 60% of the lower explosive limit (LEL).

5.2.4 Portable combustible gas detectors

In addition to the fixed automatic gas detection system, two portable combustible gas detectors are to be provided on the unit.

5.3 Hydrogen sulphide detection and alarm systems

5.3.1 Areas for protection

A fixed automatic hydrogen sulphide gas detection and alarm system are to be provided for the following areas:

- (a) Drill area;
- (b) Mud processing area; and
- (c) Well test area.

5.3.2 Alarms

The detectors are to be connected to an audible and visual alarm system with indicators in main control room. The system is to clearly indicate where gas has been detected.

Low level alarm set at 10 ppm and high level alarm set not higher than 300 ppm are to be designed. The high level alarm is to activate an evacuation alarm.

If the alarm at the main control point is not answered within 2 min, the toxic gas (hydrogen sulphide) alarm and the helideck status light are to be automatically activated.

5.3.3 Portable hydrogen sulphide gas detectors

At least two portable hydrogen sulphide gas monitoring devices are to be provided on the unit.

5.3.4 Requirements for respiratory protection equipment for hydrogen sulphide are indicated in Section 8.3.

Section 6

Fire Fighting Water Supply

6.1 Fire pumps

6.1.1 There are to be at least two independently driven fire pumps each arranged to draw directly from the sea and discharge into a fixed fire main.

6.1.2 At least one of the required pumps is to be dedicated for fire-fighting duties and be available for such duties at all times.

6.1.3 The pumps, their source of power and piping and valves are to be so arranged that a fire or flooding in any one compartment will not put all fire pumps out of action.

6.2 Pressure

6.2.1 The capacity of the required pumps is to be appropriate to the fire-fighting services supplied from the fire main. Where more pumps than required are installed, their capacity is to be to the satisfaction of IRS.

6.2.2 Each fire pump is to be able to maintain a pressure of at least 3.5 bar at any hydrants with two 19 [mm] nozzles in action. 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 7.0 bar at the foam installation and 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 could 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.

6.2.3 Where either of the required pumps is located in a space not normally manned and, in the opinion of IRS, is relatively far removed from working areas, suitable provision is to be made for remote start-up of that pump and remote operation of associated suction and discharge valves.

6.2.4 Except as provided in 6.1.2, sanitary, ballast, bilge or general service pumps may be accepted as fire pumps, provided that they are not normally used for pumping oil.

6.2.5 Every centrifugal pump which is connected to the fire main is to be fitted with a non-return valve.

6.2.6 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.

6.2.7 A fixed fire main is to be provided and be so equipped and arranged as to meet the provisions of 6.2.8 to 6.2.17.

6.2.8 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 required fire pumps operating simultaneously.

6.2.9 With the required fire pumps operating simultaneously, the pressure maintained in the fire mains is to be to the satisfaction of IRS and be adequate for the safe and efficient operation of all equipment supplied there from.

6.2.10 The fire main is to, where practicable, 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.

6.2.11 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.

6.2.12 The fire main is not to have connections other than those necessary for fire-fighting purposes.

6.2.13 All practical precautions consistent with having water readily available are to be taken to protect the fire main against freezing.

6.2.14 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.

6.2.15 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.

6.2.16 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 drilling operations. A hose is to be provided for every hydrant.

6.2.17 Fire hoses are to be of material approved by IRS and be sufficient in length to project a jet of water to any of the spaces in which they may be required to be used. Their maximum length is to be to the satisfaction of IRS. Every fire hose is to be provided with a dual-purpose nozzle and the necessary couplings. Fire hoses, together with any necessary fittings and tools, are to be ready for use at any time and are to be kept in conspicuous positions near the water service hydrants or connections.

6.2.18 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 with a maximum breadth in excess of 30 [m].

6.3 Nozzles

6.3.1 Dual purpose jet spray nozzles are to be fitted throughout the drilling unit. Nozzles are to comply with the following

.1 Standard nozzle sizes are to be 12 [mm], 16 [mm] and 19 [mm] or as near thereto as possible. Larger diameter nozzles may be permitted at the discretion of IRS.

.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 6.2.2 from the smallest pump, provided that a nozzle size greater than 19 [mm] need not be used.

6.4 Supply

(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) For the self-elevating units, the following additional fire water supply measures are to be provided:

(a) Water is to be supplied from sea water main filled by at least two submersible pumping systems. Failure of any one system is not to put the other system(s) out of function, and

(b) Water is to be supplied from drill water system while unit is lifting or lowering. Water stored in the drill water tank(s) is not to be less than 40 m³ plus engine cooling water consumptions before the unit starts lifting or lowering. Alternatively, water may be supplied from buffer tank(s) in which sea water stored is not less than the quantity mentioned above.

6.5 Additional requirements for periodically unattended machinery spaces

6.5.1 Provision is to be made for immediate water delivery from the fire main system at a suitable pressure, due regard being paid to the possibility of freezing, either:

.1 by remote starting arrangements for one of the main fire pumps. The starting positions are to be provided at strategic locations including the navigating bridge, if any, and a normally manned control station; or

.2 by permanent pressurization of the fire main system, either

.2.1 by one of the main fire pumps; or

.2.2 by a dedicated pump for the purpose with automatic starting of one of the main fire pumps on reduction of the pressure.

6.6 International shore connection

6.6.1 The surface unit is to be provided with at least one international shore connection complying with *Rules & Regulations For The Construction & Classification of Steel Ships* Pt. 6, Ch. 3, Sec 4.2.1.7 and the FSS Code. Facilities are to be available enabling such a connection to be used on any side of the unit.

Section 7

Other Fire Fighting Arrangements

7.1 General

7.1.1 This section gives the requirements for fixed fire extinguishing systems (other than fire fighting water supply specified in section 6) and for portable fire extinguishers.

7.2 Fire-extinguishing arrangement in machinery spaces and in spaces containing fired processes

7.2.1 In spaces 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 complying with *Rules & Regulations For The Construction & Classification of Steel Ships* Pt. 6, Ch.3, Sec. 4.4:

- .1.1 a fixed pressure water-spraying system;
- .1.2 a fixed gas fire-extinguishing system;
- .1.3 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 is 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, whereby 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 IRS. An approved portable extinguisher may be provided as an alternative.

7.2.2 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, are to be provided with the following arrangements:

.1 one of the fixed arrangements required by paragraph 7.2.1.1; and

.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.

7.2.3 IRS may 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.

7.2.4 Where, in the opinion of IRS, a fire hazard exists in any machinery space for which no specific provisions for fire-extinguishing appliances are prescribed in 7.2.1 to 7.2.3, 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 IRS.

7.3 Fixed fire extinguishing systems on drilling areas

- (a) A fixed water spray system is to be provided to protect drilling area. The minimum water application rate is not to be less than 20.4 l/min·m², or
- (b) At least two dual-purpose (jet/spray) fire monitors are to be installed to cover drilling and well test areas. The minimum capacity of each monitor is not to be less than 100 m³/h. The monitors may be operated either remotely or locally. Monitor arranged for local operation is to be sited in an accessible protected position.

7.4 Fixed fire extinguishing systems on mud processing area

A suitable fixed foam system is to be provided. The system is to be capable of delivering foam solution at a rate of not less than 6.5 l/min·m² (4.1 l/min·m² for Aqueous Film Forming Foam or Film-Forming Fluoroprotein Foam) for 15 minutes. Alternatively, a gas fixed fire extinguishing system may be used for enclosed mud processing spaces.

7.5 Portable fire extinguishers in accommodation, service and working spaces

7.5.1 Except for the supplemental arrangements provided in 7.5.2, 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 are to be provided in number and arrangement in accordance with "MSC.1/Circ.1275 " Number and Arrangement of Portable Fire Extinguishers on Board Ships."

7.5.2 Table 7.1 contains supplemental recommendations for number and distribution of additional portable fire extinguishers on mobile offshore drilling units. Where the recommendations in table 7.1 differ from the MSC.1/Circ.1275, the provisions of table 7.1 are to be followed. In all cases, the selection of the fire extinguishing medium is to be based on the fire hazard for the space protected. The classes of portable fire extinguishers in the table are only for reference.

7.6 Fire-fighters' outfits

7.6.1 At least two fire-fighters' outfits complying with the relevant requirements of *Rules & Regulations For The Construction & Classification of Steel Ships*, Pt. 6, Ch. 8 are to be provided, each with portable instruments for measuring oxygen and flammable vapour concentrations acceptable to IRS.

7.6.2 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.

7.6.3 The fire-fighters' outfits are to be kept ready for use in an easily accessible location that is permanently and clearly marked. They are to be stored in two or more widely separated locations.

7.7 Recharging of air cylinders

7.7.1 The apparatus for recharging air cylinders, if provided, is to have its power supplied from the emergency supply or be independently diesel-powered, and be so constructed or equipped that the air cylinders may be used immediately after recharging.

7.7.2 The apparatus is to be suitably located in a sheltered space above main deck level on the unit.

7.7.3 Intakes for air compressors are to draw from a source of clean air.

7.7.4 The air is to be filtered after compression to eliminate compressor oil contamination.

7.7.5 The recharging capacity is to meet the requirements of *Rules & Regulations For The Construction & Classification of Steel Ships* Pt. 6, Ch. 3, Cl. 4.10.2.6.

7.7.6 The equipment and its installation are to be to the satisfaction of IRS.

7.8 Additional requirements for periodically unattended machinery spaces

7.8.1 An approved fixed fire-extinguishing system is to be provided in units that are not required to have this provision by 7.2.

7.8.2 IRS may give special consideration to maintaining the fire integrity of the machinery spaces, to the location and centralization of the fire-extinguishing system controls and to the required shutdown arrangements (e.g., ventilation, fuel pumps, etc.); it may require additional fire-extinguishing appliances and other fire-fighting equipment and breathing apparatus.

7.9 Fire-extinguishing arrangements for the drill floor

7.9.1 The drill floor is to be protected by a fixed pressure water-spraying system designed to provide a minimum water application rate of 20 l/m²/min to the drill floor and related equipment, including emergency shutdown equipment, critical structural components, and enclosure fire barriers. Alternatively, multiple fixed monitors discharging at a minimum flow rate and pressure 1900 l/min at 1 MPa may be provided and arranged such that all areas and equipment can be reached by at least two monitors which are widely separated.

7.9.2 The system is to be designed for manual release from release stations located outside the protected area. Any section valves necessary for the operation of the system are to be located outside the protected area. Automatic release may be accepted by IRS.

7.9.3 Nozzles, piping, fittings and related components are to be designed to withstand exposure to temperatures up to 925°C.

7.9.4 The main fire pumps may be used to supply the fixed pressure water-spraying system if they

have sufficient capacity to simultaneously supply the fire main at the required flow and pressure.

Table 7.1 : Recommended number and distribution of additional portable extinguishers (refer Cl. 7.5.2)

Type of Space	Minimum number of extinguishers ¹	Class(es) of extinguisher(s)
Space containing the controls for the main source of electrical power	1; and 1 additional extinguisher suitable for electrical fires when main switchboards are arranged in the space	A and/or C
Cranes: With electric motors/hydraulics	0	
Cranes: With internal combustion engine	2 (1 in cab and 1 at exterior of engine compartment)	B
Drill floor	2 (1 at each exit)	C
Helidecks	In accordance with section 3	B
Machinery spaces of category A	In accordance with section 7.2	B
Machinery spaces of category A which are periodically unattended	At each entrance in accordance with section 7.2 ²	B
Main switchboards	2 in the vicinity	C
Mud pits, Mud processing areas	1 for each enclosed space (Travel distance to an extinguisher not to exceed 10 [m] for open space)	B
<p>¹ Minimum size is to be in accordance with paragraph 4.2.1.1 of chapter 8 of the <i>Rules & Regulations for The Construction & Classification of Steel Ships</i>.</p> <p>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.</p>		

Section 8

Escape

8.1 Means of escape

8.1.1 Within the accommodation spaces, service spaces and control stations the following provisions are to be applied:

.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. Exceptionally, IRS may permit only one means of escape, due regard being paid to the nature and location of spaces and to the number of persons who might normally be accommodated or employed there.

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

.3 Every escape route is to be readily accessible and unobstructed and 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 is to 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 are to be of photoluminescent material or marked by lighting. IRS will verify that such lighting or photoluminescent equipment has been evaluated, tested and applied in accordance with *Rules & Regulations For The Construction & Classification of Steel Ships* Pt. 6, Ch. 8.

8.1.2 Two means of escape are to be provided from each machinery space of category A. Ladders are to be of steel or other equivalent material. In particular, one of the following

provisions is to be complied with:

.1 two sets of 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. One of these ladders is to be located within a protected enclosure that satisfies tables 2.1 and 2.2, category (4), from the lower part of the space it serves to a safe position outside the space. Self-closing fire doors of the same fire integrity standards are to be fitted in the enclosure. The ladder is to be fixed in such a way that heat is not transferred into the enclosure through non-insulated fixing points. The enclosure is to have minimum internal dimensions of at least 800 [mm] by 800 [mm], and is to have emergency lighting provisions; or

.2 one ladder leading to a door in the upper part of the space from which access is provided to the open deck. Additionally, in the lower part of the space, in a position well separated from the ladder referred to, a steel door capable of being operated from each side is to be provided with access to a safe escape route from the lower part of the space to the open deck.

8.1.3 From machinery spaces other than those of category A, escape routes are to be provided to the satisfaction of IRS having regard to the nature and location of the space and whether persons are normally employed there.

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

8.1.5 Superstructures and deckhouses are to be sited such that, in the event of fire at the drill floor, at least one escape route to the embarkation position and survival craft is protected against radiation heat flux levels in excess of 2.5 kW/m² emanating from the drill floor .

8.1.6 Stairways and corridors used as a means of escape are to meet the provisions of *Rules & Regulations For The Construction & Classification of Steel Ships*, Pt. 6, Ch. 8, Sec. 13.3.

8.2 Emergency escape breathing devices

8.2.1 Emergency escape breathing devices (EEBDs) are to comply with the *Rules & Regulations For The Construction & Classification of Steel Ships*, Pt. 6, Ch. 8. Spare

emergency escape breathing devices are to be kept on board to the satisfaction of IRS.

8.2.2 Emergency escape breathing devices are to be provided as follows:

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

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

.1.2 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

.1.3 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).

.1.4 Alternatively, a different number or location may be determined by IRS taking into consideration the layout and dimensions or the normal manning of the space.

.2 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).

.3 For other machinery spaces, the number and location of EEBDs will be specially considered.

8.3 Respiratory protection equipment for hydrogen sulphide

8.3.1 A self-contained breathing apparatus (SCBA) positive-pressure/pressure-demand breathing equipment with full-face piece and rated for a minimum of 30 minutes is to be provided for each person in working areas where hydrogen sulphide may be encountered, and a SCBA rated for a minimum of 15 minutes is to be provided for each person in other areas, or,

8.3.2 A positive-pressure/pressure-demand air line breathing equipment with a low pressure warning alarm coupled with a SCBA rated for a minimum of 15 minutes is to be provided for each person on board the unit.

Breathing air supply line stations are to be provided at least in the following areas:

- (a) Living quarter;
- (b) Muster/evacuation area;
- (c) Drilling areas;
- (d) Mud processing areas; and
- (e) Other working areas.

Section 9

Fire Fighting Equipment for Helicopter Facilities

9.1 General

9.1.1 Where areas of a drilling unit are designated for helicopter facilities, the fire fighting systems as given in 9.2 and 9.3 are to be provided and so arranged as to adequately protect both the helicopter deck and fuel storage areas.

This section provides additional measures in order to address the fire safety objectives for units fitted with facilities for helicopters and meets the following functional provisions:

.1 helideck structure is to 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 helicopter facility operation manuals, which may be included in the operation manual (Chapter 1 of the Rules) and training are to be provided.

9.1.2 The construction of the helidecks is to be of steel or other equivalent materials. If the helideck forms the deckhead of a deckhouse or superstructure, it is to be insulated to "A-60" class standard. If IRS permits aluminium or other low melting point metal construction that is not made equivalent to steel, the following provisions are to be satisfied:

.1 if the helideck is cantilevered over the side of the unit, after each fire that may have an effect on the structural integrity of the helideck or its supporting structures, the helideck is to undergo a structural analysis to determine its suitability for further use; and

.2 if the helideck is located above the unit's deckhouse or similar structure, the following conditions are to be satisfied:

.2.1 the deckhouse top and bulkheads under the helideck are to have no openings;

.2.2 windows under the helideck are to be provided with steel shutters; and

.2.3 after each fire on the helideck or supporting structure the helideck is to undergo a structural analysis to determine its suitability for further use.

9.1.3 A helideck is to be provided with both a main and an emergency means of escape and access for fire fighting and rescue personnel. These are to be located as far apart from each other as is practicable and preferably on opposite sides of the helideck.

9.2 Fire fighting arrangements

9.2.1 Portable fire extinguishers

(a) Primary extinguishers: dry powder extinguishers of a total capacity of not less than 45 kg.

(b) Back-up extinguishers: CO₂ 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 extinguishers are to be located so that they would not be vulnerable to the same damage as the primary extinguishers.

Fixed fire fighting systems

(a) Fire water system: at least two approved nozzles of jet/spray type and hoses sufficient in length to reach any part of the helicopter deck.

(b) Fixed foam system: A foam application system consisting of monitors or foam-making branch pipes capable of delivering foam to all parts of the helideck in all weather conditions in which the helideck is intended to be available for helicopter operations. The minimum capacity of the foam production system will depend upon the size of the area to be protected, the foam application rate, the discharge rates of installed

equipment and the expected duration of application:

i) a minimum application rate of 6 l/m² within a circle having a diameter equal to the D-value;

ii) a minimum of 5 min discharge capability is to be provided

iii) foam delivery at the minimum application rate is to start within 30 [s] of system activation;

(c) the principal agent should be suitable for use with salt water and conform to performance standards not inferior to those acceptable to IRS;

(d) in lieu of the provisions of paragraphs 9.2.2 (b) and 9.2.2 (c), on units constructed on or after 1 January 2020, foam firefighting appliances complying with the provisions of the FSS Code;

(e) in addition to the provisions of 7.4, two fire-fighter's outfits; and

(f) at least the following equipment are to be stored in a manner that provides for immediate use and protection from the elements:

- i) adjustable wrench;
- ii) blanket, fire-resistant;
- iii) cutters, bolt, 600 [mm];
- iv) hook, grab or salving;
- v) hacksaw, heavy duty complete with six spare blades;
- vi) ladder;
- vii) lift line 5 [mm] diameter and 30 [m] in length;
- viii) pliers, side-cutting;
- ix) set of assorted screwdrivers;
- x) harness knife complete with sheath; and
- xi) crowbar.

(g) Drainage facilities in way of helidecks are to be:

- i) constructed of steel or other arrangements providing equivalent fire safety;

- ii) lead directly overboard independent of any other system; and
- iii) designed so that drainage does not fall onto any part of the unit.

9.3 Additional requirements for helicopter facilities with refueling capabilities

9.3.1 Fire fighting systems as in 9.2 and so arranged as to adequately protect both the helicopter deck and fuel storage areas.

9.3.2 a designated area is to be provided for the storage of fuel tanks which is to be:

.2.1 as remote as is practicable from accommodation spaces, escape routes and embarkation stations; and

.2.2 isolated from areas containing a source of vapour ignition;

9.3.3 the fuel storage area is to be provided with arrangements whereby fuel spillage may be collected and drained to a safe location;

9.3.4 tanks and associated equipment are to be protected against physical damage and from a fire in an adjacent space or area;

9.3.5 where portable fuel storage tanks are used, special attention is to be given to:

.5.1 design of the tank for its intended purpose;

.5.2 mounting and securing arrangements;

.5.3 electric bonding; and

.5.4 inspection procedures;

9.3.6 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;

9.3.7 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;

9.3.8 electrical fuel pumping units and associated control equipment are to be of a type suitable for the location and potential hazards;

9.3.9 fuel pumping units are to incorporate a device which will prevent over-pressurization of the delivery or filling hose;

9.3.10 equipment used in refuelling operations is to be electrically bonded; and

9.3.11 "NO SMOKING" signs are to be displayed at appropriate locations.

Section 10

Operational Readiness and Maintenance

10.1 General

10.1.1 The following functional provisions are to be met:

.1 gas detection systems, fire protection systems and fire-fighting systems and appliances are to be maintained ready for use; and

.2 gas detection systems, fire protection systems and fire-fighting systems and appliances are to be properly tested and inspected.

10.1.2 At all times while the unit is in service, the provisions of 10.1 are to be complied with. A unit is not in service when:

.1 it is in for repairs or lay up (either at anchor or in port) or in dry-dock;

.2 it is declared not in service by the owner or the owner's representative.

10.2 Operational readiness

10.2.1 The following gas detection and fire protection systems are to be kept in good order so as to ensure their intended performance if a fire occurs:

.1.1 structural fire protection including fire-resisting divisions and protection of openings and penetrations in these divisions;

.1.2 fire detection and fire alarm systems;

.1.3 gas detection and alarm systems; and

.1.4 means of escape systems and appliances.

10.2.2 Fire-fighting systems and appliances and portable gas detection systems are to be kept in good working order and readily available for immediate use. Portable extinguishers which have been discharged are to be immediately recharged or replaced with an equivalent unit.

10.3 Maintenance, testing and inspections

10.3.1 Maintenance, testing and inspections are to be carried out based on the guidelines developed by IMO (refer to the guidelines on

maintenance and inspection of fire protection systems and appliances-MSC/Circ.850) and in a manner having due regard to ensuring the reliability of fire-fighting systems and appliances.

10.3.2 The maintenance plan is to be kept on board the unit and be available for inspection whenever required by IRS.

10.3.3 The maintenance plan is to include at least the following fire protection systems and fire-fighting systems and appliances, where installed:

.1 fire mains, fire pumps and hydrants including hoses, nozzles and international shore connections;

.2 fixed fire detection and fire alarm systems;

.3 fixed fire-extinguishing systems and other fire-extinguishing appliances;

.4 automatic sprinkler, fire detection and fire alarm systems;

.5 ventilation systems including fire and smoke dampers, fans and their controls;

.6 emergency shut down of fuel supply;

.7 fire doors including their controls;

.8 general emergency alarm systems;

.9 emergency escape breathing devices;

.10 portable fire extinguishers including spare charges or spare extinguishers;

.11 portable hydrogen sulphide gas detection monitoring devices;

.12 portable flammable gas and oxygen monitoring devices;

.13 gas detection and alarm systems; and

.14 fire-fighter's outfits.

10.3.4 The maintenance program may be computer-based.

Section 11

Alarms

11.1 General alarms

11.1.1 A general alarm system is to be provided and so installed as to be clearly perceptible in all parts of the unit. Alarm signal devices are to be provided which will produce a distinctive and strong note.

The signals used should be limited to general emergency, toxic gas (hydrogen sulphide), combustible gas, fire alarm and abandon unit signals.

The signals given over the general alarm system should be supplemented by instructions over the public address system.

11.1.2 General alarm is to be capable of being operated at least in the following spaces:

- (a) Main control station;
- (b) Drilling console;
- (c) Navigating bridge (if any); and
- (d) Fire control station (if any).

11.2 Mud system level alarms

11.2.1 A suitable audible and visual alarm to indicate significant increase or decrease in the level of the contents of the mud pit is to be provided at the control station for drilling operations and at the mud pit. Equivalent means to indicate possible abnormal conditions in the drilling system may be considered by IRS.

11.3 Ventilation system alarm

See Ch. 11, Sec 2.2

11.4 Public address

11.4.1 The public address system is to be a loudspeaker installation enabling the broadcast of messages into all spaces where personnel are normally present and muster stations. It is to allow for the broadcast of messages from navigation bridge, central control room, emergency response centre, engine control room, ballast control station, jacking control station and drilling console. It is to be installed taking into account any acoustically marginal conditions and not require any action from the addressee. It is to be protected against unauthorized use.

11.4.2 The minimum sound pressure levels for broadcasting emergency announcements are to be:

- (1) In interior spaces 75dB(A) and at least 20dB(A) above the speech interference level; and
- (2) In exterior spaces 80dB(A) and at least 15dB(A) above the speech interference level.

End of Chapter