INTER-GOVERNMENTAL MARITIME
CONSULTATIVE ORGANIZATION

Distr.
GENERAL

A XI/Res.414
15 January 1980

Original: ENGLISH

ASSEMBLY - 11th session
Agenda item 10(b)

IMCO

RESOLUTION A.414(XI)

adopted on 15 November 1979

CODE FOR THE CONSTRUCTION AND EQUIPMENT OF MOBILE OFFSHORE DRILLING UNITS

A

THE ASSEMBLY,

RECALLING Article 16(i) of the Convention on the Inter-Governmental Maritime Consultative Organization concerning the functions of the Assembly,

NOTING that mobile offshore drilling units are increasingly being moved and operated internationally,

RECOGNIZING that the design criteria for such units are often quite different from those of conventional ships and that, by virtue of this, the application of international conventions, such as the International Convention for the Safety of Life at Sea, 1974, and the International Convention on Load Lines, 1966, is inappropriate in respect of mobile offshore drilling units,

HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its fortieth session,

1. ADOPTS the Code for the Construction and Equipment of Mobile Offshore Drilling Units (MODU Code), the text of which is set out in the Annex to this resolution, and which supersedes the following recommendations:

   (a) Safety radiocommunication requirements for drilling and production platforms and similar units (resolution A.182(VI));

   (b) Recommendation on life-saving appliances, equipment and procedures for mobile offshore drilling units (provisionally adopted by the Maritime Safety Committee at its nineteenth session (LSA/Circ.23));

   (c) Recommendation on fire safety of mobile offshore drilling units (adopted by the Maritime Safety Committee at its twenty-second session (MSC/Circ.86));

2. INVITES all Governments concerned:

   (a) To take appropriate steps to give effect to the Code not later than 31 December 1981,

   (b) To consider the Code as an equivalent to the technical requirements of the above-mentioned Conventions;

   (c) To inform IMCO of measures taken in this respect.

B

THE ASSEMBLY,

HAVING ADOPTED the Code for the Construction and Equipment of Mobile Offshore Drilling Units (MODU Code),

RECOGNIZING that the design technology of mobile offshore drilling units is rapidly evolving and that new features of mobile offshore drilling units may be introduced,

AUTHORIZES the Maritime Safety Committee to amend the Code as necessary after due consultations with relevant organizations as the Committee deems necessary.

ANNEX

CODE FOR THE CONSTRUCTION AND EQUIPMENT OF
MOBILE OFFSHORE DRILLING UNITS

PREAMBLE

1 This Code has been developed to provide an international standard for mobile offshore drilling units of new construction so that its application will facilitate international movement and operation of these units and result in a level of safety for such units and for personnel on board equivalent to that required for conventional ships engaged on international voyages by the International Convention for the Safety of Life at Sea, 1974 and the International Convention on Load Lines, 1966.

2 Throughout the development of the Code it was recognized that it must be based upon sound design and engineering principles and experience gained from operating such units; furthermore, that design technology of mobile offshore drilling units is not only a complex technology but is rapidly evolving and that the Code should not remain static but be re-evaluated and revised as necessary. To this end the Organization will periodically review the Code, taking into account both experience and future development.

3 Any existing unit which complies with the provisions of the Code should be considered eligible for issuance of a certificate in accordance with this Code.

4 The Code is not intended to prohibit the use of an existing unit simply because its design, construction and equipment do not conform to the requirements of this Code. Many existing mobile offshore drilling units have operated successfully and safely for extended periods of time and their operating history should be considered in evaluating their suitability to conduct international operations.

5 The coastal State may permit any unit designed to a lesser standard than that of the Code to engage in operations having taken account of the local environmental conditions. Any such unit should, however, comply with safety requirements which in the opinion of the coastal State are adequate for the intended operation and ensure the overall safety of the unit and the personnel on board.

6 The Code does not include requirements for the drilling of or the procedures for control of the subsea well. The drilling operations are subject to control by the coastal State.

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CHAPTER 1 – GENERAL

1.1 Purpose

The purpose of the Code for the Construction and Equipment of Mobile Offshore Drilling Units, hereinafter referred to as the Code, is to recommend design criteria, construction standards and other safety measures for mobile offshore drilling units so as to minimize the risk to such units, to the personnel on board and to the environment.

1.2 Application

1.2.1 The Code applies to mobile offshore drilling units as defined in 1.3.1 to 1.3.4.

1.2.2 The coastal State may impose additional requirements regarding the operational aspects of industrial systems not dealt with by the Code.

1.3 Definitions

For the purpose of this Code, unless expressly provided otherwise, the terms used therein have the meaning defined in the following paragraphs.

1.3.1 *Mobile offshore drilling unit* or *unit* is a vessel capable of engaging in drilling operations for the exploration for or exploitation of resources beneath the sea-bed such as liquid or gaseous hydrocarbons, sulphur or salt.

1.3.2 *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.

1.3.3 *Self-elevating unit* is a unit with moveable legs capable of raising its hull above the surface of the sea.

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

1.3.5

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

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

1.3.6 *Organization* means the Inter-Governmental Maritime Consultative Organization (IMCO).

1.3.7 *Certificate* means Mobile Offshore Drilling Unit Safety Certificate.

1.3.8 *1974 SOLAS Convention* means the International Convention for the Safety of Life at Sea, 1974.

1.3.9 *1966 Load Line Convention* means the International Convention on Load Lines, 1966.

1.3.10 *Mode of operation* means a condition or manner in which a unit may operate or function while on location or in transit. The modes of operation of a unit include the following:

.1 Operating conditions – conditions wherein a unit is on location for the purpose of conducting drilling operations, and combined environmental and operational loadings are within the appropriate design limits established for such operations. The unit may be either afloat or supported on the sea-bed, as applicable.

.2 Severe storm conditions -- conditions wherein a unit may be subjected to the most severe environmental loadings for which the unit is designed. Drilling operations are assumed to have been discontinued due to the severity of the environmental loadings. The unit may be either afloat or supported on the sea-bed, as applicable.

.3 Transit conditions -- conditions wherein a unit is moving from one geographical location to another.

1.3.11 *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.

1.3.12 *Length* (L) means 96 per cent of the total length on a waterline at 85 per cent of the least moulded depth 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.

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

1.3.14 *Normal operational habitable conditions* means:

.1 conditions under which the unit as a whole, its machinery, services, means and aids ensuring safe navigation when underway, 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 minimum confortable conditions of habitability are in working order and functioning normally; and

.2 drilling operations.

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

1.3.16 *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 conditons.

1.3.17 *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.

1.3.18 *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.

1.3.19 *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 intended to distribute electrical energy to the emergency services.

1.3.20 *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.

1.3.21 *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.

1.3.22 *Auxiliary steering gear* is that 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.

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

.1 electric steering gear, an electric motor and its associated electrical equipment;

.2 electrohydraulic steering gear, an electric motor and its associated electrical equipment and connected pump;

.3 other hydraulic gear, a driving engine and connected pump.

1.3.24 *Maximum ahead service speed* is the greatest speed which the unit is designed to maintain in service at sea at its deepest seagoing draught.

1.3.25 *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.

1.3.26 *Machinery spaces of Category A* are all spaces which contain internal combustion type machinery used either:

.1 for main propulsion; or

.2 for other purposes where such machinery has in the aggregate a total power of not less than 375 kilowatts, or which contain any oil-fired boiler or oil fuel unit; and trunks to such spaces.

1.3.27 *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.

1.3.28 *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. However, in the application of Chapter 9 the space where the emergency source of power is located is not considered as being a control station.

1.3.29 *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.

1.3.30

.1 *Enclosed spaces* are spaces delineated by floors, bulkheads and/or decks which may have doors and/or windows.

.2 *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.

1.3.31 *Industrial machinery and components* are the machinery and components which are used in connexion with the drilling operation.

1.3.32

.1 *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 the Administration by an established test procedure. Any other material is a combustible material.

.2 *A Standard Fire Test* is a test as defined in Regulation 3(b) of Chapter II-2 of the 1974 SOLAS Convention.

.3 *"A" Class Divisions* are those divisions as defined in Regulation 3(b) of Chapter II-2 of the 1974 SOLAS Convention.

.4 *"B" Class Divisions* are those divisions as defined in Regulation 3(b) of Chapter II-2 of the 1974 SOLAS Convention.

.5 *"C" Class Divisions* are those divisions constructed of non-combustible materials approved by the Administration. They need meet no requirements relative to the passage of smoke and flame or to the limiting of temperature rise.

.6 *Steel or other equivalent material* means steel or any material which, by itself or due to insulation provided, has structural and integrity properties equivalent to steel at the end of the applicable fire exposure to the standard fire test (e.g. aluminium alloy with appropriate insulation).

1.3.33 *Working spaces* are those open or enclosed spaces containing equipment and processes, associated with drilling operations, which are not included in 1.3.27.

1.3.34 *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.

1.3.35 *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.

1.3.36 *Fuel oil 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 0.18 newtons per square millimetre.

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

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

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

1.4 Exemptions

An Administration may exempt any unit which embodies features of a novel kind from any of the provisions of the Code the application of which might impede research into the development of such features. Any such unit should, however, comply with safety requirements which, in the opinion of that Administration, are adequate for the service intended and are such as to ensure the overall safety of the unit. The Administration which allows any such exemption should list such exemptions on the Certificate and communicate to the Organization the particulars, together with the reasons therefor, so that the Organization may circulate the same to other Governments for the information of their officers.

1.5 Equivalents

1.5.1 Where the Code requires that a particular fitting, material, appliance, apparatus, item of equipment or type thereof should be fitted or carried in a unit, or that any particular provision should be made, or any procedure or arrangement should be complied with, the Administration may allow any other fitting, material, appliance, apparatus, item of equipment or type thereof

to be fitted or carried, or any other provision, procedure or arrangement to be made in that unit, if it is satisfied by trial thereof or otherwise that such fitting, material, appliance, apparatus, item of equipment or type thereof or that any particular provision, procedure or arrangement is at least as effective as that required by the Code.

1.5.2 When an Administration so allows any fitting, material, appliance, apparatus, item of equipment or type thereof, or provision, procedure, arrangement, novel design or application to be substituted hereafter, it should communicate to the Organization the particulars thereof, together with a report on the evidence submitted, so that the Organization may circulate the same to other Governments for the information of their officers.

1.6 Surveys and certification

1.6.1 Each unit should be subject to the surveys specified below:

.1 An initial survey before the unit is put into service or before the Certificate required under this section of the Code is issued for the first time, which should include a complete survey of its structure, equipment, fittings, arrangements and material in so far as the unit is covered by the Code. This survey should be such as to ensure that the structure, equipment, fittings, arrangements and material fully comply with the applicable provisions of the Code.

.2 Periodical surveys at intervals specified by the Administration, but not exceeding five years, which should be such as to ensure that the structure, equipment, fittings, arrangements and material fully comply with the applicable provisions of the Code.

.3 Intermediate surveys at intervals specified by the Administration, but not exceeding thirty months, which should be such as to ensure that the structure, fittings, arrangements, safety equipment and other equipment fully comply with the applicable provisions of the Code and are in good working order. Such intermediate surveys should be endorsed on the Certificate issued under the provisions of this section.

.4 Radio station surveys in accordance with 11.10.

.5 A survey either general or partial according to the circumstances should be made every time a defect is discovered or an accident occurs which affects the safety of the unit or whenever any significant repairs or alterations are made. The survey should be such as to ensure that the repairs or alterations have been effectively made, are in all respects satisfactory and fully comply with the applicable provisions of the Code.

1.6.2 These surveys should be carried out by officers of the Administration. The Administration may, however, entrust the surveys either to surveyors nominated for the purpose or to organizations recognized by it. In every case the Administration concerned should fully guarantee the completeness and efficiency of the surveys.

1.6.3 After any survey under this section has been completed no significant change should be made in the structure, equipment, fittings, arrangements or material covered by the survey, without the sanction of the Administration, except the direct replacement of such equipment and fittings for the purpose of repair or maintenance.

1.6.4 A Certificate may be issued, after survey in accordance with this section, either by officers of the Administration or by any person or organization duly authorized by it. In every case the Administration assumes full responsibility for the Certificate.

1.6.5 The Certificate should be drawn up in the official language of the issuing country in the form corresponding to the model given in the Appendix to the Code. If the language used is neither English nor French, the text should include a translation into one of these languages.

1.6.6 Any exemptions granted under 1.4 should be clearly noted on the Certificate.

1.6.7 A Certificate should be issued for a period specified by the Administration, and should not exceed five years from the date of issue.

1.6.8 No extension of the five-year period of validity of the Certificate should be permitted.

1.6.9 A Certificate should cease to be valid if significant alterations have been made in the construction, equipment, fittings, arrangements or material specified by the Code without the sanction of the Administration, except the direct replacement of such equipment or fittings for the purpose of repair or maintenance, or if surveys as specified by the Administration under the provisions of 1.6.1 are not carried out.

1.6.10 A Certificate issued to a unit should cease to be valid upon transfer of such a unit to the flag of another country.

1.6.11 The privileges of the Code may not be claimed in favour of any unit unless it holds a valid Certificate.

1.7 Control

1.7.1 Every unit holding a Certificate issued under 1.6 is subject while under the jurisdiction of other Governments to control by officers duly authorized by such Governments in so far as this control is directed towards verifying that there is on board a valid Certificate. Such Certificate should be accepted unless there are clear grounds for believing that the condition of the unit or its equipment does not correspond substantially with the particulars of that Certificate and the Operating Manual. In that case, the officer carrying out the control may take such steps as will allow the unit to operate on a temporary basis without undue risk to the unit and the personnel on board. In the event of this control giving rise to intervention of any kind, the officer carrying out the control should inform the Administration or the Consul of the country in which the unit is registered in writing forthwith of all circumstances in which intervention was deemed to be necessary, and the facts should be reported to the Organization.

1.7.2 Notwithstanding 1.7.1, the provisions of 1.6 are without prejudice to any rights of the coastal State under international law to impose its own requirements relating to the regulation, surveying and inspection of units engaged, or intending to engage, in the exploration or exploitation of the natural resources of those parts of the sea-bed and sub-soil over which that State is entitled to exercise sovereign rights.

1.8 Casualties

Each Administration should supply the Organization with pertinent information concerning the findings of investigations of any casualty occurring to any of its units subject to the provisions of the Code. No reports or recommendations of the Organization based upon such information should disclose the identity or nationality of the units concerned or in any manner fix or imply responsibility upon any unit or person.

1.9 Review of the Code

1.9.1 The Code will be reviewed by the Organization as necessary to consider revision of existing provisions and the formulation of provisions for new developments in design, equipment or technology.

1.9.2 Where a new development in design, equipment or technology has been found acceptable to an Administration, that Administration may submit particulars of such development to the Organization for consideration of its incorporation into the Code.

CHAPTER 2 – CONSTRUCTION, STRENGTH AND MATERIALS

2.1 General

2.1.1 Administrations should take appropriate action to ensure uniformity in the implementation and application of the provisions of this chapter.

2.1.2 The design review and approval of each unit should be carried out by officers of the Administration. However, the Administration may entrust this function to certifying authorities nominated for this purpose or to organizations recognized by it. In every case the Administration concerned should fully guarantee the completeness and efficiency of the design evaluation.

2.2 Design loads

2.2.1

.1 The modes of operation for each unit are to be investigated using realistic loading conditions including gravity loadings with relevant environmental loadings. The following environmental considerations should be included where applicable:

.1 Wind
.2 Wave
.3 Current
.4 Ice
.5 Sea-bed conditions
.6 Temperature
.7 Fouling
.8 Earthquake

.2 Where possible, the above design environmental conditions should be based upon significant data with a period of recurrence of at least 50 years for the most severe anticipated environment.

.3 Results from relevant model tests may be used to substantiate or amplify calculations.

.4 Limiting design data for each mode of operation should be stated in the Operating Manual.

Wind loadings

2.2.2 Sustained and gust wind velocities, as relevant, should be considered when determining wind loadings. Pressures and resultant forces should be calculated by the method referred to in 3.2 or by some other method to the satisfaction of the Administration.

Wave loadings

2.2.3

.1 Design wave criteria should be described by design wave energy spectra or deterministic design waves having appropriate shape and size. Consideration should be given to waves of lesser height, where, due to their period, the effects on structural elements may be greater.

.2 The wave forces utilized in the design analysis should include the effects of immersion, heeling and accelerations due to motion. Theories used for the calculation of wave forces and the selection of coefficients should be to the satisfaction of the Administration.

Current loadings

2.2.4 Consideration should be given to the interaction of current and waves. Where necessary, this superposition should be performed by adding the current velocity vectorially to the wave particle velocity. The resultant velocity should be used in calculating the structural loading due to current and waves.

Loadings due to vortex shedding

2.2.5 Consideration should be given to loadings induced in structural members due to vortex shedding.

Deck loadings

2.2.6 A loading plan should be prepared to the satisfaction of the Administration showing the maximum design uniform and concentrated deck loadings for each area for each mode of operation.

Other loadings

2.2.7 Other relevant loadings should be determined in a manner to the satisfaction of the Administration.

2.3 Structural analysis

2.3.1 Sufficient loading conditions for all modes of operation should be analysed to enable the critical design cases for all principal structural components to be evaluated. This design analysis should be to the satisfaction of the Administration.

2.3.2 The scantlings should be determined on the basis of criteria which combine, in a rational manner, the individual stress components in each structural element. The allowable stresses should be to the satisfaction of the Administration.

2.3.3 Local stresses, including stresses caused by circumferential loadings on tubular members, should be added to primary stresses in evaluating combined stress levels.

2.3.4 The buckling strength of structural members should be evaluated where appropriate.

2.3.5 Where deemed necessary by the Administration, a fatigue analysis based on intended operating areas or environments should be provided.

2.3.6 The effect of notches, local stress concentrations and other stress raisers should be accounted for in the design of primary structural elements.

2.3.7 Where possible, structural joints should not be designed to transmit primary tensile stresses through the thickness of plates integral with the joint. Where such joints are unavoidable, the plate material properties and inspection procedures selected to prevent lamellar tearing should be to the satisfaction of the Administration.

2.4 Special considerations for surface units

2.4.1 The required strength of the unit should be maintained in way of the drilling well, and particular attention should be given to the transition of fore and aft members. The plating of the well should also be suitably stiffened to prevent damage during transit modes of operation.

2.4.2 Consideration should be given to the scantlings in way of large htaches to maintain strength.

2.4.3 The structure in way of components for the position mooring system such as fairleads and winches should be designed to withstand the stresses imposed when a mooring line is loaded to its breaking strength.

2.5 Special considerations for self-evaluating units

2.5.1

.1 The hull strength should be evaluated in the elevated position for the specified environmental conditions with maximum gravity loads aboard and supported by all legs. The distribution of these loads in the hull structure should be determined by a method of rational analysis. Scantlings should be calculated based on this analysis, but should not be less than those required for other modes of operation.

.2 The unit should be designed to enable the hull to clear the highest design wave including the combined effects of astronomical and storm tides. The minimum clearance may be the lesser of either 1.2 metres or 10 per cent of the combined storm tide, astronomical tide and height of the design wave above the mean low water level.

2.5.2

.1 Legs should be designed to withstand the dynamic loads which may be encountered by their unsupported length while being lowered to the bottom, and also to withstand the shock of bottom contact due to wave action on the hull. The maximum design motions, sea state and bottom conditions for operations to raise or lower the hull should be clearly stated in the Operating Manual.

.2 When evaluating leg stresses with the unit in the elevated position, the maximum overturning moment on the unit due to the most adverse combination of applicable environmental and gravity loadings should be considered.

.3 Legs should be designed for the most severe environmental transit conditions anticipated including wind moments, gravity moments and accelerations resulting from unit motions. The Administration should be provided with calculations, an analysis based on model tests, or a combination of both. Acceptable transit conditions should be included in the Operating Manual. For some transit conditions, it may be necessary to reinforce or support the legs, or to remove sections to ensure their structural integrity.

2.5.3 Structural members which transmit loads between the legs and the hull should be designed for the maximum loads transmitted and arranged to diffuse the loads into the hull structure.

2.5.4

.1 When a mat is utilized to transmit the bottom bearing loads, attention should be given to the attachment of the legs so that the loads are diffused into the mat.

.2 Where tanks in the mat are not open to the sea, the scantlings should be based on a design head using the maximum water depth and tidal effects.

.3 Mats should be designed to withstand the loads encountered during lowering including the shock of bottom contact due to wave action on the hull.

.4 The effect of possible scouring action (loss of bottom support) should be considered. The effect of skirt plates, where provided, should be given special consideration.

2.5.5 Except for those units utilizing the bottom mat, the capability should be provided to pre-load each leg to the maximum applicable combined load after initial positioning at a site. The pre-loading procedures should be included in the Operating Manual.

2.5.6 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 should have scantlings suitable for their size, function and location.

2.6 Special considerations for column stabilized units

2.6.1

.1 Unless deck structures are designed for wave impact, a clearance acceptable to the Administration should be maintained between passing wave crests and the deck structure. The Administration should be provided with model test data, past operating experience with similar configurations or calculations showing that adequate provision is made to maintain this clearance.

.2 For units operating while supported by the sea-bed the clearance required in 2.5.1.2 should be maintained.

2.6.2

.1 The scantlings of the upper structure should not be less than those required for the loadings shown in the deck loading plan.

.2 When an approved mode of operation or damaged condition in accordance with the stability requirements allows the upper structure to become waterborne, special consideration should be given to the resulting structural loadings.

2.6.3

.1 The scantlings of columns, lower hulls and footings should be based on the evaluation of hydrostatic pressure loadings and combined loadings including wave and current considerations.

.2 Where a column, lower hull or footing is a part of the overall structural frame of a unit, consideration should also be given to stresses resulting from deflections due to the applicable combined loadings.

.3 Particular consideration should be given to structural arrangements and details in areas subject to high local loadings resulting from, for example, external damage, wave impact, partially filled tanks or bottom bearing operations.

.4 When a unit is deisgned for operations while supported by the sea-bed, the footings should be designed to withstand the shock of bottom contact due to wave action on the hull. Such units should also be evaluated for the effects of possible scouring action (loss of bottom support). The effect of skirt plates, where provided, should be given special consideration.

.5 The structure in way of components for the position mooring system such as fairleads and winches should be designed to withstand the stresses imposed when a mooring line is loaded to its breaking strength.

2.6.4

.1 Bracing members should be designed to make the structure effective against applicable combined loadings, and when the unit is supported by the sea-bed, against the possibility of uneven bottom bearing loadings. Bracing members should also be investigated, where applicable, for combined stresses including local bending stresses due to buoyancy, wave forces and current forces.

.2 Where applicable, consideration should be given to local stresses caused by wave impact.

.3 Where bracings are watertight they should be designed to prevent collapse from hydrostatic pressure.

.4 Consideration should be given to the need for ring frames to maintain stiffness and shape in tubular bracing members.

2.7 Materials

Units should be constructed from steel or other suitable material having properties acceptable to the Administration.

2.8 Construction portfolio

A construction portfolio should be prepared and a copy placed on board the unit. It should include plans showing the location and extent of application of different grades and strengths of materials, together with a description of the materials and welding procedures employed, and any other relevant construction information. Restrictions or prohibitions regarding repairs or modifications should be included.

2.9 Welding

The welding procedures employed during construction should be to the satisfaction of the Administration. Welders should be qualified in the welding processes and procedures utilized. The selection of welds for testing and the methods utilized should be to the satisfaction of the Administration.

2.10 Testing

Upon completion, boundaries of tanks should be tested to the satisfaction of the Administration.

CHAPTER 3 – SUBDIVISION, STABILITY AND FREEBOARD

3.1 Inclining test

3.1.1 An inclining test should be required for the first unit of a design, when as near to completion as possible, to determine accurately the light ship weight and position of centre of gravity. The test should be carried out in the presence of an officer of the Administration or a duly authorized person or representative of an approved organization.

3.1.2 For successive units of a design, which are identical with regard to hull form and arrangement with the exception of minor changes in machinery or outfit, detailed weight calculations showing only the differences of weight and centres of gravity should be satisfactory provided the accuracy of the calculations is confirmed by a deadweight survey.

3.1.3 The results of the inclining test, or deadweight survey and inclining experiment adjusted for weight differences, should be indicated in the Operating Manual.

3.2 Righting moment and heeling moment curves

3.2.1

.1 Curves of righting moments and of wind heeling moments similar to figure 1 with supporting calculations should be prepared covering the full range of operating draughts including those in transit conditions, taking into account the maximum deck cargo and equipment in the most unfavourable position applicable. The righting moment curves and wind heeling moment curves should be related to the most critical axes. Account should be taken of the free surface of liquids in tanks.

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

3.2.2

.1 The curves of wind heeling moments should be drawn for wind forces calculated by the following formula:

$$F = \tfrac{1}{2} C_S C_H \rho V^2 A \text{ (newtons)}$$

where:

F = the wind force (newtons)

C_S = the shape coefficient depending on the shape of the structural member exposed to the wind (see table 1)

C_H = the height coefficient depending on the height above sea level of the structural member exposed to wind (see table 1)

ρ = the air mass density (1.222 kilogrammes per cubic metre)

V = the wind velocity (metres per second)

A = the projected area of all exposed surfaces in either the upright or the heeled condition (square metres)

TABLE 1. VALUES OF THE COEFFICIENT C_S

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

TABLE 2. VALUES OF THE COEFFICIENT C_H

Height above sea level (metres)	C_H
0 – 15.3	1.00
15.3 – 30.5	1.10
30.5 – 46.0	1.20
46.0 – 61.0	1.30
61.0 – 76.0	1.37
76.0 – 91.5	1.43
91.5 – 106.5	1.48
106.5 – 122.0	1.52
122.0 – 137.0	1.56
137.0 – 152.5	1.60
152.5 – 167.5	1.63
167.5 – 183.0	1.67
183.0 – 198.0	1.70
198.0 – 213.5	1.72
213.5 – 228.5	1.75
228.5 – 244.0	1.77
244.0 – 256.0	1.79
above 256	1.80

.2 Wind forces should be considered from any direction relative to the unit and the value of the wind velocity should be as follows:

.1 In general a minimum wind velocity of 36 metres per second (70 knots) for offshore service should be used for normal operating conditions and a minimum wind velocity of 51.5 metres per second (100 knots) should be used for the severe storm conditions.

.2 Where a unit is to be limited in operation to sheltered locations (protected inland waters such as lakes, bays, swamps, rivers, etc.) consideration should be given to a reduced wind velocity of not less than 25.8 metres per second (50 knots) for normal operating conditions.

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

3.2.3 In calculating the wind heeling moments the lever of the wind overturning force should be taken vertically from the centre of pressure of all surfaces exposed to the wind to the centre of lateral resistance of the underwater body of the unit. The unit is to be assumed floating free of mooring restraint.

3.2.4 The wind heeling moment curve should 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.

3.2.5 Wind heeling moments derived from wind tunnel tests on a representative model of the unit may be considered as alternatives to the method given in 3.2.2 to 3.2.4. Such heeling moment determination should include lift and drag effects at various applicable heel angles.

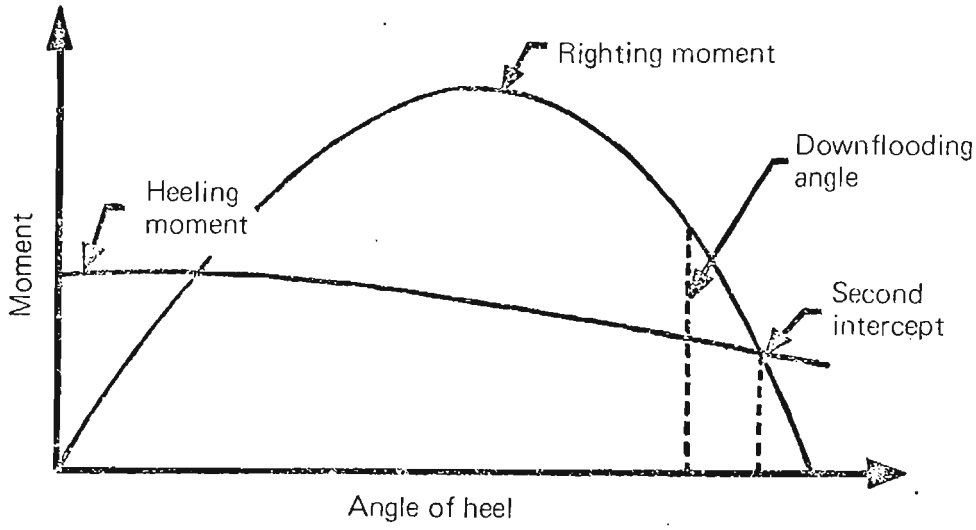

Figure 1 – Righting moment and heeling moment curves

3.3 Intact stability criteria

3.3.1 The stability of a unit in each mode of operation should meet the following criteria (see also figure 1):

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

.2 For column stabilized units the area under the righting moment curve to the angle of downflooding should be not less than 30 per cent in excess of the area under the wind heeling moment curve to the same limiting angle.

.3 The righting moment curve should be positive over the entire range of angles from upright to the second intercept.

3.3.2 Each unit should 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, should be contained in the Operating Manual.

3.3.3 Alternative stability criteria may be considered by the Administration provided an equivalent level of safety is maintained, for example, criteria based on wind tunnel tests and behaviour tests of a representative model in waves.

3.4 Subdivision and damage stability

3.4.1 The unit should have sufficient freeboard and be subdivided by means of watertight decks and bulkheads to provide sufficient buoyancy and stability to withstand in general the flooding of any one compartment in any operating or transit condition consistent with the damage assumptions set out in 3.5.

3.4.2 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 metres per second (50 knots) superimposed from any direction. In this condition the final waterline, after flooding, taking into account sinkage, trim and heel should be below the lower edge of any opening through which progressive flooding may take place.

3.4.3

.1 The requirements of 3.4.1 and 3.4.2 should 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 should be assumed that the unit is in the worst anticipated service condition as regards stability and is floating free of mooring restraints.

.2 The ability to reduce heeling angles by pumping out or ballasting compartments or application of mooring forces, etc., should not be considered as alleviating the requirements.

3.5 Extent of damage

3.5.1 *Surface units*

.1 In assessing the damage stability of surface units, the following extent of damage should be assumed to occur between effective watertight bulkheads:

.1 horizontal penetration: 1.5 metres; and

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

.2 The distance between effective watertight bulkheads or their nearest stepped portions, which are positioned within the assumed extent of horizontal penetration, should be not less than 3.0 metres; where there is a lesser distance one or more of the adjacent bulkheads should be disregarded.

.3 Where damage of a lesser extent than in 3.5.1.1 results in a more severe condition, such lesser extent should be assumed.

.4 All piping, ventilation systems, trunks, etc., within the extent of damage referred to in 3.5.1.1 should be assumed to be damaged. Positive means of closure should be provided at watertight boundaries to preclude the progressive flooding of other spaces which are intended to be intact.

3.5.2 *Self-elevating units*

.1 In assessing the damage stability of self-elevating units, the following extent of damage should be assumed to occur between effective watertight bulkheads:

.1 horizontal penetration: 1.5 metres; and

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

.2 The distance between effective watertight bulkheads or their nearest stepped portions, which are positioned within the assumed extent of horizontal penetration, should be not less than 3.0 metres; where there is a lesser distance one or more of the adjacent bulkheads should be disregarded.

.3 Where damage of a lesser extent than in 3.5.2.1 results in a more severe condition, such lesser extent should be assumed.

.4 Where a mat is fitted the above extent of damage should be applied to both the platform and the mat but not simultaneously, unless deemed necessary by the Administration due to their close proximity to each other.

.5 All piping, ventilation systems, trunks, etc. within the extent of damage referred to in 3.5.2.1 should be assumed to be damaged. Positive means of closure should be provided at watertight boundaries to preclude the progressive flooding of other spaces which are intended to be intact.

3.5.3 *Column stabilized units*

In assessing the damage stability of column stabilized units, the following extent of damage should be assumed:

.1 Only those columns on the periphery of the unit should be assumed to be damaged and the damage should be assumed in the exposed portions of the column.

.2 Columns which are subdivided into watertight compartments by watertight flats should in general be assumed to be damaged within any one compartment enclosed by watertight flats. Columns should be assumed to be flooded by damage having a vertical extent of 3.0 metres occurring at any level between 5.0 metres above and 3.0 metres below the draughts specified in the Operating Manual. Lesser distances above or below the draughts may be applied to the satisfaction of the Administration, taking into account the actual operating conditions. However, the extent of required damage region should be at least 1.5 metres above and below the draughts specified in the Operating Manual and where a watertight flat is located within this region, the damage should be assumed to have occurred in both compartments above and below the watertight flat in question.

.3 No vertical bulkhead should 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 should be disregarded.

.4 Horizontal penetration of damage should be assumed to be 1.5 metres.

.5 Footings should be assumed to be damaged when operating in a light or transit condition in the same manner as indicated in 3.5.3.1 to 3.5.3.4 or in 3.5.2, having regard to their shape.

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

3.6 Watertight integrity

3.6.1 The number of openings in watertight subdivisions should be kept to a minimum compatible with the design and proper working of the unit. Where penetrations of watertight decks and bulkheads are necessary for access, piping, ventilation, electrical cables, etc., arrangements should be made to maintain the watertight integrity of the enclosed compartments.

3.6.2

.1 Where valves are provided at watertight boundaries to maintain watertight integrity, these valves should be capable of being operated from a pump room or other normally manned space, a weather deck, or a deck which is above the final waterline after flooding. Valve position indicators should be provided at the remote control station.

.2 For self-elevating units the ventilation system valves required to maintain watertight integrity should be kept closed when the unit is afloat. Necessary ventilation in this case should be arranged by alternative approved methods.

3.6.3 *Internal openings*

.1 The means to ensure the watertight integrity of internal openings which are used during the operation of the unit, while afloat, should comply with the following:

.1 Doors should be remotely controlled from a central position on a deck which is above the final waterline after flooding and should also be operable locally from each side of the bulkhead. Indicators should be provided at the control position to indicate whether the doors are open or closed.

.2 The requirements regarding remote controls in 3.6.3.1.1 may be dispensed with for those doors or hatch covers which are normally closed while the unit is afloat, provided an alarm system (e.g. light signals) is arranged showing personnel both locally and at a central position, whether the doors in question are open or closed. A notice should be affixed to each such door or hatch cover to the effect that it is not to be left open while the unit is afloat.

.2 The means to ensure the watertight integrity of internal openings which are kept permanently closed during the operation of the unit, while afloat, should comply with the following:

.1 A notice should be affixed to each such closing appliance to the effect that it is to be kept closed while the unit is afloat, except that manholes fitted with close bolted covers need not be so marked.

.2 On self-elevating units, an entry should be made in the official log book or tour report, as applicable, to the effect that all such openings have been witnessed closed before the unit becomes waterborne.

3.6.4 *External openings*

.1 Where watertight integrity is dependent on external openings which are used during the operation of the unit, while afloat, they should comply with the following:

.1 Openings, the lower edges of which are not to be submerged, include air pipes (regardless of closing appliances), ventilators, ventilation intakes and outlets, non-watertight hatches and doorways not fitted with watertight closing appliances; and

.2 Openings such as manholes fitted with close bolted covers, small hatches* and sidescuttles of the non-opening type may be submerged.

* Small hatches, which may be submerged in case of damage, are those which are normally used for access by personnel. Such openings are to be closed by approved quick-acting watertight covers of steel or equivalent material. An alarm system (e.g. light signals) is to be arranged showing personnel, both locally and at a central position, whether the hatch covers in question are open or closed. In addition, a notice board to the effect the closing appliance is to be closed while at sea, and is only to be used temporarily, is to be fitted locally. Such openings are not to be regarded as emergency exits.

.2 The requirements of 3.6.3.2 should apply where the watertight integrity is dependent on external openings which are permanently closed during the operation of the unit, while afloat.

3.7 Freeboard

3.7.1 *General*

.1 The requirements, including those relating to certification, of the 1966 Load Line Convention should apply to all units and certificates should be issued as appropriate. The minimum freeboard of units which cannot be computed by the normal methods laid down by that Convention should be determined on the basis of meeting the applicable intact stability, damage stability and structural requirements for transit conditions and drilling operations while afloat. The freeboard should not be less than that computed from the Convention where applicable.

.2 The requirements of the 1966 Load Line Convention with respect to weathertightness and watertightness of decks, superstructures, deckhouses, doors, hatchway covers, other openings, ventilators, air pipes, scuppers, inlets and discharges, etc., should be taken as a basis for all units in the afloat conditions.

3.7.2 *Surface units*

.1 Load lines should be assigned to surface units as calculated under the terms of the 1966 Load Line Convention and should be subject to all the conditions of assignment of that Convention.

.2 Where it is necessary to assign a greater than minimum freeboard to meet intact or damage stability requirements or for any other restriction imposed by the Administration, Regulation 6(6) of the 1966 Load Line Convention should apply. When such a freeboard is assigned, seasonal marks above the centre of the ring should not be marked and any seasonal marks below the centre of the ring should be marked. If a unit is assigned a greater than minimum freeboard at the request of the owner, Regulation 6(6) need not apply.

.3 Where wells such as moonpools are arranged within the hull, the volume of the well should be deducted from the volume of displacement of the unit used for the calculation of the block coefficient. An addition should be made to the freeboard, equal to the volume of the well divided by the waterplane area to compensate for the loss of buoyancy.

.4 The procedure described in 3.7.2.3 should also apply in cases of small notches or relatively narrow cut-outs at the stern of the unit.

.5 Narrow wing extensions at the stern of the unit should be considered as appendages and excluded for the determination of length (L) and for the calculation of freeboards. The Administration should determine the effect of such wing extensions with regard to the requirements for the strength of unit based upon length (L).

3.7.3 *Self-elevating units*

.1 Load lines should be assigned to self-elevating units as calculated under the terms of the 1966 Load Line Convention. When floating or when in transit from one operational area to another units should be subject to all the conditions of assignment of that Convention unless specifically excepted. However, these units should not be subject to the terms of that Convention while they are supported by the sea-bed or are in the process of lowering or raising their legs.

.2 The minimum freeboard of units which due to their configuration cannot be computed by the normal methods laid down by the 1966 Load Line Convention should be determined on the basis of meeting applicable intact stability, damage stability and structural requirements in the afloat conditions.

.3 Where it is necessary to assign a greater than minimum freeboard to meet intact or damage stability requirements or for any other restriction imposed by the Administration, Regulation 6(6) of the 1966 Load Line Convention should apply. When such a freeboard is assigned, seasonal marks above the centre of the ring should not be marked and any seasonal marks below the centre of the ring should be marked. If a unit is assigned a greater than minimum freeboard at the request of the owner, Regulation 6(6) need not apply.

:4 Where wells such as moonpools are arranged within the hull, the volume of the well should be deducted from the volume of displacement of the unit used for the calculation of the block coefficient. An addition should be made to the freeboard, equal to the volume of the well divided by the waterplane area to compensate for the loss of buoyancy.

.5 The procedure described in 3.7.3.4 should apply in cases of small notches or relatively narrow cut-outs at the stern of the unit.

.6 Narrow wing extensions at the stern of the unit should be considered as appendages and excluded for the determination of length (L) and for the calculation of freeboards. The Administration should determine the effect of such wing extensions with regard to the requirements for the strength of unit based upon length (L).

.7 Self-elevating units may be manned when under tow. In such cases a unit would be subject to a bow height requirement which may not always be possible to achieve. In such circumstances, the Administration should consider the extent of application of Regulation 39(3) of the 1966 Load Line Convention to such units, having regard to the occasional nature of such voyages on predetermined routes and to prevailing weather conditions.

.8 Some self-elevating units utilize a large mat or similar supporting structure which contributes to the buoyancy when the unit is floating. In such cases the mat or similar supporting structure should be ignored in the calculation of freeboard. The mat or similar supporting structure should, however, always be taken into account in the evaluation of the stability of the unit when floating since its vertical position relative to the upper hull may be critical.

3.7.4 *Column stabilized units*

.1 The hull form of this type of unit makes the calculation of geometric freeboard in accordance with the provisions of Chapter III of the 1966 Load Line Convention impracticable. Therefore the minimum freeboard of each column stabilized unit should be determined by meeting the applicable requirements for:

.1 the strength of unit's structure;

.2 the minimum clearance between passing wave crests and deck structure (see 2.6.1); and

.3 intact and damage stability requirements.

.2 The minimum freeboard should be marked in appropriate locations on the structure. Where practicable, such marks should be visible to the person in charge of mooring, lowering or otherwise operating the unit.

.3 The main deck of each column stabilized unit should be made weathertight, as far as practicable.

.4 In general, heights of hatch and ventilator coamings, air pipes, door sills, etc., in exposed positions and their means of closing should be determined by consideration of both intact and damage stability requirements. In particular, all openings which may become submerged before the heeling angle at which the required area under the intact righting arm curve is achieved should be fitted with weathertight closing appliances. Weathertight closing appliances

should also be fitted to openings which lead to spaces the volume of which was included in the calculation of cross curves of stability and to sanitary discharges originating in such spaces and which lead through the shell. With regard to damage stability, the requirements in 3.6.4.1 should apply.

.5 Administrations should give special consideration to the position of openings which cannot be closed in emergencies, such as air intakes for emergency generators, having regard to the intact righting arm curves and the final waterline after assumed damage.

CHAPTER 4 – MACHINERY INSTALLATIONS FOR ALL TYPES OF UNITS

4.1 General (This section applied to Chapters 4 to 8)

4.1.1 The machinery and electrical requirements contained in Chapters 4 to 8 provide an acceptable degree of protection for personnel from fire, electric shock or other physical injuries. The requirements apply to both marine and industrial equipment.

4.1.2 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 this Code, and which are acceptable to the Administration, may be applied in addition to these requirements.

4.1.3 All machinery, electrical equipment, boilers and other pressure vessels, associated piping systems, fittings and wiring should be of a design and construction adequate for the service for which they are intended and should 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 should 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.

4.2 Machinery requirements

4.2.1 All boilers, all parts of machinery, all steam, hydraulic, pneumatic and other systems and their associated fittings which are under internal pressure should be subjected to an appropriate pressure test before being put into service for the first time.

4.2.2 Adequate provisions should be made to facilitate cleaning, inspection and maintenance of machinery including boilers and pressure vessels.

4.2.3 Where risk from over-speeding of machinery exists, means should be provided to ensure that the safe speed is not exceeded.

4.2.4 Where machinery including pressure vessels or any parts of such machinery are subject to internal pressure and may be subject to dangerous overpressure, means should, where applicable, be provided which will protect against such excessive pressure.

4.2.5 All gearing and every shaft and coupling used for transmission of power to machinery essential for the safety of the unit or persons on board should be so designed and constructed that it will withstand the maximum working stresses to which it may be subjected in all service conditions.

4.2.6 Internal combustion engines of a cylinder diameter of 200 millimetres or a crankcase volume of 0.6 cubic metres and above should be provided with crankcase explosion relief valves of an approved type with sufficient relief area. The relief valves should be arranged or provided with means to ensure that discharge from them is directed so as to minimize the possibility of injury to personnel.

4.2.7 Machinery, where applicable, should be provided with automatic shut-off arrangements or alarms in the case of failures, such as lubricating oil supply failure, which could lead rapidly to complete breakdown, damage or explosion. The Administration may permit provisions for over-riding automatic shut-off devices.

4.2.8 Means should be provided whereby normal operation of vital systems, such as ballast systems in semi-submersible units, jacking systems in self-elevating units or control of blow-out preventers, can be sustained or restored even though one of the essential auxiliaries becomes inoperable.

4.2.9 Means should be provided to ensure that machinery can be brought into operation from the "dead ship" condition without external aid.

4.3 Steam boilers and boiler feed systems

4.3.1 Every steam boiler and every unfired steam generator should be provided with not less than two safety valves of adequate capacity. However, the Administration may, having regard to the output or any other features of any boiler or unfired steam generator, permit only one safety valve to be fitted if it is satisfied that adequate protection against overpressure is provided.

4.3.2 Every oil-fired boiler which is intended to operate without manual supervision should have safety arrangements which shut off the fuel supply and give an alarm in the case of low water level, air supply failure or flame failure.

4.3.3 Every steam generating system which could be rendered dangerous by the failure of its feed water supply, should be provided with not less than two separate feed water 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 feed water system is required if automatic shutdown of the steam generating system upon loss of the feed water supply is provided. Means should be provided which will prevent overpressure in any part of the feed water system.

4.3.4 Boilers should be provided with means to supervise and control the quality of the feed water. As far as practicable, means should be provided to preclude the entry of oil or other contaminants which may adversely affect the boiler.

4.3.5 Every boiler essential for the safety of the unit and which is designed to have a water level should be provided with at least two means for indicating its water level, at least one of which should be a direct reading gauge glass.

4.4 Steam pipe systems

4.4.1 Every steam pipe and every fitting connected thereto through which steam may pass should be so designed, constructed and installed as to withstand the maximum working stresses to which it may be subjected.

4.4.2 Efficient means should be provided for draining every steam pipe where otherwise dangerous water hammer action might occur.

4.4.3 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 should be fitted.

4.5 Machinery controls

4.5.1 Machinery essential for the safety of the unit should be provided with effective means for its operation and control.

4.5.2 Automatic starting, operational and control systems for machinery essential for the safety of the unit should in general include provisions for manually overriding the automatic controls. Failure of any part of the automatic and remote control systems should not prevent the use of the manual override.

4.6 Air pressure systems

4.6.1 In every unit means should 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 should be provided for all systems.

4.6.2 The starting air arrangements for internal combustion engines, should be adequately protected against the effects of backfiring and internal explosions in the starting air pipes.

4.6.3 Starting air pipes from the air receivers to internal combustion engines should be entirely separate from the compressor discharge pipe system.

4.6.4 Provision should be made to reduce to a minimum the entry of oil into the starting air pressure systems and to drain these systems.

4.7 Arrangements for oil fuel, lubricating oil and other flammable oils

4.7.1 Arrangements for the storage, distribution and utilization of oil fuel should be such as to ensure the safety of the unit and persons on board.

4.7.2 Arrangements for the storage, distribution and utilization of oil used in pressure lubrication systems should be such as to ensure the safety of the unit and persons on board.

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

4.7.4 In machinery spaces pipes, fittings and valves carrying flammable oils should be of a material approved by the Administration, having regard to the risk of fire.

4.8 Bilge pumping arrangements

4.8.1 Units should be provided with an efficient bilge pumping plant capable of pumping from and draining any watertight compartment under all practical conditions whether the unit is upright or listed. Wing suctions should be provided if necessary for that purpose. If the Administration is satisfied that the safety of the unit is not impaired, the bilge pumping arrangements may be dispensed with in particular compartments.

4.8.2 Units should have at least two power pumps connected to the bilge main.

CHAPTER 5 – ELECTRICAL INSTALLATIONS FOR ALL TYPES OF UNITS

(See also 4.1)

5.1 General electrical requirements

5.1.1 Electrical installations should 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; and

.3 the safety of personnel and unit from electrical hazards will be assured.

5.1.2 Administrations should take appropriate steps to ensure uniformity in the implementation of application of the provisions of these requirements in respect of electrical installations.*

5.2 Main source of electrical power

5.2.1

.1 Every unit should be provided with a main source of electrical power which should include at least two generating sets.

.2 The power of these sets should be such that it is still possible to ensure the functioning of the services referred to in 5.1.1.1, except for services referred to in 1.3.14.1, in the event of any one of these generating sets being stopped.

.3 Where transformers or converters constitute an essential part of the supply system, the system should be so arranged as to ensure the same continuity of the supply, as stated in 5.2.1.2.

5.2.2

.1 A main electric lighting system which should provide illumination throughout those parts of the unit normally accessible to and used by personnel should be supplied from the main source of power.

.2 The arrangement of the main lighting system should be such that a fire or other casualty in the space(s) containing the main source of power including transformers, or converters if any, will not render the emergency lighting system required by 5.3 inoperative.

.3 The arrangement of the emergency lighting system should be such that a fire or other casualty in the space(s) containing the emergency source of power, including transformers, or converters if any, will not render the main lighting system required by this requirement inoperative.

5.3 Emergency source of electrical power

5.3.1

.1 Every unit should be provided with a self-contained emergency source of electrical power.

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* Reference is made to the recommendations published by the International Electrotechnical Commission.

.2 The emergency source of power, the transitional source of emergency power and the emergency switchboard should be located on or above the uppermost continuous deck or equivalent deck as determined by the Administration and should be readily accessible from an open deck. It should not be forward of the collision bulkhead, if any, except where permitted by the Administration in exceptional circumstances.

.3 The location of the emergency source of power, the transitional source of emergency power and emergency switchboard in relation to the main source of electrical power should be such as to ensure to the satisfaction of the Administration that a fire or other casualty in the space containing the main source of electrical power 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 sources of power, the transitional source of emergency power and the emergency switchboard should not be contiguous to boundaries of machinery spaces of Category A or of those spaces containing the main sources 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 should be in compliance with 9.1.

.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.

5.3.2 The power available should be sufficient to supply all those services that are essential for safety in an emergency, due regard being paid to such services as may have to be operated simultaneously. The emergency source of power should 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, emergency lighting:

.1 at every embarkation station on deck and over sides;

.2 in all service and accommodation alleyways, stairways and exits, personnel lift cars, and personnel lift trunks;

.3 in the machinery spaces and main generating stations including their control positions;

.4 in all control stations and in all machinery control rooms;

.5 in all spaces from which control of the drilling process is performed and where controls of machinery essential for the performance of this process, or devices for emergency switching-off of the power plant are located;

.6 at the stowage position(s) for firemen's outfits;

.7 at the sprinkler pump if any, at the fire pump referred to in 5.3.2.4, at the emergency bilge pump, if any, and at their starting positions;

.8 on helicopter landing decks;

.2

.1 For a period of 18 hours, the navigation lights, other lights and sound signals, required by the International Regulations for the Prevention of Collisions at Sea, in force;

.2 For a period of 4 days:

— any signalling lights, or

— sound signals

which may be required for marking of offshore structures;

.3 For a period of 18 hours:

.1 all internal communication equipment that is required in an emergency;

.2 fire detection and its alarm systems;

.3 intermittent operation of the manual fire alarms and all internal signals that are required in an emergency; and

.4 the capability of closing the blow-out preventer and of disconnecting the unit from the well head arrangement, if electrically controlled,

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;

.4 For a period of 18 hours one of the fire pumps if dependent upon the emergency generator for its source of power;

.5 For a period of at least 18 hours permanently installed diving equipment if dependent upon the unit's electrical power.

5.3.3 The emergency source of power may be either a generator or an accumulator battery.

.1 Where the emergency source of power is a generator it should 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 5.3.3.3 is provided; where the emergency generator is automatically started, it should be automatically connected to the emergency switchboard; those services referred to in 5.3.4 should 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 should 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 5.3.4 unless the emergency generator is capable of supplying the services mentioned in 5.3.4 and of being automatically started and supplying the required load as quickly as is safe and practicable but in not more than 45 seconds.

.2 Where the emergency source of power is an accumulator battery it should be capable of:

.1 carrying the emergency load without recharging whilst maintaining the voltage of the battery throughout the discharge period within plus or minus 12 per cent 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 5.3.4.

5.3.4 The transitional source(s) of emergency power, where required by 5.3.3.1.3, should consist of an accumulator battery suitably located for use in an emergency, which should operate without recharging whilst maintaining the voltage of the battery throughout the discharge period within plus or minus 12 per cent 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 required by 5.3.2.1 and 5.3.2.2. 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 required by 5.3.2.3.1 and 5.3.2.3.2; and

.3 intermittent operation of the services referred to in 5.3.2.3.3 and 5.3.2.3.4,

unless in respect of 5.3.4.2 and 5.3.4.3, they have an independent supply from an accumulator battery suitably located for use in an emergency and sufficient for the period specified.

5.3.5

.1 The emergency switchboard should 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 should preferably be located in the same space.

.2 No accumulator battery fitted in accordance with this requirement for emergency or transitional power supply should be installed in the same space as the emergency switchboard, unless appropriate measures to the satisfaction of the Administration are taken to extract the gases discharged from the said batteries. An indicator should 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 5.3.3.2 or 5.3.4 are being discharged.

.3 The emergency switchboard should be supplied in normal operation from the main switchboard by an inter-connector feeder which is to be adequately protected at the main switchboard against overload and short circuit. The arrangement at the emergency switchboard should be such that the inter-connector feeder is disconnected automatically at the emergency switchboard upon failure of the main power supply. Where the system is arranged for feedback operation, the inter-connector feeder should also be protected at the emergency switchboard at least against short circuit.

.4 In order to ensure ready availability of emergency supplies, arrangements should be made where necessary to disconnect automatically non-emergency circuits from the emergency switchboard to ensure that power is available automatically to the emergency circuits.

5.3.6 The emergency generator and its prime mover and any emergency accumulator battery should be designed to function at full rated power when it is upright and when inclined up to the maximum angle of heel in the intact and damaged condition as determined in accordance with Chapter III. In no case need the equipment be designed to operate when inclined more than 22½ degrees about the longitudinal axis and/or when inclined 10 degrees about the transverse axis.

5.3.7 Provision should be made for the periodic testing of the complete emergency system and should include the testing of automatic starting arrangements.

5.4 Starting arrangements for emergency generators

5.4.1 Emergency generators should 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 the Administration, so that ready starting will be assured.

5.4.2 Each emergency generator which is arranged to be automatically started should be equipped with starting arrangements acceptable to the Administration with a storage energy capability of at least three consecutive starts. A second source of energy should be provided for an additional three starts within 30 minutes unless hand (manual) starting can be demonstrated to be effective.

5.4.3 Provisions should be made to maintain the stored energy at all times.

.1 Electrical and hydraulic starting systems should be maintained from the emergency switchboard.

.2 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.

.3 All of these starting, charging and energy storing devices should be located in the emergency generator room, these devices are not to 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.

5.4.4

.1 When automatic starting is not required by these requirements 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 charge cartridges.

.2 When hand (manual) starting is not practicable, the provisions in 5.4.2 and 5.4.3 should be complied with except that starting may be manually initiated.

5.5 Precautions against shock, fire and other hazards of electrical origin

5.5.1

.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" should be earthed (grounded) unless:

.1 they are supplied at a voltage not exceeding 55 volts direct current or 55 volts, root mean square between conductors; autotransformers should not be used for the purpose of achieving this alternating current voltage; or

2. they are supplied at a voltage not exceeding 250 volts by safety isolating transformers supplying one consuming device only; or

3. they are constructed in accordance with the principle of double insulation.

.2 The Administration may require additional precautions for portable equipment. Particular attention should be paid to the use of such equipment in damp locations having large conductive surfaces.

.3 All electrical apparatus should be so constructed and so installed that it does not cause injury when handled or touched in the normal manner.

.4 Where not obtained through normal construction, arrangements should be provided to effectively earth (ground) all permanently installed machinery, metal structures of derricks, masts and helicopter decks.

5.5.2 Switchboards should be so arranged as to give easy access needed to apparatus and equipment, in order to minimize danger to attendants. The sides and backs and where necessary, the fronts of switchboards, should be suitably guarded. Exposed live parts having voltages to earth (ground) exceeding a voltage to be specified by the Administration should not be installed on the front of such switchboards. There should be non-conducting mats or gratings at the front and rear, where necessary.

5.5.3 Distribution systems with hull return should not be installed, but this does not preclude under conditions approved by the Administration 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 the Administration 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 milliamperes under the most unfavourable conditions.

5.5.4 When a distribution system, whether primary or secondary, for power, heating or lighting, with no connexion 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 should be provided.

5.5.5

.1 Except as permitted by the Administration in exceptional circumstances, all metal sheaths and armour of cables should be electrically continuous and should be earthed (grounded).

.2 All electric cables should be at least of a flame retardant type and should be installed so as not to impair their original flame retarding properties. Administrations may permit the use of special types of cables when necessary for particular applications, such as radio frequency cables, which do not comply with the foregoing.

.3 Cables and wiring serving essential or emergency power, lighting, internal communications or signals should 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 should be of a fire resistant type where they pass through high fire risk areas. Where possible all such cables should 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.

.4 Wiring should be supported in such a manner as to avoid chafing or other damage.

.5 Terminations and joints in all conductors should be so made such that they retain the original electrical, mechanical, flame retarding and, where necessary, fire resisting properties of the cable.

5.5.6

.1 Each separate circuit should be protected against short circuits. Each separate circuit should also be protected against overload, except in accordance with 7.6 or where the Administration may exceptionally otherwise permit.

.2 The rating or appropriate setting of the overload protection device for each circuit should be permanently indicated at the location of the protection device.

5.5.7 Lighting fittings should be so arranged as to prevent temperature rises that would be injurious to the wiring, and to prevent surrounding material from becoming excessively hot.

5.5.8

.1 Accumulator batteries should be suitably housed, and compartments used primarily for their accommodation should be properly constructed and efficiently ventilated.

.2 Electrical or other equipment which may constitute a source of ignition of flammable vapours should not be permitted in these compartments except as permitted in 5.5.10.

.3 Accumulator batteries except for batteries of self-contained battery operated lights should not be located in sleeping quarters. Administrations may permit relaxations from this requirement where hermetically sealed batteries are installed.

5.5.9 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 should be installed unless the Administration is satisfied that it 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.

5.5.10 Electrical apparatus and cables should, where possible, be excluded from any compartment in which explosives are stored. Where lighting is required, it should be achieved through the boundaries of the compartment. If electrical equipment cannot be excluded from such a compartment it should be so designed and used as to minimize the risk of fire or explosion.

5.6 Internal communication

Internal means of communication should be available for transfer of information between all spaces where action may be necessary in case of an emergency.

CHAPTER 6 – MACHINERY AND ELECTRICAL INSTALLATIONS IN HAZARDOUS AREAS FOR ALL TYPES OF UNITS

(See also 4.1)

6.1 Zones

Hazardous areas are divided into zones as follows:

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

Zone 1: in which an explosive gas/air mixture is likely to occur in normal operation.

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

6.2 Classification of hazardous areas*

6.2.1 For the purpose of machinery and electrical installations, hazardous areas are classified as in 6.2.2 and 6.2.4. Hazardous areas not covered in this paragraph should be classified in accordance with 6.1.

Hazardous areas Zone 0

6.2.2 The internal spaces of closed tanks and pipes for active drilling mud, as well as oil and gas products, e.g. escape gas outlet pipes, or spaces in which an oil/gas/air mixture is continuously present or present for long periods.

Hazardous areas Zone 1

6.2.3

.1 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.

.2 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.

.3 Enclosed spaces that are on the drill floor and which are not separated by a solid floor from the spaces in 6.2.3.2.

.4 In outdoor or semi-enclosed locations, except as provided for in 6.2.3.2, the area within 1.5 metres from the boundaries of any openings to equipment which is part of the mud system as specified in 6.2.3.1, any ventilation outlets of Zone 1 spaces, or any access to Zone 1 spaces.

.5 Pits, ducts or similar structures in locations which otherwise would be Zone 2 but which are arranged so that dispersion of gas may not occur.

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* The identification and extent of hazardous areas in this Chapter have been determined taking into account current practice.

Hazardous areas Zone 2

6.2.4

.1 Enclosed spaces which contain open sections of the mud circulating system from the final degassing discharge to the mud pump suction connexion at the mud pit.

.2 Outdoor locations within the boundaries of the drilling derrick up to a height of 3 metres above the drill floor.

.3

.1 Semi-enclosed locations below and contiguous to the drill floor and to the boundaries of the derrick or to the extent of any enclosure which is liable to trap gases.

.2 Outdoor locations below the drill floor and within a radius of 3 metres from a possible source of release such as the top of a drilling nipple.

.4 The areas 1.5 metres beyond the Zone 1 areas specified in 6.2.3.4 and beyond the semi-enclosed locations specified in 6.2.3.2.

.5 Outdoor areas within 1.5 metres of the boundaries of any ventilation outlet from or access to a Zone 2 space.

.6 Semi-enclosed derricks to the extent of their enclosure above the drill floor or to a height of 3 metres above the drill floor, whichever is greater.

6.3 Openings, access and ventilation conditions affecting the extent of hazardous areas

6.3.1 Except for operational reasons access doors or other openings should not be provided between:

— a non-hazardous space and a hazardous area;

— a Zone 2 space and a Zone 1 space.

Where such access doors or other openings are provided, any enclosed space not referred to under 6.2.3 or 6.2.4 and having a direct access to any Zone 1 location or Zone 2 location becomes the same zone as the location except that:

.1 an enclosed space with direct access to any Zone 1 location can be considered as Zone 2 if:

.1 the access is fitted with a gas-tight door opening into the Zone 2 space, and

.2 ventilation is such that the air flow with the door open is from the Zone 2 space into the Zone 1 location, and

.3 loss of ventilation is alarmed at a manned station;

.2 an enclosed space with direct access to any Zone 2 location is not considered hazardous if:

.1 the access is fitted with a self-closing gas-tight door that opens into the non-hazardous location, and

.2 ventilation is such that the air flow with the door open is from the non-hazardous space into the Zone 2 location, and

.3 loss of ventilation is alarmed at a manned station;

.3 an enclosed space with direct access to any Zone 1 location is not considered hazardous if:

.1 the access is fitted with gas-tight self-closing doors forming an air lock, and

.2 the space has ventilation overpressure in relation to the hazardous space, and

.3 loss of ventilation overpressure is alarmed at a manned station.

Where ventilation arrangements of the intended safe space are considered sufficient by the Administration 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.

6.3.2 Piping systems should be designed to preclude direct communication between hazardous areas of different classifications and between hazardous and non-hazardous areas.

6.4 Ventilation of spaces

6.4.1 Hazardous enclosed spaces should be ventilated. Where mechanical ventilation is applied it should be such that the hazardous enclosed spaces are maintained with underpressure in relation to the less hazardous spaces or areas and non-hazardous enclosed spaces are maintained in overpressure in relation to adjacent hazardous locations.

6.4.2 All air inlets for hazardous enclosed spaces should be taken from non-hazardous areas. Where the inlet duct passes through a more hazardous area the inlet duct is to have overpressure in relation to this area.

6.4.3 Each air outlet is to be located in an outdoor area which in the absence of the considered outlet is of the same or lesser hazard than the ventilated space.

6.5 Emergency conditions due to drilling operations

6.5.1 In view of exceptional conditions in which the explosion hazard may extend outside the above-mentioned zones, special arrangements should be provided to facilitate the selective disconnexion or shut-down of:

.1 ventilation systems;

.2 non-essential electrical equipment;

.3 essential electrical equipment;

.4 emergency equipment except battery supplied lighting and radio;

.5 generator prime movers.

6.5.2 Electrical shut-down systems that are provided to comply with 6.5.1 should be designed so that the risk of unintentional stoppages caused by malfunction in a shut-down system and the risk of inadvertent operation of a shut-down are minimized.

6.6 Electrical installations in hazardous areas

6.6.1 Electrical equipment and wiring installed in hazardous areas should be limited to that necessary for operational purposes. Only the cables and types of equipment described in this Chapter may be installed.

6.6.2 Where, in the following, reference is made to certified types of equipment, such equipment should be certified as suitable for the flammable gas/air mixture which may be encountered.*

6.6.3 Cables and types of electrical equipment permitted in hazardous areas are as follows:

.1 *Zone 0*

Certified intrinsically safe circuits or equipment and associated wiring.

.2 *Zone 1*

.1 Certified intrinsically safe circuits or equipment and associated wiring.

.2 Certified flameproof (explosion proof) equipment.

.3 Certified increased safety equipment; for increased safety motors, due consideration should be given to the protection against overcurrent.

.4 Pressurized enclosure type equipment which is certified safe or which is to the satisfaction of the Administration.

.5 Equipment in an enclosure which is filled with a dielectric and which is to the satisfaction of the Administration.

.6 Through runs of cables.

.3 *Zone 2*

.1 Certified intrinsically safe circuits or equipment and associated wiring.

.2 Certified flameproof (explosion proof) equipment.

.3 Certified increased safety equipment; for increased safety motors, due consideration should be given to the protection against overcurrent.

.4 Pressurized enclosure type equipment which is to the satisfaction of the Administration.

.5 Equipment in an enclosure which is filled with a dielectric and which is to the satisfaction of the Administration.

.6 Any equipment of a type which ensures absence of sparks or arcs and of 'hot spots' during normal operation and which is to the satisfaction of the Administration.

.7 Through runs of cables.

6.6.4 Permanently installed, fixed cables passing through Zone 1 hazardous areas should be fitted with a conductive covering, braiding or sheath for earth detection. Flexible cables passing through such areas should be to the satisfaction of the Administration.

6.7 Machinery installations in hazardous areas

6.7.1 Mechanical equipment should be limited to that necessary for operational purposes.

6.7.2 Mechanical equipment and machinery in hazardous areas should 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.

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* Equipment specified in Group IIA Class T.1 of International Electrotechnical Commission Publication 92 is considered suitable.

6.7.3 The installation of internal combustion machinery may be permitted in Zone 1 and Zone 2 hazardous areas, provided that the Administration is satisfied that sufficient precautions have been taken against the risk of dangerous ignition.

6.7.4 The installation of fired equipment may be permitted in Zone 2 hazardous areas, provided that the Administration is satisfied that sufficient precaution has been taken against the risk of dangerous ignition.

CHAPTER 7 – MACHINERY AND ELECTRICAL INSTALLATIONS FOR SELF-PROPELLED UNITS

(See also 4.1)

7.1 General

7.1.1 The requirements of this Chapter 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 requirements are additional to those in Chapters 4, 5 and 6.

7.1.2 Means should be provided whereby normal operation of propulsion machinery can be sustained or restored even though one of the essential auxiliaries becomes inoperative. Special consideration should 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 feed water;

.4 the arrangements which supply fuel oil for boilers or engines;

.5 the sources of lubricating oil pressure;

.6 the sources of water pressure;

.7 a condensate pump and the arrangements to maintain vacuum in condensers;

.8 the mechanical air supply for boilers;

.9 an air compressor and receiver for starting or control purposes; and

.10 the hydraulic, pneumatic or electrical means for control in main propulsion machinery including controllable pitch propellers,

provided that the Administration, having regard to overall safety considerations may accept a partial reduction in capability from full normal operation.

7.1.3 Main propulsion machinery and all auxiliary machinery essential to the propulsion and the safety of the unit should, as fitted in the unit, be capable of operating when the unit is upright and when inclined at any angle of list up to and including 15 degrees either way under static conditions and 22½ degrees under dynamic conditions (rolling) either way and simultaneously inclined dynamically (pitching) 7½ degrees by bow or stern. The Administration may permit deviation from these angles, taking into consideration the type, size and service conditions of the unit.

7.1.4 Special consideration should be given to the design, construction and installation of propulsion machinery systems so that any mode of their vibrations should not cause undue stresses in this machinery in the normal operating ranges.

7.2 Means of going astern

7.2.1 Units should have sufficient power for going astern to secure proper control of the unit in all normal circumstances.

7.2.2 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 should be demonstrated.

7.2.3 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 should be available on board for the use of the master or other designated personnel.*

7.2.4 Where the unit is provided with supplementary means for manoeuvring or stopping, these should be demonstrated and recorded as referred to in 7.2.2 and 7.2.3.

7.3 Steam boilers and boiler feed systems

7.3.1 Water tube boilers serving turbine propulsion machinery should be fitted with a high water level alarm.

7.3.2 Every steam generating system which provides services essential for the propulsion of the unit should be provided with not less than two separate feed water systems from and including the feed pumps, noting that a single penetration of the steam drum is acceptable. Means should be provided which will prevent overpressure in any part of the systems.

7.4 Machinery controls

7.4.1 Main and auxiliary machinery essential for the propulsion of the unit should be provided with effective means for its operation and control. A pitch indicator should be provided on the navigating bridge for controllable pitch propellers.

7.4.2 Where remote control of propulsion machinery from the bridge is provided and the machinery spaces are intended to be manned, the following should apply:

.1 the speed, direction of thrust and, if applicable, the pitch of the propeller should be fully controllable from the navigating bridge under all sailing conditions, including manoeuvring;

.2 the remote control should 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 should 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 should be indicated in the engine control room or at the manoeuvring platform as appropriate;

* Reference is made to the recommendation on information to be included in the manoeuvring booklets adopted by the Organization by resolution A.209(VII).

.5 remote control of the propulsion machinery should be possible from only one station at a time; at one control station inter-connected control units are permitted. There should 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 should be possible only in the machinery space or machinery control room;

.6 it should be possible to control the propulsion machinery locally, even in the case of failure in any part of the remote control system;

.7 the design of the remote control system should be such that in case of its failure an alarm will be given and the preset speed and direction of thrust is maintained until local control is in operation, unless the Administration considers it impracticable,

.8 indicators should be fitted on the navigating bridge for:

.1 propeller speed and direction in case of fixed pitch propellers;

.2 propeller speed and pitch position in case of controllable pitch propellers;

.9 an alarm should 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 should be limited to safeguard sufficient starting air pressure for starting locally.

7.4.3 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 should 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 8.2 to 8.5 should apply as appropriate. Particular consideration should be given to protection against fire and flooding.

7.5 Steering gear

7.5.1

.1 Except as provided in 7.5.2, units should be provided with a main steering gear and an auxiliary steering gear to the satisfaction of the Administration. The main steering gear and the auxiliary steering gear should 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.

.2 The main steering gear should be of adequate strength and sufficient to steer the unit at maximum service speed and this should be demonstrated. The main steering gear and rudder stock should 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.

.3 The main steering gear should, with the unit at her deepest sea-going draught, be capable of putting the rudder over from 35 degrees on one side to 35 degrees on the other side with the unit running ahead at maximum service speed. The rudder should be capable of being put over from 35 degrees on either side to 30 degrees on the other side in not more than 28 seconds, under the same conditions.

.4 The main steering gear should be operated by power where necessary to fulfil the requirements of 7.5.1.3 and in any case in which the Administration would require a rudder stock of over 120 millimetres diameter in way of the tiller.

.5 The main steering gear power unit(s) should be arranged to start automatically when power is restored after a power failure.

.6 The auxiliary steering gear should be of adequate strength and sufficient to steer the unit at navigable speed and capable of being brought speedily into action in an emergency.

.7 The auxiliary steering gear should be capable of putting the rudder over from 15 degrees on one side to 15 degrees on the other side in not more than 60 seconds with the unit at its deepest sea-going draught while running at one half of its maximum speed ahead or seven knots, whichever is the greater.

.8 The auxiliary steering gear should be operated by power where necessary to fulfil the requirements of 7.5.1.7, and in any case in which the Administration would require a rudder stock of over 230 millimetres diameter in way of the tiller.

.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 as required by 7.5.1.3 while operating with all power units. As far as is reasonable and practicable the main steering gear should 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.

.10

.1 Control of the main steering gear should be provided both on the navigating bridge and in the steering gear compartment. The steering gear control system which provides for control from the navigating bridge, if electric, should be supplied from the steering gear power circuit from a point within the steering gear compartment.

.2 When the main steering gear is arranged according to 7.5.1.9 there should be two independent control systems provided, each of which can be operated from the navigating bridge. Where the control system comprises a hydraulic telemotor, the Administration may waive the requirement for a second independent control system.

.3 Where the auxiliary steering gear is power operated, it should be provided with a control system operated from the navigating bridge and this should be independent of the control system for the main steering gear.

.4 Means should be provided in the steering gear compartment to disconnect the steering gear control system from the power circuit.

.11 A means of communication should be provided between the navigating bridge and the steering gear compartment.

.12

.1 The exact angular position of the rudder, if power operated, should be indicated on the navigating bridge. The rudder angle indication should be independent of the steering gear control system.

.2 The angular position of the rudder should be recognizable in the steering gear compartment.

.13 An alternative power supply, sufficient at least to supply a steering gear power unit which complies with the requirement of 7.5.1.7 and also its associated control system and the rudder angle indicator, should be provided, automatically, within 45 seconds, 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 should be used only for this purpose and should have a capacity sufficient for 10 minutes of continuous operation.

7.5.2 Where a non-conventional rudder is installed the Administration should give special consideration to the steering system, so as to ensure that an acceptable degree of reliability and effectiveness which is based on 7.5.1 is provided.

7.6 Electric and electrohydraulic steering gear

7.6.1. Indicators for running indication of the motors of electric and electrohydraulic steering gear should be installed on the navigating bridge and at a suitable machinery control position.

7.6.2

.1 Each electric or electrohydraulic steering gear comprising one or more power units should 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 should have adequate rating for supplying all motors which can be simultaneously connected to it and have to operate simultaneously.

.2 Short circuit protection and an overload alarm should be provided for these circuits and motors. Protection against excess current, if provided, should be for not less than twice the full load current of the motor or circuit so protected, and should be arranged to permit the passage of the appropriate starting currents. Where a three-phase supply is used an alarm should be provided that will indicate failure of any one of the supply phases. The alarms required in this subparagraph should be both audible and visual and be situated in a position on the navigating bridge where they can be readily observed.

7.7 Communication between the navigating bridge and engine room

Units should 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 these should be an engine room telegraph providing visual indication of the orders and responses both in the engine room and on the navigating bridge. Consideration should be given to provide a means of communication to any other positions from which the engines may be controlled.

7.8 Engineers' alarm

An engineers' alarm should be provided to be operated from the engine control room or at the manoeuvring platform as appropriate, and clearly audible in the engineers' accommodation.

7.9 Main source of electrical power

7.9.1 In addition to complying with 5.2, the main source of electrical power should comply with the following:

.1 The arrangement of the unit's main source of power should be such that the services referred to in 5.1.1.1 can be maintained regardless of the speed and direction of the main propelling engines or shafting.

.2 The generating plant should be such as to ensure that with any one generator or its primary source of power out of operation, the remaining generator(s) 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 5.3.2.1 to 5.3.2.3.

.3 For electrically self-propelled units the application of 5.2.1.2 need only include for propulsion sufficient power to ensure safe navigation when underway.

7.9.2 The main switchboard should 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.

7.9.3 In every unit where the total installed electric power of the main generators is in excess of 3 megawatts, the main busbars should be subdivided into at least two parts which should normally be connected by removable links or other approved means; so far as is practicable, the connexion of generators and any other duplicated equipment should be equally divided between the parts. Equivalent alternative arrangements should be permitted.

7.10 Emergency source of electrical power

In addition to complying with 5.3, the emergency source of power should provide:

.1 For a period of 18 hours, emergency lighting at the steering gear;

.2 For a period of 18 hours:

.1 navigational aids as required by Regulation 12 of Chapter V of the 1974 SOLAS Convention;

.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 10 minutes the steering gear where it is required to be so supplied by 7.5.1.3.

CHAPTER 8 – PERIODICALLY UNATTENDED MACHINERY SPACES FOR ALL TYPES OF UNITS

(See also 4.1)

8.1 General

8.1.1 The requirements of this Chapter are additional to the requirements of Chapters 4 to 7 and apply to periodically unattended machinery spaces specified herein. The arrangements should 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.

8.1.2 The requirements of 8.1 to 8.8 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.

8.1.3 Measures should be taken to the satisfaction of the Administration to ensure that the equipment is functioning in a reliable manner and that satisfactory arrangements are made for regular inspections and routine tests to ensure continuous reliable operation.

8.1.4 Units should be provided with documentary evidence to the satisfaction of the Administration of their fitness to operate with periodically unattended machinery spaces.

8.2 Fire safety

8.2.1 *Fire prevention*

.1 Where necessary, fuel oil and lubricating oil pipelines should be screened or otherwise suitably protected to avoid as far as is practicable oil spray or oil leakages on hot surfaces or into machinery air intakes. The number of joints in such piping systems should be kept to a minimum. Special consideration should be given to high pressure fuel oil pipes; where practicable, leakages from such piping systems should be collected and should activate an alarm.

.2 Where daily service fuel oil tanks are filled automatically, means should be provided to eliminate overflow spillages. Similar consideration should be given to other equipment automatically treating flammable liquids, e.g. oil fuel purifiers, which whenever practicable should be installed in a special space reserved for purifiers and their heaters.

.3 Where oil fuel daily service tanks or settling tanks are fitted with heating arrangements, a high temperature alarm should be provided if there is a risk that the flashpoint of the oil fuel may be exceeded.

8.2.2 *Fire detection*

.1 An approved fire detection system based on the self-monitoring principle and including facilities for periodical testing should be installed in periodically unattended machinery spaces.

.2 This fire detection system should be so designed and the detectors so positioned as to detect rapidly the onset of fire in any part of these 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 should not be permitted. The detection system should initiate audible and visual alarms distinct in both respects from any other system not indicating fire, in sufficient places to ensure that the alarm is heard and observed on the bridge and by a responsible engineer officer. When the bridge is unmanned the alarm should sound in a place where a responsible person will be on duty. After installation the system should be tested under varying conditions of engine operation and ventilation. The fire detection system where electrically supplied, should be fed automatically from an emergency source of power by a separate feeder if the main source of power fails.

.3 Incipient fires in scavenging air belts of main propelling engines should be detected and alarmed, unless the Administration considers this to be unnecessary in a particular case.

.4 Internal combustion engines of 2.25 megawatts and above or having cylinders of more than 300 millimetres bore should be protected against crankcase explosions by the provision of oil mist detectors or equivalent.

.5 Fire in boiler air supply casings and exhausts (uptakes) should be detected and arrangements for an alarm be given, unless the Administration considers this to be unnecessary in a particular case.

8.2.3 *Fire fighting*

.1 An approved fixed fire-extinguishing system should be provided in units that are otherwise not required to have this provision by 9.5.

.2 Provision should 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 by:

.1 remote starting arrangements of one of the main fire pumps. One of the starting positions should be on the navigating bridge and one at the fire control station, if any; or

.2 permanent pressurization of the fire main system by one of the main fire pumps.

.3 The Administration should give special consideration to maintaining the fire integrity of the machinery spaces, the location and centralization of the fire-extinguishing system controls, the required shutdown arrangements (e.g. ventilation, fuel pumps, etc.) and may require additional fire-extinguishing appliances and other fire-fighting equipment and breathing apparatus.

8.3 Protection against flooding

8.3.1 Bilge wells in machinery spaces should be located and monitored in such a way that the accumulation of liquids is detected at normal angles of trim and heel; they should be large enough to accommodate easily the normal drainage during the unattended period.

8.3.2 In cases where the bilge pumps start automatically, means should be provided to indicate if the influx of liquid is greater than the pump capacity or if 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 should be given to oil pollution prevention requirements.

8.3.3 The controls of any valve serving a sea inlet, a discharge below the water line or a bilge injection system should be so sited as to allow adequate time for operation in case of influx of water to the space, having regard to the time which could be taken to reach and operate such controls. The level to which the space could become flooded with the unit in the fully loaded condition should be considered and this may require control from a position above such level.

8.4 Bridge control of propulsion machinery

8.4.1 In the marine mode, including manoeuvring, the speed, direction of thrust and, if applicable, the pitch of the propeller should be fully controllable from the navigating bridge.

8.4.2 The remote control mentioned in 8.4.1 should be performed by a single control device for each independent propeller, with automatic performance of all associated services, including where necessary, means of preventing overload of the propelling machinery. However, where more than one propeller is designed to operate simultaneously, these propellers may be controlled by a single control device.

8.4.3 The main propulsion machinery should be provided with an emergency stopping device on the navigating bridge and independent from the bridge control system referred to in 8.4.2.

8.4.4 Propulsion machinery orders from the navigating bridge should be indicated in the engine control room or at the manoeuvring platform as appropriate.

8.4.5 Remote control of the propulsion machinery should be possible only from one station at a time; at one control station interconnected control units are permitted. There should 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 should be possible only in the machinery space or machinery control room.

8.4.6 It should be possible to control essential machinery and the propelling machinery locally, even in the case of failure in any part of the automatic or remote control systems.

8.4.7 The design of the remote automatic control system should be such that in case of its failure an alarm will be given and the speed and direction of thrust are maintained until local control is in operation, unless the Administration considers it impracticable.

8.4.8 Indicators should be fitted on the navigating bridge for:

.1 Propeller speed and direction in case of fixed pitch propellers;

.2 Propeller speed and pitch position in case of controllable pitch propellers.

8.4.9 The number of unsuccessful consecutive automatic attempts to produce a start should be limited in order to safeguard sufficient starting air pressure. An alarm should be provided to indicate low starting air pressure set at a level which still permits main engine starting operations.

8.5 Communication

A reliable means of vocal communication should be provided between the engine room, the control room or manoeuvring platform as appropriate, the navigating bridge and the engineer officers' accommodation.

8.6 Alarm system

8.6.1 An alarm system should be provided which should indicate any fault requiring attention.

8.6.2

.1 The alarm system should have a connexion to the public rooms and to all engineers' cabins. The Administration may permit other arrangements.

.2 The alarm system should have a connexion to the engineers' public rooms and to each of the engineers' cabins through a selector switch, to ensure connexion to at least one of those cabins. Administrations may permit equivalent arrangements.

.3 Audible and visual alarm should be activated on the navigating bridge for any situation which requires action by the officer on watch or which should be brought to his attention.

.4 The alarm system should as far as is practicable be designed on the fail-to-safety principle.

.5 The alarm system should activate the engineers' alarm required by 7.8 if an alarm function has not received attention locally within a limited time.

8.6.3

.1 The alarm system should be continuously powered with automatic change-over to a stand-by power supply in case of loss of normal power supply.

.2 Failure of the normal power supply of the alarm system should be alarmed.

8.6.4

.1 The alarm system should be able to indicate at the same time more than one fault and the acceptance of any alarm should not inhibit another alarm.

.2 Acceptance at the position mentioned in 8.6.2.1 of any alarm condition should be indicated at the positions where it was shown. Alarms should be maintained until they are accepted and the visual indications should remain until the fault has been corrected, when the alarm system should automatically reset to the normal operating condition.

8.7 Special requirements for machinery, boiler and electrical installations

8.7.1 The special provisions for the machinery, boiler and electrical installations should be in agreement with the requirements of the Administration and should contain at least the following provisions.

8.7.2 *Main source of electrical power*

.1 On units where the electrical power can normally be supplied by one generator, there should be provided suitable load shedding arrangements to ensure the integrity of supplies to services required for propulsion and steering and to ensure the safety of the unit. To cover the case of loss of the generator in operation, there should be adequate provisions for automatic starting and connecting to the main switchboard of a stand-by generator of sufficient capacity to ensure safe navigation when under way with automatic restarting of the essential auxiliaries including, where necessary, sequential operations. The Administration may waive this requirement in units where the power necessary to ensure the functioning of the services referred to in 5.1.1.1, except for services referred to in 1.3.14.2, is 250 kilowatts or less.

.2 If the electrical power is normally supplied by more than one generating set simultaneously in parallel operation, there should be provisions (by load shedding, for instance) 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 under way.

8.7.3 *Change-over function*

Where stand-by machines are required for other auxiliary machinery essential to propulsion, automatic change-over devices should be provided. An alarm should be given on automatic change-over.

8.7.4 *Automatic control and alarm system*

.1 The control system should be such that through the necessary automatic arrangements the services needed for the operation of the main propulsion machinery and its auxiliaries are ensured.

.2 Means should be provided to keep the starting air pressure at the required level if internal combustion engines are used for main propulsion.

.3 An alarm system complying with 8.6 should be provided for all important pressures, temperatures, fluid levels, etc.

.4 An adequate centralized location should be arranged with the necessary alarm panels and instrumentation indicating any alarmed faults.

8.8 Safety systems

A safety system should be provided so that serious malfunctions in machinery or boiler operations which present an immediate danger should initiate the automatic shutdown of that part of the plant and an alarm should be given. Shutdown of the propulsion system should not be automatically activated except in cases which could lead to complete breakdown, serious damage or explosion. Where arrangements for overriding the shutdown of the major propelling machinery are fitted, these should be such as to preclude inadvertent operation. If the arrangements are used, the fact should be visually indicated.

8.9 Other units

Units other than those designed for unassisted passages, having periodically unattended spaces in which machinery associated with the marine mode is located, should comply with the applicable parts of 8.2, 8.3, 8.6, 8.7 and 8.8.

8.10 Machinery spaces for drilling purposes

Where in any unit machinery spaces of Category A are intended to be periodically unattended the application of 8.2 and 8.8 to machinery spaces of Category A should be considered by the Administration, due consideration being given to the characteristics of the machinery concerned and to the supervision envisaged to ensure safety.

CHAPTER 9 – FIRE SAFETY

9.1 Structural fire protection

9.1.1 These requirements have been formulated principally for units having their hull superstructure, structural bulkheads, decks and deckhouses constructed of steel.

9.1.2 Units constructed of other materials may be accepted, provided that, in the opinion of the Administration, they provide an equivalent standard of safety.

9.1.3 *Fire integrity of bulkheads and decks*

.1 In addition to complying with the specific provisions for fire integrity of bulkheads and decks in this section and in 9.2, the minimum fire integrity of bulkheads and decks should be as prescribed in tables 3 and 4.

.2 The following requirements should govern application of the tables:

.1 Tables 3 and 4 should 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 (10) 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 1.3.28.

(2) "Corridors" means corridors and lobbies.

(3) "Accommodation spaces" are spaces as defined in 1.3.34 excluding corridors.

(4) "Stairways" are interior stairways, lifts and escalators (other than those wholly contained within the machinery spaces) and enclosures thereto.

In this connexion a stairway which is enclosed only at one level should be regarded as part of the space from which it is not separated by a fire door.

(5) "Service spaces (low risk)" are lockers and store-rooms having areas of less than 2 square metres, drying rooms and laundries.

(6) "Machinery spaces of Category A" are spaces as defined in 1.3.26.

(7) "Other machinery spaces" are spaces as defined in 1.3.27 other than machinery spaces of Category A.

(8) "Hazardous areas" are areas as defined in 1.3.29.

(9) "Service spaces (high risk)" are galleys, pantries containing cooking appliances, paint and lamp rooms, lockers and store-rooms having areas of 2 square metres or more and workshops other than those forming part of the machinery spaces.

(10) "Open decks are open deck spaces, excluding hazardous areas.

TABLE 3. FIRE INTEGRITY OF BULKHEADS SEPARATING ADJACENT SPACES

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

TABLE 4. FIRE INTEGRITY OF DECKS SEPARATING ADJACENT SPACES

Space Below ↓ / Space Above →		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Control stations	(1)	A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0	A-0	*
Corridors	(2)	A-0	*	*	A-0	*	A-60	A-0	A-0	A-0	*
Accommodation spaces	(3)	A-60	A-0	*	A-0	*	A-60	A-0	A-0	A-0	*
Stairways	(4)	A-0	A-0	A-0	*	A-0	A-60	A-0	A-0	A-0	*
Service spaces (low risk)	(5)	A-15	A-0	A-0	A-0	*	A-60	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	*
Other machinery spaces	(7)	A-15	A-0	A-0	A-0	A-0	A-0 a/	* a/	A-0	A-0	*
Hazardous areas	(8)	A-60	A-0	A-0	A-0	A-0	A-60	A-0	—	A-0	—
Service spaces (high risk)	(9)	A-60	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0 c/	*
Open decks	(10)	*	*	*	*	*	*	*	—	*	—

Notes: To be applied to both tables 3 and 4 as appropriate.

a/ Where the space contains an emergency power source or components of an emergency power source that adjoins 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 should be an "A-60" Class division.

b/ For clarification as to which note applies see paragraphs 9.2.1 and 9.2.3.

c/ Where spaces are of the same numerical category and superscript d 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.

* Where an asterisk appears in the tables the division is required to be of steel or equivalent material but is not required to be of "A" Class standard.

9.1.4 Windows and sidescuttles, with the exception of navigating bridge windows, should be of the non-opening type. Navigating bridge windows may be of the opening type provided the design of such windows would permit rapid closure. The Administration may permit windows and sidescuttles outside hazardous areas to be of the opening type.

9.1.5 External doors in superstructures and deckhouses should be constructed to "A-0" Class divisions and be self-closing, where practicable.

9.2 Protection of accommodation spaces, service spaces and control stations

9.2.1 Corridor bulkheads, including doors, should be "A" or "B" Class divisions extending from deck to deck. Where continuous "B" Class ceilings and/or linings are fitted on both sides of the bulkhead, the bulkhead may terminate at the continuous ceiling or lining. Doors of cabins and public spaces in such bulkheads may have a louvre in the lower half. Such openings should not be provided in a door in an "A" or "B" Class division forming a stairway enclosure.

9.2.2 Stairs should be constructed of steel or other equivalent material.

9.2.3 Stairways which penetrate only a single deck should 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 should be protected by "A" Class divisions. Stairways and lift trunks which penetrate more than a single deck should be surrounded by "A" Class divisions and protected by self-closing doors at all levels. Self-closing doors should not be fitted with hold-back hooks. However, hold-back arrangements incorporating remote release fittings of the fail-safe type may be utilized.

9.2.4 Air spaces enclosed behind ceilings, panellings or linings should be divided by close fitting draught stops spaced not more than 14 metres apart.

9.2.5 Ceilings, linings, bulkheads and insulation except for insulation in refrigerated compartments should be of non-combustible material. Vapour barriers and adhesives used in conjunction with insulation, as well as insulation of pipe fittings for cold service systems need not be non-combustible, but they should be kept to a minimum and their exposed surfaces should have resistance to propagation of flame to the satisfaction of the Administration.

9.2.6 The framing, including grounds and the joint pieces of bulkheads, linings, ceilings and draught stops should be of non-combustible material.

9.2.7 All exposed surfaces in corridors and stairway enclosures and surfaces in concealed or inaccessible spaces should have low flame-spread characteristics.

9.2.8 Bulkheads, linings and ceilings may have combustible veneers provided that the thickness of such veneers should not exceed 2 millimetres within any space other than corridors, stairway enclosures and control stations where the thickness should not exceed 1.5 millimetres.

9.2.9 Primary deck coverings, if applied, should be of approved materials which will not readily ignite.

9.2.10 Paints, varnishes and other finishes used on exposed interior surfaces should not be of a nature to offer an undue fire hazard and should not be capable of producing excessive quantities of smoke or toxic fumes.

9.2.11 Ducts provided for ventilation of machinery spaces of Category A and hazardous areas should not pass through accommodation and service spaces or control stations. However, the Administration may permit relaxation from this requirement provided that:

.1 the ducts are constructed of steel and insulated to "A-60" standard; or

.2 the ducts are constructed of steel and fitted with an automatic fire damper close to the boundary penetrated and insulated to "A-60" standard from the machinery space of Category A to a point at least 5 metres beyond the fire damper.

9.2.12 Ducts provided for ventilation of accommodation and service spaces or control stations should not pass through machinery spaces of Category A or hazardous areas. However, the Administration may permit relaxation from this requirement provided the ducts are constructed of steel and an automatic fire damper is fitted close to the boundaries penetrated.

9.2.13 Windows and sidescuttles which face the drill floor, with the exception of the wheelhouse windows, should be fitted with inside covers of steel or equivalent material. Such shutters may be replaced by a water-curtain protecting those windows and sidescuttles.

9.3 Means of escape

9.3.1 Within the accommodation spaces, service spaces and control stations the following requirements should 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 should be provided, situated as far apart as practicable, to allow ready means of escape to the open decks and embarkation stations. Exceptionally, the Administration 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 should normally 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 should be readily accessible and unobstructed and all exit doors along the route should be readily operable. Dead-end corridors exceeding 7 metres in length should not be permitted.

9.3.2 Two means of escape should be provided from every machinery space of Category A by one of the following:

.1 two sets of steel ladders as widely separated as possible leading to doors in the upper part of the space similarly separated and from which access is provided to the open deck. In general, one of these ladders should provide continuous fire shelter from the lower part of the space to a safe position outside the space. However, the Administration may not require the shelter if, due to special arrangements or dimensions of machinery space, a safe escape route from the lower part of this space is provided. This shelter should be of steel, insulated, where necessary, to the satisfaction of the Administration and be provided with a self-closing steel door at the lower end; or

.2 one steel ladder leading to a door in the upper part of the space from which access is provided to the open deck and additionally, in the lower part of the space and in a position well separated from the ladder referred to, a steel door capable of being operated from each side and which provides access to a safe escape route from the lower part of the space to the open deck. Exceptionally, the Administration may permit 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 employed there.

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

9.3.4 Lifts should not be considered as forming one of the required means of escape.

9.3.5 Consideration should be given by the Administration to the siting of superstructures and deckhouses 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 effects of that fire as far as practicable.

9.4 Fire pumps, fire mains, hydrants and hoses

9.4.1

.1 At least two independently driven power pumps should be provided, each arranged to draw directly from the sea and discharge into a fixed fire main. However, in units with high suction lifts, booster pumps and storage tanks may be installed, provided such arrangements will satisfy all the requirements of this paragraph.

.2 At least one of the required pumps should be dedicated for fire-fighting duties and be available for such duties at all times.

.3 The arrangements of the pumps, sea suctions and sources of power should be such as to ensure that a fire in any one space would not put both the required pumps out of action.

.4 The capacity of the required pumps should be appropriate to the fire-fighting services supplied from the fire main. However, the total capacity of the pumps need not exceed 180 cubic metres per hour. Where more pumps than required are installed, their capacity should be to the satisfaction of the Administration.

.5 Each pump should be capable of delivering at least one jet simultaneously from each of any two fire hydrants, hoses and 19 millimetre nozzles while maintaining a minimum pressure of 0.35 newtons per square millimentre at any hydrant. In addition, where a foam system is provided for protection of the helicopter deck, the pump should be capable of maintaining a pressure of 0.7 newtons per square millimetre at the foam installation.

.6 Where either of the required pumps is located in a space not normally manned and in the opinion of the Administration is relatively far removed from working areas, suitable provision should be made for remote start-up of that pump and remote operation of associated suction and discharge valves.

.7 Except as provided in 9.4.1.2, sanitary, ballast, bilge or general service pumps may be accepted as fire pumps, provided that they are not normally used for pumping oil.

.8 Every centrifugal pump which is connected to the fire main should be fitted with a non-return valve.

.9 Relief valves should 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 should be so placed and adjusted as to prevent excessive pressure in the fire main system.

9.4.2

.1 A fixed fire main should be provided and be so equipped and arranged as to meet the requirements of this paragraph and 9.4.3.

.2 The diameter of the fire main and water service pipes should be sufficient for the effective distribution of the maximum required discharge from the required fire pumps operating simultaneously.

.3 With the required fire pumps operating simultaneously, the pressure maintained in the fire mains should be to the satisfaction of the Administration and be adequate for the safe and efficient operation of all equipment supplied therefrom.

.4 The fire main should 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.

.5 The fire main should 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 The fire main should not have connexions other than those necessary for fire-fighting purposes.

.7 All practical precautions consistent with having water readily available should be taken to protect the fire main against freezing.

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

.9 A cock or valve should be fitted to serve each fire hose so that any fire hose may be removed while the fire pumps are at work.

9.4.3

.1 The number and position of the hydrants should be such that at least two jets of water, not emanating from the same hydrant, one of which should 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 should be provided for every hydrant.

.2 Fire hoses should be of material approved by the Administration 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 should be to the satisfaction of the Administration. Every fire hose should be provided with a dual purpose nozzle and the necessary couplings. Fire hoses should together with any necessary fittings and tools be kept ready for use in conspicuous positions near the water service hydrants or connexions.

9.4.4 Nozzles should comply with the following requirements:

.1 Standard nozzle sizes should be 12 millimetres, 16 millimetres and 19 millimetres or as near thereto as possible. Larger diameter nozzles may be permitted at the discretion of the Administration.

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

.3 For machinery spaces and exterior locations, the nozzle size should be such as to obtain the maximum discharge possible from two jets at the pressure specified in 9.4.1.5 from the smallest pump, provided that a nozzle size greater than 19 millimetres need not be used.

9.4.5

1. The unit should be provided with at least one international shore connexion complying with Regulation 5(h) of Chapter II-2 of the 1974 SOLAS Convention.

.2 Facilities should be available enabling such a connexion to be used on any side of the unit.

9.5 Fire-extinguishing systems in machinery spaces and in spaces containing fired processes

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

.1 One of the following fixed fire-extinguishing systems:

.1 a pressure water-spraying system complying with Regulation 11 of Chapter II-2 of the 1974 SOLAS Convention;

.2 a fire-extinguishing installation complying with Regulation 8 of Chapter II-2 of the 1974 SOLAS Convention;

.3 a system discharging a halogenated hydrocarbon of a type acceptable to the Administration; or

.4 a high expansion foam installation complying with Regulation 10 of Chapter II-2 of the 1974 SOLAS Convention.

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 should be considered as one compartment.

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

.3 A receptacle containing sand, sawdust impregnated with soda, or other approved dry material in such quantity as may be required by the Administration. Alternatively, an approved portable extinguisher may be substituted.

9.5.2 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 kilowatts, should be provided with the following arrangements:

.1 One of the fixed arrangements required by 9.5.1.1; 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 kilowatts of engine power output or part thereof. The total number of portable extinguishers so supplied should be not less than two and need not exceed six.

9.5.3 The Administration should 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.

9.5.4 Where, in the opinion of the Administration, a fire hazard exists in any machinery space for which no specific provisions for fire-extinguishing appliances are prescribed in 9.5.1 to 9.5.3, there should be provided in, or adjacent to, that space a number of approved portable fire extinguishers or other means of fire extinction to the satisfaction of the Administration.

9.6 Portable fire extinguishers in accommodation, service and working spaces

The accommodation, service and working spaces should be provided with approved portable fire extinguishers to the satisfaction of the Administration. Approved extinguishers should comply with Regulation 7 of Chapter II-2 of the 1974 SOLAS Convention.

9.7 Fire detection and alarm system

9.7.1 An automatic fire detection and alarm system should be provided in all accommodation and service spaces. The system should be to the satisfaction of the Administration.

9.7.2 Sufficient manual fire alarm stations should be fitted at suitable locations throughout the unit.

9.8 Gas detection and alarm system

9.8.1 A fixed automatic gas detection and alarm system should be provided to the satisfaction of the Administration 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.

9.8.2 At least two portable gas monitoring devices should be provided, each capable of accurately measuring a concentration of flammable gas.

9.9 Firemen's outfits

9.9.1 At least two firemen's outfits complying with Regulation 14(a) and (b)(ii) of Chapter II-2 of the 1974 SOLAS Convention should be provided.

9.9.2 For each fireman's outfit spare charges should be provided to the satisfaction of the Administration.

9.9.3 The firemen's outfits should in general be stored so as to be easily accessible and ready for use, and where applicable one of the outfits should be located within easy access of any helicopter deck.

9.10 Arrangements in machinery and working spaces

9.10.1 Means should 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 should be capable of being operated from outside such spaces in case of fire.

9.10.2 Machinery driving forced and induced draught fans, electric motor pressurization fans, oil fuel transfer pumps, oil fuel unit pumps and other similar fuel pumps should 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.

9.10.3 Every oil fuel suction pipe from a storage, settling or daily service tank situated above the double bottom should 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 should be fitted but control in event of fire may be effected by means of an additional valve on the pipeline or lines outside the tunnel or tunnels.

9.11 Provisions for helicopter facilities

9.11.1 Helicopter decks should be of steel or equivalent fire resistant construction. If the space below the helicopter deck is a high fire risk space, the insulation standard should be to the satisfaction of the Administration.

9.11.2 On any helicopter deck there should be provided and stored near to the means of access to that deck:

.1 dry powder extinguishers of a total capacity of not less than 45 kilogrammes;

.2 a suitable foam application system consisting of monitors or foam-making branch pipes capable of delivering foam solution at a rate of not less than 6 litres per minute for at least 5 minutes for each square metre of the area contained within a circle of diameter "D", where "D" is the distance in metres across the main rotor and tail rotor in the fore and aft line of a helicopter with a single main rotor and across both rotors for a tandem rotor helicopter;

.3 carbon dioxide extinguishers of a total capacity of not less than 18 kilogrammes or equivalent, one of these extinguishers being so equipped as to enable it to reach the engine area of any helicopter using the deck; and

.4 at least two dual purpose nozzles and hoses sufficient to reach any part of the helicopter deck.

9.11.3 During helicopter arrivals and departures a pre-arranged procedure should be put into operation whereby suitably trained fire safety personnel are available.

9.11.4

.1 A designated area should be provided for the storage of fuel tanks which should be:

.1 as remote as is practicable from accommodation spaces, escape routes and embarkation stations; and

.2 suitably isolated from areas containing a source of vapour ignition.

.2 The fuel storage area should be provided with arrangements whereby a fuel spillage may be collected and drained to a safe location.

.3 Tanks and associated equipment should be protected against physical damage and from a fire in an adjacent space or area.

.4 Where portable fuel storage tanks are used, special attention should be given to:

.1 design of the tank for its intended purpose;

.2 mounting and securing arrangements;

.3 electrical bonding; and

.4 inspection procedures.

.5 Storage tank fuel outlet valves should be provided with means which permit closure in the event of a fire.

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

.7 Fire-extinguishing arrangements for protection of the designated area should be to the satisfaction of the Administration.

9.11.5

.1 Electrical fuel pumping units and associated control equipment should be of a type suitable for the location and potential hazard.

.2 Fuel pumping units should incorporate a device which will prevent over-pressurization of the delivery or filling hose.

.3 The procedures and precautions during refuelling operations should be in accordance with good recognized practice.

.4 Attention should be paid to the electrical bonding of all equipment used in refuelling operations.

.5 "NO SMOKING" signs should be displayed at appropriate locations.

9.12 Storage of gas cylinders

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

.1 Permanent piping systems for oxy-acetylene are acceptable provided that:

.1 all fixed piping is of steel and suitable joints are fitted;

.2 material containing more than 70 per cent copper is not used in the system except for welding or cutting tips;

.3 allowance is made for expansion of the piping;

.4 the piping system is suitable for the intended pressures.

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

.3 Storage rooms should be constructed of steel, and be well ventilated and accessible from the open deck.

.4 Provision should be made for the expeditious removal of cylinders in the event of fire.

.5 "NO SMOKING" signs should be displayed at the gas cylinder storage rooms.

.6 Where cylinders are stowed in open locations means should be provided to:

.1 protect cylinders and associated piping from physical damage;

.2 minimize exposure to hydrocarbons; and

.3 ensure suitable drainage.

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

9.13 Miscellaneous items

9.13.1 A fire control plan complying with Regulation 4 of Chapter II-2 of the 1974 SOLAS Convention should be permanently exhibited.

9.13.2 Fire-extinguishing appliances should be kept in good order and be available for immediate use at all times while engaged in drilling operations or in transit.

CHAPTER 10 – LIFE-SAVING APPLIANCES AND EQUIPMENT

10.1 Survival craft

10.1.1 Each unit should be provided with survival craft of such aggregate capacity as will accommodate twice the total number of persons on the unit, including:

.1 rigid totally enclosed motor propelled and fire protected survival craft of such capacity as will accommodate all persons on the unit; and

.2 survival craft, capable of floating and breaking free in the event of the unit becoming submerged, of such capacity as will accommodate all persons on board.

10.1.2 In complying with the provisions above, not less than two survival craft should be provided.

10.1.3 Survival craft should be constructed and equipped so as to comply with the requirements of Regulations 5, 6, 7 and 11 or Regulations 15, 16 and 17 of Chapter III of the 1974 SOLAS Convention for lifeboats and liferafts, respectively. These Regulations should not preclude the use of new design and technology which has been found acceptable to the Administration. When, in the opinion of the Administration, any items of equipment required by Regulations 11 and 17 are unnecessary, the Administration may permit them to be dispensed with.

10.1.4 Survival craft should be so marked that they can be properly and readily identified.

10.2 Rescue boat

10.2.1 Each unit sould be provided with a rescue boat approved by the Administration and available at all times. The rescue boat should incorporate the following:

.1 ample reserve of buoyancy;

.2 robust construction;

.3 adequate proportions to permit taking aboard an unconscious person without capsizing; and

.4 propelling machinery that can be easily started in all expected conditions.

10.2.2 One of the rigid totally enclosed motor propelled survival craft may be accepted as the rescue boat if it complies with the requirements in 10.2.1.

10.3 Life-jackets

Life-jackets of an approved type and complying with the requirements of Regulation 22 of Chapter III of the 1974 SOLAS Convention should be provided for all persons on board and, in addition, spare life-jackets for 5 per cent of that number.

10.4 Lifebuoys

10.4.1 At least eight lifebuoys of a type complying with the requirements of Regulation 21 of Chapter III of the 1974 SOLAS Convention should be provided on each unit. The number and placement of lifebuoys should be such that a lifebuoy is accessible from exposed locations with particular emphasis on embarkation and disembarkation points.

10.4.2 Two of the lifebuoys should be provided with self-igniting lights, and a further two should be provided with self-igniting lights and self-activating smoke signals. The self-igniting lights should be of an approved electric battery type. The lifebuoys provided with self-igniting lights and self-activating smoke signals should be placed near the navigating bridge, main control station or where readily available to operating personnel.

10.4.3 At least two lifebuoys in widely separated locations should each be fitted with a buoyant lifeline, the length of which should be at least one and a half times the distance from the deck of stowage to the waterline at light draught, or 30 metres, whichever is greater.

10.5 Stowage, handling and launching

Life-saving appliances and equipment should be positioned or stowed to the satisfaction of the Administration to provide for:

.1 distribution at the most easily accessible and/or readily available locations with due regard being given to the particular characteristics, shape and configuration of the unit. The distribution should be such that a fire or other accident in one part of the unit would not be likely to immobilize all the appliances (see 9.3.5);

.2 the safe and rapid use of each device or piece of equipment under emergency conditions;

.3 the marshalling of persons on board at embarkation stations; and

.4 such launching devices which might be considered necessary to launch survival craft under emergency conditions. Means should be provided for actuating the descent mechanism from a position on board the survival craft. Means should also be provided for on-load release from rigid survival craft and automatic release from other craft.

10.6 Emergency procedures

10.6.1 *Person in charge*

.1 The person on each unit to whom all personnel on board are responsible in an emergency should be clearly defined. This person should be designated by title by the owner or operator of the unit or the agent of either of them.

.2 The person in charge should be well acquainted with the characteristics, capabilities and limitations of the unit. This person should be fully cognizant of his responsibilities for emergency organization and action, for conducting emergency drills and training, and for keeping records of such drills.

10.6.2 *Muster list*

.1 Each unit should have a current muster list, revised as necessary to reflect any procedural changes. The muster list should be designed to cover such emergencies as may possibly occur, including blowout, fire, collision, severe storms, man overboard and abandonment.

.2 Special duties at specific locations should be assigned, with the key assignments delegated to personnel as necessary. The muster list should show all these duties and indicate to which location each man should go and the duties he is to perform. These duties should, if possible, be comparable to the regular duties of the individual.

.3 All other persons on board should also be provided for in the muster list, indicating the location to which they should go and the duties, if any, they would be expected to perform. Visitors should be requested to read the muster list and acknowledge in writing their understanding of it.

10.6.3 *Emergency drills*

.1 Periodic drills should be conducted simulating the emergency conditions included on the muster list. All personnel should report to their respective stations and be prepared to perform the duties assigned to them. Instructions should be given as necessary to ensure that all persons are familiar with the alarm signals and with their duties and stations.

.2 Drills should be so conducted as to ensure that persons who cannot participate in an emergency drill on one date will participate in the same type of drill held at the next drill period. Drills should be held as necessary to ensure that all personnel participate at least once a month and the action be recorded in the official logbook or tour report as applicable.

.3 When drills involve rigid survival craft, such craft should if reasonable and practical in the opinion of the person in charge, be launched at least once very four months. Survival craft equipment should be examined on a regular basis to ensure that it is complete.

10.6.4 *Emergency warnings*

.1 Each unit should be provided with a general alarm system so installed as to be clearly perceptible in all parts of the unit. Control stations for activating the alarm should be installed to the satisfaction of the Administration. The number of signals used should be limited to the following: general emergency signal, fire signal and abandon unit signal. These signals should be described in the muster list.

.2 The warning signals given over the general alarm system should be supplemented by instructions over a public address system.

10.7 Portable radio apparatus

An approved portable radio apparatus for survival craft complying with the requirements of Regulation 13 of Chapter III of the 1974 SOLAS Convention should be carried on each unit. This portable radio should be kept in a suitable location ready to be moved to one of the survival craft in the event of an emergency.

10.8 Distress signals

Each unit should be provided, to the satisfaction of the Administration, with means of making effective distress signals by day and by night, including at least twelve parachute signals capable of giving a bright red light at a high altitude.

10.9 First aid kit

First aid kits should be readily available to the satisfaction of the Administration. Each unit should be provided with a stretcher capable of being used for lifting an injured person into a helicopter.

10.10 Guards and rails

To prevent persons from falling overboard the unprotected perimeter of all floor and deck areas and openings should be provided with guards, rails or other devices to the satisfaction of the Administration.

10.11 Means of embarkation

10.11.1 Means should be provided for embarkation into survival craft and other craft as appropriate. In providing the means of embarkation consideration should be given to the shape and configuration of the unit, the method of launching and embarkation into the survival craft.

Minimum physical exertion should be required for embarkation. The means of embarkation should include:

.1 where practicable, at least two widely separated fixed metal inclined ladders or stairways, extending from the deck to the surface of the water; and

.2 personnel landings to ensure safe embarkation, or, where constructional features make the provision of personnel landings impractical, other suitable transfer facilities to ensure safe embarkation, to the satisfaction of the Administration.

10.11.2 Personnel landings, where fitted, should be provided with efficient illumination. Sea areas in their vicinity should likewise be illuminated.

CHAPTER 11 – RADIOCOMMUNICATION INSTALLATIONS

11.1 Application

11.1.1 The purpose of this Chapter is to provide minimum requirements for distress and safety radiocommunications between mobile offshore drilling units and coast stations, ships and supporting aircraft in the Maritime Mobile Service.

11.1.2 The requirements are applicable to the following modes of operation of mobile offshore drilling units:

.1 when underway self-propelled;

.2 when towed, or self-propelled and accompanied by escort ships; and

.3 when stationary at the site or engaged in drilling operations.

11.2 General

Coastal States in common areas of interest should, to the extent possible, establish similar radiocommunication requirements to avoid confusion in case any ancillary craft have to divert to another coastal State in an emergency.

11.3 Self-propelled units underway

Each unit while underway at sea should comply with the applicable provisions concerning radio stations for cargo ships in Chapter IV of the 1974 SOLAS Convention and in IMCO Assembly resolutions A.335(IX) and A.336(IX).

11.4 Units when towed, or self-propelled and accompanied by escort ships

11.4.1 Each unit when manned and under tow should be provided with:

.1 a radiotelephone station complying with the provisions of Regulations 15(a), (c), (d), (e) and (f), and 16(b), (c), (d), (e), (f), (h), (i), (j), (l) and (m) of Chapter IV of the 1974 SOLAS Convention and IMCO Assembly resolution A.334(IX);

.2 an efficient means of communication between the radiotelephone station and the control room of the unit;

.3 a VHF radiotelephone station (in compliance with IMCO Assembly resolution A.336(IX));

.4 at least one emergency position-indicating radio beacon (EPIRB) appropriate to the area of operation; and

.5 an adequate means of communication with the towing ships.

11.4.2 Each self-propelled unit accompanied by one or more escort vessels should comply with the provisions of 11.3.

11.5 Units stationary at the site or engaged in drilling operations

Each unit while stationary at the site or engaged in drilling operations should comply with the provisions of 11.4.1 to 11.4.1.4 and any additional radiocommunication requirements of the coastal State.

11.6 Helicopter communications

Each unit serviced by helicopters should be provided with the radiocommunication equipment required for flight safety as determined by the coastal State.

11.7 Technical specifications for equipment

The radio station equipment should be type-approved to the technical specifications of the Administration issuing the licence. Where there is common agreement, equipment type-approved by one Administration should be accepted by the other Administration.

11.8 Gas explosion danger

Any radio equipment installed in a zone as defined in 6.1 should be in compliance with Part C of Chapter IV of the 1974 SOLAS Convention.

11.9 Accommodation for radio personnel

On each unit the accommodation of at least one of the radiotelephone operators should be situated as near as practicable to the radiotelephone operating position.

11.10 Survey of the radio station

11.10.1 The radio station of a unit should be subject to survey as specified below:

.1 by the Administration which issues the licence or its authorized representative before the radio station is put into service;

.2 when the unit is moved and comes under the administrative control of another coastal State a survey may be carried out by that State or its authorized representative;

.3 once every twelve months, carried out by an officer of the Administration and/or the coastal State or their respective authorized representative.

11.10.2 The Administration may recognize the coastal State as its authorized representative.

11.10.3 In every case when an authorized representative of the coastal State carries out an inspection a report should be issued and kept with the radio documents, and a copy, if requested, should be forwarded to the Administration.

CHAPTER 12 – LIFTING DEVICES

12.1 Cranes

12.1.1

.1 Each crane including its supporting structure which is used for the transfer of material, equipment or personnel between the unit and attending vessels should be of a design and construction to the satisfaction of the Administration and adequate for the service intended in accordance with the requirements of a recognized classification society or with national or international standards or codes.

.2 Cranes should be so located and protected as to reduce to a minimum any danger to personnel, due regard being paid to moving parts or other hazards. Their design should have regard to the materials used in construction, the working conditions to which they will be subjected and the environmental conditions. Adequate provisions should be made to facilitate cleaning, inspection and maintenance.

12.1.2 Consideration should be given to the failure mode for each crane in the event of extreme overload so that the crane operator is exposed to minimum danger.

12.1.3 The installation of each crane with particular regard to its supporting structure should be surveyed by an officer of the Administration or a duly authorized person or organization.

12.1.4 After each crane has been erected on board, and before it is placed in service, operational and load tests should be conducted. These tests should be witnessed and verified by an officer of the Administration or a duly authorized person or organization. A record of these tests and other information concerning initial certification should be readily available.

12.1.5 Each crane should be examined at intervals not exceeding twelve months. It should further be tested and certified, at intervals not exceeding four years, or after substantial alteration or repairs. These tests should be witnessed and verified by an officer of the Administration or a duly authorized person or organization. A record of these examinations, tests and certifications should be readily available.

12.1.6 A durable load rating chart and boom angle indicator should be provided in a location easily visible to the operator.

12.1.7 Except when loads are determined and marked prior to lifting, each crane should be fitted, to the satisfaction of the Administration, with a safety device to give the crane operator a continuous indication of hook load and rated load for each radius. The indicator should give a clear and continuous warning when approaching the rated capacity of the crane.

12.1.8 The Administration should give consideration to the installation of limit switches to provide for the safe operation of the crane.

12.1.9 A crane manual should be provided for each crane and should be readily available. This manual should contain full information concerning:

.1 the design standard, operation, erection, dismantling and transportation;

.2 all limitations during normal and emergency operations with respect to safe working load, safe working moment, maximum wind, maximum heel and trim, design temperatures and braking systems;

.3 all safety devices;

.4 diagrams for electrical, hydraulic and pneumatic systems and equipment;

.5 materials used in construction, welding procedures and extent of non-destructive testing; and

.6 guidance on maintenance and periodic inspection.

12.2 Personnel lifts

12.2.1 Personnel lifts should be of a design acceptable to the Administration and adequate for the service intended.

12.2.2 The construction and installation should be surveyed by an officer of the Administration or a duly authorized person or organization. The inspections should be carried out on installation and at intervals not exceeding twelve months and certificates or reports should be readily available.

12.2.3 Each lift car in a column of a column stabilized unit should provide for emergency exit with an escape ladder in the hoistway.

12.3 Drilling derricks

The design of each drilling derrick and its supporting structure should be to the satisfaction of the Administration. The rated capacity for each reeving should be included in the Operating Manual.

CHAPTER 13 – HELICOPTER FACILITIES

13.1 General

Each helicopter deck on a unit should be of sufficient size and located so as to provide a clear approach to enable the largest helicopter using the deck to operate under the most severe conditions anticipated for helicopter operations.

13.2 Construction

13.2.1 The helicopter deck should be of a design and construction adequate for the intended service to the satisfaction of the Administration.

13.2.2

.1* In general, the helicopter deck should be of sufficient size to contain a circle of a diameter equal to at least the rotor diameter of the largest helicopter intended to use the facility. The helicopter deck should have an approach/departure sector of at least 180° free of obstructions. The base of this sector should be tangent to the periphery of the circle described above as

* Reference is made to any regulations of national civil aviation authorities in the unit's area of operation.

The deck size as described in 13.2.2 is applicable to helicopters with a single main rotor. Administrations may specify different requirements if tandem rotor helicopters are to be utilized.

shown in figure 2. Outside the approach/departure sector, obstructions within one third of the rotor diameter from the periphery of the circle described above should not extend above a plane measured vertically from the edge of the deck with a rise equal to half of the horizontal distance from the periphery of the above circle.

.2* Where adverse climatic conditions are prevalent, as in the North Sea, a coastal State may for units operating in its territorial sea or on its continental shelf, specify a helicopter deck of sufficient size to contain a circle of a diameter equal to at least the overall length of the largest helicopter intended to use the facility. The approach/departure sector should be not less than 210° free of obstruction and should intersect the periphery of the circle described above as shown in figure 2. Outside the approach/departure sector, obstructions within one third of the helicopter overall length from the periphery of the circle described above should not extend more than 1/20 of the helicopter overall length above the level of the helicopter deck. The overall length of a helicopter is the distance from the tip of the main rotor blade to the tip of the tail rotor when the rotor blades are aligned along the longitudinal axis of the helicopter.

13.2.3 The helicopter deck should have a non-skid surface.

13.2.4 The helicopter deck should have drainage facilities to prevent the collection of liquids and prevent liquids from spreading to or falling on other parts of the unit having regard to the use of fire-fighting equipment and the possible spillage of fuel.

13.3 Arrangements

13.3.1 The helicopter deck should be free of projections except that landing lights or other essential projections may be installed around the periphery of the deck provided they do not rise more than 15 centimetres above the level of the helicopter deck.

13.3.2 The helicopter deck should have recessed tie-down points for securing a helicopter.

13.3.3 The helicopter deck should be protected by a safety net at least 1.5 metres wide. The outer edge should not rise more than 15 centimetres above the edge of the deck.

13.3.4 The helicopter deck should have both a main and an emergency personnel access route located as far apart from each other as practicable.

13.4 Visual aids

13.4.1 A wind direction indicator located in an unobstructed area readily visible to helicopters approaching the helicopter deck should be provided.

13.4.2 The helicopter deck should be marked (figure 2) in a contrasting colour as follows:

.1 the perimeter with a continuous line of 40 centimetres width;

.2 unit identification, and

.3 aiming circles, taking into account deck configuration, helicopter type and operational requirements.

13.4.3 Each helicopter deck should be fitted with yellow and blue lights in alternate order to enable the landing area to be easily identified at night. These lights should be positioned around the perimeter of the deck not more than 3 metres apart.

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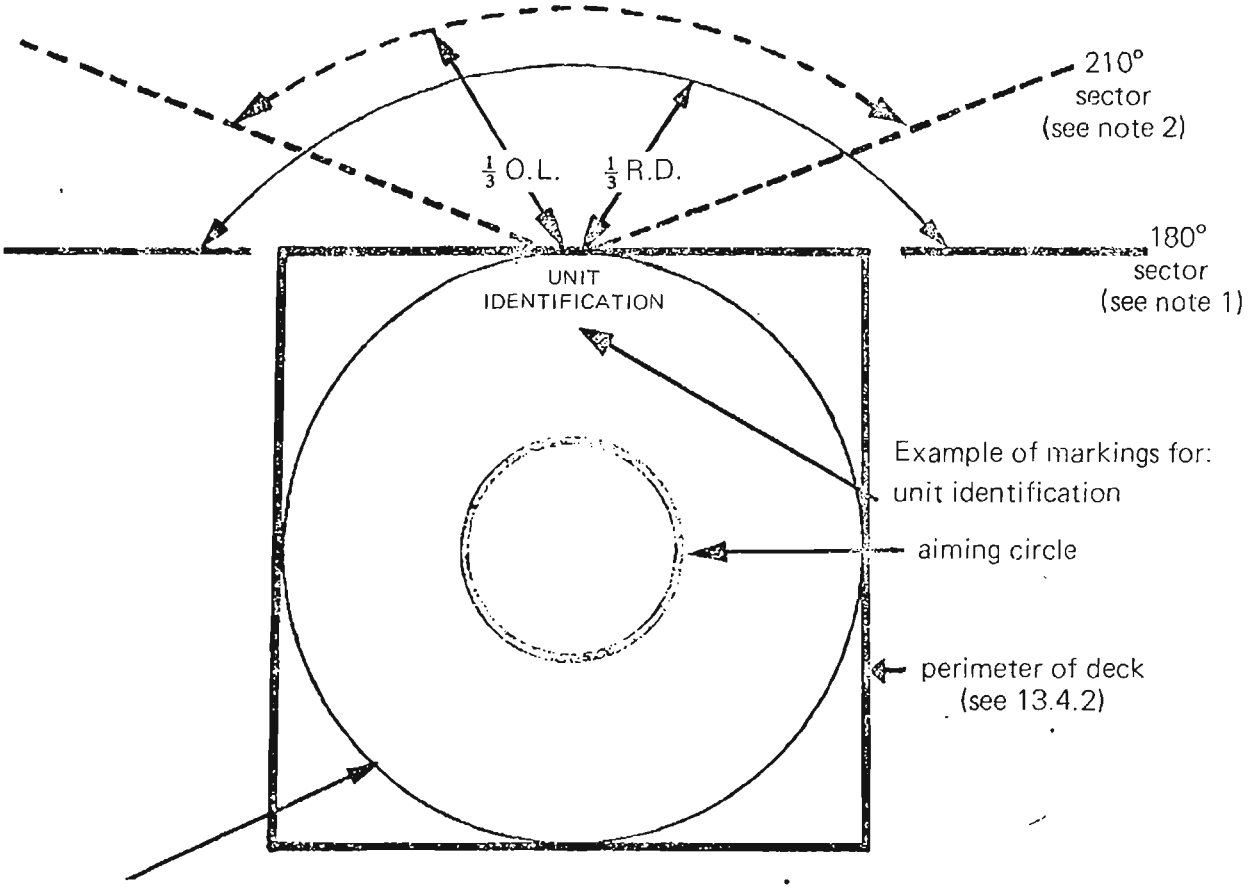
* Reference is made to any regulations of national civil aviation authorities in the unit's area of operation.

The deck size as described in 13.2.2 is applicable to helicopters with a single main rotor. Administrations may specify different requirements if tandem rotor helicopters are to be utilized.



Notes:

1. Approach/departure sector and limited obstruction area defined in 13.2.2.1 shown by solid line ——————

2. Approach/departure sector and limited obstruction area defined in 13.2.2.2 shown by broken line — — — — — —

3. Although a square helicopter deck is shown, other configurations are commonly used.

Figure 2 – Example of helicopter deck arrangement

CHAPTER 14 – OPERATING REQUIREMENTS

14.1 Operating Manual

14.1.1 An Operating Manual containing guidance for the safe operation of the unit under normal and emergency conditions, to the satisfaction of the Administration, should be on board and available to all concerned.

14.1.2 The Operating Manual should include the following information where applicable:

.1 a general description of the unit;

.2 limiting design data for each mode of operation, including loading, wave height, wave period, wind, current, draught, temperature, assumed sea-bed conditions, and other environmental factors;

.3 general arrangement plans showing watertight compartments, closures, vents, permanent ballast, and allowable deck loadings;

.4 light ship data and hydrostatic curves or equivalents;

.5 capacity plan showing the capacity, centre of gravity and free surface correction for each tank;

.6 instructions for operation of the unit including preparations and the approximate length of time required for meeting severe storm conditions, procedures for changing modes of operation and any inherent operational limitations;

.7 stability information setting forth the allowable maximum height of the centre of gravity in relation to draught data or other parameters based upon compliance with the intact and damage stability criteria;

.8 examples of loading conditions for each mode of operation and instructions for developing other acceptable loading conditions;

.9 plans and instructions for the operation of the ballast system;

.10 schematic diagrams of main and emergency power supplies and electrical installations;

.11 schematic diagrams of main oil fuel transfer and storage systems;

.12 a plan showing hazardous areas;

.13 fire control plan including type and location of fire-fighting appliances and escape routes from all compartments;

.14 safety provisions including location and operation of life-saving appliances and a procedure for evacuation of personnel from the unit;

.15 the rated capacity for each reeving of the drilling derrick; and

.16 the identification of the helicopter used for the design of the helicopter deck.

14.2 Dangerous goods

14.2.1 Dangerous goods should be stored safely and appropriately according to the nature of the goods. Incompatible goods should be segregated from one another.

14.2.2 Explosives which present a serious risk should be stored in a suitable magazine which should be kept securely closed. Such explosives should be segregated from detonators. Electrical apparatus and cables in any compartment in which explosives are intended to be stored should be designed and used so as to minimize the risk of fire or explosion.

14.2.3 Flammable liquids which give off dangerous vapours and flammable gases should be stored in a well-ventilated space or on deck.

14.2.4 Substances which are liable to spontaneous heating or combustion should not be carried unless adequate precautions have been taken to prevent the outbreak of fire.

14.2.5 Radioactive substances should be stored and handled in a safe manner.

14.3 Pollution prevention

Provision should be made such that the unit can comply with the requirements of international conventions in force.

14.4 Towing

Towing fittings should be installed so as to reduce to a minimum any danger to personnel during towing operations. Their design and arrangement should have regard to both normal and emergency conditions.

14.5 Transfer of material, equipment or personnel

14.5.1 Transfer operations, including the weights of the loads to be handled and emergency procedures, should be discussed and agreed between personnel on the unit and on attending vessels prior to commencement of such transfers. Direct communication should be maintained with the crane operator throughout such operations.

14.5.2 The unit should be equipped with at least two independent means for mooring attending vessels. The mooring position should be such that sufficient crane capacity (lifting and outreach) is available to handle loads in a safe manner.

14.5.3 The arrangement of mooring connexions on the unit to facilitate transfer operations should have regard to the risk of damage should the attending vessel come in contact with the unit.

14.5.4 The mooring lines between the unit and the attending vessel should, as far as practicable, be arranged so that if a line breaks, danger to personnel on both the attending vessel and the unit is minimized.

14.5.5 Discharges from the unit, such as those from the sewage system or ventilation from bulk tanks, should be arranged so that they minimize danger to personnel on the deck of attending vessels.

14.6 Diving systems

14.6.1 Diving systems, if provided should 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.

14.6.2 Diving systems should be designed, constructed, maintained and certified in accordance with a national or international standard or code acceptable to the Administration.

14.7 Safety of navigation

14.7.1 The requirements of the Convention on the International Regulations for Preventing Collisions at Sea in force should apply to each unit except when stationary and engaged in drilling operations.

14.7.2 Each unit when stationary and engaged in drilling operations should comply with the requirements for the safety of navigation of the coastal State in whose territorial sea or on whose continental shelf the unit is operating.

APPENDIX

Model form of Mobile Offshore Drilling Unit
Safety Certificate

MOBILE OFFSHORE DRILLING UNIT SAFETY CERTIFICATE

(Official seal)

Issued in pursuance of the

IMCO CODE FOR THE CONSTRUCTION AND EQUIPMENT OF MOBILE OFFSHORE DRILLING UNITS

Under the authority of the Government of

.....

(full official designation of the country)

by .....

(full official designation of the competent person or organization authorized by the Administration)

Distinctive identification (Name or number)	Type (section 1.3 of the Code)	Port of registry

Date on which keel was laid or unit was at a similar stage of construction or on which major conversion was commenced .....

THIS IS TO CERTIFY:

1. That the above-mentioned unit has been duly surveyed in accordance with the applicable provisions of the Code for the Construction and Equipment of Mobile Offshore Drilling Units.

2. That the survey showed that the structure, equipment, fittings, radio station arrangements and materials of the unit and the conditions thereof are in all respects satisfactory and that the unit complies with the relevant provisions of the Code.

3. That the life-saving appliances provide for a total number of ..... persons and no more as follows:

4. That, in accordance with section 1.4 of the Code, the provisions of the Code are modified in respect of the unit in the following manner:

This Certificate is valid until the ..... day of ..... 19 . .

Issued at .... 19 . .
(Place of issue of Certificate)

The undersigned declares that he is duly authorized by the said Government to issue this Certificate.

.....
(signature of official issuing the Certificate and/or seal of issuing authority)

(seal or stamp of the issuing authority, as appropriate)

SURVEYS

This is to certify that, at a survey required by section 1.6 of the Code, this unit was found to comply with the relevant provisions of the Code.

Intermediate survey

Place ..... Date .....
Signature and seal of issuing authority

Place ..... Date .....
Signature and seal of issuing authority

Place ..... Date .....
Signature and seal of issuing authority

Place ..... Date .....
Signature and seal of issuing authority

Place ..... Date .....
Signature and seal of issuing authority