RUSSIAN MARITIME REGISTER OF SHIPPING

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RULES

FOR THE CLASSIFICATION, CONSTRUCTION AND EQUIPMENT OF MOBILE OFFSHORE DRILLING UNITS AND FIXED OFFSHORE PLATFORMS

PART III

EQUIPMENT, ARRANGEMENTS AND OUTFIT OF MODU/FOP

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RULES FOR THE CLASSIFICATION, CONSTRUCTION AND EQUIPMENT OF MOBILE OFFSHORE DRILLING UNITS AND FIXED OFFSHORE PLATFORMS

Rules for the Classification, Construction and Equipment of Mobile Offshore Drilling Units (MODU) and Fixed Offshore Platforms of (FOP) of Russian Maritime Register of Shipping (RS, the Register) have been approved in accordance with the established approval procedure and come into force on 1 July 2022.

The present edition of the Rules is based on the 2018 edition taking into account the amendments and additions developed before publication.

The Rules set down specific requirements for MODU and FOP, consider the recommendations of the Code for the Construction and Equipment of Mobile Offshore Drilling Units (MODU Code), as adopted by the IMO Assembly on 2 December 2009 (IMO resolution A.1023(26)).

The procedural requirements, unified requirements, unified interpretations and recommendations of the International Association of Classification Societies (IACS) and the relevant resolutions of the International Maritime Organization (IMO) have been taken into consideration.

The Rules are published in the following parts:

Part I "Classification";
Part II "Hull";
Part III "Equipment, Arrangements and Outfit of MODU/FOP";
Part IV "Stability";
Part V "Subdivision";
Part VI "Fire Protection";
Part VII "Machinery Installations and Machinery";
Part VIII "Systems and Piping";
Part IX "Boilers, Heat Exchangers and Pressure Vessels";
Part X "Electrical Equipment"
Part XI "Refrigerating Plants";
Part XII "Materials";
Part XIII "Welding";
Part XIV "Automation";
Part XV "MODU and FOP Safety Assessment";
Part XVI "Signal Means";
Part XVII "Life-Saving Appliances";
Part XVIII "Radio Equipment";
Part XIX "Navigational Equipment";
Part XX "Equipment for Prevention of Pollution".

These Rules supplement the Rules for the Classification and Construction of Sea-Going Ships and the Rules for the Equipment of Sea-Going Ships.

REVISION HISTORY

(purely editorial amendments are not included in the Revision History)

For this version, there are no amendments to be included in the Revision History.

1 GENERAL

1.1 APPLICATION

1.1.1 All the requirements of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification and Construction of Sea-Going Ships[1] apply to MODU and FOP, unless expressly provided otherwise in this Part.

1.1.2 The requirements of this Part do not cover the following arrangements and equipment:

industrial machinery used exclusively in drilling and related operations as well as in output processing;

mooring equipment (other than the mooring equipment of drilling ships).

1.1.3 Equipment, arrangements and outfit of drilling ships shall be in full compliance with the requirements of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification and with expressly specified requirements of the Rules for the Classification, Construction and Equipment of Mobile Offshore Drilling Units (MODU) and Fixed Offshore Platforms (FOP)[2].

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1 Hereinafter referred to as "the Rules for the Classification".

2 Hereinafter referred to as "the MODU/FOP Rules".

1.2 DEFINITIONS AND EXPLANATIONS

1.2.1 The definitions and explanations relating to general terminology are given in General Regulations for the Classification and Other Activity, in Part I "Classification" and Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification, as well as in Part I "Classification" and Part II "Hull" of the MODU/FOP Rules.

For the purpose of this Part, the following definitions have been adopted.

Watertightness is the capability of a structure to prevent water penetration in any direction under the water head the structure is designed for.

Length of unit is the length of the hull measured at the level of the waterline appropriate to the unit's maximum draught while afloat in transit.

Hull is a watertight structure, which ensures buoyancy and stability of the unit. The hull may include one, two or more lower hulls (pontoons) generally, submerged in water and an upper hull, which is usually above water.

Unit is a MODU, FOP, FOP moduli and/or any elements thereof.

Draught is a vertical distance measured at the midpoint of the appropriate length of the unit from the top of the plate keel or from the point where the inner surface of the shell (outer surface for units with a non-metal shell) abuts upon the bar keel, up to the relevant waterline of the unit.

Compartment is the part of the hull interior bounded by shell plating, watertight bulkheads, decks, platforms, stringers and floors.

Margin line is a waterline down to which a unit is submerged after damages specified in Part V "Subdivision".

Dynamic positioning system is a system intended for the automatic and remote automated control of MODU propulsion machinery in order to ensure MODU dynamic position keeping at predetermined accuracy when exposed to external effects.

Breadth of unit's hull is the extreme moulded breadth of the hull measured at its mid length at the level of or below the waterline in transit.

1.3 SCOPE OF TECHNICAL SUPERVISION

1.3.1 General regulations on technical supervision of equipment, arrangements and outfit are given in General Regulations for the Classification and Other Activity and in Part I "Classification" of the Rules for the Classification, as well as in Part I "Classification" of the MODU/FOP Rules.

1.3.2 The scope of technical supervision of products included into equipment, arrangements and outfit of MODU/FOP shall be in compliance with the list given in 1.3 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification as far as applicable to the particular type of MODU/FOP, taking into account the additional arrangements listed below.

1.3.2.1 Jacking system of self-elevating MODU:

.1 hydraulic, with legs of space truss type: sliders, catches, yokes for securing hydraulic cylinders, slider guides, catch bearers, securing plates of hydraulic cylinders, support screws with nuts, fastenings (bolts, pins, nuts);

.2 hydraulic, with legs of cylinder type: moving and fixed yokes (in relation to the self-elevating MODU hull), yoke catchers, support screws with nuts, fastenings (bolts, pins, nuts);

.3 mechanical, rack-and-pinion type: jack frame, rack-and-pinion shaft, pinions, gear wheels, shafts, fastenings (bolts, pins, nuts).

1.3.2.2 Arrangements for lifting and lowering columns of submersible sea water pumps:

.1 columns and guides;

.2 stoppers;

.3 fastenings (bolts, pins and nuts).

1.3.2.3 Fixing arrangements of self-elevating MODU (if any):

.1 plates;

.2 screws and nuts.

1.3.2.4 Closing arrangements of well cementing ports for passage of cathodic protection cables and for inspection of submersible sea water pumps:

.1 manholes;

.2 covers.

1.3.3 The items of equipment, arrangements and outfit listed in 1.3 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification and in Table 1.3.3 of this Part are subject to control by the Register with respect to fulfillment of the requirements of Part XIII "Materials", Part XIV "Welding" of the Rules for the Classification, as well as Part XII "Materials" and Part XIII "Welding" of the MODU/FOP Rules.

Table 1.3.3

Nos.	Item	Blanks	Scope of test[1]
1	Catches, catch bearers, slider casings, slider guides, support screws, support screw nuts, pins of yoke catches, fastenings (bolts, pins, nuts), jacking system for hull of MODU; screws and nuts of fixing arrangements (if any), axles for securing of lifting hydraulic cylinders	Steel forgings	3.7
		Steel castings	3.8
2	Rack-and-pinion shafts, pinions, shafts of jacking system	Steel forgings	3.7
3	Yokes for securing of hydraulic cylinders, pin casings of catching devices and gear wheels of jacking system of the MODU	Steel castings	3.8
4	Moving and fixed yokes of jacking system of the MODU	Rolled steel	3.2

Nos.	Item	Blanks	Scope of test[1]
5	Securing plates of cylinders of jacking system of the MODU; plates of fixing arrangements (if any)	Steel plates	3.2
6	Frames and portals of mechanical jacks of jacking system of the MODU	Steel plates and shapes	3.2

[1] The scope of test is in accordance with the stated sections of Part XIII "Materials" of the Rules for the Classification.

1.3.4 The following equipment, arrangements and outfit are subject to the Register technical supervision during construction of the MODU in accordance with the requirements of relevant chapters of the Rules for the Classification and the MODU/FOP Rules:

.1 rudder and steering gear;
.2 anchor arrangement;
.3 towing arrangement;
.4 openings in hull, superstructures and deckhouses and their closing arrangements;
.5 jacking system of self-elevating MODU;
.6 arrangements for lifting and lowering columns of submersible sea water pumps;
.7 fixing arrangements of self-elevating MODU (if any);
.8 masts and their rigging;
.9 arrangement and equipment of spaces;
.10 emergency outfit;
.11 MODU position-keeping system and components thereof.

1.3.5 The following equipment, arrangements and outfit are subject to the Register technical supervision during construction of the FOP in accordance with the requirements of relevant chapters of the Rules for the Classification and the MODU/FOP Rules:

.1 FOP position-keeping systems and components thereof;
.2 openings in hull of the FOP and their closing arrangements;
.3 masts and their rigging;
.4 arrangement and equipment of spaces;
.5 emergency outfit;
.6 mooring and boarding arrangements.

2 RUDDER AND STEERING GEAR

2.1 GENERAL

2.1.1 The self-propelled MODU and surface units shall be provided with a reliable and efficient rudder and steering system ensuring their steering and course-keeping qualities with due regard for their operating conditions and, unless otherwise specified, complying with the requirements of Section 2 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification.

2.1.2 On non-self-propelled units it is allowed to omit the steering gear or to provide only stabilizers.

2.1.3 Self-propelled MODU equipped with rudders shall be provided with an access (passage) which makes it possible to determine technical condition of the rudder bearings and clearances in the latter as well as to make sure that all connections of the rudder pintles with gudgeons are undamaged and secured.

To ensure access, if necessary, provision shall be made for bolted plating.

2.1.4 Where a non-conventional rudder is installed on self-propelled MODU/surface units, or where a MODU/surface unit is steered by means other than a rudder, documents attesting that the steering system used ensures an acceptable degree of reliability and effectiveness, which is based on the requirements of this Chapter, shall be submitted to the Register.

2.2 STEERING GEAR

2.2.1 Except for the cases specified in 2.1.4, self-propelled MODU/surface units shall be provided with a main steering gear and an auxiliary steering gear. The main steering gear and the auxiliary steering gear shall be so arranged that a single failure in one of them, so far as reasonable and practicable, will not render the other one inoperative.

2.2.2 The main and auxiliary steering gears may have some common elements (viz., tiller, segment, reduction gear, etc.) provided that structural components of these elements comply with the requirements of 6.2.8.2 of Part IX "Machinery" of the Rules for the Classification.

2.2.3 The main steering gear shall be of adequate strength and sufficient to steer the MODU/surface unit at maximum service speed and this shall be demonstrated. The main steering gear shall be so designed that it will not be damaged at maximum astern speed of the MODU/surface unit but this design requirement need not be proven by trials at maximum astern speed and maximum rudder angle.

2.2.4 The main steering gear shall, with the unit at its deepest seagoing draught, be capable of putting the rudder or nozzle rudder over from 35 on one side to 35 on the other side with the unit running ahead at maximum service speed. The rudder or nozzle rudder shall be capable of being put over from 350 on either side to 300 on the other side in not more than 28 s, under the same conditions.

2.2.5 The main steering gear shall be operated by power where necessary to fulfil the provisions of 2.2.3 of this Part and in any case in which the diameter of the rudder stock required by 2.3.1 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification in way of the tiller exceeds 120 mm. In all other cases the main steering gear may be hand-operated, complying with the requirements of 6.2.3.2 of Part IX "Machinery" of the Rules for the Classification.

2.2.6 The auxiliary steering gear shall be of adequate strength and sufficient to steer the MODU/surface unit at navigable speed and capable of being brought speedily into action in an emergency.

2.2.7 The auxiliary steering gear shall be capable of putting the rudder or nozzle rudder over from 15 on one side to 15 on the other side in not more than 60 s with the MODU/surface unit at its deepest seagoing draught while running at one half of its maximum speed ahead or seven knots, whichever is the greater.

2.2.8 The auxiliary steering gear shall be operated by power where necessary to fulfil the provisions of 2.2.6 of this Part, and in any case in which the diameter of the rudder stock required by 2.3.1 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification in way of the tiller exceeds 230 mm. In all other cases the auxiliary steering gear may be hand-operated, complying with the requirements of 6.2.3.3 of Part IX "Machinery" of the Rules for the Classification.

2.2.9 Where the main steering gear comprises two or more identical power units an auxiliary steering gear need not be fitted if the main steering gear is capable of operating the rudder in accordance with the provisions of 2.2.3 while operating with all power units.

As far as is reasonable and practicable the main steering gear shall be so arranged that a single failure in piping or in one of the power units will not impair the integrity of the remaining part of the steering gear.

2.2.10 Control of the main steering gear shall be provided both on the navigating bridge and in the steering gear compartment. If the steering gear control system which provides for control from the navigation bridge is electric, it shall be supplied from the steering gear power circuit from a point within the steering gear compartment.

2.2.11 When the main steering gear is arranged according to 2.2.9, two independent control systems shall be provided, each of which shall be operated from the navigation bridge.

Where the control system comprises a hydraulic telemotor, the second independent control system may be omitted.

2.2.12 A means of communication shall be provided between the navigation bridge and:

.1 the steering gear compartment; and

.2 the emergency steering position, if provided.

2.2.13 The exact angular position of the rudder or nozzle rudder, if power operated, shall be indicated on the navigation bridge. The rudder/ nozzle rudder indication shall be independent of the steering gear control system.

2.2.14 The angular position of the rudder/ nozzle rudder shall be recognizable in the steering gear compartment.

2.2.15 The exactness of the rudder/nozzle rudder angle indication shall comply with the requirements of 2.9.15 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification.

2.2.16 The steering gear shall be provided with a system of the rudder/nozzle rudder stops complying with the requirements of 2.9.11 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification.

2.2.17 In all other aspects the steering gear shall meet the requirements of 6.2 of Part IX " Machinery" of the Rules for the Classification, 5.10 and Section 7 of Part X "Electrical Equipment" of the MODU/FOP Rules.

3 ANCHOR ARRANGEMENT

3.1 GENERAL

3.1.1 For the period of operations at sea (in particular, when moving to the location) each MODU/FOP shall be generally provided with anchor arrangement specified in 3.1.1 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification, intended for temporary positioning of MODU/FOP at sea, and ensuring, if necessary, holding anchorage under stormy conditions which severity is in excess of that permissible for operations at sea.

If specially justified, MODU/FOP may be not provided with an anchor arrangement. In this case, to ensure temporary positioning of MODU/FOP consideration may be given to anchor arrangements of tow order vessels. Thereby detailed results of calculations and justifications for ensuring holding anchorage under stormy conditions including the characteristics of support vessels, safety factors, environmental effects and loads shall be submitted to the Register.

For MODU, it is permitted to use the position mooring system as the anchor arrangement.

3.1.2 For bower anchors of MODU/FOP, considering temporary nature of the anchor arrangement operation and the possible anchorage depths, it is permitted to include wire and synthetic fibre ropes into the anchor arrangement.

3.1.3 The need for provision of stoppers to secure the anchors for sea shall be determined by the shipowner.

3.1.4 The anchor arrangement of FOP may be located on the hull or on special overhang platforms installed for the period of operations at sea. Considering the temporary nature of the anchor arrangement operation, it is reasonable to provide the use of individual items of the anchor arrangement (machinery, hawse pipes, holders, etc.) for other purposes during operation of MODU (as the mooring and other arrangements).

3.1.5 If provision is made for installation of the anchor arrangement, the anchor equipment of the MODU/FOP shall be selected from Table 3.1.3-1 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification or when chain cables of R3, R3S and R4 grades are applied — from Table 3.1.5 of this Part according to the equipment number N_e determined in compliance with 3.2 of this Part where the equipment number obtained does not exceed values given in the said Tables.

Where the equipment numbers exceed tabulated values given in the Rules for the Classification, the anchor equipment of MODU/FOP shall be determined by special calculations, based on natural conditions and loads corresponding to the possible conditions for performance of operations at sea, having regard to additional positioning of MODU/FOP ensured by tow order vessels. In such a case, it is recommended to assume the design parameters of environmental effects by 15 — 20 % higher than those which are assumed when determining the total pull of tow order vessels.

Table 3.1.5

Equipment number N_e		Bower anchors		Chain cables for bower anchors			
				Total length of both chain cables, in m	Diameter, in mm		
Exceeding	Not exceeding	Number	Mass per anchor, in kg		Grade R3	Grade R3S	Grade R4
1390	1480	2	4230	577,5	50	—	—
1480	1570	2	4590	577,5	50	—	—
1570	1670	2	4890	577,5	52	—	—
1670	1790	2	5250	605	54	50	—
1790	1930	2	5610	605	56	52	50

Equipment number N_e		Bower anchors		Chain cables for bower anchors			
				Total length of both chain cables, in m	Diameter, in mm		
Exceeding	Not exceeding	Number	Mass per anchor, in kg		Grade R3	Grade R3S	Grade R4
1930	2080	2	6000	605	58	54	52
2080	2230	2	6450	632,5	60	56	54
2230	2380	2	6900	632,5	62	58	56
2380	2530	2	7350	632,5	64	60	58
2530	2700	2	7800	660	66	62	60
2700	2870	2	8300	660	68	64	62
2870	3040	2	8700	660	70	66	64
3040	3210	2	9300	687,5	73	68	66
3210	3400	2	9900	687,5	76	70	66
3400	3600	2	10500	687,5	76	73	70
3600	3800	2	11100	715	78	73	70
3800	4000	2	11700	715	81	76	73
4000	4200	2	12300	715	84	78	76
4200	4400	2	12900	742,5	84	81	78
4400	4600	2	13500	742,5	87	81	78
4600	4800	2	14100	742,5	90	84	81
4800	5000	2	14700	770	92	87	84
5000	5200	2	15400	770	95	90	87
5200	5500	2	16000	770	95	90	87
5500	5800	3[1)]	16900	820	97	90	87
5800	6100	3	17800	820	100	92	90
6100	6500	3	18800	820	105	95	95
6500	6900	3	20000	820	107	100	97
6900	7400	3	21500	820	111	102	100
7400	7900	3	23000	820	114	105	102
7900	8400	3	24500	820	117	107	105
8400	8900	3	26000	820	122	111	111
8900	9400	3	27500	820	127	117	114
9400	10000	3	29000	820	127	120	114
10000	10700	3	31000	820	132	124	120
10700	11500	3	33000	820	137	130	124
11500	12400	3	35500	820	142	132	127
12400	13400	3	38500	820	147	137	130
13400	14600	3	42000	820	152	142	137
14600	16000	3	46000	820	157	147	142

[1)] One anchor is supposed to be a spare anchor.

3.1.6 MODU/FOP, as a rule, shall be equipped with not more than two anchors. For prolonged towings at sea under severe natural conditions, it is necessary to provide a spare set of the anchor arrangement items (anchor, anchor rope, joining devices, etc.) which may be carried on MODU/FOP or on tow order vessels.

3.1.7 For drilling ships, the anchor equipment shall be selected from Table 3.1.3-1 according to the equipment number determined by Formula (3.2.1-1) of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification.

3.2 EQUIPMENT NUMBER

3.2.1 The equipment number used for selection of anchor equipment of MODU/FOP is determined by the formula

$$N_e = K_1 K_2 \Delta^{2/3} + K_3 A \qquad (3.2.1)$$

where K_1, K_2, K_3 = coefficients accounting for the form of the hull, effect of waves and wind conditions at the anchorage, respectively;

Δ = volume displacement of MODU/FOP or FOP modules sections at the given draft (or to the centre of the load line mark), in m³;

A = total projected area of the structures above the waterline (passing through the centre of the load line mark) on the plane normal to the horizontal projection of the anchor line, in m².

3.2.2 The form coefficient K_1 shall be taken equal to:

1,5 for drilling units with pontoons of rectangular shape and FOP/FOP moduli;

1,75 for drilling catamarans and units of similar types.

The coefficient K_1 may be also obtained from the ratio R/R' where R' and R are resistances of the submerged part of a conventional ship and a drilling unit, FOP/FOP moduli, with the same displacement, respectively.

The coefficients K_2 and K_3 with design wind velocity not exceeding 36 m/s and design wave height of 3 % probability not exceeding 11 m are taken from Table 3.2.2. Where the above design weather condition parameters are exceeded, the values of K_2 and K_3 coefficients shall be determined proceeding from the actual conditions of the MODU/FOP operation.

Table 3.2.2

MODU/FOP	K_2	K_3
Open sea	1,2	2,1
Enclosed sea	1,1	1,8

3.2.3 In well-grounded cases the Register may accept other values of coefficients given in 3.2.2 provided it is proved that the proposed values are in agreement with the actual service conditions.

3.2.4 The application of other calculation methods for anchor equipment is allowed.

In this case, detailed data on construction, characteristics of items and location of the anchor arrangement on MODU/FOP, justifications, methods, calculation results, accepted safety factors, design parameters of holding anchorage under stormy conditions, consideration of additional positioning due to operation of the tow order shall be submitted to the Register.

3.3 ANCHORS, CHAIN CABLES AND ROPES FOR ANCHORS, ANCHOR EQUIPMENT AND MACHINERY

3.3.1 Anchors, chain cables and ropes for anchors, anchor equipment and machinery shall comply with the requirements of 3.3.2, 3.3.3, 3.4.4 — 3.4.9, 3.4.12, 3.6.1 — 3.6.4 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification, respectively.

It is allowed to use in a MODU/FOP chain cables with intermediate lengths of a continuous length and strength grade according to 7.2 of Part XIII "Materials" of the Rules for the Classification.

3.3.2 A chain cable may be replaced with a wire rope except for the anchor length and the next section of a common link chain.

In this case the total length of the chain cable portion shall be equal to the distance between the anchor machinery and the point of securing the anchor for sea, but it is not to be less than 12,5 m.

The breaking strength of such ropes shall be generally not less than the breaking load of the corresponding chain and their length is not to be less than 1,5 times the length of these chain cables.

Equipment and machinery shall ensure the required wire rope tension during anchor stowage and during station-keeping of the unit to preclude formation of sheepshank knots on the rope.

3.3.3 Use of synthetic fibre ropes in the anchor arrangement of MODU/FOP is allowed, provided the requirements in 4.1.6 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification are met.

3.3.4 When selecting the anchor arrangement on the basis of special calculations, the anchor characteristics (type, mass) shall be determined on the assumption that they will ensure the required holding power. The holding power of the anchor shall be determined under design parameters of holding anchorage under stormy conditions with a safety factor within the range from 0,8 up to 1,0. In this case, the anchor rope tension shall not exceed the permissible value considering the safety factor which is recommended to be taken not less than 1,7.

3.3.5 If specially justified, FOP may be not equipped with anchor machinery where the carriage, dropping and heaving of anchors are provided by auxiliary of tow order vessels.

3.3.6 Anchors, chain cables and ropes shall be manufactured in compliance with the requirements of Appendices 1 — 3 to Section 3 of Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships and Sections 3 and 7 of Part XIII "Materials" of the Rules for the Classification.

4 POSITION-KEEPING SYSTEMS AND COMPONENTS THEREOF

4.1 GENERAL

4.1.1 The requirements of this Section apply to passive and active position-keeping systems intended for MODU/FOP positioning with restriction of shiftings within the prescribed limits and ensuring of normal conditions to perform technological processes and works at a site (drilling, production, loading of solid ballast, outfitting, etc.).

The requirements cover the following:

.1 position mooring systems of MODU/FOP, including anchors and flexible anchor lines;

.2 dynamic positioning systems enabling MODU positioning with the use of specially installed thrusters.

4.1.2 The requirements of this Section also apply to distributed anchoring systems ensuring positioning of mast FOP/tension leg platforms with the use of slack or taut anchor lines.

4.1.3 When developing position mooring systems, consideration shall be given to the requirements of Part II "Hull" and Part IV "Stability" which may be affected by the position-keeping system operation.

4.2 ANCHORING SYSTEMS

4.2.1 The anchoring MODU/FOP position mooring systems include, as a rule, several separate anchor arrangements each consisting generally of the following components:

.1 a complex of fittings, machinery and devices on MODU/FOP;

.2 anchor lines;

.3 anchor supports.

The composition and characteristics of the components of the anchor arrangements and anchoring system as a whole shall be determined by the designer.

4.2.2 The Register shall be provided with documentation showing location and containing detailed specification of anchoring system including anchors, connecting shackles, anchor lines consisting of chain, wire, synthetic or fibre rope as well as drawings of fairleads, guide devices, windlasses and other components of anchoring systems and their foundations.

4.2.3 The Register shall be additionally provided with:

.1 calculation of anchoring system including determination of the number of anchor lines which shall be used in operation of the MODU/FOP and during emergency situations, mass and type of anchor;

.2 breaking strength calculation for the anchor line. Material specifications of the anchor line;

.3 design and calculation of the anchor and anchor shackle unless they are of a type which has been previously approved;

.4 design of the anchor line stopper. Material specifications;

.5 design of guiding devices of the anchor line. Material specifications;

.6 design of chain/rope connections (if any). Type and design of connection of the rope and anchor shackle, if any. Material specifications;

.7 foundations and strengthening;

.8 design and calculations of special components used as a part of anchor lines and anchor arrangements (buoyancy elements, weights, corrosion protection systems, shock-absorbing inserts, etc.), if any.

4.3 STRUCTURE

4.3.1 The anchoring system shall be so designed that movements of MODU/FOP and forces (stresses) arising in the components as well as sudden failure of any anchor line will not cause damages to the hull and progressive failure of the remaining anchor lines.

The anchoring system as a whole shall ensure station-keeping of MODU/FOP in case of breaking of one (any one or the most loaded one) anchor line up to its restoration.

4.3.2 The components and devices shall be arranged on the MODU/FOP hull in such a way as to provide access for inspection and repair. For the devices inaccessible for inspection and repair, special requirements for reliability and service time shall be specified.

4.3.3 When designing anchoring systems, safety factors shall be determined for normal operational condition, survival condition under extreme factors and for conditions where damages of MODU/FOP are likely to occur.

Safety factors criteria shall be established in the design considering the recommendations of the recognized norms (standards) and the probability of occurrence of the ultimate condition under consideration. The quantitative values of safety criteria shall define the necessary margin in order to preclude hazardous (ultimate) condition in terms of fatigue and ultimate strength, buckling, rigidity, deformation of the anchoring system components and ultimate movements, speeds and accelerations of MODU/FOP.

4.3.4 When designing anchoring systems for MODU/FOP, different levels of environmental effects shall be taken into account:

operational environmental conditions — conditions characterized by frequent recurrence during service period and restricting only performance of some complicated technological operations and works;

extreme environmental conditions — conditions with low probability of exceedance during service period, which are maximum permissible for the anchoring system.

4.3.4.1 Characteristics of environmental conditions shall be assumed in compliance with the requirements of 2.2 of Part II "Hull" and Appendix 5 to Part IV "Stability".

4.3.4.2 Depending on the time spent by MODU/FOP in the area of operation, it is recommended to assume the following recurrence periods for extreme environmental conditions:

more than 1 year: environmental conditions with a recurrence period of 100 years;

less than 1 year: environmental conditions with a recurrence period of 10 years.

4.3.4.3 Calculation of the effects imposed by the extreme environmental loads shall be carried out for at least 8 directions (north, north-east, east, etc.) taking into account the orientation of MODU/FOP in the area of operation. In this regard, account shall be taken, when the direction of the current coincides with the direction of the waves and is opposite to it. The recommended duration of simulation for each design case is 9 h.

4.3.4.4 Taking into account the combined action of several parameters of extreme environmental conditions, the combinations of parameters of external effects given in Table 4.3.4.4 shall be taken as a basis.

Table 4.3.4.4

	Recurrence period for extreme environmental effects		
Time spent by MODU/FOP in the area of operation	Waves	Wind	Current
More than 1 year	100 years	100 years	50 years
Less than 1 year	10 years	10 years	5 years

4.3.5 It is recommended to design the MODU/FOP position mooring systems in the following sequence:

.1 to pre-select the dimensions and characteristics of the anchoring system components;

.2 to determine safety factors and criteria for various modes of operation;

.3 to identify possible combinations of environmental effects and phenomena typical for the prescribed location of MODU/FOP;

.4 to justify the rated levels of weather effects and operating conditions proceeding from the requirements for the reliable positioning of MODU/FOP, technological, communication and other requirements and recurrence of environmental effects;

.5 to determine the parameters of environmental loads for rated conditions;

.6 to do the calculations of MODU/FOP behaviour with determination of forces (tensions, loads) in the anchoring system components;

.7 to compare the criteria obtained from the calculation with the safety criteria;

.8 if necessary, to define more exactly the anchoring system characteristics.

When doing calculations, consideration shall be given to various MODU/FOP loading conditions, including the case of compartment flooding, and various pre-tension values of anchor lines because they affect significantly the fulfilment of operational requirements for restriction of movements.

It is recommended to do the calculations successively for static loads, dynamic effects and cyclic loads. Where necessary, calculations of vibrations and dynamics of anchor lines may be done.

4.3.6 The developed design to be submitted to the Register shall include final calculation of the anchoring systems which are intended for use during operation of MODU/FOP considering safety factors and environmental conditions.

The calculation shall take into account the following factors:

.1 rated environmental conditions, such as waves, winds, currents, ebb tides and flood tides, depths;

.2 air and water temperatures;

.3 ice conditions (if any);

.4 seabed configuration;

.5 geologic and technical conditions of the water area bed.

4.3.7 Calculations of anchoring systems may be made using both the deterministic and the statistic (probabilistic) approach.

When using the deterministic approach, parameters of the rated operational and extreme phenomena shall be initially determined (refer to 4.3.4). For the said phenomena the relevant values of loads and effects the anchoring system is designed for shall be determined.

When using the probabilistic approach, combinations of all kinds of weather conditions and phenomena shall be initially determined. Calculations of the anchor system and statistic analysis of reactions shall be done for all these combinations.

Calculations of reactions in anchor lines and the movements of MODU/FOP may be done by quasistatic or dynamic methods. When using the quasistatic method, effects of wind, current and wave drift force components are treated as static forces and the wave disturbing forces which induce motions are treated as harmonic loads with wave frequency. The methods are generally to take into account the dynamic nature of the effect, six degrees of freedom of the structures, inertia forces, influence exerted by friction forces and non-linear effects resulted from both physical and geometrical non-linearity. For anchoring systems in operation over a long period of time, calculations for cyclic loads and analysis of strength considering the endurance limit of components shall be done. For taut anchor lines the influence of vibrations which can be produced by eddies formed in water flow under the effect of current and waves shall be assessed.

Based on the calculation results, it is necessary to determine the maximum and minimum forces (tensions) in the system components, movements, speeds and accelerations of MODU/FOP under various environmental effects, as well as the rated service life of anchor lines. The rated values of these parameters shall be compared with safety criteria (strength, buckling, fatigue strength, operational restrictions).

4.3.8 The anchoring system components shall be designed with due regard for the adequate safety factors and with the use of methods allowing to identify extreme loading conditions for each component. In particular, consideration shall be given to a sufficient number of course angles along with the most unfavourable combination of wind, current and waves acting generally in one direction in order to determine the maximum tension of each anchor line.

When considering a certain site where MODU/ FOP is positioned, consideration shall be also given to any applicable patterns of irregular waves if they can result in increased loads.

In case of an iceberg threat, consequences of interactions between icebergs and the platform hull and anchor lines shall be considered.

4.3.9 When a quasi-static method is used, the maximum tension of each anchor line shall be calculated for the maximum deviation from each rated condition given in 4.3.10, combining with each other the following static and dynamic characteristics of MODU/FOP:

.1 mean steady shifting under the effect of a certain wind, current and wave drift forces;

.2 the most probable maximum movement (amplitude of oscillations) of MODU/FOP lying at anchor under the effect of waves due to wave excitation;

.3 effect of damping and inertia forces exerted on anchor lines shall be allowed for in the calculation, as applied to considerably greater depths;

.4 effect of the slowly changing movement shall be allowed for when the magnitude of such movement seems to be considerable.

4.3.10 When using the quasi-static method mentioned in 4.3.9 consideration shall be given to the following minimum safety factors at the maximum deviation of MODU/FOP from the nominal values in a broad range of directions (refer to Table 4.3.10).

Table 4.3.10

Design condition	Safety factor (SF) used in quasistatic method of calculation
Operation	2,7
Operation under severe storm conditions	1,8
Operation with one anchor line failed	1,8
Operation under severe storm conditions with one anchor line failed	1,25

$$SF = PB/T_{max}$$

where T_{max} = anchor line tension characteristic equal to the maximum value obtained according to 4.3.9;

PB = minimum rated breaking strength of the anchor line.

Operation is the most rigorous design weather conditions of normal operation established by the owner or designer.

Operation under severe storm conditions is the most rigorous design conditions of severe storm established by the owner or designer.

Operation with one anchor line failed is a condition after breaking of any anchor line in operation. Operation under severe storm conditions with one anchor line failed is a condition after breaking of any anchor line in severe storm.

4.3.11 When doing dynamic calculation, the minimum safety factors for the maximum tension of anchor lines according to Table 4.3.11 as well as other safety factors satisfying the Register may be taken into consideration.

The conditions of operation and severe storm as defined above shall be taken into account in the designs of MODU/FOP, except for the cases when the Register considers it possible to apply less severe requirements in certain areas of the shelf.

Table 4.3.11

Design condition	Safety factor (SF) used in dynamic method of calculation
Operation	2,0
Operation under severe storm conditions	1,5
Operation with one anchor line failed	1,5
Operation under severe storm conditions with one anchor line failed	1,05

$$SF = PB/T_{max}$$

where T_{max} = anchor line tension characteristic equal to the maximum value obtained when the dynamic method of calculation is used;
PB = minimum rated breaking strength of the anchor line.

Definitions of operational terms are given in Table 4.3.10.

4.3.12 As a rule, the maximum movement of MODU/FOP lying at anchor under the effect of waves at continuous mean shifting shall be determined by model tests.

When considering column-stabilized MODU, values of C_{sj} and C_{Hj} given in Part IV "Stability" of the MOD/FOP Rules may be included into the analysis of anchoring systems enabling the unit to be maintained at a drilling site. As an alternative to the calculation methods for determination of the wind load given in Part IV "Stability", the Register may take into account the values of the wind capsizing moments obtained from the wind tunnel tests according to the recognized methods.

The Register may accept analytical calculations subject to the condition that the calculation method submitted is based on the recognized methods verified by model tests.

4.3.13 The Register may accept various calculation methods for the maximum tension (loads) of the anchor line components provided that the safety level required by 4.3.9 — 4.3.11 is ensured.

4.3.14 The values of the maximum MODU/FOP movements, obtained from the calculation shall meet the condition

$$X_{ult}/x \geq k \qquad (4.3.14)$$

where X_{ult} = ultimate values of MODU/FOP movements established by the requirements of the design and the operating manual for the equipment;
x = maximum rated movements for the rated operating mode under consideration;
k = safety factor the value of which may be taken equal to 1,15 when the quasi-static method is used and equal to 1,05 when the dynamic method is used.

4.3.15 If the estimated time to be spent by MODU/FOP in the area of operation exceeds 1 year, it is necessary to carry out fatigue assessment of the anchor line components.

For fatigue assessment, it is necessary to consider the long-term effects of external loads, wind, waves and currents, acting together.

The spectral method may be used for fatigue assessment. The fatigue life of anchor line components determined by calculations shall be 3 times longer than the fatigue life of the anchoring system. When there are no reliable data on S-N curves, and when access for inspections and repair cannot be provided, the fatigue life of anchor line components shall be 10 times longer.

4.3.16 The holding power of the ship type anchor for MODU/FOP intended for operation at one station throughout the whole service life shall be determined at design parameters of holding anchorage under stormy conditions with the following safety factors:

.1 not less than 1,8 when the quasi-static method is used;

.2 not less than 1,5 when dynamic method is used for calculation of MODU/FOP in intact condition and the position mooring system;

.3 not less than 1,2 when the quasi-static method is used and 1,0 when dynamic method is used for calculation of MODU/FOP in damaged condition or the position mooring system.

4.3.17 For MODU/FOP which can be used at different locations throughout their service life as well as for the non-ship-type anchors, determination of holding power and safety factors values shall be determined for each MODU/FOP location.

4.3.18 The Register may specially consider a case in which the anchoring systems are used in conjunction with thrusters to maintain the MODU at a drilling site.

4.4 EQUIPMENT

4.4.1 Winches.

4.4.1.1 The design of the winch shall provide for adequate dynamic braking capacity to control normal combinations of loads from the anchor, anchor line and anchor handling vessel during deployment of the anchors at the maximum design pay out speed of the winch.

The attachments to the hull shall be such as to adequately withstand the load equal to the breaking strength of the anchor line.

4.4.1.2 Each winch shall be provided with two independent power-operated brakes. Each brake shall be capable of withstanding a static load in the anchor line of at least 50 % of its breaking strength.

One of the brakes may be replaced by a manually operated brake.

4.4.1.3 On loss of power to the winches, the power-operated braking system shall be automatically applied and capable of withstanding 50 % of the total static braking capacity of the winch.

4.4.2 Anchor line tensioning devices.

4.4.2.1 The anchor line tensioning devices shall be designed to take up the design combined load from the anchor and anchor line.

4.4.2.2 Each anchor line tensioning devices shall be provided with a power-operated stopper capable of withstanding a static load in the anchor line of at least 80 % of its breaking strength.

4.4.2.3 The attachments of the anchor line tensioning devices to the MODU/FOP hull shall be such as to adequately withstand the load equal to the breaking strength of the anchor line.

4.4.3 Fairleads and guiding devices.

4.4.3.1 Fairleads and guiding devices shall be designed to prevent excessive bending and wear of the anchor line. The attachments to the hull shall be such as to adequately withstand the stresses imposed when the anchor line is loaded to its breaking strength.

4.4.3.2 Guides shall be of roller type. The guide roller shall be provided with a turning device.

4.4.3.3 From the guide roller, the chain shall run directly to the chain sprocket of the winch or the tensioner stopper without passing through an additional guide.

From the guide roller, the chain shall run directly to the chain sprocket of the winch or the tensioner stopper.

4.4.3.4 The number of chain link pockets to be provided in the chain guide rollers shall not be less than 5.

In case of guide rollers for wire ropes, the ratio of the roller groove diameter to the nominal rope diameter shall not be less than 16.

4.4.3.5 The use of guides for the combined rope- and-chain anchor lines are allowed.

4.4.3.6 In calculation, the rated stresses in the structural components of the guide shall not exceed 0,9 times the yield stress of the material when subjected to the breaking load of the anchor line. The strength calculation shall be made for the most unfavourable direction of the anchor line.

Consideration in the calculation shall be given to the design working range of the roller turning angles in horizontal plane and the design anchor line departure angle in vertical plane.

4.5 ANCHOR LINES

4.5.1 The Register shall be satisfied that the anchor lines have been designed to meet the design parameters of the anchoring system.

4.5.2 Means shall be provided to enable the anchor line to be released after loss of main power.

4.5.3 Means shall be provided to measure anchor line tension.

4.5.4 Anchor lines shall be of sufficient length to prevent hoisting of the anchor in the extreme cases foreseen in the anticipated operating conditions.

4.5.5 Anchor lines may be of chain, wire, synthetic or fibre rope or any combination thereof.

Chains for anchor lines shall meet the requirements of 3.3.1.

4.5.6 Diameters of the chain cables or ropes used in the anchor line shall be consistent with the breaking load of the anchor line according to the ultimate strength and fatigue strength calculations which shall allow for the wear and corrosion of the chain cables and ropes.

4.5.7 Connections between the anchor line components and the attachments to other components (anchors and hull) shall be designed with due regard for the alignment of the components being connected and with smooth transitions to preclude stress concentration.

4.6 ANCHORS

4.6.1 Type and design of the anchors shall be approved by the Register.

4.6.2 As a rule, anchors of the FOP shall be of ground, pile or gravity type.

The design of the anchor piles shall comply with the recognized specifications, rules and standards.

4.6.3 The anchor and anchor shackle shall withstand a load equal to the minimum breaking load of the strongest anchor line which shall be used in conjunction with the anchor involved.

4.6.4 All anchors of MODU/FOP shall be so secured as to prevent them from shifting during transit

4.6.5 After the unit has been positioned on station anchors shall be tested by load in order to verify their holding power.

The test load shall correspond generally to the design load on the anchor line under maximum operational conditions and shall be applied during at least 5 min.

The value of the test load shall be agreed with the Register.

4.7 QUALITY CONTROL

4.7.1 Description of the quality control arrangements in the process of manufacture particular assemblies of the anchoring system shall be submitted to the Register. The assemblies shall be designed, manufactured and tested in accordance with recognized specifications and standards. The equipment so tested shall be durably and clearly marked by the Register and shall be delivered together with the documents showing test results.

4.8 CONTROL STATIONS

4.8.1 A manned control station shall be provided with means to indicate and automatically record cable tensions and the wind speed and direction.

4.8.2 Reliable means of communication shall be provided to communicate between locations critical to the anchoring operation.

4.8.3 Means shall be provided at the control position of each winch to monitor anchor line tension and winch power load and to indicate the amount of anchor line paid out.

4.9 DYNAMIC POSITIONING SYSTEMS OF MODU

4.9.1 Thruster systems.

4.9.1.1 The thruster system shall be capable of producing appropriate thrust in longitudinal and transverse direction as well as turning moment to eliminate yawing and for steering on the course.

4.9.1.2 For the equipment of the dynamic positioning system which falls into classes 2 and 3, as defined in 7.5 of Part XIV "Automation", the thruster system shall be so connected with the power system that the requirements of 4.9.1.1 of this Part are met even in the event that one part of the combined power system and thrusters connected thereto is failed.

4.9.1.3 The magnitude of thrust produced by the thrusters, which is used in the failure effect analysis mentioned in 7.9.4 of Part XIV "Automation" shall be corrected with due account of the interaction of thrusters and other factors reducing the useful thrust.

4.9.1.4 Failure of the thruster system including pitch, azimuth and speed control system shall not cause the thruster to rotate or being put on the uncontrolled maximum pitch and speed.

4.9.1.5 The calculative methods for determination of thrust and turning moment to eliminate yawing and for steering on the course shall be submitted to the Register.

4.9.1.6 The thrusters used as the sole means of dynamic positioning shall provide the level of safety equivalent to that provided by anchoring systems, and complying with the Register requirements.

5 MOORING AND BOARDING ARRANGEMENTS

5.1 For FOP the operation of which involves the use of contact mooring method for the supply vessels shall be provided with mooring and boarding arrangements to ensure approach of ships and embarkation/disembarkation of people.

5.2 The Register shall be provided with drawings and documentation of the mooring and boarding arrangements which show their location and containing detailed description of the arrangements.

5.3 In calculation of the mooring and boarding arrangements consideration shall be given to the loads due to:

.1 tied up ships swinging foul of the mooring arrangements under the action of wind, waves, current and ice (if any);

.2 a ship swinging foul when approaching the mooring arrangement;

.3 mooring line tension when the ship is subjected to wind and current action.

5.4 Account shall be taken of the provision of shielding barriers on the windward side of the tied up ship if this can result in significant reduction of the wind loads on the ship.

5.5 Mooring and boarding arrangements shall be located on at least two sides of the platform and shall rise:

by at least 1,5 m above the highest annual sea level;

by at least 1 m above the ice cover level;

by at least 0,5 m above the design wave crests when people stay on the platforms where arrangements are located.

When the FOP design features and operational conditions do not allow to arrange mooring and boarding arrangements on two sides of the platform, it is permitted to locate them at one FOP side only.

5.6 The mooring and boarding arrangements of ice-resistant FOP shall ensure approach of ships and disembarkation of people under the clean water conditions and emergency evacuation of the platform personnel under all service conditions.

5.7 Where the calculation-supported possibility of performing operations at the weather condition parameters of the open sea in the area of FOP operation, which are inferior to those given below, is not provided approach, mooring, stay of ships, cargo handling operations therefrom, transfer of people shall be assured under the following conditions:

wind speed: 8 to 10 m/s;

wave height: 0,75 to 1,25 m (force 3);

current speed: 0,6 knots.

5.8 The mooring and boarding arrangements shall provide safe conditions for making fast ships with displacement of 2500 t and over at the approach speed up to 1 knot and to withstand appropriate loads produced by ships swinging foul without damage to their particular structural elements.

In each particular case therewith the maximum displacement of the ship shall be specified in drawings, the mooring and boarding arrangements are designed for under the conditions stated in 5.7.

5.9 On the ice-resistant FOP, action of ice on the mooring and boarding arrangements when in inoperable condition shall be precluded.

5.10 The mooring and boarding arrangements shall be provided with systems to monitor the ship stay conditions and with means to prevent damage to ship hull due to accidental overloading.

5.11 Illumination of the places of embarkation/ disembarkation at dark shall be at least 30 lux.

5.12 If necessary, mooring and boarding arrangements may be provided with mooring and fendering equipment to ensure supply vessels anchorage. In case of contactless mooring of ships, FOP may be provided only with mooring equipment to attach ropes.

5.13 Characteristics and complete set of the mooring and fendering equipment depend on the mooring method (contact, contactless, alongside, by stem), mass and overall dimensions and characteristics of mooring equipment on design ships.

Generally, it is recommended to equip FOP with a set of arrangements for hoisting and securing of mooring ropes of ships: heaving lines, line-throwing appliances, mooring hawses, fairleads, bollards or bitts, self-releasing hooks, machinery (winches, capstans).

5.14 Mooring and fendering equipment shall be designed on the basis of special calculations of interaction of ships during approach, stay and reloading from MODU/FOP:

When selecting the components of the equipment, it is recommended to:

.1 use slowly restorable shock-absorbers of high power capacity with low rigidity parameter and low friction coefficients;

.2 include safety devices ("weak link") to prevent damage to the mooring or fendering equipment as a whole;

.3 specify dimensions and arrangement of fendering equipment so that minimum loads are transferred to the hulls of ships and MODU/FOP;

.4 whenever possible, bring each mooring rope on a separate winch;

.5 ensure reasonable lengths and inclination angles for each mooring rope;

.6 provide for the possibility and ease of repairing the equipment;

.7 assume design loads on the mooring equipment items and components that are consistent with the strength of the mooring ropes of the largest design ship;

.8 use, where possible, the same components (machinery, hawses, stoppers, holders) in anchor, mooring and towing arrangements.

5.15 The mooring and boarding arrangements fitted in MODU on designer's discretion shall meet the requirements of this Section.

6 TOWING ARRANGEMENT

6.1 GENERAL

6.1.1 Each MODU/FOP shall be provided with towing arrangement. Generally, the towing arrangement of MODU/FOP shall include tow line lengths permanently secured to the hull, to which the ropes of the towing ships are connected, gear (equipment) for securing, release and hoisting of tow lines, and is also to be provided, if necessary, with tow ropes. Tow ropes may be stored on the tug and not be included into the outfit of MODU/FOP. In case of prolonged transit under severe natural conditions, it is recommended to provide a spare set of the tow rope and tow line length secured to the hull.

6.1.2 The number, composition and characteristics of the towing arrangement components depend basically on the towing resistance of MODU/FOP and pull performance of the towing ships. As a rule, the towing resistance and sufficiency of the bollard pulls shall be supported by special calculations allowing for the actual conditions and specific features of the transit route. The calculations shall take into account the requirements and criteria specified in the MO Rules.

6.1.3 Strength of various components of towing equipment shall correspond to that of the design tow rope selected and meet the requirements of 5.3 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification.

6.1.4 All connecting items like shackles, rings, links, triangle plates, etc. shall have ultimate load bearing capacity which is, as minimum, by 50 % in excess of the documented minimum breaking load of the MODU/FOP towing arrangement to be used.

6.2 TOW LINE

6.2.1 For towage with the use of a single tow tug, each non-self-propelled MODU shall be provided with tow lines while the FOP/FOP moduli shall be towed with the use of tow lines according to the requirements of 5.2.2 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification.

The breaking strength, in N, of the tow line shall be determined from the model tests and shall not be less than the greater value determined by the formulae:

$$F_{br} = 716 S_s v^2; \qquad (6.2.1\text{-}1)$$

$$F_{br} = \begin{cases} 4P_{bp}, & \text{at } P_{bp} < 25000; \\ 2{,}2P_{bp}, & \text{at } P_{bp} > 1000000 \end{cases} \qquad (6.2.1\text{-}2)$$

where S_s = area of the head resistance of the submerged part of MODU, FOP/FOP moduli, in m²;
v = towing speed specified in the certificates, in knots;
P_{bp} = rated bollard pull at the hook, in N;
2,2; 4 = proportionality factors (safety factors).

In Formula (6.2.1-2), for the intermediate values of the rated bollard pull, the proportionality factor (safety factor) shall be determined by linear interpolation.

6.2.2 The length of the towing line *L,* in m, for the non-self-propelled MODU, FOP/FOP moduli shall be determined by the formula (but not less than 700 m)

$$L = 350 + 0{,}045 N_e \qquad (6.2.2)$$

where N_e = equipment number (refer to 3.2.1).

The length of the tow line may be reduced where the specific conditions of the towage route and influence of the tug engines operation on the towed objects are accounted for and where shock absorbing inserts are available, etc.

6.2.3 For self-propelled MODU the characteristics of the tow line shall be taken from Table 3.1.3-1 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification according to the equipment number determined in compliance with 3.2 of this Part.

6.2.4 MODU may be not provided with a tow line if:

.1 the MODU is towed by a tug provided with a tow line with characteristics not lower than those specified in 6.2.1 — 6.2.3;

.2 the MODU carries a sufficient number of arrangements of adequate strength for securing the tow line taken in from the tug.

6.3 CHAIN CABLES

6.3.1 When chain cables are used as a part of the tow line, the breaking strength of these chain cables shall not be less than the design breaking strength of the tow rope.

Chain cables shall be included into the total length of the tow line.

6.4 TOWAGE WITH THE USE OF SEVERAL TUGS

6.4.1 When the MODU, FOP/FOP moduli are being towed by several tugs, the breaking strength F', in N, of each tow line shall not be less than that determined by the formula

$$F' = K_4 F_{br}/n \qquad (6.4.1)$$

where K_4 = the coefficient equal to 1,15 when towed by two tugs and to 1,3 when towed by three and more tugs;
n = number of tow lines;
F_{br} = the design breaking strength according to 6.2.1 when towed by one tug, in N.

6.4.2 The total length of the tow line L_t, in m, for each tug shall not be less than

$$L_t = 2000 P_{bp}/F_{\min br} \qquad (6.4.2)$$

where P_{bp} = bollard pull, in N;
$F_{\min br}$ = minimum breaking strength of the tow line, in N.

6.5 SPECIAL ARRANGEMENTS

6.5.1 MODU/FOP shall be provided with arrangements for passing the tow line to the tug or towing vessel and for taking in of the line.

Where in transit the escort tugs are used, additional towing arrangements shall be provided. The strength of the connecting devices of these arrangements shall be 1,3 times higher than the minimum breaking strength of the relevant tow line.

Where towing and handling operations shall be carried out, the towing arrangement shall include mooring (bumpering) and special boarding facilities.

During the period of towing the special arrangements shall provide access of the personnel to MODU/FOP.

6.5.2 If synthetic fibre rope inserts are used in tow lines, the total breaking strength of the insert shall be not less than 2,3 times the minimum breaking strength of the tow line when the bollard pull is less than 500 kN and not less than 1,5 times the minimum breaking strength of the tow line when the bollard pull is more than 1000 kN.

For tugs with the bollard pull within the range from 500 up to 1000 kN, the safety factor shall be determined by linear interpolation.

7 SIGNAL MASTS

7.1 GENERAL

7.1.1 The signal masts shall meet the requirements of Section 6 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification; the angles of heel and trim shall be taken considering the maximum parameters of motions for the MODU concerned.

The signal masts of FOP/FOP moduli shall be calculated depending on conditions of the actual loads in the area of their operation, therewith the stresses in the mast structure elements shall not exceed 0,7 of the upper yield stress of their material.

7.1.2 Installation of signal means shall comply with the requirements of Part III "Signal Means" of the Rules for the Equipment of Sea-Going Ships and Part XVI "Signal Means" of the MODU/FOP Rules.

8 OPENINGS IN HULL, SUPERSTRUCTURES AND DECKHOUSES AND THEIR CLOSING APPLIANCES

8.1 GENERAL

8.1.1 The requirements of this Section apply to arrangement and closing appliances of openings located above the margin line of a MODU and FOP/FOP module while afloat according to 1.1 of Part V "Subdivision".

8.1.2 Openings in hull, superstructures and deckhouses of the MODU to which a minimum freeboard has been assigned, and their closing appliances shall be in full compliance with the requirements specified for ships of unrestricted service in Section 7 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification and with the expressly specified requirements of the MODU/FOP Rules.

8.1.3 Surfaces adjacent to rotary table shall have, as far as possible, no openings through which gas or water could penetrate into hull structures. All such openings which are unavoidable shall be provided with quick-acting closing appliances.

8.1.4 External openings fitted with appliances to ensure watertight integrity of the MODU hull, superstructures and deckhouses, which are kept permanently closed while afloat, shall comply with the requirements of 8.3.4.3.

8.2 COAMINGS

8.2.1 The coaming height of openings for doors, companion hatches, skylights, ventilating trunks, ventilator cowls, cargo hatches in exposed areas as well as closing appliances of these openings shall be determined with regard to the requirements for intact and damage stability and according to the position of

the openings specified in 7.1.4 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification.

8.2.2 The Register may relax the requirements for the coaming height proceeding from:

.1 the value of the freeboard assigned provided that it is much greater than that required by the Load Line Rules for Sea-Going Ships;

.2 the purpose of the spaces to which these openings lead;

.3 the dimensions, location, strength and watertight integrity of the spaces.

8.3 OPENINGS IN WATERTIGHT SUBDIVISION BULKHEADS AND THEIR CLOSING APPLIANCES

8.3.1 Openings in watertight subdivision bulkheads and their closing appliances in MODU/FOP shall meet the requirements of 7.12 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification and the expressly specified requirements of the MODU/FOP Rules.

8.3.2 The requirements of this Section cover the MODU/FOP to which the requirements of Part V "Subdivision" are applicable.

8.3.3 Openings in FOP watertight subdivision bulkheads and their closing appliances.

8.3.3.1 Doors shall be remotely controlled from the central control station on the deck which is above the damage waterline after flooding and shall be also operable locally from each side of the bulkhead. Open/shut indicators shall be provided at the control station to show whether the doors are open or closed.

8.3.3.2 The requirements for remote control may be dispensed with for those doors or hatch covers which are normally closed while the FOP is afloat, provided that an indication system is arranged to show to the personnel both locally and at the central control station, whether the doors or hatch covers are open or closed.

A notice shall be affixed to each such door or hatch cover stating that it shall not to be left open while the FOP is afloat.

8.3.4 Openings in MODU watertight subdivision bulkheads and their closing appliances.

8.3.4.1 Doors and hatch covers which are used during the operation of the MODU while afloat shall be remotely controlled from the ballast control station and shall also be operable locally from each side of the bulkhead. Open/shut indicators shall be provided at the control station to show whether the doors and hatch covers are open or closed.

In addition, remotely controlled doors used while the MODU is at sea shall be sliding watertight doors with audible alarm. The power, control and indicators shall be operable in the event of main power source failure. Arrangements approved by the Register shall be made to ensure closing and securing of doors in case of remote control system failure.

Each power-operated sliding watertight door shall be provided with an individual hand-operated gear. It shall be possible to open and close the door by hand at the door itself from both sides.

8.3.4.2 Doors and hatch covers in self-elevating units, or doors placed above the deepest load line draught in column-stabilized units and on drilling ships and barges, which are normally closed while afloat, may be of the quick-acting type and shall be provided with an alarm system (e.g., light signals) showing personnel both locally and at the ballast control station whether the doors or hatch covers in question are open or closed.

A notice shall be affixed to each such door or hatch cover stating that it shall not be left open while the unit is afloat.

The closing appliances shall have strength, packing and means for securing which are sufficient to maintain watertightness under the design water pressure of the watertight boundary under consideration.

8.3.4.3 Openings fitted with closing appliances to ensure watertight integrity, which shall be kept permanently closed while the MODU is afloat, shall comply with the following:

.1 a notice to the effect that the opening (except for the manholes fitted with bolted covers) shall always be kept closed while the MODU is afloat shall be fitted on the closing appliance in question;

.2 opening and closing of such closure (securing) devices shall be noted in the unit's logbook, or equivalent;

.3 the closing appliances shall have strength, packing and means for securing which are sufficient to maintain watertightness under the design water pressure of the watertight boundary under consideration.

8.4 HATCH COVERS

8.4.1 Covers of companion hatches shall be watertight and fitted with quick-acting appliances for securing and opening and also with position indicators.

Position indicators shall be provided to show the position of the cover when the MODU/FOP is in the operating or transit condition.

8.5 MANHOLES

8.5.1 The design of manholes for pontoons of semi-submersible or submersible MODU shall meet the applicable requirements in 7.9 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification.

9 ARRANGEMENT AND EQUIPMENT OF SPACES

9.1 GENERAL

9.1.1 The arrangement and equipment of spaces shall comply with the requirements of Section 8 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification and the expressly specified requirements of the MODU/FOP Rules.

9.1.2 The MODU/FOP are covered by the requirements of the Rules for the Classification applicable to special purpose ships.

9.2 EXITS, DOORS, CORRIDORS, STAIRWAYS AND VERTICAL LADDERS

9.2.1 At least two separate escape routes spaced as far apart as practicable shall be provided from each deck having spaces which are likely to be regularly manned or in which personnel is accommodated, to the open decks and places of embarkation into lifeboats and liferafts.

9.2.2 As an exception, the Register may permit only one means of escape, due regard being paid to the nature and location of spaces and the number of persons who normally might be accommodated or employed there.

9.2.3 The helideck shall have both a main and an emergency personnel access routes located as far apart from each other as practicable, preferably on opposite sides of the helideck.

9.2.4 The working spaces of MODU/FOP shall be provided with exits located on opposite sides. The exits shall be provided with doors which open outside.

9.2.5 Exits from spaces and structures leading to the area where toxic or explosive gases are likely to release are not permitted.

9.2.6 All corridors and passageways shall be readily accessible and afford free movement of people along them.

Dead-end corridors exceeding 7 m in length are not permitted.

9.2.7 The use of a vertical ladder as one means of escape may be permitted if it can be demonstrated than installation of a vertical ladder is impossible.

9.2.8 Stairways and corridors used as means of escape shall be not less than 700 mm in clear width and shall have a handrail on one side. Stairways and corridors with a clear width of 1800 mm and over shall have handrails on both sides. The angle of inclination of the stairways shall be, in general, 450 but not greater than 50°, and in machinery spaces and small spaces not more than 60°. Doorways which give access to a stairway shall be of the same size as the stairway.

9.2.9 Lifts, except lifts in the columns of column-stabilized MODU, shall not be considered as forming one of the required means of escape.

The car of each lift in the columns of the above-mentioned MODU shall ensure emergency escape along with the ladder in the lift trunk.

9.2.10 Lighting of the escape routes.

9.2.10.1 In addition to the emergency lighting, as specified in 6.3 of Part X "Electrical Equipment", the means of escape in accommodation areas, including stairways and exits, shall be marked by lighting or photoluminescent strip indicators at all points of the escape route, including angles and intersections. The marking shall enable personnel to identify the routes of escape and readily identify the escape exits.

9.2.10.2 The marking of the escape routes shall comply with the requirements of 8.5.5.2 — 8.5.5.8 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification.

9.2.10.3 If electric illumination is used, it shall be supplied by the emergency source of power and it shall be so arranged that the failure of any single light or cut in a lighting strip will not result in the marking being ineffective.

9.2.10.4 Additionally, escape route signs shall be of photoluminescent material or marked by lighting.

9.3 ACCESS

9.3.1 Means of access to cargo and other spaces.

9.3.1.1 Each space within the MODU/FOP shall be provided with at least one permanent means of access to enable, throughout the life of a unit, overall and close-up inspections and thickness measurements of the unit's structures to be carried out by the Register, the company, and the MODU/FOP's personnel and other as necessary. Such means of access shall comply with the provisions of 9.3.3 of this Part and IMO resolution MSC.158(78)[1] as amended and IACS Unified Interpretation MODU 1 (Rev.1 Oct 2015)[2].

9.3.1.2 Where a permanent means of access may be susceptible to damage during normal operations or where it is impracticable to fit permanent means of access it is allowed, in lieu thereof, to provide movable or portable means of access, as specified in IMO resolution MSC.158(78), provided that the means of attaching, rigging, suspending or supporting the portable means of access form a permanent part of the MODU/FOP's structure.

All portable equipment shall be capable of being readily erected or deployed by the MODU/FOP's personnel.

9.3.1.3 The materials of all means of access shall meet the requirements of Part XII "Materials".

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

9.3.2.1 Safe access to holds, cofferdams, tanks and other spaces shall be direct from the open deck and such as to ensure their complete inspection.

Safe access may be from a machinery space, pump-room, deep cofferdam, pipe tunnel, hold, double hull space and similar compartment not intended for the carriage of oil or hazardous materials where it is impracticable to provide such access from an open deck.

9.3.2.2 Tanks, and subdivisions of tanks, having a length of 35 m or more, shall be fitted with at least two access hatchways and ladders, as far apart as practicable.

Tanks less than 35 m in length shall be served by at least one access hatchway and ladder.

When a tank is subdivided by one or more swash bulkheads or similar obstructions which do not allow ready means of access to the other parts of the tank, at least two hatchways and ladders shall be fitted.

9.3.2.3 Each hold shall be provided with at least two means of access as far apart as practicable. In general, these accesses shall be arranged diagonally, e.g. one access near the forward bulkhead on the port side, the other one near the aft bulkhead on the starboard side.

9.3.3 Access Manual

9.3.3.1 A MODU/FOP's means of access to carry out overall and close-up inspections and thickness measurements shall be described in an Access Manual which may be incorporated in the MODU/FOP's Operating Manual. The Access Manual shall be kept on board the MODU/FOP and shall be updated as necessary.

9.3.3.2 The structure of the Access Manual shall meet the provisions of Section 4 of IMO resolution MSC.134(76)[3].

9.3.4 General technical specifications.

9.3.4.1 For access through horizontal openings, hatches or manholes, the dimensions shall be sufficient to allow a person wearing a self-contained air-breathing apparatus and protective equipment to ascend or descend any ladder without obstruction and also provide

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1 Refer to the Collection of IMO Resolutions Relating to the RS Activities, No.8, 2005 Edition.

2 Refer to the Supplement to rules and guidelines of Russian Maritime Register of Shipping "IACS Procedural Requirements, Unified Interpretations and Recommendations".

3 Refer to the Collection of the IMO Resolutions Relating to the RS Activities, No.7, 2004 edition.

a clear opening to facilitate the hoisting of an injured person from the bottom of a confined space.

The minimum clear opening shall be not less than 600 × 600 mm.

When access to a hold is arranged through a flush manhole or a hatch, the top of the ladder shall be placed as close as possible to the deck or hatch coaming. Access hatch coamings having a height greater than 900 mm shall also have steps on the outside in conjunction with the ladder.

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

9.4 GUARD RAILS, BULWARK

9.4.1 Any exposed areas and companionway openings in the decks shall be provided with guard rails, bulwark or other arrangements complying with the requirements of 8.6 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification.

10 ARRANGEMENT FOR LIFTING AND LOWERING COLUMNS OF SUBMERSIBLE SEA WATER PUMPS

10.1 GENERAL

10.1.1 The requirements of this Section apply to assemblies and components of the arrangement intended for lifting and lowering the columns of submersible sea water pumps of self-elevating MODU, except for the assemblies and components the requirements for which are specified in Part I "Classification", Part II "Hull", Part VI "Fire Protection" and Part VII "Machinery Installations and Machinery" of the MODU/FOP Rules.

10.2 SPECIAL REQUIREMENTS

10.2.1 Each submersible sea water pump shall be installed on its own column and shall be independently driven.

10.2.2 The design of the well shall allow for free movement of the column with the pump installed at the maximum permissible heel and trim of the MODU and at nominal parameters of the wind and waves.

10.2.3 The arrangement shall comprise guides which allow for vertical movement of the column and prevent its spontaneous rotation around its own axis.

10.2.4 Provision shall be made for stoppers intended for fixing effectively the column in the required (top, down, intermediate) position and for relieving the stresses in driving machinery induced by environmental and functional loads under operating conditions of the MODU as defined in Part II "Hull".

10.2.5 Assemblies and components of the arrangement for lifting and lowering submersible sea water pumps shall be checked for strength under the action of static functional loads.

10.2.6 The column structure shall be calculated for strength under the action of environmental loads due to maximum permissible waves and wind stated in the Operating Manual for the MODU considered and of loads due to current in the prescribed area of operation and transit.

10.2.7 When a cable drive is chosen, its design and strength shall meet the requirements of the Rules for the Cargo Handling Gear of Sea-Going Ships.

10.2.8 The design of the arrangement shall allow for lowering of the column and connection of the submersible pump to the system during not more than 15 mm.

11 JACKING SYSTEM OF SELF-ELEVATING MODU

11.1 GENERAL

11.1.1 The requirements of this Section apply to jacking system intended for elevation and lowering of the platforms and legs of MODU.

This system shall also comply with the requirements specified in Part I "Classification", Part II "Hull", Part VI "Fire Protection" and Part VII "Machinery Installations and Machinery".

11.1.2 Each leg shall be served by an independent gear. Jacking mechanism shall be arranged so that a single failure of any component does not cause an uncontrolled descent of the self-elevating MODU.

11.2 SPECIAL REQUIREMENTS

11.2.1 The jacking system shall be so designed as to preclude spontaneous relative motion of the legs and platforms of MODU and retain efficiently the elevated platforms or legs in required position with the drive being inoperative or in case of loss of power.

For hydraulic jacks provision shall be made for an arrangement to allow for relieving of the hydraulic system when in non-operative mode, except for the jacks operated by hydraulic cylinders with pilot operated check valves available.

11.2.2 Fixation of the jacks on the substructure and joining of the components of the system shall be made so that warping due to manufacturing and mounting defects could not have an adverse effect on the operation of the system.

11.2.3 The components of the system shall be checked for strength having regard to the loads specified in Section 2 of Part II "Hull".

11.2.4 The allowable stresses are determined in accordance with the requirements of Part II "Hull".

11.2.5 The jacking system shall allow for self-checking or shall be provided with a device to do this before the MODU platform begins to be elevated or lowered.

11.2.6 The jacking system shall operate reliably at the maximum permissible heel and trim which are specified in the Operating Manual for the MODU concerned.

11.2.7 The jacking system shall be so designed as to exclude the possibility of simultaneous disengagement of all the catches toothed into racks of the legs.

11.2.8 The jacking system shall allow for disconnection of any of the main cylinders in case of failure of the cylinder or its piping.

In this case, the system shall permit moving of the platform and legs of the MODU until the safe position is reached.

11.2.9 In order to keep the column in the required position, each jacking system shall be provided, if necessary, (at the designer's discretion) with relieving and fixing arrangements capable of taking up all the loads acting on the legs under particular operating conditions and of transmitting the loads to the hull of the MODU.

11.2.10 The fixing arrangements (if any) shall be designed so that fast releasing of the legs could be possible at any operational warping of the legs with respect to the hull.

11.2.11 The jacking system shall be operable from a central jacking control station. A communication system shall be provided between the central jacking control and a location in each leg.

11.2.12 The jacking control station shall have the following:

.1 audible and visual alarms for jacking system overload and unit out-of-level;

.2 instrumentation to indicate inclination of the unit on two horizontal perpendicular axes and brake release status.

12 EMERGENCY OUTFIT

12.1 GENERAL

12.1.1 The emergency outfit of MODU shall be in full compliance with the requirements of Section 9 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification and the expressly specified requirements of the MODU/FOP Rules.

The emergency outfit items for FOP shall be determined by the shipowner.

12.1.2 MODUs which are defined in 1.2.1 of Part I "Classification" of the MODU/FOP Rules shall be provided with the emergency outfit according to items 4, 5, 6, 8, 10, 12, 13, 15 — 32, 34 — 40 of Table 9.2.1 of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification as specified for ships from 70 up to and including 150 m in length.

13 LIFTING DEVICES

13.1 GENERAL

13.1.1 The lifting devices of the MODU/FOP and surface units shall meet the requirements of the Rules for the Cargo Handling Gear of Sea-Going Ships.

13.1.2 Cranes used on the MODU/FOP shall be so located and protected as to reduce to a minimum any danger to personnel, due regard being paid to moving parts of the cranes.

13.1.3 Cranes used for loading and discharging of offshore supply vessels shall be furnished with rating tables or curves which take into account the dynamics associated with the MODU/FOP's and vessel's motions.

13.1.4 A Crane Manual shall be provided for each crane. This Manual shall contain full information concerning:

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

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

.3 all safety devices;

.4 testing of the emergency lowering system for personnel transfer, if fitted;

.5 diagrams for electrical and hydraulic systems and equipment;

.6 materials used in crane's structures, welding procedures and extent of non-destructive testing; and

.7 guidance on operation, maintenance and periodic inspections.

13.1.5 MODU/FOP and surface units shall be furnished with information on the rated capacity of all lifting and hoisting equipment installed thereon.

13.1.6 MODU/FOP's and surface unit's personnel transfer nets and platforms may be used for pilot transfer.

Russian Maritime Register of Shipping

Rules for the Classification, Construction and Equipment of Mobile Offshore Drilling Units and Fixed Offshore Platforms
Part III
Equipment, Arrangements and Outfit of MODU/FOP

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