

RULES

FOR THE CLASSIFICATION AND CONSTRUCTION OF FLOATING OFFSHORE OIL-AND-GAS PRODUCTION UNITS

PART XI ELECTRICAL EQUIPMENT

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RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF FLOATING OFFSHORE OIL-AND-GAS PRODUCTION UNITS

Rules for the Classification and Construction of Floating Offshore Oil-and-Gas Production Units (FPU) of Russian Maritime Register of Shipping (RS, the Register) have been approved in accordance with the established approval procedure. The date of coming into force of the present Rules is 1 January 2022.

The present Rules set forth specific requirements for FPU, consider the recommendations of the IMO Code for the Construction and Equipment of MODU, as adopted by the IMO Assembly on 19 October 1989 (IMO resolution A.649(16)), take account of international practice of FPU construction and operation, requirements of the rules of the IACS members, international standards, as well as experience of Russian Maritime Register of Shipping relating to the classification and construction of ships, mobile offshore drilling units and fixed offshore platforms, stated in the relevant rules.

The Rules are published in the following parts:

Part I "Classification";

Part II "Hull";

Part III "Equipment, Arrangements and Outfit";

Part IV "Stability";

Part V "Subdivision";

Part VI "Fire and Explosion Protection";

Part VII "Machinery Installations";

Part VIII "Systems and Piping";

Part IX "Machinery";

Part X "Boilers, Heat Exchangers and Pressure Vessels";

Part XI "Electrical Equipment";

Part XII "Refrigerating Plants";

Part XIII "Materials";

Part XIV "Welding";

Part XV "Automation";

Part XVI "General Requirements and Safety Principles".

The present Rules supplement the Rules for the Classification and Construction of Sea-Going Ships, Rules for the Equipment of Sea-Going Ships and Rules for the Classification, Construction and Equipment of Mobile Offshore Drilling Units and Fixed Offshore Platforms.

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 The requirements of this Part of the Rules for the Classification and Construction of Floating Offshore Oil-and-Gas Production Units¹ cover electrical equipment of machinery installations, systems and arrangements of FPU subject to the Register technical supervision, as well as particular kinds of electrical equipment in compliance with [1.3](#).

1.1.2 The applicable requirements of this Part are applied to fixed electrical equipment and automation equipment not listed in [1.3](#) but capable to adversely affect the operation of essential machinery and appliances in case of their fault or failure.

¹ Hereinafter referred to as "the FPU Rules".

1.2 DEFINITIONS AND EXPLANATIONS

1.2.1 Definitions and explanations shall be found in General Regulations for the Classification and Other Activity, in Part I "Classification" and in Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships¹, in Part I "Classification" and in Part X "Electrical Equipment" of the Rules for the Classification, Construction and Equipment of Mobile Offshore Drilling Units and Fixed Offshore Platforms², as well as in Part I "Classification", Part III "Equipment, Arrangements and Outfit" and Part VI "Fire and Explosion Protection" of the FPU Rules.

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

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

1.3 SCOPE OF TECHNICAL SUPERVISION

1.3.1 The applicable kinds of essential equipment listed in 1.3.2 and 1.3.3, Part X "Electrical Equipment" of the MODU/FOP Rules are subject to technical supervision.

1.3.2 On FPU with rotatable structures the distribution boards, control and monitoring desks and panels of rotating structures, arrangements for transmitting electric power and control and monitoring signals to (slip-ring unit) swivels/rotatable structures are also subject to technical supervision.

1.4 TECHNICAL DOCUMENTATION

1.4.1 Prior to the technical supervision of electrical equipment manufacture, the documentation on each kind of equipment, listed in 1.4.2, Part X "Electrical Equipment" of the MODU/FOP Rules shall be submitted to the Register for consideration.

1.4.2 For FPU with rotatable structures the slip-ring unit busbar calculation for dynamic and thermal short circuit stability shall be submitted to the Register for consideration prior to the technical supervision of electrical equipment manufacture.

2 GENERAL REQUIREMENTS

The applicable requirements of Section 2, Part X "Electrical Equipment" of the MODU/FOP Rules cover the FPU electrical installations and electrical equipment with consideration of stated below.

2.1 OPERATING CONDITIONS

2.1.1 Climatic operating conditions of electrical equipment shall meet the requirements stated in 2.1.1, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.1.2 Electrical equipment shall be capable of reliable performance under the mechanical effects given in 2.1.2, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.1.3 Requirements to operating conditions of electrical equipment of unmanned FSPM and SSPM used in marine operations shall meet the requirements in 2.1, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.1.4 Electrical equipment shall be designed to remain operable in case of deviations in power supply parameters given in 2.1.3, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.2 ELECTROMAGNETIC COMPATIBILITY

2.2.1 The equipment shall operate trouble-free under conditions of interference stated in 2.2, Part XI "Electrical Equipment" of the Rules for the Classification and 2.2, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.3 MATERIALS

2.3.1 Materials shall meet the requirements of 2.3, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.4 DESIGN REQUIREMENTS AND PROTECTION OF ELECTRICAL EQUIPMENT

2.4.1 Protection of electrical equipment shall meet the requirements of 2.4, Part X «Electrical Equipment» of the MODU/FOP Rules.

**2.5 PROTECTIVE EARTHING OF NON-CURRENT CARRYING
METAL PARTS OF ELECTRICAL EQUIPMENT**

2.5.1 Earthing of metal parts of electrical equipment shall meet the requirements of 2.5, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.6 LIGHTNING PROTECTION

2.6.1 Lightning protection shall meet the requirements of 2.6, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.7 ARRANGEMENT OF ELECTRICAL EQUIPMENT

2.7.1 Arrangement of electrical equipment shall meet the requirements of 2.7, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.8 SPECIAL ELECTRICAL ROOMS

2.8.1 Special electrical rooms shall meet the requirements of 2.8, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.9 HAZARDOUS AREAS

2.9.1 FPU shall be divided into hazardous and non-hazardous areas in accordance with the requirements of [2.9.2 – 2.9.4](#).

2.9.2 Hazardous areas are divided as follows:

zone 0 in which an explosive gas/air mixture is continuously present or present for a long period;

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 exist for a short time.

2.9.3 FPU hazardous zones and areas are given in [Table 2.9.3](#).

Table 2.9.3

Nos.	Areas and spaces	Hazardous zones
1	<p>1.1 The internal spaces of closed tanks and piping for containing active non-degassed drilling mud, oil that has a closed-cup flashpoint below 60 °C or flammable gas and vapour, as well as produced oil and gas in which an oil/ gas/air mixture is continuously present or present for long periods.</p> <p>1.2 Internal spaces of open-type processing equipment from the surface of drilling mud to upper openings.</p> <p>1.3 Internal spaces of vent pipes discharging oil/gas/air mixture from spaces specified in items 1.1 and 1.2 of the Table.</p>	0
2 ¹	<p>2.1 Enclosed spaces, in which open-type processing equipment and devices for oil and drilling mud containing oil and oil gases are installed.</p> <p>2.2 Internal volumes of trunks, ducts, trays and other similar structures from which the dispersion of combustible gases and oil vapours is impossible.</p> <p>2.3 Storerooms for cargo hoses carrying highly inflammable fluids (HIF) having a flashpoint 60 °C and less.</p> <p>2.4 Paint lockers, storerooms containing paints, dissolving agents, etc.</p>	
3	<p>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.</p> <p>3.2 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.</p> <p>3.3 Outdoor locations below the drill floor and within a radius of 1,5 m from a possible source of release such as the top of a drilling nipple.</p> <p>3.4 Enclosed spaces that are on the drill floor and which are not separated by a solid floor from the spaces in item 3.2 of the Table.</p> <p>3.5 In outdoor or semi-enclosed locations, except as provided for in item 3.2 of the Table, the area within 1,5 m from the boundaries of any openings to equipment which is part of the mud system as specified in item 3.1 of the Table, any ventilation outlets of zone 1 spaces, or any access to zone 1 spaces.</p> <p>3.6 Pits, ducts or similar structures in locations which would otherwise be zone 2 but which are so arranged that dispersion of gas may not occur.</p>	1
4 ¹	<p>4.1 Enclosed spaces, in which enclosed-type processing plants and facilities, equipment, apparatus, pipelines, shutdown facilities and adjusting devices for HIF having a flashpoint 60 °C and less and combustible gases are installed.</p> <p>4.2 Pumping and piping spaces for oil and technological drain water whenever the oil content in the effluent exceeds 150 mg/l.</p> <p>4.3 Outdoor location within 5 m from the boundaries of open-type processing facilities, equipment, apparatus containing oil and oil gases or HIF having a flashpoint 60 °C and less.</p>	
5	<p>5.1 Enclosed spaces, which contain open sections of the mud circulating system from the final degassing discharge to the mud pump suction connection at the mud pit (degassed drilling mud).</p> <p>5.2 Outdoor locations within the boundaries of the drilling derrick up to a height of 3 m above the drill floor.</p>	2

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Nos.	Areas and spaces	Hazardous zones
	5.3 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.	
	5.4 In outdoor locations below the drill floor, within a radius of 1,5 m area beyond the zone 1 area as specified in item 3.3 of the Table.	
	5.5 The areas 1,5 m beyond the zone 1 areas specified in 3.5 of the Table and beyond the semi-enclosed locations specified in item 3.2 of the Table.	
	5.6 Outdoor areas within 1,5 m of the boundaries of any ventilation outlet from or access to a zone 2 space (from non-hazardous space).	
	5.7 Semi-enclosed derricks to the extent of their enclosure above the drill floor or to a height of 3 m above the drill floor, whichever is greater.	
	5.8 Air-closed spaces (locks) between zone 1 and the non-hazardous areas.	
6	6.1 Outdoor location within 3 m from the boundaries of enclosed-type processing facilities, equipment, apparatus, as well as from the boundaries of Christmas trees.	
	6.2 Semi-enclosed spaces, in which processing facilities, arrangements, equipment, apparatus are installed; spaces within a radius of 15 m about the well axis from lower structures of the platform to the full height of the drilling derrick.	
	6.3 Semi-enclosed spaces below the drilling derrick working floor within the boundaries of enclosure containing oil and oil gases or HIF having a flashpoint 60 °C and less.	
	6.4 Semi-enclosed spaces, in which Christmas trees are installed within the boundaries of enclosure.	
	6.5 Semi-enclosed spaces for storage of cargo hoses carrying HIF having a flashpoint 60 °C and less.	
	6.6 The spaces extended in horizontal and vertical directions within 3 m from the boundaries from air pipes and safety valves and devices for air ejection from exhaust ventilation systems of zone 1 and 2 spaces.	
	6.7 The spaces extended in horizontal and vertical directions within 0,5 m from the boundaries from any holes and openings (windows, doors) of zone 1 and 2 spaces.	
¹ The areas and spaces specified in items 2, 4 and 6 of the Table form part of hazardous zones only under condition of FPU/MODU/FOP compliance with the requirements of the RF supervisory bodies.		

2.9.4 Other locations and spaces not associated with zones 0, 1 and 2 relate to non-hazardous area.

2.9.5 Hazardous zones classification for locations and spaces in accordance with [Table 2.9.3](#) ([items 1, 3](#) and [5](#)) may, in each particular case, be changed on the Register requirement depending on the structural features of the unit and the conditions of locations and spaces ventilation.

**2.10 OPENINGS. ACCESS AND VENTILATION CONDITIONS AFFECTING THE EXTENT
OF HAZARDOUS AREAS**

2.10.1 Openings and ventilation of hazardous zones shall meet the requirements of 2.10, Part X "Electrical Equipment" of the MODU/FOP Rules.

2.11 ELECTRICAL EQUIPMENT AND CABLES IN HAZARDOUS AREAS

2.11.1 Electrical equipment and cables in hazardous areas shall meet the requirements of 2.11, Part X "Electrical Equipment" of the MODU/FOP Rules, as well as the applicable requirements of 19.2, Part XI "Electrical Equipment" of the Rules for the Classification, in particular:

regarding electrical equipment – 19.2.4.1, 19.2.4.2, 19.2.4.4 – 19.2.4.12;

regarding cable laying – 19.2.6;

regarding integrated cargo and ballast systems – 19.2.7.

2.12 ANTISTATIC EARTHING

2.12.1 Antistatic earthing shall meet the requirements of 2.12, Part X "Electrical Equipment" of the MODU/FOP Rules.

3 MAIN SOURCE OF ELECTRICAL POWER

3.1 COMPOSITION AND CAPACITY OF MAIN SOURCE OF ELECTRICAL POWER

3.1.1 Composition and capacity of main source of electrical power shall meet the requirements of 3.1, Part X "Electrical Equipment" of the MODU/FOP Rules.

3.1.2 FPU main source might consist of two independent feeders from external power sources laid in different cable runs spaced as far as possible.

3.1.3 Composition and capacity of electrical units of the main source or feeders from external power sources shall be determined with regard to the following modes of the FPU operation:

- .1** operation at sea and/or maneuvering;
- .2** production and treatment of products;
- .3** inboard/outboard transfer of products including preparatory and completion operations;
- .4** emergency modes, for instance, fire, flooding or others emergency conditions affecting the FPU safety;
- .5** other modes in compliance with arrangement and purpose of FPU, for example:
living quarter operation (for manned SPM),
taking-in of fuels and supply,
routine maintenance.

3.2 GENERATING SETS

3.2.1 Generating sets shall meet the requirements of 3.2, Part X "Electrical Equipment" of the MODU/FOP Rules.

3.3 NUMBER AND CAPACITY OF TRANSFORMERS

3.3.1 Number and capacity of transformers shall meet the requirements of 3.3, Part X "Electrical Equipment" of the MODU/FOP Rules.

3.4 POWER SUPPLY FROM AN EXTERNAL SOURCE OF ELECTRICAL POWER

3.4.1 Power supply from external source of electrical power shall meet the requirements of 3.4, Part X "Electrical Equipment" of the MODU/FOP Rules.

3.5 CONNECTION OF UNITS OF MAIN SOURCE OF ELECTRICAL POWER

3.5.1 Connection of units of main source of electrical power shall meet the requirements of 3.5, Part X "Electrical Equipment" of the MODU/FOP Rules.

3.6 UNINTERRUPTIBLE POWER SUPPLIES

3.6.1 Uninterruptible power supplies (UPS) shall meet the requirements of 3.6, Part X "Electrical Equipment" of the MODU/FOP Rules.

4 DISTRIBUTION OF ELECTRICAL POWER

4.1 Distribution of electrical power shall meet the requirements of Section 4, Part X "Electrical Equipment" of the MODU/FOP Rules.

5 ELECTRIC DRIVES OF MACHINERY AND ARRANGEMENTS

5.1 Electric drives of machinery and arrangements shall meet the requirements of Section 5, Part X "Electrical Equipment" of the MODU/FOP Rules.

6 LIGHTING

6.1 Lighting shall meet the requirements of Section 6, Part X "Electrical Equipment" of the MODU/ FOP Rules, taking into consideration of the following amendment.

6.2 Escape lighting shall meet the requirements of Part XVI "General Requirements and Safety Principles" and shall be provided at the escape routes, as well as in the staff muster stations.

7 INTERNAL COMMUNICATION AND ALARMS

7.1 Internal communication and alarms shall meet the requirements of Section 7, Part X "Electrical Equipment" of the MODU/FOP Rules.

8 ELECTRIC PROTECTION SYSTEM

8.1 Electric protection system shall meet the requirements of Section 8, Part X "Electrical Equipment" of the MODU/FOP Rules.

9 EMERGENCY ELECTRICAL INSTALLATIONS

9.1 GENERAL

9.1.1 Emergency electrical installations shall meet the requirements of Section 9, Part X "Electrical Equipment" of the MODU/FOP Rules.

9.1.2 In case the emergency lighting is provided mainly by emergency generator, some lighting fixtures shall be equipped with backup accumulator battery supply.

9.1.3 All manned areas of FPU shall be equipped with emergency lighting supplied from emergency power source.

Lighting shall be sufficient to effectively perform necessary operations in emergency situation, including reading of symbols and arrangement plans ([refer to Table 9.1.3](#)).

Table 9.1.3

Area	Normal recommended illuminance	Power supply from emergency generator	Power supply from storage battery ¹
Common working areas and machinery spaces	200 lux, 300 lux at control boards	²	15 lux
Common passages from spaces	100 lux	²	15 lux
Accommodation spaces, cabins and corridors	150 lux ³	²	15 lux
Main control stations, bridge, radio room and standby control stations	500 lux (adjustable)	100 lux	100 lux
Emergency generator room and fire pump room	200 lux	²	25 lux
Temporary refuge	200 lux	100 lux	100 lux
Staff muster station	200 lux	100 lux	100 lux
Embarkation station and launching place of life-saving appliances	200 lux	100 lux	100 lux
¹ Operating period of storage battery shall comply with escape duration.			
² Total illuminance shall be equal to 25 lux, special attention shall be paid to illuminance of entrances and exits.			
³ Illuminance in service spaces, galley, mess room, laundry, etc. shall be higher, usually 300 lux and above.			

Emergency escape and entrance routes, as well as exit points shall be illuminated in such a way that they may be easily distinguished in emergency.

Muster and embarkation stations, launching arrangements and surface of sea under them shall be illuminated by emergency lighting.

9.1.4 Emergency power sources on FPU shall ensure supplying of applicable consumers stated in 9.3.1, Part X "Electrical Equipment" of the MODU/FOP Rules within 18 h, as well as:

- .1 emergency lighting of turret room and cargo pump room;
- .2 hazardous and toxic gas detection and alarm system;
- .3 electric wires and turret control system;
- .4 electric drives and control systems of blow-out preventer and of the gear disconnecting FPU from the well head arrangement, as well as electric drives and control systems of production and offloading systems ensuring safety shut-down of production and offloading processes.

9.1.5 Cables, feed wires of emergency electrical equipment from emergency power source laid out via high fire hazard shall be fire-resistant or flame-resistant as specified in 16.8.1.7 and 16.8.1.8, Part X "Electrical Equipment" of the MODU/FOP Rules. This requirement covers also remote control cables of these appliances.

9.1.6 Systems for tackling emergencies, emergency power supply as well as control and monitoring systems associated with them shall be self-contained and located in such a way that they are not damaged due to the causes affecting the main power supply system.

9.2 EMERGENCY SHUTDOWN AND SAFETY SYSTEMS

9.2.1 FPU shall be provided with an emergency shutdown system (ESD) and process equipment control and safety system (ECS). The ESD and ECS systems may be combined in one system.

9.2.2 The objective of an emergency shutdown system (ESD) is initiating actions to shut down and isolate electrical and processing equipment in order to prevent escalation of abnormal conditions into a major hazardous event and to limit the extent and duration of any such events which do occur.

9.2.3 The main objective of ECS is to shutdown the equipment for production, storage and offloading hydrocarbons, as well as to relieve overpressure by means of specially provided systems to prevent hazard for the whole installation protection of FPU, its personnel and equipment in emergency situations and to prevent the environmental pollution in case of equipment breakage or process failure.

9.2.4 Emergency shutdown (ESD) system.

9.2.4.1 Emergency shutdown (ESD) system shall comply with the following functional requirements:

isolate FPU from the major product inventories within pipelines and reservoirs which, if released on failure, would pose an intolerable risk to the personnel, environment and equipment;

sectionalize topside inventory to limit the quantity of material released on loss of containment;

monitor potential ignition sources such as fired units, engines and non-essential electrical equipment;

control subsurface safety valve(s) on FPU;

where appropriate, depressurize product inventory and vent it to a safe place.

9.2.4.2 ESD system shall be designed so that:

it shall provide all necessary information at the control station so that the operator could manage the emergency situation;

it may be initiated manually or automatically or both. When manual initiation is required, the ESD system shall not require the operators to make complex or non-routine decisions;

once initiated, all control actions required by ESD system shall occur automatically;

manual stations for initiation of ESD shall be located in easily accessible, well marked positions protected against unintentional activation;

it shall contain facilities for testing of both input/output devices and internal functions;

the reliability of the system is provided by redundancy of its elements;

the system contains means of automatic self-control of the operational condition of its elements and provides alarm signals to the FPU personnel if an element is faulty;

the system maintains its operability under possible fire conditions within the period of time sufficient for restoring the process equipment safe condition.

9.2.4.3 ESD system shall provide 3 levels of emergency shutdown (the first level is the highest), which are selected based on the necessity of preventing the emergency situation escalation from one zone of FPU to another:

1st level – emergency shutdown initiated automatically during the fire or major product spill. The personnel evacuation from FPU may become necessary. The 1st level emergency shutdown may also be initiated manually;

2nd level – process shutdown initiated automatically in case of significant deviation of process parameters on FPU from maximum allowable values or as a result of initiating the 1st or 2nd level of emergency shutdown, e.g., the emergency shutdown of a shore reservoir;

3rd level – local shutdown initiated by switching off of specific types of equipment.

9.2.4.4 Upon the emergency shutdown the following explosion proof electrical equipment located in non-enclosed spaces and certified for operation within zone 2 shall continue functioning:

- .1 emergency lighting within 30 min;
- .2 preventer emergency control system;
- .3 general alarm system;
- .4 public address system;
- .5 communication radio equipment supplied from its own accumulator batteries;

9.2.4.5 All ESD levels shall be initiated automatically (on receiving fire protection system signals) or manually from CCS.

9.2.4.6 Manual initiating of each ESD level shall be performed by pushing one button. The time required for the process control systems to activate each ESD level after the latter has been initiated by the operator shall be reduced to minimum.

9.2.4.7 ESD system shall be arranged so that the highest level shutdown initiation provides for automatic activation of all the lower levels shutdown operations.

9.2.4.8 Protection shall be provided against the ESD activations caused by accidental or short-time signals of process disruption, including switching over from/to reserve or emergency power supply.

9.2.4.9 In case of complete power, compressed air or hydraulic supply failure the way for restoring safe condition of the process equipment shall be provided.

9.2.4.10 Taking into consideration exceptional circumstances under which the danger of explosion can spread onto hazardous areas, special means shall be provided for effecting selective manual disconnection or shutdown of:

ventilation;

all non-essential electrical equipment in non-hazardous areas;

all essential electrical equipment including the equipment supplied from accumulators and generator prime movers, except such previously tested equipment as emergency lighting, general alarm system, etc., which shall function in case of emergency.

The radio installation supplied from accumulator batteries is not required to be previously tested or incorporated into ESD system.

9.2.4.11 Technical devices for ESD systems manual activation shall be located in the following rooms:

emergency control stations;

auxiliary control stations, e.g., main escape routes, helideck, etc.

9.2.4.12 The valve activated automatic shutdown shall take place under the following conditions:

discovered fire in turret and crude oil tanks areas;

discovered product vapour concentration is 50 % of LFL in turret and cargo tank areas.

9.2.4.13 The automatically activated ventilation shutdown shall be performed under the following conditions:

discovered maximum gas concentration is 20 % of LFL in air inlets in the non-hazardous areas;

discovered fire in the enclosed non-hazardous area.

9.2.4.14 ESD system shall be based on open valve and equipment circuits.

Electric ESD systems shall be designed so that the risk of unforeseen shutdown due to a failure in the functioning of the system or of unforeseen shutdown operation is minimized.

9.2.4.15 ESD initiation shall activate audible and visual alarm signals at the control stations.

The alarm signals shall be indicated so that the equipment initiating the ESD activation and its location can be easily identified at the control stations.

9.2.4.16 ESD system activating sensors, actuators/triggers and the equipment and circuits associated with them shall be installed and operate independently of monitoring and control systems.

9.2.4.17 Manual ESD actuation system shall be, as far as practicable, independent of the automatic ESD actuation system.

9.2.4.18 ESD system shall be designed so that it can be tested when FPU is in operation.

9.2.5 Equipment safety and control system (ECS) in the FPU process area.

9.2.5.1 ECS system is intended to shutdown the equipment for production, treatment, storage and offloading hydrocarbons, as well as to relieve overpressure by means of specially provided systems to prevent hazard to the whole FPU.

9.2.5.2 ECS design shall be developed in accordance with the FPU design, set of equipment installed and production process peculiarities. Requirements of Part XIV "Automation" of the MODU/FOP Rules shall be considered as applicable.

9.2.5.3 ECS shall function automatically and independently of other control and monitoring systems. ECS manual activation shall be provided as follows: from the control station, wellhead areas (well cutoff valves), helideck and embarkation stations. The possibility of ECS remote activation shall be provided.

9.2.5.4 ECS activation periodic checks shall be provided by simulating emergency situations specified in ECS design.

9.2.5.5 The requirements of this chapter apply to ECS equipment subject to technical supervision by the Register irrespective of an automation mark in the FPU class notation.

9.2.5.6 Depending on possible consequences of emergency situation, the following process shutdown shall be provided by ECS:

shutdown of separate FPU blocks and systems both with and without emptying them of the product and stopping the entire process;

complete shutdown of the hydrocarbon production and treatment of other systems both with and without emptying them of the product;

complete shutdown of all process equipment (except emergency life support systems), closing cutoff valves on the wellheads and pipelines connecting FPU with the other structures of the offshore oil and gas field facilities or with transport ships, emptying the process equipment and pipelines through the systems provided for this purpose.

9.2.5.7 In case of emergency situation in one of the wells or one of the equipment blocks the possibility of their shutdown shall be provided (i.e. partial shutdown of the process).

ECS shall provide the following compulsory stages of partial shutdown:

closing of all wellhead valves and plates (including those fitted in the block of submerged blowout preventer equipment);

complete shutdown of the production and treatment block and equipment and systems associated with it. The number of stages depends on the particular FPU design.

9.2.5.8 The algorithm of closing/opening cutoff valves, switching on/off other devices, the list of possible process failures and troubleshooting, list of parameters values which are characteristic to partial or complete process stopping shall be specified in the corresponding sections of the equipment operating manuals.

9.2.5.9 All process shutdown operations shall be performed automatically upon the command given by the process control system.

In case of automatic control system failure the possibility for operator's intervention shall be provided and the work shall proceed manually.

9.2.5.10 The process shall be terminated in case of fire in the process area.

9.2.5.11 When the product vapour concentration in the air of the hazardous zones (0, 1, 2) reaches 20 % of LEL (lower flame limit) alarm actuation shall be provided and emergency exhaust ventilation (EEV) shall be activated.

9.2.5.12 In case of further concentration increase up to 50 % of LEL, blackout, fire, and high/low pressure in the wellhead product delivery pipeline, all the processes in the oil and gas production systems shall be shutdown, including EEV.

9.2.5.13 Realization of algorithms of emergency shutdown of hydrocarbon production process of products in any module or block shall not lead to an emergency situation on other FPU modules or blocks.

9.2.5.14 The complete shutdown of all process equipment and processes upon the operator's signal from the CCS or other control stations is provided in case of the emergency situation escalation: oil/gas blowout; seal failure of the systems containing products; fire alarm actuation.

9.2.5.15 In case of complete process equipment and processes shutdown the following shall be provided:

- closing of wellhead valves;
- product treatment process shutdown;
- disconnection of main sources of electric power;

9.2.5.16 The signal for automatic operation of closing devices (cutoff valves) shall be provided in response to:

- the signal from air monitoring sensors;
- fire alarm actuation;
- loss of power supply;
- safety systems failures;
- ship contact with FPU when mooring;
- installation loss of stability;
- structures collapse due to the helicopter crash and fall onto the topside.

9.2.5.17 Response to above mentioned signals shall also be provided manually upon the signal from the control panel or by pressing emergency stop buttons located in other FPU areas.

9.2.5.18 Provision shall be made for the possibility of remote control of all the steps of shutdown process.

10 ELECTRICAL MACHINES

10.1 Electrical machines shall meet the requirements of Section 10, Part X "Electrical Equipment" of the MODU/FOP Rules.

11 TRANSFORMERS

11.1 Transformers shall meet the requirements of Section 11, Part X "Electrical Equipment" of the MODU/FOP Rules.

12 POWER SEMICONDUCTOR UNITS

12.1 Power semiconductor units shall meet the requirements of Section 12, Part X "Electrical Equipment" of the MODU/FOP Rules.

13 ACCUMULATOR BATTERIES

13.1 Accumulator batteries shall meet the requirements of Section 13, Part X "Electrical Equipment" of the MODU/FOP Rules.

14 ELECTRICAL APPARATUS AND ACCESSORIES

14.1 Electrical apparatus and accessories shall meet the requirements of Section 14, Part X "Electrical Equipment" of the MODU/FOP Rules.

15 ELECTRICAL COOKING AND HEATING APPLIANCES

15.1 Electrical cooking and heating appliances shall meet the requirements of Section 15, Part X "Electrical Equipment" of the MODU/FOP Rules.

16 CABLES AND WIRES

16.1 Cables and wires shall meet the requirements of Section 16, Part X "Electrical Equipment" of the MODU/FOP Rules.

17 ELECTRIC PROPULSION PLANTS

17.1 Electric propulsion plants shall meet the requirements of Section 17, Part X "Electrical Equipment" of the MODU/FOP Rules.

**18 REQUIREMENTS FOR ELECTRICAL EQUIPMENT DESIGNED FOR VOLTAGE
ABOVE 1000 V UP TO 15 kV**

18.1 Electrical equipment designed for voltage above 1000 V up to 15 kV shall meet the requirements of Section 18, Part X "Electrical Equipment" of the MODU/FOP Rules.

19 SPARE PARTS

19.1 Spare parts shall meet the requirements of Section 19, Part X "Electrical Equipment" of the MODU/FOP Rules.

Russian Maritime Register of Shipping

**Rules for the Classification and Construction of Floating
Offshore Oil-And-Gas Production Units
Part XI
Electrical Equipment**

FAI "Russian Maritime Register of Shipping"
8, Dvortsovaya Naberezhnaya,
191186, St. Petersburg,
Russian Federation
www.rs-class.org/en/