

# **RULES**

## **FOR THE CLASSIFICATION AND CONSTRUCTION OF FLOATING OFFSHORE OIL-AND-GAS PRODUCT UNITS**

### **PART VIII SYSTEMS AND PIPING**

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# **RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF FLOATING OFFSHORE OIL-AND-GAS PRODUCT UNITS**

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Rules for the Classification and Construction of Floating Offshore Oil-and-Gas Product Units (FPU) 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 January 2023.

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 Rules supplement the Rules for the Classification and Construction of Sea-Going Ships and the 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 Product Units<sup>1</sup> cover the following systems and piping:

- .1** bilge systems;
- .2** ballast systems;
- .3** cargo handling systems;
- .4** air, overflow, sounding pipes;
- .5** ventilation systems;
- .6** domestic service systems;
- .7** fuel oil systems;
- .8** lubricating oil systems;
- .9** water cooling systems;
- .10** compressed air systems;
- .11** exhaust gas systems;
- .12** steam and blow-off systems;
- .13** feed water systems;
- .14** thermal liquid systems;
- .15** condensate systems;
- .16** product heating systems;
- .17** exhaust gas systems;
- .18** systems for level control in tanks;
- .19** cargo tank washing systems;
- .20** fuel oil systems for helicopters.

**1.1.2** Pumping and piping shall meet the applicable requirements of Part VIII "Systems and Piping" of the Rules for the Classification and Construction of Sea-Going Ships<sup>2</sup> and Part VIII "Systems and Piping" of the Rules for the Classification, Construction and Equipment of Mobile Offshore Drilling Units and Fixed Offshore Platforms<sup>3</sup>.

**1.1.3** The fuel oil used on FPU shall meet the requirements of [2.7](#), Part VII "Machinery Installations".

**1.1.4** Machinery and elements of the systems shall remain operative under climatic conditions specified in [2.1.1](#), Part XI "Electrical Equipment" and in [2.3.2 – 2.3.5](#), Part VII "Machinery Installations".

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<sup>1</sup> Hereinafter referred to as "the FPU Rules".

<sup>2</sup> Hereinafter referred to as "the Rules for the Classification".

<sup>3</sup> Hereinafter referred to as "the MODU/FOP Rules".

## **1.2 DEFINITIONS AND EXPLANATIONS**

**1.2.1** For the purpose of this Part, the definitions given in 1.2, Part VIII "Systems and Piping" of the Rules for the Classification have been adopted, where by the ship FPU is meant.

### **1.3 SCOPE OF TECHNICAL SUPERVISION**

**1.3.1** The scope of technical supervision shall meet the requirements of 1.3, Part VIII "Systems and Piping" of the Rules for the Classification.

**1.3.2** The technical documentation submitted to the Register for review and approval shall also include schematic diagrams of the process systems conveying dangerous and flammable media.

## **1.4 PROTECTION AND INSULATION OF PIPING**

**1.4.1** Protection and insulation of pipes shall meet the requirements of 1.4, Part VIII "Systems and Piping" of the Rules for the Classification.

**1.5 WELDING AND NON-DESTRUCTIVE TESTING OF WELDED JOINTS**

**1.5.1** Welding and non-destructive testing of welded joints in pipelines shall be effected in compliance with the applicable requirements of 2.5 and Section 3, Part XIV "Welding" of the Rules for the Classification.



## **2 GENERAL REQUIREMENTS FOR SYSTEMS AND PIPING**

**2.1** Materials used for manufacture of metal pipes, the allowable radii of pipe bends and heat treatment thereof after bending, allowable pipe wall thickness and types of pipe joints shall meet the requirements of Section 2, Part VIII "Systems and Piping" of the Rules for the Classification.

**2.2** Plastic pipes in the units shall be manufactured, assembled and tested in compliance with the requirements of Section 3, Part VIII "Systems and Piping" of the Rules for the Classification.

**2.3** Construction of the manually and remotely operated valves, their marking, arrangement and installation, construction of the sea-inlet water boxes and ice boxes, bottom and side valves, openings in shell plating shall meet the requirements of 4.1 – 4.3, Part VIII "Systems and Piping" of the Rules for the Classification, as well as 2.4, Part VIII "Systems and Piping" of the MODU/FOP Rules.

**2.4** The air pipe automatic closing devices shall meet the requirements of 4.4, Part VIII "Systems and Piping" of the Rules for the Classification and 2.4.2, Part VIII "Systems and Piping" of the MODU/FOP Rules.

**2.5** Piping laying through watertight and fire-resisting structures, in tanks and cargo holds in the vicinity of electrical and radio equipment, inside machinery and other spaces shall be effected with due regard to the requirements of Section 5, Part VIII "Systems and Piping" of the Rules for the Classification and 2.5, Part VIII "Systems and Piping" of the MODU/FOP Rules.

**2.6** Tests of piping and fittings shall meet the requirements of Section 21, Part VIII "Systems and Piping" of the Rules for the Classification.

### **3 REQUIREMENTS FOR THE GENERAL PURPOSE PIPING SYSTEMS**

#### **3.1 BILGE SYSTEM**

**3.1.1** The bilge system shall meet the applicable requirements of Section 7, Part VIII "Systems and Piping" of the Rules for the Classification and 3.1.1, Part VIII "Systems and Piping" of the MODU/FOP Rules.

### **3.2 BALLAST SYSTEM**

**3.2.1** The ballast system shall meet the applicable requirements of Section 8, Part VIII "Systems and Piping" of the Rules for the Classification, 3.1.2, Part VIII "Systems and Piping" of the MODU/FOP Rules and [2.4.2](#), Part V "Subdivision" of the FPU Rules.

**3.2.2** The system equipped with fixed pumps shall be capable to remove and take in ballast for all ballast tanks irrespective of their replacement in any combination and sequence.

**3.2.3** A system equipped with submersible pumps shall be divided in such a way so that ballast tanks can be filled/emptied independently of one another where tanks are emptied by means of pumps and filled by gravity or by means of pumps.

### **3.3 CARGO SYSTEM**

**3.3.1** The cargo system shall meet the requirements of Section 9, Part VIII "Systems and Piping" of the Rules for the Classification as far as it is applicable and sufficient.

**3.3.2** FPU shall be provided with stripping system for effective stripping of tanks.

### **3.4 CARGO TANK WASHING SYSTEM**

**3.4.1** Cargo tank washing system shall meet the requirements of 9.12, Part VIII "Systems and Piping" of the Rules for the Classification.

### **3.5 OFFLOADING SYSTEMS**

#### **3.5.1 General.**

**3.5.1.1** Cargo tanks of FPU having a descriptive notation **FPSO** or **FSO** in the class notation shall meet the requirements of IMO resolutions MEPC.139(53), MEPC.142(54), as well as, in the case of liquefied gas storage, the applicable requirements of Part IV "Cargo Tanks" of Rules for the Classification and Construction of Ships Carrying Compressed Natural Gas.

**3.5.1.2** Offloading systems include piping with the installed shut-off valves, which transport the finished product from the product unit for processing the well fluids to the inlet manifolds of transport ships or floating single point mooring (FSPM).

**3.5.1.3** Transport ships intended for offshore operations with FPU shall be equipped with cargo handling gear and other systems required to perform mooring and offloading operations in compliance with 9.5, Part VIII "Systems and Piping" of the Rules for the Classification and the requirements of the FPU Rules.

**3.5.1.4** Structural measures shall be taken to ensure the following:  
examination of the entire cargo line to provide reliability of attachment and tightness thereof;  
examination and operational testing of the fitted shut-off, control and safety valves and arrangements;  
check of emergency disconnecting systems provided for the mooring arrangement and cargo handling gear.

**3.5.1.5** In the dark periods of time cargo operation areas shall be illuminated to ensure visual observation of offloading system equipment condition.

**3.5.1.6** Materials shall be selected with consideration for the chemical and physical properties of the well fluids, as well as the environmental conditions.

**3.5.1.7** Possible pressure changes (fluctuations) in the piping components of offloading system during normal operation and/or in emergency situations shall be taken into account when selecting structural components.

**3.5.1.8** Provision shall be made for pressure transducers to ensure termination of transfer when pressure in the system increases/drops over/below the set values.

**3.5.1.9** Provision shall be made for automatic and remotely operated shut-off devices allowing, if necessary, to disconnect the offloading system from the source of the well fluids with due regard to the formation pressure value.

**3.5.1.10** Shut-off devices shall be operated from emergency shutdown system (ESD) and process equipment safety and control system (ECS) (refer to 9.2, Part XI "Electrical Equipment").

**3.5.1.11** Provision shall be made for preventing hydraulic impact which can occur when the above devices come into action (limitation of closing/opening rate, appropriate blocking, discharge of products to special tank or to by-pass pipeline, etc.).

**3.5.2** All hoses with design pressure not exceeding 1,6 MPa as regards their construction and tests, shall meet the requirements of Section 6, Part VIII "Systems and Piping" of the Rules for the Classification.

#### **3.5.3 Production swivel.**

**3.5.3.1** The production swivel shall ensure:  
tight and reliable connection of the fixed and rotating parts of the cargo pipeline;  
tightness of the swivel sections and connections to the piping in respect to the environment and one another;  
safe release and co-rotation with the structures of turret, mooring swivel or other applicable arrangements;  
transportation, if provided by the design, of other media (e.g. fire water, nitrogen, hydraulic liquids, etc.), as well as electric power, monitoring and control signals in all operating modes.

**3.5.3.2** The swivels shall be made of steel with flange and welded joints and provided with lubricating oil system of bearings and leak return system.

Parts of the swivel exposed to pressure shall be designed in compliance with the requirements to cargo piping systems. Account shall be taken of at least the following:

- torque required to turn the swivel at the maximum design pressure from fixed position;
- weight of swivel and hoses;
- dynamic loads due to the unit motions, wind and current;
- loads due to pipelines;
- loads due to pressure;
- temperature loads.

**3.5.3.3** The swivel shall be tested at the firm (manufacturer) in compliance with the test program approved by the Register. At least, the following tests shall be provided in the program:

static (without rotation) testing by hydraulic pressure exceeding the design pressure not less than by 1,5 times during at least two hours (no leak or appreciable pressure drop is permitted);

dynamic testing at four full rotations of the swivel rotating section with pressure equal to the nominal pressure being delivered to the swivel hull. Each rotation shall be performed by steps of 30° during approximately 30 s. The first three rotations shall be clockwise and the last rotation shall be counterclockwise. The breakaway and rotational torque shall be recorded.

The requirements of this paragraph apply to the swivel sections ensuring transportation of the products. Leakage values during tests in other sections shall comply with the technical documentation approved by the Register.

**3.5.3.4** If provision is made for several rotating sections, their hulls shall be subjected to joint and component testing.

**3.5.3.5** Mean values of the friction torque during the rotation of rotating sections and of leakages through the sealing shall not exceed the values established by the approved technical documentation of the manufacturer.

**3.5.3.6** If provision is made for joint operation of the production swivel and turret, mooring swivel or another arrangement, their alignment and safe release of each section shall be confirmed during the assembly test.

#### **3.5.4 Cargo hoses.**

**3.5.4.1** Materials used for manufacture of hoses shall meet the requirements of Section 6, Part VIII "Systems and Piping" and Part XIII "Materials" of the Rules for the Classification.

Materials specifications shall meet the adopted standards and contain strength characteristics.

**3.5.4.2** Connection pieces and flanges of the hoses shall be manufactured of steel.

The flanges shall be forged and their outer surfaces including faces shall be protected by electroplating, zinc spraying or by other permissible method. Coating shall be applied in conformity with relevant standards and procedures.

**3.5.4.3** The hoses shall be equipped with:

- arrangement for transfer of the hose to ship;
- quick-action device for emergency disconnection with shut-off valve;
- special sections for bending the hose over the gun wall of TS, where necessary;
- special sections protected from the action of broken ice.

**3.5.4.4** When operating under ice conditions, contact of the cargo hoses with ice hummocks shall be avoided, unless this is envisaged by the hose construction (clearance not less than 4 m above the consolidated ice level).

**3.5.4.5** The floating hoses shall meet the following requirements:

buoyancy reserve is minimum 20 %;

buoyant material of the hoses which is applied around the hose body is firmly glued to the body and its coating and all longitudinal butts of that material are tightly glued together;

buoyant material is distributed over the entire length of the hoses in such a way so that the hoses jointed together as a single link be afloat and have similar draught.

**3.5.4.6** Double wall hoses for holding any product shall be provided with leakage detection system.

**3.5.5 Other structural units.**

**3.5.5.1** The composition of the equipment shall ensure emergency shut-off in case of excessive pressure increase.

**3.5.5.2** A continuous monitoring of pressure in the pipeline and pump characteristics is required.

**3.5.5.3** To ensure emergency stop of the product offloading, provision shall be made for: automatic, remote and manual operation of the pipeline valves (to prevent oil spill and reduce fire hazard);

installation of safety valves on the inlet pipeline which in case of exceeding the permissible pressure discharge the product into the collection tank;

shut-off of the submerged pipeline;

shutdown valves on the pipelines between the SPM and storage or between FPU and TS.

When developing arrangements and apparatus for emergency stop of product supply the formation of hydrates, hydraulic impact and clogging shall be avoided.

**3.5.6 Product transportation control.**

**3.5.6.1** Cargo control room (CCR) on FPU shall be located on the open deck (upper or 1st tier deckhouse) far apart from the machinery spaces and far aft of all cargo tanks according to 2.4.9, Part VI "Fire Protection" and 3.2.10, Part VII "Machinery Installations" of the Rules for the Classification.

CCR shall be equipped with:

control, monitoring means and alarm devices for cargo handling operations according to 3.2.11, Part VII "Machinery Installations" of the Rules for the Classification;

means of communication according to 3.3.2, Part VII "Machinery Installations" of the Rules for the Classification.

In particular, the cargo operations control system shall provide:

remote control of valves;

remote control of pump revolutions;

automatic closing of valves when the limiting level of cargo in tanks is reached;

remote monitoring of level in tanks;

alarm to indicate the highest level in ballast tanks;

remote monitoring of the discharge and suction pressure of cargo and ballast pumps;

automated operation of the inert gas system.

**3.5.6.2** The pumps shall be stopped within a minimum possible time in case of emergency disconnection.

**3.5.6.3** The pressure indicators shall be fitted in appropriate locations to stop cargo pump if the pressure in the pipeline exceeds the set value of the maximum permissible pressure or drops below the set minimum value thereof.

**3.5.6.4** Valve interlocking shall be provided as follows:

main distributing valves shall be closed unless other components have been connected;

valves located adjacent to detachable joints shall be closed until the joints are detached.

**3.5.6.5** For hydraulically driven valves provision shall be made for hydropneumatic accumulators providing at least two full cycles of the actuator "opening-closing" operation.



**3.5.6.6** The pressure release and reducing device in the cargo pipeline shall meet the following requirements:

pumping plants shall be equipped with pressure release devices in case of pressure increase above the maximum value;

the safety devices shall be adjusted to the pressure equal to maximum permissible working pressure;

if the product contains substances which can bring the safety valves out of service or rapid pressure rise can occur the bursting discs shall be installed in place of safety valves;

all systems operating under pressure (containing toxic or flammable media) shall be equipped with a pressure release system in cases of fire;

the pressure release system shall reduce pressure in the system to the level at which the failure shall not occur having regard to the fire duration, heat input conditions and material properties;

when selecting material account shall be taken of the temperature decrease effect during pressure release in the shut-off fittings and outlet pipeline;

opening of the pressure release valves shall be supplied from the source of power ensuring uninterruptible power supply, or from the accumulator.

**3.5.6.7** Two-way communication shall be provided between FPU and production consumers (including shore-based facilities), as well as salvage vessels.

This equipment on the unit may be portable, fixed or combined and to ensure reliable communication the equipment shall be duplicated.

**3.5.7 Corrosion protection.**

**3.5.7.1** An appropriate corrosion-resistant coating shall be applied on productive swivels, piping and fittings. Such coating is not required for parts manufactured from corrosion-resistant materials.

**3.5.7.2** When designing, corrosive action of the marine environment, as well as corrosive effect due to the presence of CO<sub>2</sub>, O<sub>2</sub> and H<sub>2</sub>S in the products shall be taken into consideration.

### **3.6 AIR, OVERFLOW AND SOUNDING PIPES**

**3.6.1** Air, overflow and sounding pipes shall meet the applicable requirements of Section 10, Part VIII "Systems and Piping" of the Rules for the Classification, 3.1.3, Part VIII, "Systems and Piping" of the MODU/FOP Rules.

**3.6.2** In case when FPU is equipped with a fixed inert gas system it shall be provided with closed measurement devices for taking ullages of cargo and slop tanks.

### 3.7 VENTILATION SYSTEM

**3.7.1** Ventilation systems shall meet the applicable requirements of Section 12, Part VIII "Systems and Piping" of the Rules for the Classification and 3.3.1, Part VIII "Systems and Piping" of the MODU/FOP Rules.

**3.7.2 Smoke ventilation.**

**3.7.2.1** Smoke ventilation shall be designed to ensure safe evacuation of people at the initial stage of fire.

**3.7.2.2** Smoke extraction shall be provided from spaces and escape routes if the time of filling them with smoke is below the design time required to evacuate people from these spaces and by the specified escape routes.

**3.7.2.3** It is recommended to provide smoke extraction from:

accommodation spaces;

escape routes;

corridors of more than 15 m in length having no natural lighting through light openings in external boundaries, in continuously or temporarily attended spaces in process and auxiliary areas.

**3.7.2.4** The requirements of [3.7.2](#) do not cover:

spaces in which time for filling them with smoke exceeds the time required to evacuate people from the space;

spaces of less than 200 m<sup>2</sup>, equipped with automatic water or foam fire extinguishing systems;

spaces equipped with automatic gas fire extinguishing systems;

corridors if for all spaces having doors leading to this corridor direct smoke extraction is designed.

**3.7.2.5** The required capacity of smoke ventilation shall be determined by calculation.

**3.7.2.6** For smoke protection of space provision shall be made for the following:

installation of fans of explosion-proof design corresponding to the hazardous zone category;

air ducts made of non-combustible materials with fire-resistance rating approved by the Register;

smoke valves made of non-combustible materials which automatically open in fire;

emission of smoke to atmosphere at a height not less than 2 m above the deck;

installation of devices to prevent penetration of smoke through the air ducts of smoke ventilation from one space to another.

**3.7.2.7** Fans for smoke extraction shall be located in separate rooms with fire-resisting bulkheads.

**3.7.2.8** In fire the outside air shall be delivered to smoke-free stairway trunks with air overpressure and to air locks.

**3.7.2.9** In the spaces to be protected simultaneous activation of automatic fire extinguishing systems (gas or powder) and smoke ventilation is not allowed.

**3.7.2.10** The system shall be designed so that to minimize the probability of smoke penetration to accommodation spaces and to areas temporarily occupied by the personnel during accidents.

**3.7.3 Other requirements.**

**3.7.3.1** The temporary refuge shall be equipped with mechanical ventilation to ensure overpressure therein as compared with the pressure in adjacent spaces and the maximum pressure shall be safe for the personnel who stay in the temporary shelter.

### **3.8 DOMESTIC SERVICE SYSTEMS**

**3.8.1** Steam shall be supplied to steam heaters in the machinery spaces, sanitary spaces, storerooms, conditioners, air and water heaters, to clear distant pieces, to steam sewage tanks, heating coils of ballast and fresh water tanks.

**3.8.2** Spaces containing electrical equipment which ensures safety of the unit and functioning of the vital systems and arrangements shall be heated by electric heaters.

## **4 REQUIREMENTS FOR MACHINERY SYSTEMS**

### **4.1 FUEL OIL SYSTEM**

**4.1.1** The fuel oil system shall meet the requirements of 3.2.1, Part VIII "Systems and Piping" of the MODU/FOP Rules, as well as Section 13, Part VIII "Systems and Piping" of the Rules for the Classification to the extent that is reasonable and practicable.

## **4.2 LUBRICATING OIL SYSTEM**

**4.2.1** The lubricating oil system shall meet the requirements of Section 14, Part VIII "Systems and Piping" of the Rules for the Classification and 3.2.2.2, Part VIII "Systems and Piping" of the MODU/FOP Rules to the extent that is reasonable and practicable.

### **4.3 WATER COOLING SYSTEM**

**4.3.1** The water cooling system shall meet the requirements of Section 15, Part VIII "Systems and Piping" of the Rules for the Classification to the extent that is reasonable and practicable.

**4.3.2** The sea water pumps used for cooling the internal combustion engines shall be located below the water level.

**4.3.3** The cooling system of prime movers of the electric generators and auxiliary machinery shall ensure an uninterrupted operation thereof under all operational conditions.

#### **4.4 COMPRESSED AIR SYSTEM**

**4.4.1** The compressed air system shall meet the requirements of Section 16, Part VIII "Systems and Piping" of the Rules for the Classification to the extent that is reasonable and practicable.



#### **4.5 EXHAUST GAS SYSTEM**

**4.5.1** The exhaust gas system shall meet the requirements of 3.2.5.2, Part VIII "Systems and Piping" of the MODU/FOP Rules, as well as Section 11, Part VIII "Systems and Piping" of the Rules for the Classification to the extent that is reasonable and practicable.

#### **4.6 FEED WATER, STEAM AND BLOW-OFF, THERMAL LIQUID SYSTEMS**

**4.6.1** If FPU is equipped with the boiler(s), the feed water, steam and blow-off and thermal liquid systems shall meet the requirements of Sections 17, 18 and 20, Part VIII "Systems and Piping" of the Rules for the Classification to the extent that is reasonable and practicable.

**4.6.2** Provision shall be made for insertion of additives into the feed water.

**4.6.3** Laying of steam pipes and blow-off pipes as well as calculation for thermal expansion shall meet the requirements of Section 18, Part VIII "Systems and Piping" of the Rules for the Classification.

#### **4.7 CONDENSER INSTALLATIONS**

**4.7.1** In case when main or auxiliary turbines are installed, the condenser installations shall meet the requirements of Section 19, Part VIII "Systems and Piping" of the Rules for the Classification.

## **5 SPECIAL SYSTEMS**

### **5.1 FUEL OIL SYSTEMS FOR HELICOPTERS**

**5.1.1** The fuel oil systems for helicopters shall meet the requirements of 13.13, Part VIII "Systems and Piping" of the Rules for the Classification and 3.3.4, Part VIII "Systems and Piping" of the MODU/FOP Rules to the extent that is reasonable and practicable.

## **5.2 PROCESS PIPING**

**5.2.1** The process pipelines which, in case when FPU is used for its designed purpose, may contain dangerously explosive gases or flammable liquids shall not pass through accommodation and service spaces, control stations and machinery spaces, tanks and dry compartments.

**5.2.2** The pipelines containing incompatible substances shall be laid as far as possible apart.

**5.2.3** The pipelines shall be inclined (in practice, up to 0,02) to ensure their emptying when inoperative. When determined the inclination value account shall be taken of the viscosity properties of oil, extent of the pipeline, its laying conditions. In justified cases, the pipelines may be inclined less than specified above or laid without any inclination, but in this case measures shall be taken to ensure emptying of the pipelines.

### **5.3 INERT GAS SYSTEM**

**5.3.1** In case of application on FPU the inert gas system it shall meet the requirements of 9.16, Part VIII "Systems and Piping" of the Rules for the Classification.

Russian Maritime Register of Shipping

**Rules for the Classification and Construction of Floating  
Offshore Oil-And-Gas Product Units  
Part VIII  
Systems and Piping**

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