ND No 2-020101-050-E

Spent-fuel assemblies are fuel elements assemblies extracted from a nuclear reactor, whatever their energy content may be.

Radioactive waste equipment is equipment intended for radioactive waste collection, treatment and storage.

Personnel (occupationally exposed persons) is part of the crew occupationally exposed to ionizing radiation.

Radioactive wastes are substances in any aggregative state, materials, products, equipment containing radionuclides in amounts exceeding the values established by the current rules and regulations, and not subject to further use.

Radioactive wastes can be solid, liquid and gaseous. Radioactive wastes grading by their level of radioactivity is established by Fundamental Sanitary Rules for Radiation Safety Enforcement.

A nuclear support vessel is a cargo vessel intended for:

storage of new and spent fuel assemblies of nuclear reactor cores;

operations on unloading of spent fuel assemblies and loading of new fuel assemblies into reactors;

reception, decontamination, repairs and storage of NSSS equipment;

reception, treatment and transfer of gaseous, liquid and solid radioactive wastes.

In addition, a nuclear support vessel can fulfil the following functions of an auxiliary vessel not associated with radioactivity:

supply of nuclear powered ships and floating facilities with working media and their reception on board (fresh water, high purity water, compressed air (gas));

supply of nuclear powered ships and floating facilities with electrical and heat energy;

other functions of operational support of nuclear powered ships and floating facilities.

A nuclear support vessel can provide the whole complex of operational support or individual types of such support for nuclear powered ships and floating facilities, which determines the design of the nuclear support vessel, of the equipment installed thereon and its nomenclature.

2 CLASSIFICATION

2.1 CLASS NOTATION OF A VESSEL

See circular 844c

2.1.1 Where a vessel complies with the appropriate requirements of the RS Rules, Rules for Nuclear Ships and these Rules, radioactivity symbol ☢

.1 side and bottom collision and grounding protective structure in way of spent-fuel assemblies storages and liquid radioactive waste tanks;

.2 drawings and strength calculations of liquid radioactive tanks with indication of distances between side and bottom shell plating and the tanks;

.3 drawings of supports and other structures for securing built-in liquid radioactive waste tanks;

.4 scheme of integrity and leak tightness tests of controlled area compartments.

2.4.1.3 Radiation safety documentation:

.1 basic diagram, description and composition of radiation monitoring;

.2 charts of anticipated radiation levels in the interior spaces of the vessel and on outer surfaces of hull structures with spent fuel assemblies, liquid and solid wastes storage facilities totally filled;

.3 charts of anticipated radiation levels in the interior spaces of the vessel (accommodation and controlled area spaces) and in the vicinity of the vessel in the course of handling operations;

.4 efficacy calculations of biological shielding for spent fuel assemblies, liquid and solid radioactive waste storage facilities, spaces where personnel can stay, made or approved by a competent authority;

.5 radiation conditions evaluation in case of the most serious accidents and charts and calculations of anticipated radiation levels in case of accidents in the interior spaces and in the vicinity of the vessel, approved by a competent authority;

.6 description of decontamination procedures for spaces and equipment subject to radioactive contamination; for equipment and materials transferred from serviced ships as well as contaminated and decontaminated equipment and materials transfer routes. Description and arrangement plan of the main decontaminating equipment.

2.4.1.4 Documentation on systems and piping:

.1 basic diagrams of water and air systems serving spent fuel assemblies storage facilities and liquid radioactive waste tanks, of liquid radioactive waste reception and discharge systems;

.2 basic diagrams of ventilation systems for spent fuel assemblies and solid radioactive waste storage facilities, the spaces where they are located, liquid radioactive tank spaces, equipment storage spaces and the controlled area as a whole;

.3 basic diagram of fire fighting and signalling systems in the vessel controlled area;

.4 basic diagram of waste water and special bilge systems of the vessel controlled area spaces;

.5 calculations on systems and piping of spent fuel assemblies storage facilities, liquid radioactive waste tanks and liquid radioactive waste reception and discharge control station.

2.4.1.5 Documentation on electrical equipment:

.1 drawings of cable routing in the controlled area with cable penetrations of the biological shielding and divisions between the controlled and monitored areas;

.2 arrangement plans of electrical equipment of handling means;

.3 basic diagrams of process and heat monitoring and signalling as well as alarm systems;

.4 arrangement of the equipment in the main control room;

.5 list of control, monitoring and signalling parameters of special systems;

.6 drawings of control and monitoring console of propulsion and ship systems, liquid radioactive waste treatment facilities (if any) and radiation monitoring.

2.4.2 Detailed plans for a vessel under construction.

In addition to the documentation specified in Part I "Classification" of the RS Rules, the following detailed design documentation is to be submitted for a nuclear support vessel.

2.4.2.1 Hull documentation:

.1 drawings of main structural members of the controlled area spaces and their attachments to hull members;

.2 drawings of spent fuel assemblies storage facilities with closures, liquid radioactive waste built-in tanks and their foundations;

.3 arrangement plans of openings in bulkheads and decks bounding the controlled area and their closures.

2.4.2.2 Documentation on radiation safety:

.1 arrangement plans of the process radiation monitoring system equipment;

.2 testing programme of the radiation monitoring system at the manufacturer's;

.3 drawings of biological shielding of the controlled area spaces, special equipment, pipes for radioactive material transfer and special fittings.

2.4.2.3 Documentation on pumping and piping:

.1 drawings of pipes of the systems listed in 2.4.1.4 with indication of fittings, pipe fastenings and penetrations through gastight bulkheads and biological shielding;

.2 installation (location and mountings) of bottom and side fittings in the vessel controlled area.

2.4.2.4 Documentation on electrical equipment:

.1 circuit diagrams of main and emergency electrical power supply to consumers (fixed and portable), directly associated with the vessel use for the intended purpose;

.2 circuit diagrams of main and emergency electrical power supply to automation, monitoring and signalling devices;

.3 calculation of the required electrical power capacity providing main operating conditions of the vessel.

3 HULL

3.1 A vessel designed for reception and storage of new fuel assemblies, spent fuel assemblies and/or medium radioactivity waste is to have collision, grounding and stranding protection referred to in Part IV "Hull" of Rules for Nuclear Ships.

3.2 Double-skin structure is to be provided in way of the spaces intended for storage of new fuel assemblies, spent fuel assemblies and radioactive waste. Longitudinal bulkheads are to be positioned at a distance equal to at least 1/5 of the vessel breadth from the vessel's side, except the cases where collision protection prevents the damage that deep. Proof is to be presented to the Register that penetration limit in case of collisions assumed in the design of the vessel will not be exceeded.

3.3 Decks, platforms and deck covers which can be used for permanent or temporary storage of heavy equipment (containers, trans-shipment appliances, etc.) are to be of adequate strength and fitted with fixed or detachable supports and fixing devices in accordance with the RS Rules requirements.

Deck covers of spaces for new and spent fuel assemblies, solid radioactive waste storage are to have sectional structure allowing for their partial opening.

3.4 Provision is to be made for reliable securing of the shielding, designed with due regard for the acting inertia forces and potential design accidents.

3.5 The controlled area spaces are to be designed to allow for decontamination of the surfaces.

3.5.1 The bulkhead members are to be fitted on the side of the spaces with less probability of contamination.

3.5.2 The hull structure, including foundations, is to prevent stagnation areas in the course of decontamination.

3.5.3 Design of the foundations and machinery and equipment attachments is to allow for decontamination. The foundations inaccessible for decontamination are to be sealed.

3.6 The fire safety of nuclear support vessels is to comply with the requirements of Part VI "Fire Protection" of Rules for Nuclear Ships.

The fire protection of the controlled area spaces of nuclear support vessels is to meet additional requirements placed upon the reactor compartment spaces of nuclear ships.

4 STABILITY, SUBDIVISION

4.1 Nuclear support vessels are to comply with the requirements of Part IV "Stability" and Part V "Subdivision" of the RS Rules and Part V "Subdivision" of Rules for Nuclear Ships, having regard to the following.

4.1.1 A nuclear support vessel designed for storage (transportation) of new fuel assemblies, spent fuel assemblies and/or medium radioactivity waste is to remain afloat, and intact vessel's stability under all operational loading conditions corresponding to the purpose of the vessel is to be sufficient to meet the requirements of Rules for Nuclear Ships for damage stability in case of (side and/or bottom) damage at any place lengthwise.

4.1.2 Subdivision requirements for a nuclear support vessel designed for other purposes than those referred to in 4.1.1 are subject to special consideration by the Register, having regard to the purpose, design and service area of the vessel, but, in any case, intact stability is to be sufficient for meeting the requirements of Rules for Nuclear Ships for damage stability in case of side and/or bottom damage in any place lengthwise between two nearest bulkheads.

5 GENERAL REQUIREMENTS FOR NUCLEAR SUPPORT VESSELS

5.1 Along with general purpose systems and facilities, nuclear support vessels are to have, depending on service conditions and intended use, the following additional systems and facilities.

5.1.1 Facilities for safe reception, storage and discharge of spent and new fuel assemblies of nuclear reactors, as well as facilities and equipment for spent fuel assemblies loading into transport containers.

5.1.2 Facilities for solid radioactive waste reception, storage and discharge.

5.1.3 Liquid radioactive waste reception, storage and discharge systems and facilities intended for segregated reception and storage of liquid radioactive waste different in terms of their volumetric radioactivity, and their dis-

charge to the shore or to another vessel. Liquid radioactive waste tanks are to be located in the controlled area spaces of different categories. Liquid radioactive waste classification regarding their volumetric radioactivity and categorization of the controlled area spaces are regulated by Fundamental Sanitary Rules for Radiation Safety Enforcement.

Where a nuclear support vessel is intended for reception and storage of large quantities of liquid radioactive waste, it is recommended that provision be made in the system for water treatment plant to decrease the volumetric radioactivity level of the liquid radioactive waste to be stored.

5.1.4 Waste water and special bilge systems intended for collection of the vessel's own radioactive water from the controlled area spaces, its storage and discharge.

A system is to be provided for collection of radioactive media leak from where they are likely to appear and their discharge into a special tank.

5.1.5 Decontamination and spraying (washing) systems of process spaces and decks, intended for reception and storage of decontaminating solutions concentrated ingredients, solution preparation and supply to the areas of decontamination and subsequent spraying (washing) of decontaminated items or surfaces.

5.1.6 Controlled area ventilation system which is to be independent of the vessel's ventilation system.

5.1.7 Compressed gas (air, nitrogen, etc.) systems for process needs, which are to be independent of similar general-purpose systems of the vessel.

5.1.8 Liquid radioactive tank cofferdams heating system which is to be independent of the general-purpose heating system of the vessel.

5.1.9 Reception, decontamination and storage facilities for different nuclear steam supply system equipment.

5.2 Liquid radioactive waste tanks, spent and new fuel assemblies and solid radioactive waste storage facilities are to be located in special spaces totally complying with the requirements of these Rules.

5.3 Biological shielding is to be provided for spaces referred to in 5.2.

5.4 Spent fuel assemblies storage facilities and liquid radioactive waste tanks are to be of built-in design, welded and made of corrosion-resistant materials. Their framing, strengthening in support locations, etc. are to be made on the outside. Water collectors fitted with efficient drainage arrangements are to be provided at the bottom of the tanks. The tank bottom slope to the water collector is to provide water discharge under any operating heel or trim of the vessel. Drainage pipe shut-down valves are to be installed either on the tanks directly or (in case biological shielding is provided) on the branch pipes of adequate strength. The storage facilities and tanks are to be surrounded by

cofferdams. The possibility of using integral tanks for low-radioactivity liquid radioactive waste is to be proved and agreed upon with a competent authority, and approved by the Register.

Where necessary, liquid radioactive waste tank cofferdams are to be provided with heating system. Where steam heating is used, condensate collection and storage are to be separated from vessel's general systems. Steam and condensate discharge into the atmosphere is not allowed. Corrosion-resistant materials are to be used for the manufacture of the heating system. Heating elements installation inside the tanks is not allowed.

5.5 Storage facilities for spent fuel assemblies, liquid and solid radioactive waste are to be arranged as far as possible from accommodation spaces and spaces where people can stay.

It is recommended that accommodation spaces and spaces where people permanently stay be segregated from the controlled area by process spaces.

5.6 Double bottom tanks located below spent fuel assemblies, liquid and solid radioactive waste storage facilities are not allowed to be used for potable and washing water storage.

5.7 Minimum equipment necessary is to be installed in the controlled area spaces. The arrangement of such equipment, pipes, cable runs is not to prevent proper decontamination of hull structures and equipment itself. The number of transit pipes, cables and other services through these spaces and their length is to be kept to a minimum, and they are to be laid in sealed corridors, linings or conduits.

5.8 Bilge wells of the controlled area spaces are to be protected with screens preventing the wells contamination by foreign matters and provided with indicators showing the presence of water therein.

The pipes in the sealed spaces to discharge water from the bilge wells are to be fitted with shut-down devices with position indicators, the information being displayed on a control panel in the main handling operations control room.

5.9 The controlled area spaces where aerosols might arise are to have closing devices capable to provide their tightness.

The closing devices are to be fitted with "open-closed" position indicators, the information being displayed on a control panel in the main handling operations control room. Every closing device is to be numbered.

5.10 In addition to the controlled area spaces, a list of individually sealed spaces is to be presented including potable water tanks, provision stores and other spaces where equipment or outfit necessary for life support of the ship and its crew is located. The list of such spaces is to be agreed upon with the Register.

5.11 No machinery of the vessel systems as well as bottom and side fittings serving the systems may be located in the controlled area. Where such machinery and equipment are to be placed outside the machinery space for serving the remote controlled area spaces, a special compartment is to be enclosed outside the controlled area. The compartment is to have a separate entrance from the upper deck and to be provided with independent bottom and side fittings. Such machinery may include ballast, fire and bilge pumps and other machinery. The number of bottom and side fittings for the controlled area equipment serving is to be kept to a minimum.

5.12 Nuclear support vessels intended for reactor cores reloading, new and spent fuel assemblies and solid radioactive waste transportation and storage are to have the main handling operations control room.

The control room is to be provided with:

.1 visual and audible water level indication in the spent fuel assemblies storages and tanks;

.2 thermal control instruments for spent fuel assemblies storages and heat-exchange equipment;

.3 position indicators for pipe fittings of special systems;

.4 means for operation signalling of electric pumps and heat exchangers of special systems and monitoring of their parameters;

.5 means for water presence signalling in the bilge wells of the special bilge system in the controlled area spaces;

.6 radiation monitoring information means for vessel spaces, open decks, ventilation exhaust outlets of the controlled area ventilation system and places of possible uncontrolled release of radioactive gases or aerosols;

.7 alarms operating in case of emergency in the new and spent fuel assemblies storage spaces;

.8 alarm signals for personnel evacuation from the dangerous area (see 8.6.4);

.9 information means for controlled area ventilation operation and vacuum in the spaces with indication of fan operation and valve positions;

.10 means for two-way communication with the vessel machinery space, valve control station, new assembly preparation room and main work places in the controlled area, including positions from where cargo cranes operating with new and spent fuel assemblies are controlled;

.11 means for two-way communication with the station from where repairs of the served ship are controlled;

.12 tele-monitoring system for the controlled area spaces where potentially hazardous works are performed as well as for new and spent fuel assemblies storage spaces.

All control, monitoring and signalling equipment in the main handling operations control room is to be combined on special panels which, in addition to main electrical power supply, are to be fed from emergency sources of electrical power to be automatically connected.

5.13 Fittings of process systems dealing with liquid radioactive waste pumping are to be positioned in an enclosure provided with biological shielding and controlled from the valve control station adjacent to the fitting enclosure.

Along with this, the valve control station is to be fitted with information means referred to in 5.12.1, 5.12.3, 5.12.4 and 5.12.5. The fitting enclosure is to have a coating suitable for multiple decontaminations.

The length of the pipes and the number of fittings are to be minimized, all pipe joints and pipe connections with fittings are to be welded (except for detachable pipes). The fittings are to have bellows seals. The pumps for liquid media are to be electrically driven and to have watertight construction. All special-purpose systems of nuclear support vessels are not to be connected with vessel's general-purpose systems.

In spaces were sea water can fall on pipes and fittings made of not stainless steel, such pipes and fittings are to have efficient protective coatings.

5.14 Permanent special process equipment may have energy supply (electrical power, compressed gases, etc.) directly from vessel's general-purpose systems (for compressed gases see 7.4). Non-permanent process equipment is to have energy supply from self-contained energy stations through regular detachable facilities.

5.15 Cargo-handling facilities in the controlled area spaces are to be of an enclosed design and accessible for decontamination. The lowering-hoisting mechanism is to have a wide speed range, including the lowest speeds. Where a cargo handling gear is controlled from a cabin, access to the cabin is to be from a space outside the controlled area.

Cargo-handling gear is to meet the requirements of the Register Rules for the Cargo-Handling Gear of Sea-Going Ships.

Necessity to move different equipment, apparatus, instruments, etc. is to be kept to a minimum. For this purpose provision is to be made in the controlled area for special spaces equipped for necessary repairs, adjustments and testing of the main technical facilities installed in the controlled area.

5.16 Provision is to be made for reception of pure process media (water, steam, gases) from the outside and their discharge to the served ship or to the shore.

5.17 Equipment of the special spaces (special-purpose sanitary spaces, laboratories, workshops) is subject to the Register technical supervision in terms of energy supply thereto and safe operation of pressure vessels, lighting,

communication, signalling, ventilation, strength of equipment securing, fire protection, space drainage, decontamination.

5.1.18 Integrity and leak tightness testing is to be provided for systems and facilities without putting a nuclear support vessel out of service.

5.1.19 Vessels intended for reactor cores loading/unloading or only for spent and new fuel assemblies reception, storage and discharge are to be fitted with trim and cross-flooding systems and fittings to maintain equilibrium of the vessel during handling operations.

6 FUEL ASSEMBLIES AND SOLID WASTE STORAGE FACILITIES

6.1 NEW FUEL ASSEMBLIES STORAGE FACILITIES

6.1.1 Where provision for new fuel assemblies storage is made on board a vessel (floating facility), an appropriate space is to be fitted with racks for new fuel assemblies storage in the position and in the state indicated in the manufacturer's Specifications and Nuclear Safety Rules, as well as with fittings for installation and secure fastenings of transport containers with new fuel assemblies.

6.1.2 The number of pipes passing through the spaces containing new fuel assemblies storage facilities is to be kept to a minimum. Installation of steam pipes in the new fuel assemblies storage spaces is not allowed, pipes for other purposes within such spaces are to have permanent joints. The spaces are to be equipped with a bilge system. It is recommended that an independent bilge (stripping) system be installed.

6.1.3 The new fuel assemblies storage space is to be provided with a properly equipped assemblies condition incoming control station and a station for preparation of new fuel assemblies for process operations. The latter is to have two-way communication with the main handling operations control room.

In order to provide handling operations of new fuel assemblies loading into the nuclear reactor, the station is to have two-way communication with the handling operations control station of the serviced ship.

6.1.4 Transport-handling appliances in the new fuel assemblies storage spaces are to prevent damage of containers with new fuel assemblies or the assemblies themselves in the course of handling operations.

6.1.5 Appliances to be used for heating of new fuel assemblies storage spaces are to prevent air temperature and humidity rising above the values specified in the requirements for new fuel assemblies storage conditions.

6.1.6 The space is to be equipped with a permanent spontaneous chain reaction alarm system. Besides, provision is to be made for use of portable means for radiation level monitoring and alarms in separate locations of the space where short-time operations with new fuel assemblies can be carried out (incoming control stations, places of likely short-time controlled accumulation of new fuel assemblies in the course of handling operations, etc.).

6.2 SPENT FUEL ASSEMBLIES STORAGE FACILITIES

6.2.1 Where spent fuel assemblies might be stored on board the vessel the following is to be provided:

.1 special storage facilities of adequate capacity, having fittings for fixing the covers. The main items of storage facilities (covers, plugs, etc.) are to be unified but they are to be properly marked to identify the particular set they belong to. Closures of individual cells (boxes, holders) as well as those of every section and the whole storage facility are to have reliable stoppers to prevent them from spontaneous opening in case of the vessel motions.

Storage facilities are to have radiation protection that reduces an equivalent dose power on exposed surfaces down to the magnitudes specified in Fundamental Sanitary Rules for Radiation Safety Enforcement and Regulations for Radiation Safety;

.2 devices for directing and accurate placement of each individual spent fuel assembly of the core in the box cell or storage facility holder;

.3 devices for spent fuel assemblies boxes safe loading and unloading from storage facilities and transfer thereof to the shore transport means or special vessels;

.4 an independent storage facility or section with appropriate equipment to receive and store emergency spent fuel assemblies. If storage of such spent fuel assemblies is provided, the storage facility is to be fitted with a separate exhaust ventilation duct. Design provisions are to be made to prevent such space from flooding it with water;

.5 a possibility to carry out radiation-hazardous handling operations with spent fuel assemblies in the vessel's (floating facility's) spaces isolated from the environment. It is recommended that an alarm system preventing such operations in case of seal failure of the spaces be installed.

The design is to be such as to prevent or at least to minimize any possibility of uncontrolled release of radioactive gases and aerosols during loading or unloading of spent fuel assemblies to/from storage facilities. Provision is to be made in storage facilities for local air sampling to measure volumetric radioactivity of radioactive gases or aerosols.

6.2.2 Spent fuel assemblies storage facility is to be suitable for storage of all core rods. Sectional storage facilities (for several sets of the core rods) are allowed.

The design of the top plates of the storage facility closures is to allow for their partial opening. Furthermore, to reduce a combined radiation level in the course of handling operations with spent fuel assemblies, provision is to be made inside the storage facility for a cover for each individual spent fuel assembly or groups of spent fuel assemblies in case several spent fuel assemblies are supposed to be kept in one box.

The design of spent fuel assemblies storage facilities is to provide nuclear and radiation safety and to prevent spontaneous nuclear chain reaction under any possible conditions of spent fuel assemblies storage. Biological shielding of storage facilities is to provide radiation protection in case they are loaded with the spent fuel assemblies of the highest radioactivity.

6.2.3 Spent fuel assemblies storage facilities are to be made of stainless steel. The interior surface coatings of storage spaces and equipment are to allow for multiple decontamination thereof.

The design of spent fuel assemblies storage facilities and their equipment is to provide a possibility for their drainage, periodical internal examinations and necessary repairs.

6.2.4 Where spent fuel assemblies are to be stored under continuous residual heat dissipation conditions, a triple-circuit cooling system is to be provided. The spent fuel assemblies cooling circuit and intermediate circuit are to work on a closed-cycle principle. In case of sectional storage facilities, heat dissipation is to be provided from each section separately. High-purity process water is to be used as a heat-dissipation medium in the spent fuel assemblies cooling circuit and intermediate circuit. The intermediate circuit heat carrier may be cooled in heat exchangers cooled with sea water by vessel's general-purpose means.

Standby heat dissipation means are to be provided in the spent fuel assemblies cooling circuit and intermediate circuit. Both main and standby heat dissipation means for the spent fuel assemblies cooling circuit are to be supplied with electrical power from the main and emergency sources of electrical power. Continuous monitoring of heat carrier radioactivity in the spent fuel assemblies cooling circuit and at least periodical monitoring of heat carrier radioactivity in the intermediate circuit and sea water at the heat exchanger outlet shall be provided.

Means are to be provided in the heat dissipation system for water cleaning from mechanical impurities and radioactive contamination. Fittings installed directly on storage facilities are to be remote controlled and to have position indicators with displaying the information on their position in the main handling

operations control room and in the valve control station. Where provision is made for local control of the fittings, they are to have an appropriate biological shielding. The fittings used are to have signal devices and local indicators of their position.

6.2.5 Spent fuel assemblies storage facilities are to be provided with a process water sectional flooding system, a bilge system and an independent ventilation system with air intake from under the closures (upper plates) of the storage sections to prevent water from being entrained into the ventilation system (see 7.5.5).

6.2.6 The capacity of the equipment (pumps, heat exchangers, etc.) serving the systems of the spent fuel assemblies storage facilities is to be based on the calculation with due regard for possible design accidents. The storage flooding or emptying rates are to be proved.

6.2.7 Where spent fuel assemblies are loaded directly into the storage facility (section, container) filled with water, the storage facility is to be fitted with an overflow system for water excess being overflowed into a special overflow tank to be installed according to the requirements of 5.4 and equipped with air pipes of an adequate cross-sectional area and continuously operating remote level indicators with information being displayed in the main handling operations control room. Provision is to be also made for high and low level audible alarms to operate in the same control room. The overflow tank capacity is to be proved by calculation. The tank may be located outside the storage space. In such case, the overflow pipes and the tank are to have biological shielding.

It is allowed to provide one overflow tank for all sections of the spent fuel assemblies storage facility. In this case, however, its capacity is to be increased, and any possibility of water overflow from one section to another through the overflow pipe is to be prevented.

For requirements for air pipes of the overflow tank, see 7.1.1.8.

6.2.8 The water is to be pumped out of the spent fuel assemblies storage facility (or section thereof) or overflow tank by means of electrically driven pumps of watertight construction or other means preventing radioactive water leaks. Where such means can operate only if filled with water, provision is to be made for interlock of their starting in case no water is available in the pumps and stopping upon reaching the lower water level in the spent fuel assemblies storage facilities. A possibility of inadvertent process water drainage and storage facility emptying in case of any pipe damage because of process water ejection is to be prevented.

6.2.9 Every section of the spent fuel assemblies storage facility (in case of a sectional design) is to be fitted with a heat monitoring system and continu-

ously operating remote process water level indicator with entire level range visual, and upper and lower level audible signalling with information led to the main handling operations control room and the valve control station.

The heat-monitoring system and level-indication system are to be designed so as to allow for repairs and component replacement without emptying the section.

For direct supervision of the handling operations a properly shielded position fitted with two-way communication with the main handling operations control room and repairs control room of the serviced ship is to be provided in the storage facility space.

6.2.10 Upon manufacture and installation on board the overflow tank of the spent fuel assemblies storage facility and systems serving the tank are to be tested for integrity and leak tightness.

Trays made of stainless steel or an appropriate barrier on the deck plating are to be placed under the fittings installed. All pipe connections and fitting-to-pipe connections are to be welded.

6.2.11 Spent fuel assemblies are to be loaded into a storage facility (section) through a special arrangement enabling to coordinate and mate the axes of the transfer container and holders (box cells) in the storage facility plates.

6.2.12 Provision is to be made for an expansion tank for priming of the heat dissipation system of spent fuel assemblies storage facilities, replenishing the leaks and heat expansion compensations.

6.2.13 The sea cooling water for heat dissipation from the secondary-circuit coolant of the storage facility cooling system is to be supplied from at least two independent sea valves. Provision is to be made for sea cooling water supply when the vessel is docked. In order to prevent the secondary-circuit coolant from supercooling at low sea water temperatures provision is to be made for its recirculation, i.e. partial discharge of the sea water into the intake sea valve trunk.

Twin mechanical strainers, one of which is to be in operation, are to be provided in the sea water system.

Use may be made of the sea cooling water from the ship system, provided it meets the requirements of this paragraph and has an adequate capacity reserve.

6.2.14 A special container properly protecting the personnel against penetrating radiation is to be provided for spent fuel assemblies transfer from the nuclear reactor into the storage facility. The container is to be designed so as to allow for its control during spent fuel assemblies unloading from the nuclear reactor and prevent spent fuel assemblies from open transfer.

6.2.15 The design of non-fixed handling equipment working in conjunction with vessel' machinery and arrangements (containers, temporary storage

facilities, essential rigging, etc.) is considered by the Register in the course of design and manufacture to the extent specified in 2.2.3 from the perspective of its operational and radiation safety. Places for permanent or temporary storage of heavy handling equipment are to be adequately strengthened, provided with arresting or other fixing devices and biological shielding, where necessary.

6.3 SOLID RADIOACTIVE WASTE STORAGE FACILITIES

6.3.1 Solid radioactive waste, other than spent fuel assemblies, may be stored in special storage facilities of stationary type (safe cabinets) and of non-stationary type (containers), which are to be located in specially designed spaces.

A special-purpose fixed or transport container is to be provided for storage of changeable or temporarily removable large-sized equipment, if it is required by the core repair or re-loading technology. The container is to be equipped with devices for fixing the transferred equipment inside the container, and heat dissipation and power supply means are to be provided, where necessary.

6.3.2 The storage space is to have a trunk for loading and unloading containers by outside cargo-handling gear or a properly equipped lift. The cargo platform (cabin) of the lift is to be designed so as to prevent the containers or individual loads from sliding when the vessel is rolling, loads from dropping into the trunk or creating obstacles for lift platform movement. Provision is to be made for access into the lift trunk for its decontamination and repairs.

The requirements of the Register Rules for the Cargo-Handling Gear of Sea-Going Ships are totally applicable to the lifts.

The storage space is to be fitted with a cargo-handling gear for moving the containers inside the space.

6.3.3 Stationary storage facilities (safe cabinets) are to be located to minimize the vessel list effect on solid radioactive waste handling operations, and their doors, when opened, are not to obstruct the passages in the space. The doors or other closing appliances of the spaces are to be fixed in the open position and locked when closed. It is recommended that the doors be fitted in such a way as to be an additional protective shield when works with open storage facilities are in process. Use of guillotine or folding-down doors is not allowed.

It is recommended that higher activity solid waste is stored separately from lower activity waste.

Where solid radioactive waste types are segregated according to their activity level, different biological shielding of the storage facilities is allowed. The dosage rate on the storage facilities outer surfaces, however, is not to exceed the magnitudes required by the national Sanitary Rules and Radiation Safety Standards.

6.3.4 Each container or box for storage of solid radioactive wastes shall bear identification number affixed to the outer surface. Entrance door of the waste storage space is to be fitted with a position indicator, information being displayed in the main handling operations control room.

6.3.5 The storage facilities and equipment are to be designed to make decontamination possible.

6.3.6 Solid radioactive waste storage facilities and spaces where they are located and where such waste might develop aerosols or radioactive gases, are to have closing appliances capable of providing their tightness. The ventilation system of such storages and spaces, where it is a part of the special ventilation system (see 7.5), is to be fitted with aerosol filters.

6.3.7 Portable containers are to be used for radioactive waste collection, temporary storage and transfer to the shore or other vessels. The containers are to have reliable fittings for their gripping and carriage, the shape and size of the containers are to allow for their transportation along the routes to be used in the course of handling operations. The container covers are to be securely locked, their shape and strength are to provide their integrity under storage conditions.

The containers are to be painted with a warning coating and marked with the standards radioactivity symbol.

Provision is to be made for safe storage of the containers to prevent arbitrary movement and damage of the containers themselves and equipment of the spaces.

Where provision is made for storing the containers on open decks of the vessel, any possibility of moisture penetration inside the containers or radioactive particle escape out of them is to be structurally prevented. This refers both to the container structure and structural design of their storage places on board (shelters for the case of bad weather, etc.).

7 SPECIAL SYSTEMS

7.1 SYSTEMS AND FACILITIES FOR LIQUID RADIOACTIVE WASTE RECEPTION, STORAGE, TREATMENT AND DISCHARGE

7.1.1 Liquid radioactive waste storage facilities.

7.1.1.1 Special built-in tanks located in the controlled area spaces specially intended for this purpose are to be provided for liquid radioactive waste reception and storage. Supports (foundations) are to enable access for inspection and repairs of tank bottom.

The structural strength of the liquid radioactive waste tanks is to be ensured, in case of their filling up to the top of air or overflow pipes, with a safety factor equal to 1.5.

7.1.1.2 For liquid radioactive waste storage, tanks are to be provided with mandatory allocation of tanks for keeping medium-radioactivity water. Communication between the medium- and low-radioactivity water storage tanks is not allowed.

7.1.1.3 Tanks for storage of medium-radioactivity water are to be made of corrosion-resistant materials suitable for multiple decontamination and washing. Such tanks are to have the necessary biological shielding. Where concrete is used for this purpose, the outer surfaces of the shielding are to be lined with a material allowing its decontamination or replacement.

7.1.1.4 Tanks for low-radioactivity water storage may be made of ordinary constructional materials with subsequent application of anti-corrosive coat ings; vessel structures and spaces may be used as biological shielding. The efficiency of their protective properties, however, is to be checked by filling the tanks up to the upper level with liquid waste, having the maximum volumetric radioactivity permitted by Fundamental Sanitary Rules for Radiation Safety Enforcement for low-radioactivity water.

7.1.1.5 Liquid radioactive storage facilities are to have:

.1 at least two manholes giving access inside the tanks for cleaning, inspection and repairs;

.2 a system for supply inside the tanks and distribution of decontaminating solutions and steam for their heating;

.3 a system for washing and discharge of decontaminating solutions and washing water;

.4 collecting wells to minimize non-removable residue of liquid radioactive waste;

.5 remote level gauging and audible alarms of the upper and lower levels with information led to the main handling operations control room and valve control station;

.6 a sampling device;

.7 tank ventilation system (air pipes);

.8 a system for liquid radioactive waste overflow from the tanks;

.9 devices to prevent inadmissible pressure increase in the tanks, where necessary;

.10 systems and/or means of removing sediments upon emptying the tanks.

The tanks are to be protected from spontaneous emptying in case of filling or other pipes damage because of process water ejection due to a “syphon” effect.

7.1.1.6 Fittings are to be installed directly on the tanks in readily accessible places; they are to be of bellows type with branch connections to be welded, and are to be remote controlled. Stainless steel trays are to be provided in the fitting installation area or barriers are to be fitted on the deck (platform) plating to collect leaks in case of bellows damage.

Where valves are locally controlled, they are to have biological shielding.

The valves are to be provided with local position indicators and signal devices with extreme position indicators in the main handling operations control room and valve control station".

7.1.1.7 Tanks permanently or periodically operating under internal pressure are to be subjected after manufacture and then again after installation on board the ship and connection of pipes to a hydraulic test according to the requirements of Part X "Boilers, Heat Exchangers and Pressure Vessels" of the RS Rules.

Tanks operating under hydrostatic pressure are to be subjected after manufacture and then again after installation on board and connection of pipes to hydraulic tests as required by Part II "Hull" of the RS Rules.

Periodical surveys and tests of the liquid radioactive waste storage tanks are to be carried out with intervals specified in Guidlines on Technical Supervision of Nuclear Ships, Floating Facilities and Nuclear Support Vessels in Service. These surveys and tests are generally to be combined with works on tank decontamination, washing and repairs.

7.1.1.8 Liquid radioactive waste storage tanks are to be fitted with air pipes made of corrosion-resistant materials. The air pipes from medium-radioactivity waste tanks (see 5.1.3) are to be led from the top part of the tanks to the space where they are located or to a higher category space (in terms of the existing or anticipated radioactive contamination), if any. The air pipes from low-radioactivity waste tanks may be led to the open deck. In this case, the ends of the pipes are to be as high and as far as possible from the spaces of crew accommodation and from air intakes of the vessel's ventilation system. Where special ventilation system is installed, the air pipes of the tanks are to be led to the ventilation mast. Several air pipes may be combined into one pipe, the diameter of which is to be increased accordingly. In such case, however, any possibility of liquid radioactive waste overflow from one tank into another is to be prevented. An exception is made for a special overflow tank, if any, which is covered by the requirements of 7.1.1.8 and 7.1.1. Air pipes of medium- and low-radioactivity waste storage tanks may not be combined. Connections of air pipes with tanks and air pipes between themselves are to be welded. Pressure/vacuum valves are to be fitted on the outlets of the air pipes of liquid radioactive waste storage tanks, irrespective of their volumetric radioactivity,

and adequate radiation monitoring is to be provided. Low-radioactivity liquid radioactive waste storage tanks, provided their air emissions, in the opinion of the competent sanitary authorities, are not unacceptable for the environment, may be exempted from the latter requirement. No shut-off means (except the cases referred to in 7.1.1.10) are allowed on the air pipes.

7.1.1.9 In addition to air pipes, liquid radioactive waste storage tanks operating only under hydrostatic pressure are to be fitted with an overflow system for liquid radioactive waste collection and discharge when the main tanks are overfilled. The system is to comply with the requirements of Part VIII "Systems and Piping" of the RS Rules.

Several overflow pipes may be combined into one pipe with an appropriate increase of the diameter. In this case, however, liquid radioactive waste overflow from one tank to another through the overflow system, when one of the tanks is overfilled or at a heavy list of the vessel, is not allowed. A separate tank is to be available and provided with biological shielding, if necessary, for medium-radioactivity waste overflow from the tanks through an independent system. It can be located in the same space where the medium-radioactivity waste storage tank is arranged. Air pipes of different radioactivity liquid waste overflow tanks located within one watertight compartment may be combined with air pipes of the appropriate tanks.

The overflow system from each liquid radioactive waste storage tank is to be provided with a device signalling the waste overflow. The device is to be of adequate strength or to be protected from possible damages. In addition to the signalling means required by Part VIII "Systems and Piping" of the RS Rules, the overflow tank is to be provided with a low-level alarm for the case referred to in 7.1.2.4. All indications and alarms are to be led to the main handling operations control room and valve control station.

7.1.1.10 Shut-off valves of a bellows type having remote control and local position indicators with the information being displayed in the main handling operations control room and valve control station are to be fitted on the air pipes of liquid radioactive waste storage tanks where an excessive pressure is likely to arise. The valves are to be permanently open and to be closed only in the course of handling operations that involve a pressure increase in the tanks.

It is recommended that these valves be interlocked with fittings for compressed air (gas) supply to the tanks to squeeze liquid radioactive waste out of the tanks, thus preventing air (gas) supply into the tanks when the valves on the air pipes are open. The excessive air is to be discharged either into the space where the tanks are located or directly into the exhaust part of the special ventilation system equipped with filters providing the required cleaning effect.

The tanks are to be properly protected against an inadmissible pressure increase. Where the tank structure and protection device (see 7.1.1.5.9) fail to prevent active water ejection in the course of handling operations, the excessive air (or air-water mixture) is to be discharged into a special drain tank or another insulated tank.

7.1.1.11 The requirements of Part VIII "Systems and Piping" of the RS Rules, where they are not in conflict with these Rules, are also applicable to the liquid radioactive waste storage tanks and their air and overflow pipes.

7.1.2 Liquid radioactive waste systems.

7.1.2.1 Pipes of liquid radioactive waste reception, treatment and discharge systems are to be independent of other piping and made of corrosion-resistant steels. Pipe connections with other pipes and fittings are to be welded. Fittings of these systems are to be of the bellows type with branches to be welded.

Independent pipes are to be provided for reception, transfer and discharge of medium- and low-radioactivity liquid radioactive waste.

7.1.2.2 Liquid radioactive waste reception on board, transfer from one tank into another, transfer for treatment and discharge are to be only forced (except overflow or leak collection systems). Liquid radioactive waste may be conveyed either by electric pumps of watertight construction or by compressed air (gas) supply directly to the liquid radioactive waste storage tanks of a nuclear ship or a nuclear support vessel. In the latter case, the system supplying compressed air (gas) to the liquid radioactive waste storage tanks is to provide a working medium supply both from the vessel's own sources and from the outside sources.

7.1.2.3 Where electric pumps are used for liquid radioactive waste reception and discharge, provision is to be made on board for at least two pumps of watertight construction, preventing radioactive water leaks in the course of treatment. A bypass system automatically preventing a pressure increase in the pipes (in case of operation of quick-closing devices on the discharge pipe) is to be provided for each pump.

The pumps are to be installed in a special pump room. At least two pumps totally independent of the liquid radioactive waste systems with low volumetric radioactivity of the pumped media are to be provided for medium-radioactivity waste pumping. These pumps are to be either installed in specially protected rooms or have additional biological shielding.

The pumps are to be started and stopped, and their operation is to be controlled from a control station located outside the pump room (at the valve control station) and from the main handling operations control room, which are to have two-way communication between them, with the ship served and with the shore.

The equipment and arrangement of the pump room are to comply with the requirements of Section 5.

7.1.2.4 Where electric pumps for liquid radioactive waste transfer are designed in such a way that their operation requires priming with working medium, their start is to be interlocked with an indicator showing availability of water in the pumps, and their stopping – with a low level alarm for liquid radioactive waste storage tanks.

7.1.2.5 The liquid radioactive waste system is to provide waste reception and discharge on either side, using both the served ship's facilities and vessel's own facilities. The waste discharge outside the vessel is to prevent contamination of the vessel itself and the environment. Liquid radioactive waste reception and discharge fittings are to be combined in common reception-discharge stations located on either side, to be local- and remote-controlled and to have position indicators.

Liquid radioactive waste fittings and pipes on their entire length are to have biological shielding, where necessary. Removable lines of an approved design are to be used for liquid radioactive waste reception and discharge from one ship to another and to the shore. The station equipment is to prevent liquid radioactive waste spillage in the course of transfer or in emergencies involving damage of the lines. Provision is to be made for quick-closing isolating devices for prompt isolation of the pipes in case of breaks or spontaneous disconnection of removable lines. It is recommended that such devices should automatically operate when an alarm on pressure drop in the system operates.

The liquid radioactive waste reception-discharge station is to have:

.1 tight closure of all openings in the vessel's outside structures (sides, upper deck);

.2 connection of pipes for washing and decontamination of the station room, its equipment and systems;

.3 connections for compressed air supply for purging and emptying of liquid radioactive waste systems and removable lines;

.4 heating system preventing icing where leaks are likely to occur in the course of handling operations carried out in winter time and freezing of the systems themselves;

.5 twin mechanical filters on waste reception-discharge pipe;

.6 fairly high coamings in side openings to prevent liquid radioactive waste from flowing overboard in case of leakages or damages or spontaneous disconnection of removable lines. The places for removable line connection are to be well away from outside openings; means are to be provided for fixing the lines and preventing them from dropping overboard;

.7 handling devices for lines transfer outside and their reception back;

.8 local barriers (trays) to contain likely spillages of liquid radioactive waste, the barriers are to be of adequate height, which, however, should not impede the personnel;

.9 connection of vacuum drying system;

.10 means for measuring activity of received and discharged liquid radioactive waste;

.11 necessary biological shielding where equipment and systems are arranged.

.12 communication with the main handling operation control room and valve control station.

All detachable equipment is to be kept in special spaces located next to the stations. All materials used in the station structures and equipment installed or coatings used therein are to be resistant to corrosive media and to be suitable for multiple decontamination.

7.1.2.6 Provision is to be made for removable lines flushing and drying by supplying flushing water and compressed air to the liquid radioactive waste discharge system after the last bellows valve. Fittings of the flushing water and compressed air supply systems are to be of non-return shut-down type and to be installed directly on the liquid radioactive waste pipeline. All connections of removable lines are to be of quick-release type, but preventing any liquid radioactive waste leaks.

A possibility is to be available to test the removable lines for leak tightness upon their assembly before operations begin.

7.1.2.7 In order to reduce contamination of pipes and storages, mechanical filters or other water cleaning means are to be installed in the suction and discharge parts of the liquid radioactive waste transfer system.

Provision is to be made for safe replacement of mechanical filters and their transportation to the storage.

7.1.3 Equipment for liquid radioactive waste treatment.

7.1.3.1 In addition to the tanks and pipes with fittings indicated in 7.1.1 and 7.1.2, referred to the equipment of liquid radioactive waste treatment are separators, mechanical and ion-exchange filters, evaporators, cementing tanks and pumps with their fittings, instrumentation and control devices.

7.1.3.2 Tanks used as supply, collecting and other tanks in the liquid radioactive waste treatment system are to have rounded corners, conical or elliptical bottoms, medium agitators and mechanical appliances for cleaning bottom surfaces from residues.

7.1.3.3 Equipment for treatment of liquid radioactive waste containing radioactive media is to be isolated with shields to prevent direct streaming of radiation. The shields are to be easily detachable and are not to interfere with

control and maintenance of the equipment.

7.1.3.4 Equipment for liquid radioactive waste treatment refers to the third class of safety and third class of design according to Section 5, Part VIII "Nuclear Steam Supply Systems" of Rules for Nuclear Ships.

7.1.3.5 Equipment for liquid radioactive waste treatment is to withstand loads with acceleration 3*g*, to remain in operation with a heel up to 15° either side and a trim 5°.

7.1.3.6 Fittings of the systems and equipment for liquid radioactive waste treatment are to be of the bellows type, made of corrosive-resistant materials, have local manual control as well as local position indicators and symbols in line with those on the control panel. Identification plates with font not less than 10 are to be made of a corrosive-resistant metal.

7.1.3.7 The connections of the liquid radioactive waste treatment pipes are to be welded and to comply with the rules and regulations for welding and testing of welded joints, approved by the Register. Other types of joints are subject to special consideration by the Register.

7.1.3.8 Evaporators used in liquid radioactive waste treatment are to be capable of providing the quantity and purity of the condensate produced as required by the technical documentation approved by the Register. The outer surfaces of the evaporators with operating temperature of 60 °C and over are to be thermally insulated.

7.1.3.9 Fittings and instrumentation used in special systems of nuclear support vessels are to comply with the requirements of 6.3, Part X "Boilers, Heat Exchangers and Pressure Vessels" and 2.2, Part XV "Automation"of the RS Rules. Materials used for manufacture of liquid radioactive waste treatment equipment are to be those specified in the documentation approved by the Register, and to have a certificate issued by the manufacturer or an accredited independent laboratory, where chemical composition and mechan ical properties are indicated.

7.1.3.10 Design of equipment for liquid radioactive waste treatment is to provide the performance of internal survey using remote control means.

7.1.3.11 Pumps used in liquid radioactive waste treatment are to be made of corrosion-resistant metals and to have waterproof construction.

7.1.3.12 Tanks for keeping cementing components are to provide their storage in a dry and bulk condition. Connecting elements for filling the tanks and cementing tanks are to ensure tightness of connections.

7.1.3.13 The construction of the cementing tanks and agitators is to allow for their cleaning from cementing mortar.

7.1.3.14 The complex of liquid radioactive waste treatment equipment is to include laboratories for chemical and radiological analyses.

7.1.3.15 The design of liquid radioactive waste treatment equipment complex is to include a document on analysis of likely emergency situations and failures of the equipment, their consequences and measures of response.

7.2 SPECIAL BILGE SYSTEM

7.2.1 A special bilge system, independent of the vessel's systems is to be provided for drainage of the controlled area spaces.

7.2.2 Special and bilge systems of controlled area spaces is to be provided with means capable to ensure an appropriate sealing level of the spaces.

Used as such means may be shut-down valves installed on suction pipes of the bilge system of the sealed spaces. The valves are to have local and remote position indicators with information displayed in the main handling operations control room and valve control station. It is recommended that these valves be remote controlled (the drive is to be located outside the sealed space).

7.2.3 The bilge system in the controlled area spaces is to be of a closed-circuit type and to be equipped with special built-in tanks for waste radioactive water collection and storage, and scuppers provided with a valve and its closed position indicators. Waste water bilge wells in the controlled area spaces are to be fitted with water-presence indicators, information being displayed in the main handling operations control room.

Waste water drainage by gravity is allowed into the spaces of the same category (in terms of ionizing radiation and radioactive contamination) located below, provided the decks (platforms) of those spaces are not watertight. Otherwise the pipes for water intake from the bilge wells are to be equipped with non-return shut-off valves.

7.2.4 The throughput of the bilge pipes and scuppers is to provide fast water removal from the spaces. The scuppers are to be arranged so as to prevent stagnant areas formation in any operating position of the vessel hull.

7.2.5 The spaces located above the bilge tank level may be drained by gravity. To prevent bilge water from flowing back and its discharge into other spaces through scuppers in case the tanks are overfilled, non-return valves are to be installed on the bilge pipes or valves on the scuppers are to be of non return shut-off type.

7.2.6 For drainage of the controlled area spaces located at the level of the bilge tanks or below, vacuum-drainage or another method of total bilge water removal is to be used. Vacuum drainage is also recommended for the spaces above the controlled area. For vacuum drainage of the spaces provision is to be made for a vacuum pump of the type approved by the Register with a suitable tank for vacuum creation. The pump is to be controlled, its operation

and vacuum in the vacuum tank are to be monitored from the local station and main handling operations control room. For drainage of concealed areas use is to be made of hoses with slot nozzles, and places for their connection are to be provided. Provision is to be made for vacuum drainage of boxes, containers and other facilities for spent fuel assemblies individual storage and transportation.

7.2.7 Waste water of different radioactivity level, as well as alkaline and acid decontamination water is to be segregated. Bilge collecting tanks for medium-radioactivity water storage are to be shielded.

Medium-radioactivity water tanks and pipes are to be concentrated in places most distant from crew accommodation spaces and other spaces where people permanently stay.

7.2.8 The design of bilge collecting tanks is to comply with the requirements of 7.1.1.

The bilge collecting tanks and vacuum tank are to be fitted with level indicators with low level light signalling, and upper level light and sound signalling led to the main handling operations control room, washing and entire drainage facilities, and sampling devices. Besides, the bilge tanks are to be provided with air pipes in compliance with 7.1.1.8 and 7.1.1.11.

Air pipes may be combined only within one watertight compartment and only for tanks of bilge water of the same volumetric radioactivity category.

Where controlled area spaces are drained by gravity, the air pipes of the bilge tanks are to be led above the deck of the uppermost drained space. In case of vacuum drainage, the air pipes of the bilge tanks are to be led to the deck where the drainage vacuum pump tank is installed.

7.2.9 The bilge tanks are to be drained by electrically driven pumps of watertight construction, having the adequate capacity, or by squeezing the water with compressed air (gas) or other means approved by the Register.

Where compressed air (gas) is used, inadmissible pressure increase is to be prevented in the bilge tanks (see 7.1.1.10).

7.2.10 The vacuum pump tank is to be drained into a special bilge system or directly into the liquid radioactive waste tank. Where the vacuum tank is drained with compressed air, a safety device is to be provided preventing inadmissible pressure increase therein.

7.3 DECONTAMINATION AND SPRAYING SYSTEMS

7.3.1 Technical means are to be provided on board the nuclear support vessels for radioactive contamination removal as well as for containment and immobilization of not easily removable radioactive contaminants. The means

to be used depend on the particular purpose of the vessel and are subject to the Register's consideration in each particular case.

7.3.2 For decontamination and washing of the spaces, tanks, handling equipment and vessel's structures where radioactive contamination might arise, decontamination and washing systems are to be provided.

The decontamination system is to include:

storage tanks for concentrated ingredients of decontaminating solutions;

solution-making stations;

pipes to supply solutions, washing water, high-purity water and steam to decontaminated objects;

pipes for decontaminating water drainage into collecting tanks, different for acid and alkaline waters.

7.3.3 For needs associated with preparation of decontaminating solutions and washing of decontaminated surfaces, process water supply system is to be provided to supply water to the solution-making stations and appropriate process spaces. Washing water may be drained to a bilge tank of the special bilge system.

7.3.4 Decontaminating water (alkaline and acid) bilge tanks are to be of the built-in type. Their design is to comply with the requirements of 7.1.1. Besides, they have to be provided with fittings and pipes for spraying water supply thereto and internal spraying means.

7.3.5 The system of reception and supply of acids and alkalis to the decontaminating solution-making station is to be safe in operation and to prevent their spillage. Liquid components are to be supplied to the storage tanks by a closed-circuit method. The liquid component and ready solution storage tanks are to be of the built-in type, and their design is to comply with the requirements of 7.1.1. The tanks are to be made of materials suitable for aggressive alkaline and acid media storage and to be located in isolated spaces equipped with spraying system and exhaust ventilation.

Where dry components are used for making decontaminating solutions, they are to be kept in watertight package in special storerooms equipped with exhaust ventilation and located in the vicinity of the solution-making station. Acid and alkaline components are to be kept separately. They are to be supplied to the solution-making tanks from outside.

7.3.6 The decontaminating solution-making station and associated store rooms and storage facilities are to be located outside the controlled area. Where many equipment items are to be decontaminated, provision is to be made on the nuclear support vessels for a special decontamination space located within the controlled area and equipped with baths, racks and local decontamination stations, where decontaminating solutions, process water, steam and compressed

air supply is to be provided. Besides, local cargo-handling gear, grips, stoppers, platforms and similar items necessary for large-sized equipment transportation and handling are to be provided.

The nomenclature of decontamination space equipment is decided by the vessel's designer and is subject to approval by a competent authority.

The decontamination space and equipment installed therein are to have a corrosion-resistant coating or to be made of appropriate materials.

The decontamination space is to be equipped with facilities of communication with the main handling operations control room and exhaust ventilation from all local decontamination stations and baths, which is capable to provide the necessary number of air changes. Filters for exhaust air cleaning capable to clean the air up to the standards required by Fundamental Sanitary Rules for Radiation Safety Enforcement are to be fitted in the ventilation room.

7.3.7 The components and ready decontaminating solutions are to be pumped with special facilities to be controlled from local stations.

7.4 COMPRESSED AIR AND GAS SYSTEMS

7.4.1 For process needs provision is to be made on a nuclear support vessel for special compressed air or gas supply systems segregated from the vessel's similar systems. In order to supply compressed air to the system, an independent air compressor of appropriate parameters and capacity is to be provided and installed outside the controlled area. Compressed air from the compressor is to be supplied through a non-return shut-off valve to an intermediate air receiver installed in the controlled area, a non-return shut-off valve is to be installed directly on the bulkhead bounding the controlled area and to be located outside the controlled area.

For redundancy purposes and/or in case of small compressed air consumption for process needs, it is allowed to supply the air from the vessel's system. In this case, the air is also to be supplied to an intermediate air receiver installed in the controlled area through a non-return shut-off valve (for its installation, see above). A reducing valve and a safety valve are to be installed directly before the non-return shut-off valve (outside the controlled area), where necessary.

The equipment and installation of the intermediate air receiver are to comply with the requirements of Part X "Boilers, Heat Exchangers and Pressure Vessels" of the RS Rules.

7.4.2 Connections of compressed air and gas pipes with other pipes and with fittings within the controlled area are to be welded. The pipes and air receivers are to be made of materials allowing multiple decontamination or

they are to have an appropriate coating. Apart from shut-down valves, non-return valves are to be installed on the open ends of the pipes.

Provision is to be made for a branch pipe (pipe connection) for compressed air or gas delivery from the outside. The branch pipe (connection) is to be installed before the non-return valve outside the controlled area.

7.4.3 Compressed air (gas) in contact with radioactive compounds, upon being used, is to be removed through air ducts of the special ventilation system.

7.4.4 Gas bottles of non-explosive process gases (nitrogen, helium) are to be installed in specially equipped spaces in special groups connected to the appropriate pipes. Connection to standard transport cylinders is allowed. The space where the gas bottles are installed is to provide their protection against heating from foreign sources. The location of such spaces and exits therefrom is to be such that personnel can quickly leave the space in case of oxygen-replacing gases spontaneous release therein. The space is to be located outside the controlled area.

7.4.5 Where provision is made for gas (nitrogen, helium) storage in fixed gas bottles, their equipment and installation are to comply with the requirements of Part X "Boilers, Heat Exchangers and Pressure Vessels" of the RS Rules.

7.4.6 Provision is to be made for periodical surveys and hydraulic tests of fixed air and gas bottles without dismantling thereof.

7.4.7 The equipment necessary for process gases (nitrogen, oxygen, acetylene, etc.) generation and storage as well as for gas and electric welding is to be located outside the controlled area. The equipment installation on board a nuclear support vessel is subject to special consideration by the Register.

7.4.8 Process gases are to be supplied through independent pipes to independent and segregated stations and then directly to work areas through removable pipes.

7.4.9 Provision is to be made for receiving of non-explosive process gases (nitrogen, helium) from the outside or their transfer to the serviced ship or to the shore through separate detachable pipes.

The gas transfer is to be forced. Installation of vessel's gas compressors is to comply with the requirements of these Rules and those of Part IX "Machinery" of the RS Rules.

7.5 SPECIAL VENTILATION SYSTEM

7.5.1 An independent special ventilation system is to be provided for spaces where radioactive contamination might occur. In addition to the re-

quirements of this Chapter, the system is to comply with the requirements of Part VIII "Systems and Piping" of the RS Rules as far as they are not in conflict with these requirements.

7.5.2 The special ventilation system in spaces where radioactive contamination might occur, is to be made of materials suitable for multiple decontamination. The number of flanged connections in the system within the controlled area is to be minimized. No flanged connections, holes, etc. are allowed outside the controlled area.

7.5.3 The special ventilation system may be either a combined system (exhaust and supply) or a purely exhaust system. In any case, however, the ventilating air is to flow in the direction of the spaces with higher airborne contamination by creating appropriate vacuum therein.

The special ventilation system may not be combined with other systems, including a heating system of several spaces where air heaters are used. It is not recommended that such combination be used for general-purpose ventilation system of a nuclear support vessel.

7.5.4 Air intakes are to be provided with filters to prevent dust or foreign particles penetration into the controlled area spaces. After cleaning, the air is to be discharged through a special ventilation mast which effective emission hight is specified by the sanitary regulations.

In any case, however, air discharged from the special ventilation system is to be prevented from re-entry into air intakes of the vessel's ventilation.

Devices for continuous monitoring of the discharged air volume and radioactivity are to be provided at the ventilation mast outlet.

7.5.5 The categories of spaces equipped with supply and exhaust ventilation, pressure and vacuum in the spaces, and the number of air changes are to comply with the requirements of the current Fundamental Sanitary Rules for Radiation Safety Enforcement.

Ventilation ducts of the controlled area spaces of different categories in terms of radioactive contamination or ionizing radiation levels are to be segregated.

The ventilation system of the spaces where spent fuel assemblies storage facilities are located or where high-radioactivity waste is or may be kept is to be capable to maintain an air temperature in these spaces not in excess of 55 °C, unless other requirements for spent fuel assemblies and high-radioactivity waste storage conditions are specified.

7.5.6 When the ventilation system is not in operation, the air is to be prevented from flowing through the ventilation ducts from spaces of higher contamination to those of lower contamination.

7.5.7 Where necessary, the special ventilation system is to be fitted with twin filters for discharged air cleaning from aerosols and other radioactive par-

ticles. In this case, any possibility of air discharge bypassing the filters is to be prevented.

7.5.8 Redundancy of supply and exhaust ventilation fans and heat exchangers of the special ventilation system is to be provided. It is recommended that stand-by fans should start automatically in case of failure of running fans. The main pipe fittings are to be remote controlled from the spaces outside the controlled area.

7.5.9 Exhaust duct filters of the special ventilation system are to be provided with spare filtering cartridges, be readily accessible and provided with appliances for their safe replacement.

7.5.10 General control of the special ventilation system is to be effected from the main handling operations control room. Local control stations are to be provided to control separate parts of the systems.

It is recommended that provision be made for interlocking of electric fans start and stop with opening and closing of the appropriate fittings.

7.5.11 In spaces intended for high-activity materials storage or treatment as well as in places of likely release of gases or aerosols, local air extraction directly from work places is to be arranged. In this case, the first cascade of aerosol filters may be located in the same space.

7.5.12 All ventilation system components (ventilation ducts and pipes, filter bodies, etc.) are not to hinder decontamination of the adjacent structures and equipment.

7.5.13 Upon its manufacture and installation on board, the special ventilation system is to be tested for leak tightness.

Periodic tests of the special ventilation system for leak tightness are not required; the tests, however, are to be carried out after repairs with replacement of its tight components, such as portions of the ducts, fittings, etc. After replacement of filtering elements, local tightness checks of the system in operation are sufficient.

7.5.14 Emergency ventilation system is to be provided for radioactive gases and aerosols concentration quick reduction in enclosed spaces of the vessel. As the emergency ventilation mobile filtering unit or another arrangement of the type approved by the Register may be used. The capacity and number of air changes to be provided by the emergency ventilation system as well as its filters resolving power are governed by the volume of the controlled area largest enclosed space where the highest concentration of radioactive gases or aerosols might occur. The emergency ventilation system is to be started from the main handling operations control room. Where a mobile unit is used as an emergency ventilation system, it is to be local- and remote-controlled.

7.6 FUEL ASSEMBLIES HANDLING EQUIPMENT COMPLEX

7.6.1 Complex of equipment for handling of core new and spent fuel assemblies is to meet the requirements of Rules for Nuclear Ships and other normative documents of the state supervision autorties.

7.6.2 The complex is to include the following equipment:

.1 operating floor;

.2 a machine tool for cutting core rod liner welds, resistance thermal elements, thermo-electrical and core rod liner cutting converters;

.3 a three-operation handling container;

.4 movement control mechanism with a support;

.5 a gripping device for extraction of compensation group rod lengtheners and pins;

.6 a device for locking a compensating group;

.7 a device of unloading of ionization chamber suspensions;

.8 a device for tightening and untightening nuts for the pressure flange securing and shifting of the flange and reactor cover;

.9 pumping station;

.10 a device for checking compensating group travels and forces;

.11 a gripping device for placing and fixing rod-type fuel assemblies;

.12 a gripping device for loading new fuel assemblies;

.13 a measuring device;

.14 a device for welding of core rod liners, resistance thermometers and platinum thermometers;

.15 an inspection device;

.16 control and monitoring system of machinery actuator drives;

.17 a container for storage, transportation and placement of a neutron source.

7.6.3 Technical design of the handling equipment complex for spent cores or spent fuel assemblies is subject to approval by the Register. The following items are to be defined and justified in the technical design of the handling equipment complex:

.1 handling procedures;

.2 technical means and measures to ensure nuclear and radiation safety;

.3 condition of safety-related systems.

7.6.4 The technical design of the handling equipment complex to be submitted to the Register is to include the following documentation:

.1 performance specification for delivery of handling equipment complex, including machinery, electrical equipment, remote control system;

.2 drawings of individual articles of the complex with sections, indication of dimensions on the drawings, materials, welding, welding consumables, roughness and smoothness of surfaces;

.3 specification of the complex equipment;

.4 list of the articles of the handling equipment complex with indication of their main characteristics and information on approval by the Register;

.5 list of deviations from the RS Rules requirements with supporting information;

.6 electrical schematic and circuit diagrams of the complex articles;

.7 electrical schematic and circuit diagrams of remote control systems;

.8 description of handling equipment complex;

.9 strength and reliability calculations;

.10 biological shielding diagram and calculation;

.11 thermal design of cooling system;

.12 drawing and calculations of cargo-handling gear;

.13 testing program;

.14 list of spare parts, tools and accessories.

7.6.5 Prior to commencement of handling equipment manufacture, working drawings are to be approved by the Register according to the list agreed upon.

7.6.6 The handling equipment is to ensure safety of personnel and environment when handling spent cores or removable shield itself and spent fuel assemblies. The current radioactive irradiation norms are not to be exceeded in the course of handling operations. Integrity of cores and fuel assemblies is to be maintained during handling.

7.6.7 In the course of handling, core or fuel assemblies heat is to be removed. The cooling system of handled core or fuel assemblies is to meet the requirements of Part VII "Machinery Installations" of the RS Rules.

7.6.8 Provision is to be made in the handling equipment for reliable gripping of the removable shield with the core or without it or fuel assemblies, their extraction out of the reactor, sealing of the shield with or without the core in the container and sealing of the container with spent fuel assemblies.

7.6.9 Cargo-handling gear of the handling equipment complex is to comply with the requirements of the Register Rules for the Cargo-Handling Gear of Sea-Going Ships, the remote control system is to meet the requirements of Part XV "Automation" of the RS Rules.

Duplication of electrical power supply and redundancy of the control channels are to be provided.

7.6.10 Strength calculations of handling equipment are to be made with regard to the specifics of the equipment.

Materials, welding, weld quality testing are to comply with the requirements of Part VIII "Nuclear Steam Supply Systems" of Rules for Nuclear Ships (safety class 2).

7.6.11 Materials used for handling equipment components affected by radioactive contamination are to be suitable for multiple decontaminations.

7.6.12 Instrumentation used in handling equipment is to meet the requirements of Part VII "Machinery Installations" of the RS Rules.

7.6.13 Hydraulic tests of handling equipment are to be carried in accordance with the requirements approved by the Register.

7.6.14 Survey of equipment during manufacture is to be effected in compliance with the provisions of Guidelines on Technical Supervision during Construction of Nuclear Ships and Floating Facilities, Nuclear Support Vessels and Manufacture of Materials and Products.

7.6.15 Periodical tests and surveys of handling equipment are to be carried out in accordance with Table 1.3.1, Guidelines on Technical Supervision of Nuclear Ships, Nuclear Floating Facilities and Nuclear Support Vessels in Service.

8 ELECTRICAL EQUIPMENT

8.1 GENERAL

8.1.1 The requirements of this Section cover electrical units and equipment of nuclear support vessels and are additional to the requirements of Part XI "Electrical Equipment" of the RS Rules and Part X "Electrical Equipment" of Rules for Nuclear Ships.

8.1.2 Electrical equipment installed in the controlled area spaces is to have protective enclosure not lower than IP 56, and radiation monitoring sensors – IP 68.

8.2 EMERGENCY SOURCES OF ELECTRICAL POWER

8.2.1 An independent emergency source of electrical power is to be installed on each nuclear support vessel. Its capacity is to be sufficient for feeding the consumers referred to in 8.2.2.

A diesel-generator is to be used as an emergency power source.

On non-self-propelled vessels of a simple design, permanently lying at berths and referred to the category of berth-connected ships (floating radiation monitoring stations, special-purpose sanitary stations, etc.) as well as on self-

propelled ships of restricted service, not having nuclear fuel, liquid or solid radioactive waste (floating warehouses, heating vessels, etc.), a necessity to provide an emergency source of electrical power, its type and capacity is subject to special consideration by the Register.

8.2.2 In addition to the consumers referred to in Part XI "Electrical Equipment" of the RS Rules, the following consumers are to receive electrical power from emergency switchboard busbars fed by the emergency generator, directly or through a transformer, from separate feeders:

.1 electric drives of pumps of all cooling circuits for spent fuel assemblies storage facilities;

.2 electric drive of one of the washing water pumps for the special-purpose sanitary space;

.3 electric drives of fans for the emergency ventilation system and air supply to pneumatic suits;

.4 signalling of closing the doors to the controlled area;

.5 emergency lighting, alarm system and internal communication in the controlled area spaces according to the requirements of these Rules;

.6 radiation monitoring and nuclear hazard occurrence fixed devices, in case they are supplied from the vessel's electrical system;

.7 control, monitoring and signalling positions in the valve control and handling operations control stations.

8.3 ELECTRICAL POWER DISTRIBUTION

8.3.1 Power to consumers in the controlled area spaces is to be supplied from special distribution boards located outside the controlled area.

8.3.2 Power to consumers providing heat extraction from the spent fuel assemblies storage facilities, their condition signalling and monitoring systems, including radiation monitoring, is to be supplied from two feeders, one of which is supplied through the emergency switchboard.

8.3.3 Starting arrangements of electric drives of cooling circuits of the spent fuel assemblies storage facilities are to ensure automatic re-start of electric motors when voltage is restored after power supply interruption.

8.3.4 Each consumer serving the controlled area spaces and arrangements, which is supplied from two different sources of electrical power or from two feeders, is to be fitted with an automatic power switch located outside the controlled area.

8.3.5 Provision is to be made for power supply to the vessel's electrical system from an outside source of electrical power, for that purpose a switchboard for shore power connection is to be installed on board. In addition to the

devices required by Part XI "Electrical Equipment" of the RS Rules, minimum voltage and phase failure protection devices are to be provided on the switchboard. Additional shore power switchboards may be installed, where necessary, location of which relative to each other is to be governed by the vessel's basing conditions.

8.3.6 Starting arrangements of electric drives located in the controlled area spaces are to be installed outside the controlled area. It is allowed to install push-buttons in the controlled area spaces.

8.4 CABLING

8.4.1 Electric cable penetrations of the controlled area spaces are to be as close to electrical equipment as possible. Cables are to be laid on the shortest routes possible.

8.4.2 Transit cables are not allowed to run through the controlled area spaces. Where, however, it will be deemed necessary (structurally impossible to get around these spaces, etc.), the cables are to be laid in tight conduits, linings or ducts. Use of cables with outside wire braiding is not allowed.

8.4.3 Packing cable boxes and individual cable glands are to be installed from the "cleaner" space side as far as it is practicable. In this case, a clearance on the opposite side is to be filled in with cable compound to the thickness of protective layer.

8.4.4 It is recommended that single-row installation of cables in the cable boxes be used to provide their proper radioactive decontamination, and power cables, and monitoring and signalling device cables be segregated.

8.4.5 Bunched and individual cables are to be laid at a distance of at least 60 mm from bulkhead surfaces, decks, framing and other hull structures.

8.4.6 Cable runs are to be laid so that to provide access for their decontamination.

8.4.7 All fitter tools for electrical equipment and cabling are to be of simple design and to have corrosion protection. Use of perforated parts and products is not allowed.

8.5 LIGHTING

8.5.1 Controlled area spaces are to have at least two lighting groups fed from separate feeders.

8.5.2 Group boards of main lighting for controlled area spaces are to have remote on/off switching with appropriate signalling.

8.5.3 Emergency lighting fixtures are to be installed for lighting of:

.1 radiation monitoring positions;
.2 valve and handling operations control rooms;
.3 spent fuel assemblies storage rooms;
.4 special-purpose sanitary space;
.5 main passages in the controlled area spaces.

8.6 INTERNAL COMMUNICATION AND SIGNALLING

8.6.1 Provision is to be made for two-way loudspeaking and telephone communication of the main handling operations control room with:
.1 wheelhouse;
.2 engine room;
.3 valve control station;
.4 observation station in the new fuel assemblies storage room;
.5 handling operations observation station in the spent fuel assemblies storage room;
.6 decontamination space;
.7 radiation monitoring station;
.8 special-purpose sanitary room.

8.6.2 Provision is to be made for two-way loudspeaking or telephone communication of the main handling operations control room with the repairs control room of the serviced ship.

8.6.3 All closures in ship structures bounding the controlled area are to be provided with signalling of their opening, and information is to be displayed in the main handling operations control room or at the radiation monitoring station. It is recommended that local audible signalling of door or other closure opening be installed.

8.6.4 In the controlled area process spaces permanently or periodically attended by personnel a signalling system is to be provided to warn personnel of a necessity to urgently leave the controlled area spaces. The system is to include light panels with appropriate text in the controlled area main spaces and sound signals to be clearly heard in all spaces, different in tone from all the other signals. The warning alarm system is to be started from the main handling operations control room or radiation monitoring station.

8.7 POWER SUPPLY OF RADIATION MONITORING SYSTEM

8.7.1 Electrical powe supply to fixed components of radiation monitoring system is to be realised from the main and emergency switchboards. Where these components and systems are fed through converters, they are to

be at least two in number, located on either side, and automatically switched over.

8.7.2 Power supply of radiation monitoring components is to be automatically switched over to the emergency source.

8.7.3 There shall be no additional switches on the supply feeders of fixed components of radiation monitoring system except those installed on the main and emergency switchboards.

8.7.4 Pilot lamp of voltage indication and power supply failure audible alarm are to be provided on the power supply switchboard of the radiation monitoring system.

8.7.5 Power supply system of radiation monitoring components is not to be used for any purpose other than for intended use.

9 RADIATION SAFETY

9.1 RADIOLOGICAL PROTECTION

9.1.1 In order to ensure radiation safety of the crew and environment, biological shielding of spent fuel assemblies, solid, liquid and gaseous waste storage facilities and other possible radiation sources (pipes, wires, machinery, equipment, etc.) is to be provided.

Biological shielding for spaces and individual equipment is to be calculated on the basis of the maximum radiation level possible for the particular space or equipment, using the magnitudes specified in Fundamental Sanitary Rules for Radiation Safety Enforcement and State Radiation Safety Standards.

The design of the biological shielding is to efficiently provide a possibility of carrying out any docking operations on the vessel's hull and arrangements.

9.1.2 The controlled area is to be enclosed on board the vessel. Entrance to the controlled area is to be allowed only through the special-purpose sanitary space equipped with clothes changing facilities, dose rates recording facilities, washing equipment.

9.1.3 The controlled area spaces are to be sub-divided into categories as regards probability and level of radioactive contamination.

Air vacuum in the spaces (or groups of spaces), air humidity, temperature and number of air changes are to be provided by the vessel's special ventilation system and to be consistent with the national Sanitary Rules in force.

9.1.4 Where air flows from one space to another, the flow is to be from areas of lower potential airborne contamination to areas of higher potential airborne contamination.

9.1.5 Air discharged from the controlled area spaces is to be continuously monitored and is to pass through efficient filters.

The controlled area ventilation system is to be designed so as to prevent contamination of the space where people can stay, and accumulation of radioactive substances. Radioactivity of the special ventilation system emissions is not to exceed the rates specified in Fundamental Sanitary Rules for Radiation Safety Enforcement and Safety Radiation Standards.

9.1.6 Personnel individual protection means and systems providing their use are to be available.

9.1.7 In order to prevent accumulation of radioactive contamination, provision is to be made for decontamination of all the controlled area spaces, equipment installed therein as well as of the vessel's hull, including its outer surfaces. Coatings and paintings of the structures are to allow multiple decontamination.

9.1.8 The configuration of the controlled area spaces is to be simple, without recesses and projecting parts as far as practicable. Corners of the hull structures are to be rounded, as far as practicable, and surfaces and welded joints are to have roughness of not lower than class 5 or 6.

9.1.9 Machinery and equipment not suitable for decontamination are to be easily replaceable.

It is recommended that a provision be made for covering this machinery and equipment in operation.

9.2 RADIATION MONITORING

9.2.1 Nuclear support vessels are to be provided with radiation monitoring means.

9.2.2 Depending on the purpose of a nuclear support vessel radioactive monitoring means may include:

.1 fixed centralized monitoring system;

.2 fixed monitoring units and instruments;

.3 portable radiometric and radiation monitoring instruments.

9.2.3 The number and nomenclature of radiation monitoring instruments and their location on board a nuclear supply vessel is to be approved by the Register.

9.2.4 Radiation monitoring means are to provide:

.1 monitoring of ionizing radiation dose rates on board;

.2 monitoring of equipment and spaces radiocontamination level;

.3 monitoring of radioactive emissions into the atmosphere through the nuclear support vessel ventilation system;

.4 monitoring of volumetric radioactivity and quantity of liquid radioactive waste on board a nuclear support vessel;

.5 environmental monitoring in spent and new fuel assemblies storage facilities in the nuclear support vessels intended for nuclear fuel handling;

.6 signalling on position of all closing appliances in the structures bounding the controlled area;

.7 individual radiation monitoring of the personnel.

9.2.5 Radiation monitoring means are to provide record and storage (depending on the purpose of the nuclear support vessel) of:

.1 ionizing radiation levels on board;

.2 radioactive contamination levels for spaces;

.3 quantity and volumetric radioactivity of liquid radioactive waste stored on board a vessel and discharged from the vessel to the environment;

.4 individual dose magnitudes of personnel radioactive irradiation.

9.2.6 Where the centralized radiation monitoring is available on board, the radiation monitoring station is to be located either in the vicinity of the main handling operations control room or to be combined therewith.

LIST OF CIRCULAR LETTERS AMENDING/SUPPLEMENTING NORMATIVE DOCUMENT

ND No.2-0201010-050, Rules for the Classification and Construction of Nuclear Support Vessels, 2007

(Normative document No. and title)

Item No.	Circular letter No., date of approval	List of amended and supplemented paras
1	312-14-844c dated 08.10.2015	Section 2, pare 2.1.1; Section 8, para 8.1.2

RUSSIAN MARITIME REGISTER OF SHIPPING

HEAD OFFICE

CIRCULAR LETTER **No.** 312-14-844c dated 08.10.2015

Re:

Amendments to the Rules for the Classification and Construction of Nuclear Support Vessels, 2007, ND No. 2-020101-050

Item of technical supervision:

Product code 15119999, vessel

Implementation	from the date of publication
Valid: till	-
Validity period extended till	-
Cancels / Amends/ Supplements Circular Letter No.	- dated -
Number of pages:	1
Appendices:	-

Technical Director - Head of Classification Directorate Vladimir I. Evenko

Amends Rules for the Classification and Construction of Nuclear Support Vessels,2007, ND No. 2-020101-050

1. **Section 2 CLASSIFICATION, Chapter 2.1 CLASS NOTATION OF A VESSEL**

Para 2.1.1 shall be amended to read:

"**2.1.1** Where a vessel complies with the appropriate requirements of the RS Rules, Rules for Nuclear Ships and these Rules, the descriptive notation **Nuclear support vessel** is added to the class notation referred to in Part I "Classification" of the RS Rules, -.

Operational capabilities of the nuclear support vessel according to its purpose are shown, where necessary, as additional characteristics in Section "Other characteristics" of the Classification Certificate (e.g., treatment of liquid radioactive waste)."

2. **Section 8 ELECTRICAL EQUIPMENT, Chapter 8.1 GENERAL**

In para 8.1.2 the value "IP 68" shall be replaced with "IP 57".

It is necessary to do the following:

1. Bring the content of the Circular Letter to the notice of the RS surveyors.
2. Follow the above amendments to this Circular Letter during the review and approval of the ships' technical documentation and survey thereof.

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Правила классификации и постройки судов атомно-технологического обслуживания

Russian Maritime Register of Shipping
Rules for the Classification and Construction of Nuclear Support Vessels

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