

Federal Environmental, Industrial and Nuclear Supervision Service

**FEDERAL STANDARDS AND RULES
IN THE FIELD OF USE OF ATOMIC ENERGY**

Approved by
Decree of
Federal Environmental,
Industrial and Nuclear
Supervision Service
No 1 of
28 April 2006

**NEAR-SURFACE DISPOSAL OF RADIOACTIVE WASTE.
SAFETY REQUIREMENTS**

NP-069-06

Effective
since 1 November 2006

Moscow 2006

UDK 621.039.58

NEAR-SURFACE DISPOSAL OF RADIOACTIVE WASTE. SAFETY REQUIREMENTS

Federal Environmental, Industrial and Nuclear Supervision Service
Moscow, 2006

These federal standards and rules in the field of use of atomic energy further elaborate and specify the federal standards and rules "Radioactive Waste Management Safety. General Provisions" (NP-058-04) and "Disposal of Radioactive Waste. Principles, Criteria and Basic Safety Requirements" (NP-055-04) as regards safety ensurance during near-surface disposal of radioactive waste.

These rules cover the radioactive waste near-surface disposal facilities, which are under design, construction, operation, closure, and closed facilities.

The regulatory document is issued for the first time¹.

The regulatory document has been developed on the basis of legal and normative documents of the Russian Federation, the Joint Convention on the Safety of Spent Nuclear Fuel Management and the Safety of Radioactive Waste Management, federal standards and rules in the field of use of atomic energy, radiation safety standards and other, as well as the IAEA recommendations: the Safety Series No 111-F, the Principles of Radioactive Waste Management and the Safety Standard Series No WS-R-1, Near Surface Disposal of Radioactive Waste.

LIST OF ACRONYMS

NS RWDF	-	Near-Surface Radioactive Waste Disposal Facility
RW	-	Radioactive Waste
SAR	-	Safety Analysis Report
SRS	-	Sealed Radioactive Source

BASIC TERMS AND DEFINITIONS

The following terms and definitions are used for the purposes of this document:

Bottom fill shall mean the engineered feature located below radioactive waste disposal cells and designed for: waterproofing of the radioactive waste disposal cells, preventing migration of radionuclides into the bearing rocks, protection of the radioactive waste disposal cells against intrusion of animals and roots of vegetation.

Buffer material shall mean the material (concrete, clay, bitumen etc.) used to limit penetration of water (atmospheric precipitation and (or) ground water to RW packages and to reduce speed of radionuclide migration from RW to the NS RWDF near-field zone or to minimize a time period of contact of RW packages with atmospheric precipitation and (or) ground water (sand, gravel, extracted rock, mixes of sand with a granular sorbent).

Man-made cavities (mine tunnels) shall mean cavities in the crust resulted from mining operations. The open cavities (shallow trenches, open pits, strip pits) and closed cavities (wells, shafts, adits, drifts) are distinguished.

Near-surface disposal of radioactive waste shall mean the RW disposal in structures constructed on the ground surface and (or) at a depth of several meters up to one hundred meters.

Near-surface radioactive waste disposal facility shall mean the stationary facility (facilities) and (or) structure (structures) intended for the near-surface disposal of radioactive waste and located within the territory determined by the design and provided with the systems and equipment required for RW management.

Period of potential radioactive waste hazard shall mean the time period after which the specific activity of radionuclides contained in RW will decrease down to values that allow to exempt RW from the radiation safety standards and rules.

Radioactive waste disposal cell shall mean the part of the NS RWDF, which is designed as a separate arrangement (enclosure, chamber, section, canyon, module etc.), in which the radioactive waste to be disposed of is placed.

Radioactive waste disposal system shall mean the combination of natural geological formation, NS RWDF structures and disposed RW.

Top fill shall mean the engineered feature located above radioactive waste disposal cells and designed for: waterproofing of the radioactive waste disposal cells, preventing migration of radionuclides into the environment, protection of the radioactive waste disposal cells against intrusion of animals and roots of vegetation, as well as inadvertent intrusion of humans.

Other terms used in this document are defined as per the federal laws and federal standards and rules in the field of use of atomic energy.

1. PURPOSE AND SCOPE

1.1. This document “Near-Surface Disposal of Radioactive Waste. Safety Requirements” has been developed on the basis of the Federal Law “On the Use of Atomic Energy”^{1*)} and the Federal Law “On Radiation Safety of the Population”^{2**)}.

1.2. This document applies to the near-surface disposal of radioactive waste and establishes safety requirements for radioactive waste near-surface disposal facilities, which are under design, construction, operation, closure, and closed facilities.

2. GENERAL REQUIREMENTS

2.1. The NS RWDS safety shall be ensured during the period of its operation, closure and throughout the entire period of the potential hazard of radioactive waste after it has been closed.

2.2. Solid and (or) solidified radioactive waste shall be subject to disposal in the near-surface RWDF.

2.3. Short-lived (containing radionuclides with a half-life of less than 30 years, and Cs-137) low, intermediate and high-level radioactive waste, which contains a limited content of long-lived (half-life of more than 30 years) radionuclides, shall be subject to near-surface disposal.

Maximum specific activity of alpha emitters (uranium, transuranic alpha emitters etc.) with a half-life of more than 5 years in separate RW packagings shall not exceed 3.7×10^3 Bq/g provided that its specific activity does not exceed 370 Bq/g in average for the whole NS RWDF.

The value of maximum specific activity of radionuclides in RW being disposed shall be set in accordance with requirements of the federal standards and rules and with regard to the calculated period of RW potential hazard.

2.4. The radioactive waste which meets acceptance criteria (quality criteria) for RW disposal established in accordance with regulatory documents shall be subject to disposal in NS RWDF.

2.5. It is prohibited to dispose in NS RWDF:

2.5.1. High-level long-lived RW,

2.5.2. RW which contains:

- more than 3% of a liquid;

^{1*)} The Federal Law of 21.11.1995 N 170-FZ “On the Use of Atomic Energy”, Code of Laws of the Russian Federation, 1995 N 48, Art. 4552 as amended on: 10.02.1997 N 28-FZ, Code of Laws of the Russian Federation; 1997, N 7, Art. 808; 10.07.2001 N 94-FZ, Code of Laws of the Russian Federation, 2001, N 29, Art. 2949; 28.03.2002 N 33-FZ, Code of Laws of the Russian Federation, 2002, N 13, Art. 1180; 11.11.2003 N 140-FZ, Code of Laws of the Russian Federation, 2003, N 46 (Part I), Art. 4436.

^{2**)} The Federal Law of 09.01.1996 N 3-FZ “On Radiation Safety of the Population”, Code of Laws of the Russian Federation, 1996, N 3, Art. 141.

- strong oxidants and chemically unstable substances;
- corrosive substances in concentrations which can lead to corrosion damage to containers, disposal cells and other components of NS RWDF;
- flammable, explosive and fire hazardous substances;
- substances capable of detonation or explosive decomposition;
- substances which produce heat and flammable gases when contact with water;
- substances which exothermal interaction with water is accompanied with an explosion;
- substances capable of sublimation, as well as generation of gases, vapors in quantities leading to loss of integrity of engineered barriers;
- chemical substances which have toxicometric characteristics corresponding to Class I (extremely dangerous) and Class II (highly dangerous) of hazard;
- pathogenic and infectious substances;
- biologically active substances;
- substances which form complex compounds in concentrations which can significantly affect radionuclide migration to the environment.

2.5.3. RW which heat release can lead to changes in physical, chemical and mechanical properties of RW packagings and reduction of efficiency of engineered and natural barriers.

2.6. According to the disposal cell location regarding the surface, NS RWDFs are divided into the surface facilities where RW disposal cells are located at the level of natural relief of the earth's surface or above it and underground NS RWDFs where RW disposal cells and (or) man-made (natural) underground cavities for RW disposal are located below the level of natural relief of the earth's surface.

RW disposal method (surface or underground), facility design and properties of barriers shall be selected and justified in the NS RWDF design depending on RW characteristics (radionuclide composition, specific activity, period of potential hazard, physical and chemical properties) and with consideration of environmental conditions of NS RWDF site.

2.7. The NS RWDF shall include a system of physical barriers (engineered and natural) which prevent propagation of ionizing radiation and radioactive substances into the environment.

A number and purpose of the NS RWDF barriers shall be determined and justified in the NS RWDF design considering the results of studies of barriers and predictive calculations done to evaluate safety of the RW disposal system.

2.8. At NS RWDF the following shall be used as engineered barriers:

- walls of vessels (equipment), containers, pipelines containing RW (in RW management systems before its disposal);
- SRS casing (when spent SRS are disposed);
- RW packaging;
- metal (metal alloy) matrix material with a low melting temperature (Pb, Pb alloys, Sn, Bi etc.) (where spent SRS are disposed in RW well-type disposal cells);
- casing pipe, bentonite-cement stone of the annulus (where RW is disposed in RW disposal cells like large diameter wells);
- structural materials of a RW disposal cell;
- buffer materials;

- civil engineering structures;
- bottom and (or) top fills.

2.9. A layout and structural materials for the RW container (metal, concrete, reinforced concrete, plastics, composite and other materials) shall be selected basing on:

- form (physical and chemical characteristics) of RW;
- RW packaging handling techniques.

2.10. The RW container design and structural materials shall ensure that its integrity and performance, including strength and leak tightness remain during RW packaging handling period at NS RWDF, as well as during the period following RW disposal, as set in the NS RWDF design.

The container structural materials and materials used for coating of its surfaces shall ensure protection against atmospheric impacts, corrosive impacts of RW, and make its decontamination feasible.

2.11. The container design shall provide for handling and transportation operations with the RW packaging.

2.12. RW containers and RW packagings intended for a long-term storage and (or) disposal shall be subject to mandatory certification.

2.13. Short-lived low-level solid radioactive waste (soil contaminated with radioactive substances, large-size non-separable equipment and civil engineering structures contaminated with radioactive substances, low-level solidified RW and other similar RW) can be disposed in RW trench-type disposal cells without containers.

2.14. For disposal of long-lived high-level RW the engineered features to remove heat from RW packagings shall be foreseen.

2.15. The disposal of intermediate and short-lived high-level RW, as well as spent SRS with leaking casings shall be carried out using non-return shielded containers, which are to be placed in RW disposal cells

At NS RWDF spent SRS with leaking casings shall be disposed in transportation containers and (or) concrete containers.

2.16. At NS RWDF with RW disposal cells of the well type only spent SRS with non-leaking casings shall be disposed. The SRS with non-leaking casings can be disposed in the NS RWDF with RW disposal cells of the well type without shielded containers.

2.17. The buffer material shall be placed in RW disposal cells around RW packagings to fill hollows and free volumes in the RW disposal cells.

2.18. Buffer materials used to minimize a time period when RW packagings contact with atmospheric precipitation and (or) ground water (sand, gravel, excavated rock, mixes of sand with a granular sorbent) shall possess a high draining capability.

2.19. The NS RWDF civil engineering structures shall ensure radiation protection of employees (personnel) and population against ionizing radiation, prevent propagation of radioactive substances beyond structures, as well as withstand natural and man-induced impacts during the period of time justified in the NS RWDF design.

2.20. A waterproofing shall be foreseen to prevent ingress of ground water and atmospheric precipitation to RW disposal cells.

2.21. The top fill shall consist of several layers, including:

- a filtration-proof (waterproof) layer of a material to prevent RW contact with atmospheric precipitation and surface water;
- a draining layer of a material to prevent water from getting to the waterproof layer;
- a layer of a material preventing penetration of animals, roots of vegetation, inadvertent intrusion of humans and destruction of the waterproof layer.

The top fill vertical layout shall ensure drain and removal of atmospheric precipitation from the RW disposal zone.

2.22. The bottom fill shall consist of several layers, including:

- a bottom material which withstands mechanical loads;
- a waterproofing layer;
- a sorbent to prevent propagation of radionuclides being leached from RW to the NS RWDF near-field zone.

2.23. The NS RWDF design shall provide technical measures aimed at preventing ingress of atmospheric precipitation, surface and ground water to RW disposal cells during the NS RWDF operation period, including:

- a system of water clean-up structures and (or) drain wells to remove (pump out) surface water;
- a temporary roofing for protection against atmospheric precipitation;
- a system for monitoring of water presence in RW disposal cells;
- a system for removal of water if it gets into RW disposal cells.

Water being removed from RW disposal cells, as well as water from draining structures and wells, shall be subject to radiation monitoring and, as necessary, collected in tanks and cleaned up before it is released into the environment.

2.24. Engineered barriers of the closed NS RWDF shall be protected against damages associated with intrusion of animals, roots of vegetation and inadvertent intrusion of humans.

2.25. The bearing (used as a foundation for the NS RWDF structures) and host (in which the NS RWDF structures are located) rocks as per requirements of Section 3 shall be used as natural barriers of NS RWDF.

3. SAFETY REQUIREMENTS TO BE IMPLEMENTED DURING SITING AND CONSTRUCTION OF NEAR-SURFACE RADIOACTIVE WASTE DISPOSAL FACILITIES

3.1. When selecting a NS RWDF site the factors, processes and phenomena of natural and man-induced origin, which are characteristic of the region, shall be studied. The studies shall be conducted in accordance with requirements of the regulatory documents.

3.2. Geologic and hydro-geological, topographic, hydrographic, engineering-geological, seismic, tectonic and climatic conditions of the NS RWDF site shall meet requirements of regulatory documents. When selecting the NS RWDF site the site characteristics, which can affect NS RWDF safety, effects of NS RWDF on the population and environment shall be studied and assessed.

3.3. The natural barriers of NS RWDF shall limit a contact of ground water with the engineered barriers and migration of radionuclides to the NS RWDF near-field zone in case engineered barriers lose integrity.

3.4. The NS RWDF can be constructed in high-permeability soils of the zone of suspended water (sand, sandstone, clay sand), low-permeability soils (clay, clay loam, rock, rock salt), as well as in permafrost.

The most acceptable soils for construction of NS RWDF are low-permeability rock adjacent to geological blocks of simple and homogeneous texture.

3.5. If the NS RWDF is constructed in halogen formations, the central regions of salt formations located in slow or extremely slow water cycle zones shall be selected. There shall not be brine lens, permeable rock layers within the processed rock mass.

3.6. If the NS RWDF is constructed in permafrost rock, the regions of solid permafrost formations where the permafrost rock is a cryogenic confining layer and does not contain intrapermafrost water shall be selected. The RW disposal cell depth shall be selected considering cryogenic and geological processes and seasonal frost line and thaw line of the soil.

3.7. If the existing natural or man-made closed cavities are used for NS RWDF construction a study shall be conducted to include a survey of tunnel stability, conditions of the lining, water content and other characteristics affecting RW disposal safety.

3.8. The host (bearing) rock for the NS RWDF construction shall be selected considering results of a comprehensive study of hydro-geological and geochemical properties of the rock mass. In the permafrost areas the geocryogenic studies shall be additionally carried out.

3.9. The technical solutions made during the NS RWDF construction shall not lead to a loss of isolating (filtering and sorption) properties of natural barriers.

4. SAFETY REQUIREMENTS TO BE IMPLEMENTED DURING DESIGN OF NEAR-SURFACE RADIOACTIVE WASTE DISPOSAL FACILITIES

4.1. The system of technical and organizational measures to ensure safety of NS RWDF shall be described in the NS RWDF design and reflected in NS RWDF SAR.

4.2. Sufficiency of technical solutions to ensure safety as adopted in the NS RWDF design shall be justified by computer modeling for the entire period of potential hazard of the disposed RW considering potential natural and man-induced impacts in the NS RWDF location region, as well as taking into account physical and chemical processes ongoing in NS RWDF.

4.3. The NS RWDF design shall justify the selection and properties of the NS RWDF engineered barriers, their number and purpose. The following information shall be given in the justification of engineered barriers adopted in the NS RWDF design:

4.3.1. RW (RW packagings) characteristics:

4.3.1.1. RW container, including:

- corrosion resistance, radiation resistance, mass, configuration (geometric sizes) – for a metal container;
- density, porosity, water permeability, gas permeability, freezing resistance, radiation resistance, resistance to microorganisms, mildew and fungi, fire resistance, configuration (geometric sizes) – for a reinforced concrete container;
- a sealing technique;
- reliability, durability;
- other characteristics which determine the isolating capability of the container.

4.3.1.2. Properties of matrix material.

4.3.1.3. Properties of compound.

4.3.1.4. Radionuclide composition, specific activities of radionuclides, cumulative activity values, equivalent dose rate from a packaging, homogeneity (lack of voids); mechanical strength (static, dynamic, shock loads), resistance to thermal loads and heating cycles; radiation immunity.

4.3.2. The RW disposal cell design, properties of the RW disposal cell structural materials.

4.3.3. Properties of buffer materials (waterproofing materials), including water permeability (filtration factor), sorption capacity with regard to radionuclides (distribution factor).

4.3.4. Characteristics of civil engineering structures (materials in use, reliability indicators, time to approach the limiting state).

4.3.5. Characteristics of the bottom and (or) top fill, including characteristics of materials, number and thickness of layers.

4.4. The NS RWDF design shall justify applicability of the site and host (bearing) rock for RW disposal considering:

- an RW disposal method (surface or underground);
- a mineral composition of the host (bearing) rock;
- rock thickness and its strength properties;
- rock filtering and sorbtion properties;
- ground water feed and discharge areas;
- speed and direction of the ground water flow;
- a geochemical composition of ground water.

4.5. The NS RWDF SAR shall contain results of a NS RWDF safety analysis covering its operation period and the period after its closure, including a list of initiating events of design basis accidents and a list of beyond design basis accidents; results of predictive calculations for the safety assessment of the RW disposal system; as well as methodologies and computer codes used for justification of the NS RWDF safety. Computer codes used for safety justification shall be qualified in accordance with the established procedure.

4.6. The predictive calculations for the safety assessment of the RW disposal system shall consider all main paths of propagation of ionizing radiation into the environment.

The NS RWDF design shall justify a list of initiating events considered in the predictive calculations for the safety assessment of the RW disposal system and adopted scenarios of radionuclide propagation.

4.7. The predictive calculations for the safety assessment of the RW disposal system shall serve as the basis for the NS RWDF design justification of:

- a composition of the system of barriers and their characteristics;
- a RW radionuclide composition;
- permissible, NS RWDF averaged specific activity of radionuclides in RW disposal cells (RW packagings);
- permissible, NS RWDF averaged specific activity of alpha emitters (uranium, transuranic alpha emitters etc.) having a half-life of more than 5 years in RW disposal cells (RW packagings);
- maximum specific activity of radionuclides in separate in RW disposal cells (RW packagings);
- maximum specific activity of alpha emitters (uranium, transuranic alpha emitters etc.) having a half-life of more than 5 years in RW disposal cells (RW packagings);
- cumulative (total) activity of long-lived radionuclides in RW (RW packagings);
- cumulative (total) activity of RW;
- RW placing density (RW quantity per unity of volume of NS RWDF);
- maximum quantity of RW (t, m³).

4.8. If spent SRS are disposed in the NS RWDF with RW disposal cells of well type, the value of permissible heat release of the disposed ionizing radiation sources (metal casing with sources) shall be also justified.

5. Safety ensurance during operation of near-surface radioactive waste disposal facilities

5.1. The operating organization shall establish an organizational structure for safe NS RWDF operation.

5.2. The operating organization shall recruit, train, issue independent work permits for and maintain required competence of the employees (personnel).

5.3. Basing on the documentation of developers of the NS RWDF equipment, processes and design the operating organization shall develop the NS RWDF operating documentation.

The operating documentation shall include rules and basic practices of safe operation of NS RWDF, a general procedure for performing safety-related operations, safe operation limits and conditions, specific instructions for the employees regarding working methods during normal operation and operational events, including pre-emergency situations, and actions of the employees to ensure safety during accidents.

5.4. Radiation safety during operation of NS RWDF shall be ensured by technical and organizational measures in accordance with requirements of federal standards and rules in the field of use of atomic energy, standards and rules of radiation safety and this document.

5.5. During operation the radiation monitoring shall be arranged for in the NS RWDF premises, site, controlled area and surveillance zone.

The radiation monitoring scope, methods and equipment at operated NS RWDF shall provide:

- individual monitoring (Dosimetry, radiometry) of the employees (personnel) exposure;
- monitoring of radiation situation in the work area, premises, on site and controlled area of NS RWDF;
- monitoring of releases and discharges of radioactive substances;
- timely detection of changes in the radiation situation in the work area, premises, on site, controlled area and surveillance zone of NS RWDF.

5.6. The following measures shall be implemented during NS RWDF operation:

- protection of the employees (personnel) and population against radiation impact of RW;
- prevention of uncontrolled releases and discharges;
- prevention of radioactive contamination of the NS RWDF premises and site.

5.7. The operating organization shall provide:

- receipt and incoming inspection of RW (RW packagings);
- physical protection of NS RWDF, as well as RW control and accounting;
- documenting and keeping the information required for NS RWDF closure.

5.8. As the NS RWDF enclosures (sections, chambers, cells etc.) are filled with RW packagings the enclosures shall be sealed.

5.9. The NS RWDF shall have a controlled area and surveillance zone; it shall have a claim in case of underground disposal of RW.

5.10. An analysis of the current safety level of NS RWDF and predictive calculations to assess safety of RW disposal system shall be carried out to determine the necessity and scope of technical and organizational measures aimed at safety ensurance of the employees (personnel) and population and safety ensurance of the RW disposal system at NS RWDF in operation (sealed) and under closure.

On the basis of the analysis and predictive calculations all practically feasible measures shall be implemented to meet requirements of this document and other federal standards and rules in the field of use of atomic energy.

The measures shall be implemented through a corresponding program to be developed and implemented by the operating organization.

6. SAFETY ENSURANCE DURING OPERATION OF NEAR-SURFACE RADIOACTIVE WASTE DISPOSAL FACILITIES

6.1. The technical and organizational measures being carried out during NS RWDF operation shall be implemented considering the future closure activities.

6.2. The technical and organizational measures being carried out during NS RWDF closure shall be aimed at reducing radiation impacts to the employees (personnel), population and environment as low as achievable considering social and economic factors.

6.3. The operating organization shall ensure safe closure of NS RWDF, including: measures to prevent accidents and mitigate their consequences, safe management of RW,

as well as its control and accounting, NS RWDF physical protection, monitoring of environment on-site, in the controlled area and surveillance zone of NS RWDF.

6.4. The operating organization shall develop and implement a NS RWDF closure quality assurance program and control quality assurance of activities of organizations who perform work and (or) render services to the operating organization.

6.5. Before the NS RWDF assigned operating period (or 30-year period) is expired, the operating organization shall develop a NS RWDF closure program.

The development of the NS RWDF closure program shall be completed before the RW is stopped to be placed in NS RWDF. The NS RWDF closure program shall describe possible NS RWDF closure options.

6.6. After the RW placement in NS RWDF is stopped, the operating organization shall prepare the facility for closure, including:

- a comprehensive engineering and radiation survey of NS RWDF;
- decontamination of the equipment, pipelines, systems and components in the scope required for the closure preparation;
- reprocessing and conditioning of RW accumulated at NS RWDF during its operation and its placement at NS RWDF.

6.7. On the basis of input data obtained through the comprehensive engineering and radiation survey and analysis of the design and operating documentation of NS RWDF the operating organization shall develop the documentation required for NS RWDF closure in accordance with terms of references and closure program, including:

- results of the comprehensive engineering and radiation survey of NS RWDF;
- an NS RWDF closure project;
- a quality assurance program of NS RWDF closure;
- process regulations for implementing work during the NS RWDF closure;
- operating manuals for systems and components required for implementing work to close NS RWDF;
- plans of measures to protect the employees (personnel) in case of an accident;
- a manual regarding elimination of accident consequences at NS RWDF being closed;
- a NS RWDF closure SAR.

6.8. The NS RWDF closure shall be conducted in accordance with the NS RWDF closure project. The NS RWDF closure project shall describe and justify the final option of NS RWDF closure. The NS RWDF closure design solutions shall be aimed at bringing the facility in a state in which it will remain safe during the period of potential hazard of RW placed in it.

6.9. The NS RWDF under closure shall be staffed with the employees (personnel) who have necessary competence and permits to work independently issued in accordance with the established procedure.

6.10. The NS RWDF closure operations shall be carried out in accordance with the operating documentation developed in accordance with the NS RWDF closure project.

6.11. The operating organization shall ensure safety of the closed NS RWDF; keeping the documentation about the closed NS RWDF during a period of time specified in the NS

RWDF closure project; and maintaining the engineering barriers as specified in the project in accordance with requirements of federal standards and rules.

6.12. After the NS RWDF closure the following shall be carried out during a period of time specified in the NS RWDF closure project:

- physical protection of NS RWDF;
- monitoring of the RW disposal system including the monitoring of conditions of engineered and natural barriers;
- monitoring of the environment;
- keeping the documentation about the closed NS RWDF, which contains main characteristics of NS RWDF and disposed RW; main results of the monitoring of the RW disposal system; information on measures implemented to ensure safety of the closed NS RWDF.

The NS RWDF closure project shall define the scope, methods and equipment of physical protection, RW disposal system monitoring, as well as the scope of information about the closed NS RWDF and its keeping procedure.

6.13. If during the monitoring of the RW disposal system deviations from the NS RWDF ultimate state as prescribed by the NS RWDF closure project are revealed as leading to reduction of its safety level, all practically feasible measures shall be implemented to ensure safety of the closed NS RWDF, including: measures to reduce migration of radionuclides; decontamination of soil; clean-up of surface and ground water; removal of water from disposal cells; and other required measures.

6.14. Maps of the NS RWDF site boundaries shall be prepared and recorded in the State Land Use Register. The closed NS RWDF shall be fitted with warning signs to inform humans on radiation hazard in case of an inadvertent intrusion to the RW disposal system. Requirements for the warning signs and their positioning are established in regulatory documents.

6.15. The closed NS RWDF monitoring shall be carried out in accordance with a program to be developed and implemented by the operating organization. The program shall establish the procedure, conditions and planned implementation timeframe of the following measures:

- safety monitoring of the closed NS RWDF;
- monitoring of the RW disposal system, including the monitoring of the engineered and natural barrier conditions;
- monitoring of the environment;
- protection of engineered barriers against damage associated with intrusion of animals and roots of vegetation;
- dismantling and removal of systems and equipment intended for the monitoring of the RW disposal system;
- prevention of inadvertent intrusion of humans.

The program shall describe:

- a procedure for keeping the documentation about the closed NS RWDF;
- the ultimate state of NS RWDF after the monitoring of the RW disposal system is completed.

