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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB 11929-2011

**Regulations for designing storage building of high level
radioactive liquid waste**

高水平放射性废液贮存厂房设计规定

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Foreword

All technical contents of this standard are mandatory. This standard was drafted in accordance with GB/T 1.1-2009 given rules. This standard replaces GB 11929-1989 "high-level radioactive liquid waste storage plant design requirements." This standard and GB 11929-1989 Compared to, in addition to editorial changes, the major technical changes are as follows:

- Normative documents used instead of GB 18871 and GB 4792 GB 8703; increased EJ588, EJ849, EJ877, EJ/T 681, EJ/T 938, EJ/T 939;
- Remove the "Terminology" section;
- Remove the "Site Selection" section;
- In the General emphasized the "high level liquid waste storage plant is part of the reprocessing plant, reprocessing plant site should be in the same building." (See 3.1);
- Increased plant building (structure) building materials, systems and components grading requirements (see 4.1);

--- Original standard Appendix A canceled, moved to table of contents

4.3.1 of this standard, and revised accordingly;

--- Increasing the building ventilation system design requirements (see 4.3.4);

--- Content of the original standard 10.1,10.2,

10.3 moved to this standard 4.3 "storage plant design principles", as the 4.3.5, 4.3.6,4.3.7, and has been amended accordingly;

--- Increasing the water storage tank and fill acid plant (see 5.1.9);

--- Increased acidity tank testing requirements (see 5.2c));

--- Increased Chapter 6, "Radioactive Waste Management," adds radioactive waste minimization considerations, and the original standard 9.1.4,

1 Scope

China's mandatory national regulations for designing storage buildings for high level radioactive liquid waste. High level liquid waste is the raffinate from reprocessing spent nuclear fuel, and it is the most hazardous material civil industry produces: intensely radioactive, chemically aggressive, and generating enough decay heat to boil itself dry if cooling stops. It must be stored, cooled and stirred for decades before it can be vitrified. The building that holds it is therefore designed around a small number of things that must never fail together - the tank and its containment, the cooling that removes the decay heat, the ventilation that manages the hydrogen produced by radiolysis, and the shielding. Redundancy is the governing principle, because a loss of cooling is not recoverable by evacuation. The regulations specify the design requirements for such buildings, and they exist because a failure of one would be a national event.

The standard provides a high level radioactive waste (hereinafter referred to as "high-level liquid waste") storage plant design technical requirements involved. This standard applies to produce spent fuel reprocessing high level liquid waste storage plant design.

2 Normative references

The following documents for the application of this document is essential. For dated references, only the dated version suitable for use herein Member. For undated references, the latest edition (including any amendments) applies to this document.

GB 18871 ionizing radiation protection and safety of radiation sources basic standards
EJ588 nuclear fuel reprocessing plant decommissioning radiation protection Standard
format and content of EJ/T 681 nuclear fuel reprocessing plant safety analysis report EJ849
nuclear fuel reprocessing plant radiation safety design requirements EJ877 nuclear fuel
reprocessing plant safety design guidelines After EJ/T 938 nuclear fuel reprocessing plant,

ventilation and air purification design requirements EJ/T 939 nuclear fuel processing plant was built after grading criteria (structure) building materials, systems and components

3 General

3.1 high level liquid waste storage plant is part of the reprocessing plant, reprocessing plant should be at the same site construction, and built close to high level liquid waste Making facilities, to avoid long-distance transport.

3.2 Design should ensure safe, reliable and practical, to minimize the generation of radioactive waste and radioactive substances secondary to environmental release Heavy volume.

3.3 design work should be carried out safety analysis and environmental impact assessment.

3.4 Plant design should ensure radiation safety, and follow the ALARA principle.

3.5 in tank design should be a comprehensive analysis of various factors affecting the critical safety and, if necessary, take all reasonably practicable measures to ensure Criticality safety certificate.

3.6 plant design should meet the requirements of the seismic and other external events defense.

3.7 should be designed to meet the requirements for emergency and decommissioning.

3.8 Design should develop quality assurance program.

3.9 Design of the tank should be clearly defined design lifetime.

3.10 high level liquid waste storage plant design should follow GB 18871, EJ588, EJ849, EJ877 and other design-related provisions.

4 Storage plant

4.1 storage building building (structure) grade buildings, systems and components To ensure the implementation of the nuclear safety functions, deal with high-level radioactive waste storage plant building (structure) building materials, systems and components division level of safety, and roots According to the security level to determine the seismic classification, grading and quality assurance design, manufacturing, procurement requirements. Classification principles see EJ/T 939.

4.2 Storage Plant composition

4.2.1 Process Plant storage system components High level liquid waste storage plant process systems should include the following components.

- a) high-level radioactive waste storage tanks and waste transportation equipment;
- b) high-level liquid waste tank mixing system;
- c) high-level radioactive waste liquid cooling system;
- d) high-level radioactive waste storage tank dilution air and process exhaust aftertreatment system;
- e) other auxiliary systems.

4.2.2 Storage Plant Building

4.2.2.1 concrete shielding equipment room High level liquid waste storage tanks and ancillary equipment with radioactive process used should be provided in sufficient thickness of the shield of reinforced concrete provided Preparation room.

4.2.2.2 Process trench and valve chamber Pipeline transportation of radioactive waste, the valve should be arranged in the pipe trench technology with shield and valve chamber.

4.2.2.3 cladding and liquid collection pit Radiological equipment room, valve chamber and process pipe trench should be lined by plane, and should be selected corrosion, irradiation, facing materials easy decontamination, the surface of the bottom cover Department should make certain slope and let drip hole at the lowest point.

4.2.2.4 Install the access area For installation, maintenance radiological equipment, installation and maintenance area should be set up.

4.2.2.5 Process control room and other ancillary buildings Including professional (water, heating, electricity, gas, etc.) buildings, gates and other health.

4.3 storage plant design principles

4.3.1 high level liquid waste storage plant shall be arranged in accordance with GB 18871 standards, the radiation in the workplace is divided into control and supervised areas, in order to In radiation protection management and control of occupational exposure, and in accordance with the EJ849, according to the level and extent of possible radiation contamination, and then control Area is divided into three sub-areas, namely green zone, orange zone and the red zone, white zone is supervised areas. The district should have a reasonable airflow and vacuum requirements, specific points District principles in Table 1.

4.3.2 high level liquid waste storage plant design should follow the principle of defense in depth. Wherein the multiple barriers including tanks and piping systems, equipment room Stainless steel cladding, concrete equipment room, building ventilation systems. Equipment room should be provided to withstand the weight of the entire structure, permeability and small Geotechnical radionuclides have higher adsorption capacity, to ensure the safety of the tank.