

INDUSTRIAL COMPLEX FOR SOLID RADWASTE MANAGEMENT (ICSRM) AT CHERNOBYL NUCLEAR POWERPLANT

GENERAL

After an international tendering process NUKEM was awarded to build the Industrial Complex for Solid Radwaste Management (ICSRM) at the Chernobyl Nuclear Power Plant.

The ICSRM consists of four facilities:

Lot 0: SLWS (Solid and Liquid Waste Storage)

Lot 1: A solid waste retrieval facility (LOT 1), comprising the installation of a retrieval facility for operational Low and Intermediate Level Short-Lived Waste (LILW-SL) and High Level Waste (HLW) currently stored in the existing storage silo. Due to the Chernobyl accident, this storage also contains an unknown percentage of Long-Lived (LL) waste.

Lot 2: A solid waste processing plant, comprising a plant for the sorting and segregation of all categories of solid radwaste and the processing of the solid LILW-LL/SL generated from the previous retrieval activities (LOT 1) and from the routine operational and decommissioning activities of the ChNPP. LILW-SL will be packaged and immobilized for removal to the near surface disposal facility (LOT 3) whilst higher category wastes (LILW-LL and HLW) will be packaged, over-packed and stored in a temporary storage facility SLWS (LOT 0) while awaiting the construction of an interim storage facility.

Lot 3: A repository for the disposal of short-lived waste, comprising a near surface repository in accordance with the requirements of the Ukrainian Nuclear Regulatory Authorities and in the form of an engineered facility for the final disposal of LILW-SL conditioned in LOT 2 and for wastes from the Liquid Radwaste Treatment Plant (LRTP) currently to be finalized at Chernobyl NPP site. The facility will maintain its integrity during 300-year institutional control period.

The Contract is a turnkey contract comprising the above mentioned four discrete packages. It governs the design, analyses, licensing support, fabrication, assembling, testing, inspection, quality assurance, documentation, delivery, erection and pre-commissioning of structures, foundations, systems, materials, equipment, components, services and other required items, of the ICSRM, to support the safe retrieval, receipt sorting for all radwaste, processing and disposal for solid Low and Intermediate Level Waste Short-Lived (LILW-SL), and temporary storage and disposal for Low and Intermediate Level Solid Waste Long-Lived (LILW-LL) and High Level Waste (HLW), which are currently stored on the ChNPP site or will be generated during the decommissioning operations.

The 47.7 Mio € Contract between the Government of Ukraine represented by Chernobyl Nuclear Power Plant (Employer) and NUKEM (Contractor) is financed by the TACIS Program (Technical Assistance for the CIS) of the European Commission (EC) and was approved by the EC on March 5, 2001. In an amendment, the contract was expanded in regard of the modification of the already existing SLWS facility.

LOT 0 : Solid and Liquid Storage (SLWS)

The existing SLWS building was refurbished in accordance with the revised storage concept (amendment 3) to allow temporary storage of 200-l drums with HLW and LILW-SL radioactive waste. The refurbished compartments will provide storage capacity for about 13,000 drums for at least 30 further years.

LOT 0 was handed over to the Employer in June 2008

LOT 1 SOLID WASTE RETRIEVAL FACILITY (RFSW)

The originally offered concept is based on constructing a new containment building (shelter) on top of the existing Storage Silo and a support services building to one end. The RFSW incorporates the retrieval equipment and support services required to ensure safe retrieval of all the waste, at a rate of 3 m³ per day, and decontamination of all the compartments. The request for variation required a repositioning of the support service building due to unforeseen infrastructural underground situations. At the same time Value Engineering efforts have shown,

that it was necessary to improve the originally designed barrier concept to achieve these functions in a reliable way. Therefore, a caisson is installed on top of the storage vault openings as an additional barrier. The Caisson Retrieval Concept is shown in **figure 1**.

LOT 2 SOLID WASTE PROCESSING FACILITY (SWPF)

The requirement to create a new processing building enabled the design of a new lay out adjacent to the LOT 1 facility with connection via personnel/material bridge to the LOT 1 Support Building and common infrastructural installations for both Lots. The waste processing and treatment process itself is based on the following sorting concept which will guarantee production of waste product packages in accordance with the waste acceptance criteria of the repository:

- The sorting and the size reduction facilities will be installed inside a hot cell, the sorting / size reduction cell, equipped with all the necessary equipment for remote characterization, segregation and size reduction operations. Should size reduction be required due to characterization procedures or for packaging, size reduction operations can be carried out at any stage during the sorting process.
- Radiological characterization will be undertaken by means of a combination of both the NUKEM Gamma Camera (a crane operated system equipped with a gamma spectrum analyzer and dose rate meter) and passive neutron detectors which are mounted under the sorting table. This will facilitate characterization into the categories Low and Intermediate Level Waste – short lived (LILW-SL), Low and Intermediate Level Waste – long lived (LILW-LL) and High Level Waste (HLW).
- Further treatment of LILW-SL will require visual characterization into the categories: combustible, non combustible but compactable, non combustible and non compactable waste.

LOT1 and 2 were handed over to the Employer in April 2009 and are currently under warranty conditions. The LOT 2 sorting and the following processing concept is shown in **figure 2**.

LOT 3 ENGINEERED NEAR SURFACE DISPOSAL FACILITY (ENSDF)

The design of LOT 3 is originally based on the El Cabril facility in Spain which is already in operation.

The ENSDF was built in the VEKTOR Complex site which is located within the Exclusion Zone 10 km SW of the Chernobyl NPP. It includes a newly built disposal facility based on modular structure with mobile containment and lifting framework and a waste package control unit facility. An existing building will be used for services and maintenance.

Main feature of the variation concept is the possibility of direct disposal of unshielded 200 l drums from LRTP. That means, the originally designed disposal container for this kind of waste is now solely used as transportation container commuting between the two facilities. This modification almost doubles the disposal capacity but requires additional characterization and storage equipment for 200 l drums. To compensate the higher Nuclide inventory inside the storage vaults, an additional imbedding of the drums layer by layer will be required. To provide additional shielding, the drums are stored in the center of the storage vaults with the disposal containers coming from LOT 2 SWPF on the outside. The general storage concept is shown in **figure 3 + 4**.

LOT 3 was handed over to the Employer in December 2007.

FIGURES

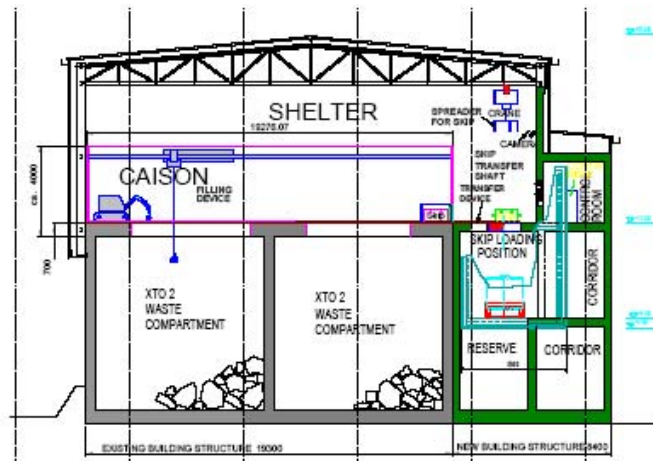


figure 1 Caisson Retrieval Concept

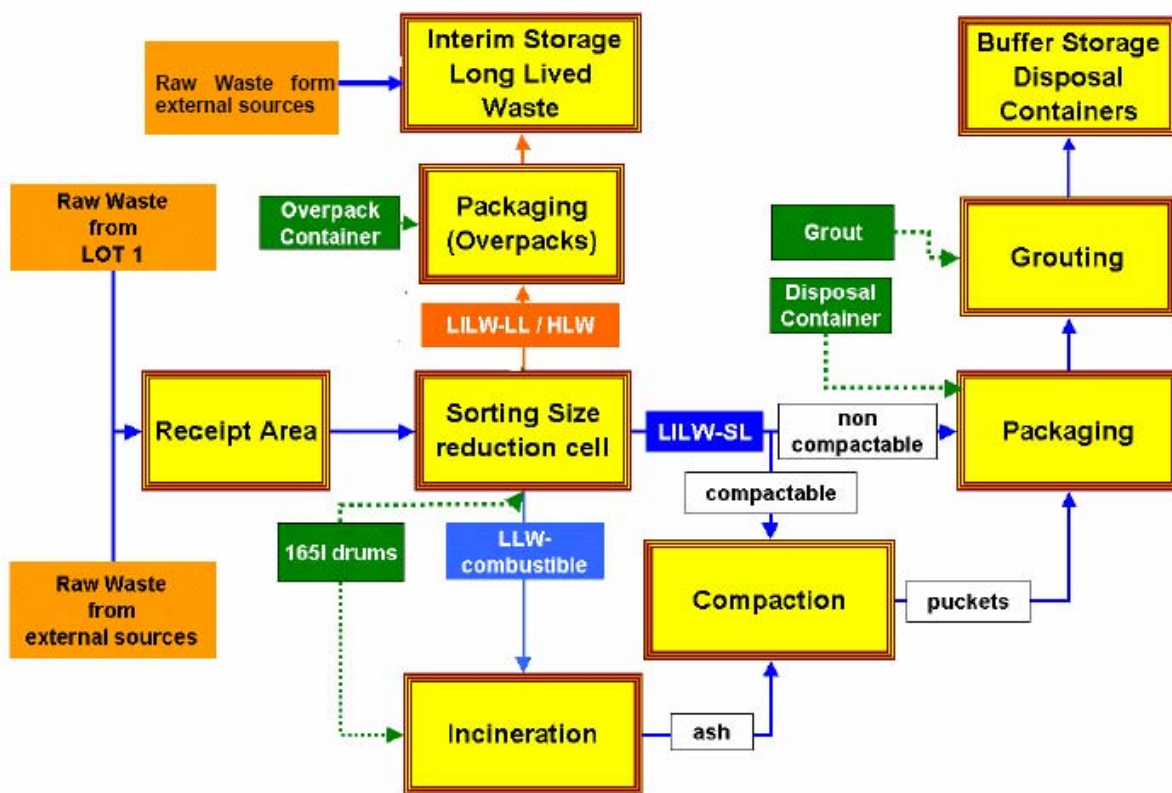


figure 2 LOT 2 sorting and processing concept



Figure 3: Retrieval facility for waste currently stored in the existing



Figure 4: Waste treatment facility



Figure 5: Sorting cell with manipulators



Figure 6: Internal transportation for containers

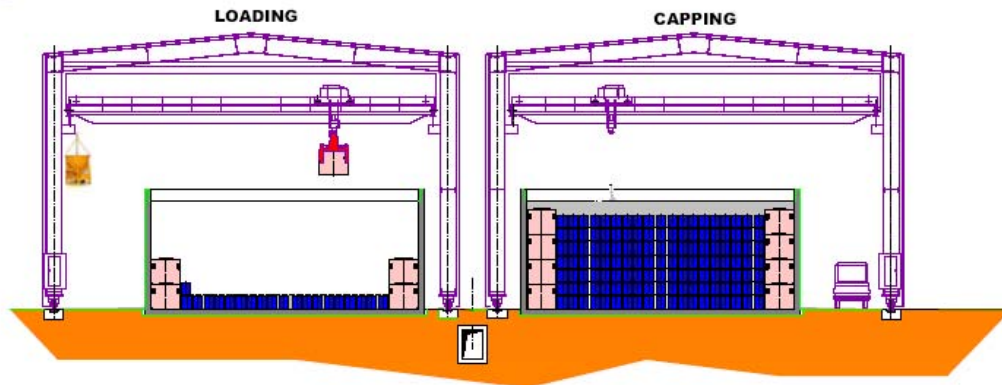


Figure 7: General storage procedure



Figure 8: Storage compartments of Lot 3