SRNL
SAVANNAH RIVER NATIONAL LABORATORY
TM

Factsheet

Shielded Cells

Overview

The Savannah River National Laboratory's Shielded Cells Facility gives the laboratory the ability to safely work with a wide variety of highly radioactive samples and items in support of various research and development initiatives. Skilled operators, standing safely outside the cells, use manipulator arms to perform work inside the cells.

The facility consists of sixteen 6-foot by 6-foot work stations or cells with the following features:

- The exterior walls of the facility are made of 3-foot-thick high-density concrete with a 1/8-inch thick stainless steel liner.
- Each cell has a 3' x3' shielding window. Shielding windows are 3-foot thick leaded glass, filled with mineral oil for optimal viewing capabilities.
- The facility is designed to shield a source reading up to 10,000 rem/hour (rem is a measure of radiation exposure).
- Each cell is equipped with two electrically powered manipulators. Operators standing outside the cells use these manipulators to perform work inside the cells.
- Each cell is equipped with electricity, fire protection, air, gas and water, all operated from outside the cell.
- The drains in the cells direct any liquid residue to the laboratory's High Activity Drain System, which is equipped to handle highly radioactive liquids.
- The high airflow filtration/exhaust system is triple HEPA filtered and routed through a sand filter system before discharging through a 100' high stack.
- There are several 11" by 11" shielded ports throughout the facility for the placement and removal of samples and supplies into the cells.
- Removable roof panels, roof plugs and transfer ports provide the ability to move equipment and material of many sizes into the cells. The facility is able to handle large shielded shipping casks and transfer highly radioactive materials from casks into the cells.

Years of experience with the manipulators enable SRNL Shielded Cell operators to perform tasks that require great dexterity.

The cells are arranged in two sections, or "cell blocks." Cell Block A, which has six cells, is equipped with a one-ton crane for transferring material from one cell to another. Cell Block B, which has 10 cells, is equipped with two one-ton cranes. An exterior truck dock has a 10-ton crane for use in loading and unloading radiological trailers and transferring large or heavy material into a high-bay receiving area. This area is adjacent to the cells and has another 10-ton crane, which moves the loads into and out of the cells; this crane is also used for removing the cell ports, roof covers and roof plugs.

In addition to the operating cells, the facility maintains a set of non-radioactive mock-up cells that provide full-scale replicas of the footprint and operational capability of the radioactive cells, including the manipulators. These cells are used for staging of equipment and for developing detailed work procedures for operations to be conducted in the active cells. Research equipment is tested here for compatibility with remote operations before being placed inside the radioactive cells.

U.S. DEPARTMENT OF ENERGY

Shielded Cells

Research Capabilities

The cells include specialized equipment for a variety of analytical and research tasks. Examples are rheology studies (studying how substances move or flow), destructive examination, and gas analysis. Equipment includes an in-cell gamma counter to measure radiation rates, a shielded optic microscope and an examination periscope with 100x capability. There are also analytical balances, drying ovens, a rheometer and a furnace capable of reaching 1100º C. This oven is used for research studies investigating vitrification of radioactive waste for permanent geological storage (disposal). In addition, other testing and analytical equipment can be installed, tailored to customer needs.

In addition to the manipulators, the cells include equipment for a variety of analytical and research tasks, such as an examination periscope with 100x capability.

Selected Projects

The SRNL Shielded Cells Facility is actively involved in a number of research and development initiatives in support of high-level radioactive waste (HLRW) management programs, such as the Savannah River Site's Defense Waste Processing Facility (DWPF, which immobilizes HLRW in a stable glass form for permanent disposal), Salt Waste Processing Facility, Saltstone, and the closure of SRS' radioactive waste storage tanks. The facility also supports other initiatives requiring the study or manipulation of highly radioactive samples and items.

Some of the projects performed in the cells:

- Discovery and isolation of a microorganism capable of surviving in highly radioactive waste. The microbe was decontaminated in the cells, allowing it to be taken to biotechnology labs for further study.
- Development and testing with actual HLRW of the processes used in the DWPF, including vitrification
- Testing methods for decontamination of solutions to radioactive levels low enough so they do not have to be disposed as HLRW
- In support of the Salt Waste Processing Facility, demonstration of a caustic solvent extraction process to isolate cesium-137 from salt waste, so that it can be processed at DWPF, allowing the remaining salt solution to be disposed of as low-activity waste in Saltstone
- Purification of 2 kilograms of curium-244 for offsite evaluation as a heat source
- Support SRS in a demonstration of solvent extraction to purify plutonium-239
- Examination of nuclear reactor components when the SRS reactors were operating
- Support of Hanford River Protection Project, which is establishing a facility to convert the Hanford site's HLRW to a stable glass form, using processes similar to those used by DWPF
- Initial purification of californium-252 (a spontaneous neutron emitter) and fabrication of medical sources for treatment of cancer

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