

REFURBISHMENT OF AECL HOT CELLS

FRANK KENNEDY

*Nuclear Facilities Operations, AECL Chalk River Laboratories
Station 17, Chalk River, Ontario, Canada K0J1J0*

ABSTRACT

This paper discusses the plans that Atomic Energy of Canada Ltd. (AECL) has developed to refurbish their existing hot cell facilities to maintain operational capability until a new National Shielded Facility is operational. The refurbishment goals are to complete upgrades to key safety systems and operational equipment within the next 4 years.

1. Introduction

Atomic Energy of Canada Ltd. (AECL) is primarily a power reactor design / build company with support services for their CANDU Reactors. The design and the majority of the support services are located in Sheridan Park, Mississauga, Ontario. The research group for the CANDU Reactors and additional radioactive support services are located at Chalk River Laboratories in Chalk River Ontario.

AECL's CANDU business was developed and is currently sustained by R&D and support service work conducted at the Chalk River Laboratories (CRL). Hot cell facilities are one of the essential corner stones of this AECL business initiative. The facilities have been used primarily for the development and testing of reactor fuel and reactor components; e.g. pressure tubes. The shielded facilities also serve a primary role in developing and supporting the isotope business and the day-to-day operation of the NRU research reactor.

2. Background

Shielded facilities have been in existence at the CRL site, since the late 1940s. Over the decades, the number and capability of the shielded facilities was expanded. The philosophy was to meet the immediate need with little consideration for their long-term use or an overall development plan. The shielded facilities currently consist of three cells in B234 (Universal Cells (UC)), two cells in B250 and 13 cells in B375 [Fuels Materials Cells (FMC)]. Irradiated fuel storage is available in the FMC's Horizontal Storage Block and component storage in its Horizontal and Vertical Blocks, and B234's Archive Storage Block. The NRU water bays are used to store both fuel and component materials.



The Fuel Material Cells (FMC) is used to analyse fuels and fuel channel materials samples by performing visual exams, cutting, polishing, mounting and performing metallography. Gamma spectrometry, fuel burn up, and gas puncture tests are some of the experiments performed within these cells. In addition, there is a set of mechanical test cells that perform various mechanical tests using tensile testing machines. A separate shielded area is used for Delayed Hydride Cracking (DHC) tests using ovens and slightly radioactive fuel channel materials. All liquid-destructive radioactive work is performed with the FMC suite of hot cells.



The Universal Cells (UC) are used primarily for dismantling large assemblies, off site flask receiving, repackaging radioactive wastes from other facilities around the site, processing cobalt, visual examinations, milling / machining (dry), unique developmental experiments such as pressure tube burst tests, and urgent work for Candu utilities such as primary heat transport filter testing.

Over the years the shielded facilities in the Fuel Material Cells and Universal Cells have been operated safely and effectively. Aging nuclear facilities now have typical issue such as the ability to obtain spare parts and the ability to remove risks (such as fire hazards). The Chalk River hot cells have had numerous assessments conducted and the results have lead to changes that are now being implemented in the Shield Facilities Refurbishment Project (SFRP).

3. Project Details

The upgrades for sustaining nuclear platform work consists of the work packages required to address all key potential deficiencies that could compromise safe and effective operation of the existing FMC and UC cells. The potential deficiencies have been evaluated over the last 10 or more years in various documents.

The major issue with determining upgrades is how extensive an upgrade is required. There are many challenges with older buildings and the expectation of renovating them to meet to current standards is not within the realm of being practical. AECL has decided to invest in upgrades that would provide maximum benefit for safety enhancements and to begin the process of investing in a new state of the art shielded facility that will replace the capabilities of these current facilities.

The upgrades that AECL has chosen to complete prior to a new-shielded facility becoming operational are the following:

UC Upgrades

- The class III & IV electrical systems will be assessed and components that cannot be maintained or meet the electrical code will be replaced.
- Ventilation system for the exhaust of the three hot cells will be evaluated (flow and filtration) and centralised into a common exhaust stack complete with a new stack monitoring system. There is currently 1 exhaust stack per cell.
- The isolation room doors will be replaced with fire rated doors. Interior walls will also be replaced with fire rated walls.
- The UC 1 & 2 doors will have seals installed to reduce in-cell leakage.
- All existing fume hoods & ventilated cabinets will be replaced and 2 additional walk-in type fume hoods shall be added for maintenance work.
- All building Continuous Air Monitors (CAMs) will be replaced.
- A remote centralized safety related alarm panel would be located at the entrance the building.
- New stereomicroscope for UC3.

Previous UC Upgrades Completed:

- New building air supply HVAC system
- New Area Gamma Monitors
- Centralized Ventilation Control
- Centralized Area Gamma Monitoring Station.

FMC Upgrades

- All building Continuous Air Monitors (CAMs) will be replaced.
- Material Handling Crane will be replaced (Dinny Crane)
- Active Liquid Waste System to be upgraded or replaced.
- Ventilation system upgrades including new carbon absorbers for FMC-3
- Transfer of FMC2 work to other Hot Cells.
- New stereomicroscope for FMC1.
- Replacements of fume hoods.

Previous FMC Upgrades Completed

- New Area Gamma Monitors
- Centralized Area Gamma Monitoring Station.

The new shielded facility work has also begun. This fiscal year, the collection of requirements is being assembled and information gathering is being developed with regards to the state of the art for the shielded facilities of the future. AECL is excited with the advancement that robotics and visual imaging. It will be the corner stone of hot cell work in the future.

References

All references are AECL internal documents and are not available for disclosure.