

# Hanford Facility Beryllium Fact Sheet

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Building Number/Name: 2345Z Plutonium Fabrication Facility  
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Responsible Contractor: CHPRC  
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## **PAST OPERATIONS**

Beryllium brought in facility: Yes

Form of beryllium: SOLID

Period of beryllium operations (dates): Start: 1961 End: 2012

Location(s) in facility that contained beryllium materials: Pure beryllium metallic powder was used in the Standards Lab Rooms 221C, 221D & 221E until mid-1980s. Approximately 25 grams of beryllium was stored in a vial in this area. Waste records document that the Standards Lab beryllium was moved into Room 179, Glovebox 179-4.

In 1988, beryllium metal was used in Glovebox 179-4. All unused analytical grade beryllium was eventually sealed out of Glovebox 179-4 as TRU waste. Additionally, the Analytical Labs area contained various material vials with up to 1.0% beryllium. All of this material was removed from 234-5Z and processed as waste.

Waste plutonium with potential beryllium contamination was processed in numerous gloveboxes and associated systems in 234-5Z. Low levels of beryllium are expected inside glovebox and glovebox systems of 234-5Z that processed waste plutonium residues. Rooms in 234-5Z with glovebox systems containing Potential Internal Beryllium Contamination (PIBC) include 228A, 228B, 228C, 230A, 230B, 230C, 235B, 136, 145, 157, 169, 170 and 179. Relevant gloveboxes and glovebox systems are labeled with PIBC signs. Rooms containing these systems are Beryllium Controlled Areas.

Beryllium tools were stored in drawers of several toolboxes and storage cabinets in Room 194A, cabinets 24, 25 & 28. Those suspect tools have been removed with drawers cleaned and sample results indicate no detectable presence of beryllium. Beryllium tools were collected and placed into Connex H. Connex H and all of its contents were removed for disposal in 2004.

234-5Z processed several hundred plutonium/beryllium (PuBe) neutron sources primarily in Room 236.

Five gamma spectroscopy instruments with beryllium "windows" on the detector end are stored in 234-5Z. Only one instrument is currently in use.

Description of beryllium activities: Beryllium material in the labs was used until the mid-1980s for emission spectroscopy standards. Beryllium was mixed using a mortar and pestle on a bench top in the Standards Lab and then mixed with plutonium inside glovebox containment.

In 1988, analytical-grade beryllium metal was used for tests inside glovebox 179-4. A high-temperature thermite reaction was used to oxidize, or burn, combinations of plutonium and beryllium.

The primary mission for PFP after plutonium production stopped in the late 1980s was plutonium waste stabilization. Numerous campaigns used the glovebox systems in 234-5Z to process various types of

plutonium waste. Waste material was calcined or otherwise treated to specification to allow safe disposal, primarily at the Waste Isolation Pilot Plant (WIPP). Waste plutonium residues processed in 234-5Z included Rocky Flats Environmental Technology Site (RFETS) plutonium waste that contained up to 0.6% beryllium.

Most of the PuBe neutron sources were repackaged in Room 236 and relocated to other areas. Some of these PuBe neutron sources were machined for plutonium reclamation in Glovebox HA-39 (thought to be located near the west end of room 235B). Glovebox HA-39 was decommissioned and removed in 1977.

Gamma spectroscopy instruments with beryllium "windows" are used when resolution of low energy gamma rays is desired. All but one of the gamma spectroscopy instruments in use in 234-5Z have aluminum windows. The beryllium component of these instruments is marked and wrapped or contained within shielding.

Building monitoring data summary: Beryllium area air and wipe samples have been collected in 234-5Z since at least 1999. In 2004, a full MARSSIM wipe sampling characterization of the facility was conducted. Approximately 650 samples were collected in 234-5Z during this sampling campaign. All samples results were below the Laboratory Limit of Quantification (LOQ).

Beryllium sampling of the Standards Lab has occurred during every evolution of the D&D cleanout of this area since 2009. Over 800 wipe samples and 50 area air samples have been collected from this area to date. All samples results have been below the relevant Laboratory Limit of Quantification (LOQ).

Numerous sample evolutions have been conducted to characterize beryllium exposure potential related to internal beryllium contamination of the 234-5Z glovebox systems used to stabilize plutonium waste. Since 2010, almost every work evolution that involved intrusion into these systems has been sampled by area air monitoring and/or wipe sampling. Approximately 1500 area air and wipe samples have been collected during these sample campaigns. The vast majority of these sample results have been below the relevant Laboratory Limit of Quantification (LOQ). All sample results have been far below the relevant Action Levels and Trigger Levels specified by the Hanford Site Chronic Beryllium Disease Prevention Program (CBDPP) and associated guidance.

Due to difficulties associated with sampling inside high-contamination glovebox systems, beryllium contamination inside 234-5Z glovebox systems used to stabilize plutonium waste has been evaluated based on technical analysis using conservative assumptions about beryllium to plutonium ratios inside these systems, with radiological contamination used as a proxy for beryllium contamination. The assumptions for these calculations are formally stated in TE-PFP-1 0-002-0, "*PFP Closure Project Calculation of Bounding Plutonium Activity Indicative of Beryllium Concentrations*". Validation of these assumptions by actual sampling has been a top CHPRC priority, with sampling inside the glovebox systems beginning in 2010. Collection and analysis of these samples has been extraordinarily challenging for many reasons, including TRU contamination routinely exceeding mCi levels. To date, approximately 40 wipe samples collected from 234-5Z glovebox systems used to stabilize plutonium waste have been analyzed for beryllium. Beryllium contamination exceeding the CBDPP Action Level of 0.2 ug/100 cm<sup>2</sup> has been found on most of these samples, with some samples in excess of 20.0 ug/100cm<sup>2</sup>. However, results from these interior glovebox samples consistently show the TE-PFP-1 0-002-0 assumptions regarding beryllium to plutonium ratios are conservative.

Monthly beryllium wipe sample evolutions have been conducted in lunch rooms, change rooms and step-off pads in 234-5Z. Since 2010, approximately 400 routine monthly samples have been collected in 234-5Z. With the exception of one sample collected from a gamma spectroscopy instrument with beryllium components, all samples results have been below the relevant Laboratory Limit of Quantification (LOQ).

Personnel monitoring data summary: Workers on numerous job evolutions have been sampled for beryllium. Work evaluated by personal air sampling includes Room 266 electrical work, various Standards Lab D&D cleanout evolutions and work evolutions during breaching of contaminated glovebox systems with potential beryllium contamination. Work activities involving breaching of glovebox systems in the Remote Mechanical "C" line area (228A, 228B, 228C, 230A and 230B) currently require personal air sampling.

Specify Engineering/Administrative controls used during operations: Continuous negative building ventilation with separate negative ventilation of glovebox systems has been operational for decades. Sealed glovebox and other process equipment enclosures have been required during the handling of materials containing plutonium with beryllium impurities. Intrusive work activities into systems with PIBC require additional engineered isolation. Air flow is regularly verified in the Standards Lab into the Rooms 221CDE. Administrative controls are established by the Beryllium Work Permits (BWPs) associated with this facility.

**Maximum Estimated Past Be exposure: None known**

### **CURRENT OPERATIONS**

Building still present: YES

Beryllium present: YES

Current building occupancy/activity: The building is undergoing glovebox removal. It is currently listed as Inactive. This is a Beryllium Controlled Facility and has various beryllium internally contaminated systems and BCAs.

**Maximum Estimated Current Be Exposure from Routine Operations: LOW**

Basis for above information: The D&D activities are tightly controlled using sound engineering and good work practices with trained and medically qualified Beryllium Workers in appropriate PPE. Stone and Webster report and interviews with onsite personnel; FDH beryllium assessment report; PFP Resource Center release of "Update and Status of Beryllium at PFP" Information Bulletin 3 dated March 8, 2004, PFP Resource Center release of "Information of the Status of PFP Be Work" dated May 26, 2004. A summary of the beryllium in the building is located in the Beryllium Facility Assessment Form 12/21/2009.

Comments, including any additional information needed (specify): N/A

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*For questions or comments, please send email to [Kristy\\_J\\_Kimmerle@rl.gov](mailto:Kristy_J_Kimmerle@rl.gov)*