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Pacific Northwest National Laboratory
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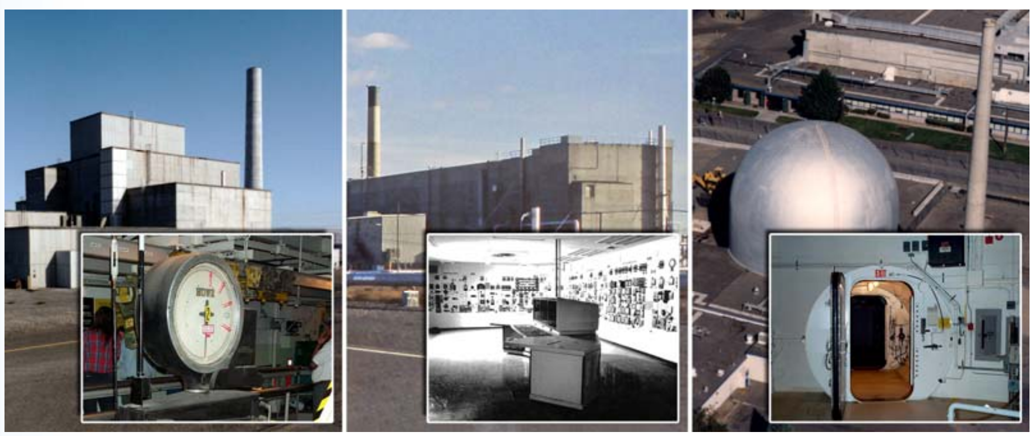
Mitigation of Selected Hanford Site Manhattan Project and Cold War Era Artifacts

E. P. Kennedy
D. W. Harvey



September 2006

Prepared for the U.S. Department of Energy
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Collage l-r: 105-KW Reactor with Howe Scale
PUREX Plant with Central Control Room
Plutonium Recycle Test Reactor with Personnel Air Lock

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Contents

Acknowledgments iii

Hanford Site Acronyms and Jargon ix

Introduction 1

Purpose 1

Selection Criteria 2

Summary of Artifacts Selected 3

Conclusion 3

100 Areas Artifacts 5

105-KW Building – K-West Reactor 7
Howe Scale (105-KW-1) 7
Two Signs on South Wall of Discharge Chute Area (105-KW-2a & b) 9

165-KW Building – Power Control Building 11
Power Control Room Panels (165-KW-1) 11
Wooden Cabinet for Hanging Construction Drawings (165-KW-2) 12

183-KE Building – Water Treatment Filter Plant 13
Headhouse Control Panel (183-KE-1) 13

190-KW Building – Pump House 14
"Hear-Here" Telephone Booth and Phone Set (190-KW-00001) 14

190-KE Building – Pump House 15
Ventilation Control Panel (190-KE-1) 15

1706 KE/KEL Building – Water Studies Test Facility/Chemistry and Waste Treatment Technology Building 16
Demineralizer Water Treatment Control Panel (1706-3) 16
Reactor Recirculation Water Laboratory Control Room Panels (1706-6) 17

200 Areas Artifacts 19

202-A Building – PUREX Plant 21
PUREX Central Control Room (CP0012) 21

221-U Building – U Plant 23
Electrical Panel (CP0003) 23
480 Breaker Unit (CP0002) 24
Process Control Board (CP0007) 25
Process Control Board (CP0004) 26

222-S Building – Control Laboratory 27
Fume Hood #2 (222-S-8) 27
Glass Cabinet (222-S-7) 29

224-B Building – Concentration Facility ... 30
Main Process Control Board (CP0016) ... 30
F-Cell Loadout Process Control Board (CP0014) ... 31
Spray Pump for Centrifuges D and E (CP0017) ... 32

234-5Z/234-5ZA Building – Plutonium Finishing Plant ... 33
RMA Line Control Room Desk (234-5Z-1798-4) ... 33
RMA Line Control Room Panel (234-5Z-1798-4) ... 35
Glove Box Blower (PFP-2002-5) ... 36
RMC Line Control Room Desk for Button/Crucible Separation (234-5Z-1798-3) ... 37
Mass Spectrometer (234-5Z-1798-5) ... 38

236-Z Building – Plutonium Reclamation Facility ... 39
Control Room Panels (PRF-2) ... 39

2736-Z Building – Primary Plutonium Storage Facility ... 40
Storage Vaults and Contents (2736-Z-1) ... 40

2736-ZB Building – Primary Plutonium Storage Support Facility ... 41
Dry Air Glove Box (Not tagged due to contamination) ... 41

271-U Building – Office and Service Building ... 42
Exhaust Sand Filter Model (CP0001) ... 42

277-W Building – Fabrication Shop ... 44
Toledo Scale (277-8) ... 44

300 Area Artifacts ... 45

306-W Building – Materials Development Laboratory ... 47
Loewy Press Control Panel and Enclosure (306-W-8) ... 47
Swage Machine (306-W-10) ... 49

308 Building – Plutonium Fabrication Pilot Plant (Fuels Development Laboratory) ... 50
Glove Box (308-2) ... 50
Fuel Pin X-Ray Machine (308-1) ... 51
Hopper Control Board (308-3) ... 52
Control Room Panel/Annunciator Board (308-4) ... 53

309 Building – Plutonium Recycle Test Reactor ... 54
Personnel Air Lock (309-2) ... 54
Interim Examination and Maintenance Cell Manipulators (309-4) ... 55

314 Building – Metallurgical Engineering Laboratory ... 56
Baldwin-Tate-Emery Universal Testing Machine (314-7) ... 56

324 Building – Chemical Engineering Laboratory ... 57
Mockup Cell and Manipulator (324-4) ... 57
Transfer Pass-Through Mechanism (324-3) ... 58

325 Building – Radiochemistry Laboratory ... 59
Equipment Storage Shelves (325-6) ... 59
Criticality Panel Alarm (325-12) ... 60

333 Building – Fuel Cladding Facility ... 61
Billet Preheat Furnace/Oven (333-2) ... 61
Loewy 2700-Ton Extrusion Press (Not tagged due to contamination) ... 62

340 Building – Waste Neutralization Facility 63
Main Control Panel (340-3) 63
Motor Control Center Panel (340-2) 64

3745-B Building – Positive Ion Accelerator Building 65
Electrostatic Tandem Van de Graaff Accelerator (3745-B-1)........ 65
Van de Graaff Accelerator Control Panels and Console (3745-B-2) 66

400 Area Artifacts........ 67

403 Building – Fuel Storage Facility in Fast Flux Test Facility........ 69
Heads Seals Status Panel (FFTF-15)........ 69
T-3 Shipping Cask (FFTF-25)........ 70

4621-W Building – Auxiliary Equipment Facility 71
Diesel Generator #2 (FFTF -14)........ 71
Electrical Switchgear Panels (FFTF-13) 72

4703 Building – Fast Flux Test Facility Control Building........ 73
Control Room Panels (FFTF-20) 73

700 Area Artifacts........ 75

748 Building – Emergency Decontamination Facility 77
Harold McCluskey Chair (748-1) 77
Patient Bed/Shielded Body Wash Tank (748-2) 78
Hanging Lead Mask/Shield (748-3)........ 79
Suspension Patient Gurney (748-4)........ 80

Resources 81

Hanford Site Acronyms and Jargon

AEC	Atomic Energy Commission
billet - uranium	semi-finished, short, thick bar of uranium in the form of a cylinder; produced offsite from ingots and began arriving at the Hanford Site November 1944 in preparation for Hanford's capability to extrude the billets into rods which started early 1945
button	metal chunks of plutonium approximately the size of a hockey puck, which were the result of converting plutonium nitrate into plutonium metal
canyon	vernacular term used at the Hanford Site for the chemical separations plants, inspired by their long, high, narrow structure
cell	often referred to as a "hot cell," a heavily shielded room in which radioactive materials can be handled remotely using robotic or otherwise remote manipulators and viewed through shielded windows. Many hot cells have walls, made of concrete or metal, which are a meter or more in thickness. These allow extremely radioactive items to be manipulated and worked upon without exposing operators to dangerous amounts of radiation.
control boards/panels	whether "board" or "panel" was used depended on the operators. When the artifacts were catalogued with name and number, the name given was whatever the operator at the time of the interview used.
CREHST	Columbia River Exhibition of History, Science, and Technology
critical	condition in which a material undergoes nuclear fission at a self-sustaining rate
DOE-RL	U.S. Department of Energy, Richland Operations Office
Dummy element	Cylinder containing no metallic uranium. Dummy elements were used to space the fuel elements within the reactor core.
FFTF	Fast Flux Test Facility

fuel element	pipe cylinder that contained the nuclear fuel for the plutonium production reactors; commonly referred to as a "slug" at the Hanford Site; the process of creating a fuel element consisted of
	ingot — initial form of uranium
	billet — produced offsite from ingots and began arriving at the Hanford Site November 1944 in preparation for Hanford's capability to extrude the billets into rods which started January 1945
	rod — initially produced offsite from billets and began arriving at the Hanford Site October 1943; produced at the Hanford Site beginning January 1945
	fuel core — uranium part of the fuel element produced from rods
HEPA	high efficiency particulate air; a type of filter
HEW	Hanford Engineer Works – name of the Hanford Site from 1943-1946
IAEA	International Atomic Energy Agency
IEM	interim examination and maintenance; type of cell manipulator
loadout	transfer by truck of concentrated plutonium nitrate to Hanford's Plutonium Finishing Plant where the nitrate was converted into a nuclear weapon component
PFP	plutonium finishing plant (Z Plant/234-5Z/234-5ZA Building)
precipitation	process in which a chemical was added to liquid to cause the targeted material to turn into a semi-solid and become suspended in the liquid; precipitation was used for both extraction and decontamination
PRTR	Plutonium Recycle Test Reactor
PUREX	plutonium-uranium extraction; chemical separations plant (A Plant/202-A Building at the Hanford Site)
REDOX	reduction-oxidation; chemical separations plant (S Plant/202-S Building at the Hanford Site)

RMA	Remote Mechanical A Line; one of the processing lines in the Plutonium Finishing Plant, which used a remote process to mechanically manipulate the plutonium
RMB	Remote Mechanical B Line; processing line that became obsolete prior to operation and never processed any plutonium
RMC	Remote Mechanical C Line; processing line that incorporated all the improvements made over the years to the RMA Line
single-pass reactors	water cooled nuclear reactors which discharge their cooling water after a single use rather than recirculating it; the first eight production reactors at the Hanford Site were single-pass reactors; N Reactor, the ninth reactor, had a water recirculation system
slug	jargon at the Hanford Site for "fuel element," which was a pipe cylinder that contained the nuclear fuel for the plutonium production reactors

Introduction

Purpose

This document is the first time that Manhattan Project and Cold War era artifacts from the Hanford Site have been assembled within a publication. The compilation partially fulfills the U.S. Department of Energy, Richland Operations Office (DOE-RL) requirement to comply with Stipulation V(C) of the *Programmatic Agreement for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site, Washington* (DOE/RL-96-77, Rev. 0). Under this stipulation, DOE-RL is to locate and identify artifacts that may have interpretive or educational value as potential museum exhibits for local, regional, or national museums.

The publication presents photographic and written documentation of a number of Manhattan Project and Cold War era artifacts that were identified and tagged during assessment walk throughs of historic buildings on the Hanford Site but which could not be curated within the Hanford collection because they were too large for long-term storage and/or exhibit purposes or were radiologically contaminated. This documentation effort, which includes photographs of the current appearance of these artifacts together with brief summaries of their physical description and purpose, mitigates the inability to physically preserve these items.

The significance of the artifacts in this publication is based not on the individual significance of any single artifact but on their collective contribution to the science and engineering of creating plutonium and advancing nuclear technology, which occurred at the Hanford Site during the Manhattan Project and Cold War Era with both its military as well as later commercial advances in nuclear fuel and power. The significance of the Hanford Site and all the machines, equipment, fittings, fixtures, furnishings, instruments, and implements needed to create plutonium is related in the *History of the Plutonium Production Facilities at the Hanford Site Historic District, 1943-1990* (p. 1.5):

> *The Hanford Site was established for one reason—to produce plutonium for use in weapons. With a production record of 54.5 metric tons (quantity published to date, which is 60 percent of the total amount of weapons-grade plutonium produced by the United States), the Hanford Site fulfilled its Manhattan Project and Cold War mission. At its inception, the Hanford Site was largely an experiment, the production-scale culmination of two key events—the demonstration of a controlled, sustainable nuclear chain reaction capable of transforming uranium into plutonium, and the discovery of a process to separate plutonium from uranium following irradiation.*

Many of the artifacts in this publication are simply representative of a typical industrial item indicative of its time. Some of the artifacts selected are items that had to be fabricated by the Hanford Site contractor because nothing existed on the market to fulfill that particular need (see the wooden cabinet for hanging maps, Artifact No. 165-KW-2). Other artifacts, such as the control boards/panels depict advances in monitoring systems and controls when looked at chronologically according to the manufacture dates. Some artifacts, because of security issues, could not be captured with photos. The artifacts captured here are just a taste of all the apparatus required to accomplish the mission. As more artifacts are identified, an addendum will be added to this publication.

Some of the artifacts that could be preserved are being added to the U.S. Department of Energy collection managed by the Columbia River Exhibition of History, Science, and Technology (CREHST, 95 Lee Boulevard, Richland, Washington). Others being preserved are in temporary storage or are tagged and awaiting removal prior to demolition of the building in which they are located. For readers interested in an in depth history, see the *History of the Plutonium Production Facilities at the Hanford Site Historic District, 1943-1990* at http://www.hanford.gov/doe/history/docs/rl-97-1047/index.pdf. Hard copies are available at Battelle Press (http://www.battelle.org/Bookstore/) under the title *Hanford Site Historic District: History of the Plutonium Production Facilities 1943-1990*.

Selection Criteria

While the ideal would be to have a pure collection of "one-of-a-kind" prototypes and items most representative of the research and production processes, reality is many of those items were not accessible either because of radiation or security issues. The artifacts in this publication are those that were captured by the camera at the time of assessment walk throughs of buildings scheduled for demolition at the Hanford Site.

The following criteria were used to select the artifacts to include in this initial publication:

- From Manhattan Project and Cold War era buildings most representative of production processes and research and development activities in the 100, 200, and 300 Areas and either contaminated or too large to be included in the Hanford collection. Artifacts from 400 Area buildings were also included due to the significance of the prototype Fast Flux Test Facility and from the 748 Building as it was the prototype of emergency decontamination facilities in the DOE complex.

- "One-of-a-kind" prototype, representative of a significant leap of technology (innovation and "spin-offs"), made specifically for the Hanford Site, and/or representative of telling the Hanford story

- Only those identified and tagged from historic buildings previously assessed. No new walk throughs or assessments were undertaken for this effort.

- Already captured in photos to reduce field and research time
- Identified by referring to historic building documents and talking with Hanford employees and retirees who supplied information on the uses and significance of the selected artifacts

Summary of Artifacts Selected

When the artifacts were catalogued with name and number, the name given was whatever the person who used the item or the operator at the time of the assessment walk through called it. For instance, whether the name “control board” or “control panel” was recorded depended on what the operator called it and does not indicate a difference—“board” and “panel” being synonyms. The number given was dependent on the particular numbering system used by the contractor doing the assessment walk through. The result is artifact names and numbers that are not always consistent.

The initial 57 artifacts selected for this publication are indicative of some of the production processes and research and development activities that occurred in the

- 100 Areas – 9 artifacts from the site of the Hanford production reactors (B, C, D, DR, F, H, KE, KW, and N reactors) where uranium fuel was irradiated
- 200 Areas – 20 artifacts from the site of the Hanford chemical separations plants (bismuth phosphate process plants B and T, plutonium uranium extraction plant PUREX, and reduction and oxidation plant REDOX) where plutonium was extracted from the irradiated fuel
- 300 Area – 19 artifacts from the site of the Hanford research, development, and fuel fabrication operations where the components for use in both nuclear weapons and as fuel for nuclear power plants were researched, developed, fabricated, assembled, maintained, and modified
- 400 Area – 5 artifacts from the site of the Hanford Fast Flux Test Facility where the fast breeder reactor was located to help stretch the nation’s uranium supply
- 700 Area – 4 artifacts from the site of the Hanford emergency care facility where injured and contaminated Hanford staff were taken for emergency decontamination

Conclusion

It is anticipated that this publication will contribute to the appreciation of the industrial and scientific heritage of the Hanford Site and its associated technological features. An addendum will be added to this publication in the future. To allow for dissemination to a wider audience, this document will be published on the website maintained by the DOE-RL Cultural and Historic Resources Program at http://www.hanford.gov/doe/history/?history=manhattan.

100 Areas Artifacts

105-KW Reactor

105-KW Building – K-West Reactor

The construction of the 105-K Area reactors was part of Project X, a large Cold War expansion effort at the Hanford Site in the early 1950s in response to the accelerating arms race between the Soviet bloc and the United States and its North Atlantic Treaty Organization allies. The 105-KW Reactor, along with the 105-KE Reactor, was completed in 1955. The 105-KW and 105-KE reactors were the last single-pass reactors built at the Hanford Site. The two "jumbo" plutonium production reactors were larger than their predecessors and capable of twice the production.

Howe Scale (105-KW-1)

Physical Description

- Date – unknown; Manufacturer – Howe Scales Company; Size – 6 feet 6 inches high by 3 feet 6 inches wide.

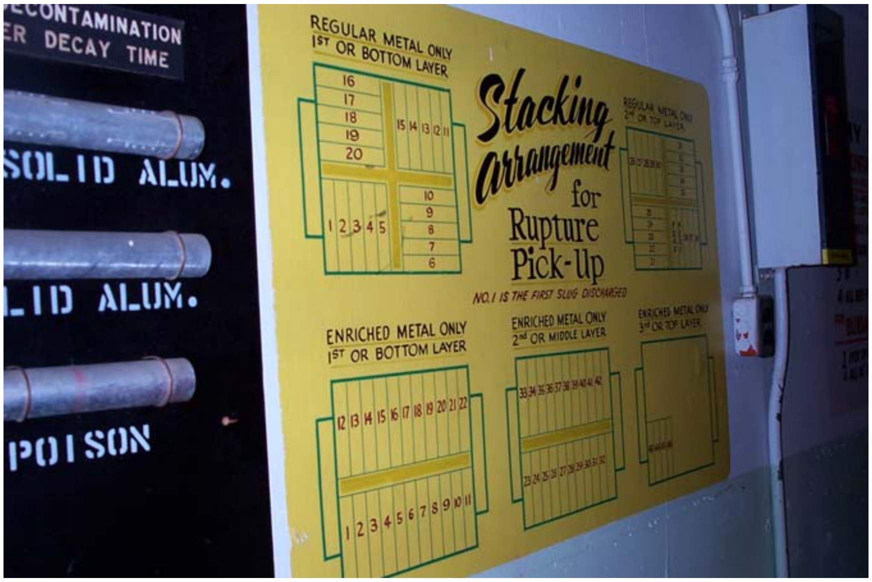
- Located in the 105-KW Reactor fuel storage basin area, the Howe scale was constructed of steel with a glass-covered round dial.

Purpose

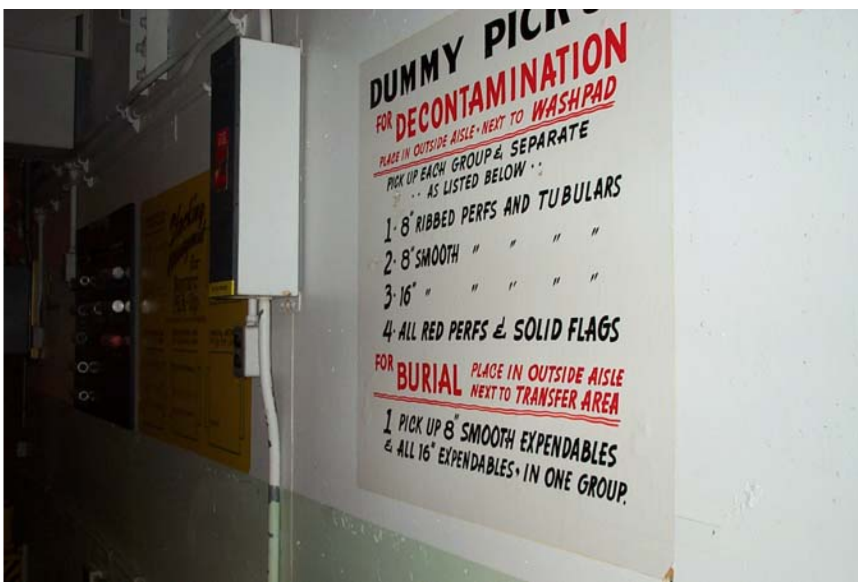
- The Howe scale was used to weigh irradiated fuel slugs after they were transferred in steel buckets from the reactor process area to the fuel storage basin where they were kept under 20 feet of water. The buckets were suspended from rods that passed through the slots in the floor and hung on trolleys attached to monorail tracks suspended from the ceiling. Each bucket of slugs was weighed by a mechanism attached to the monorail carriage and the Howe scale. The weighing of the slugs contributed to the fuel slug history and tracking of the slugs transferred out of the reactor process area. Each bucket weighed about half a ton and held a specified number of slugs. The weighing verified the number of slugs in each bucket prior to their transfer to the 200 Areas chemical separations plants and, thereby, ensured the number of slugs in the bucket did not exceed the number that could cause a spontaneous reaction.

Two Signs on South Wall of Discharge Chute Area (105-KW-2a & b)

"Stacking Arrangement for Rupture Pick-Up" (105-KW-2a)



"Dummy Pick-Up" (105-KW-2b)



Physical Description

- Date – circa 1955; Manufacturer – unknown; Size – "Stacking Arrangement for Rupture Pickup" sign approximately 3 feet 6 inches by 2 feet 6 inches; "Dummy Pick Up" sign approximately 3 feet by 3 feet.

- The signs were painted on a concrete wall in the reactor's spent-fuel discharge area.

Purpose

- Each reactor building contained a spent-fuel storage basin, which served as a collection, storage, and transfer facility for the fuel elements discharged from the rear face of the reactor. When discharged, the fuel elements were sorted into storage buckets under 20 feet of water. The sign, “Stacking Arrangement for Rupture Pickup,” told workers how to remotely stack ruptured fuel elements to avoid a criticality. Ruptured elements were a problem because fission products entered the water cooling system following a rupture. When radionuclides were detected in the water cooling system, the reactor would be shut down and the cooling water diverted to a trench or crib. The sign, “Dummy Pick Up,” was divided into two sets of instructions which told workers how to retrieve dummy elements for decontamination and reuse or for burial when their useful life had been reached.

165-KW Building – Power Control Building

Constructed in 1955, the 165-KW Building housed the powerhouse, valve pit, control room, and electrical switchgear for the water supply system in the 100-KW Area.

Power Control Room Panels (165-KW-1)

Physical Description

- Date – circa 1955; Manufacturer – unknown; Size – each wing was 22 feet wide by 7 feet high.
- The power control room panels, located in the 165-KW Building, consisted of controls, dials, gauges, and switches, constructed of metal and glass and split into two wings.

Purpose

- The panels were used to monitor and distribute electrical power to operate the water supply system in the 100-KW Area. The water system included potable water and raw water for fire suppression and sanitation purposes. A duplicate system was installed for the 105-KE Area.

Wooden Cabinet for Hanging Construction Drawings (165-KW-2)

Physical Description

- Date – unknown; Manufacturer – 200 Area Fabrication Shop; Size – 4 feet high by 3 feet 6 inches wide by 3 feet deep.
- Located in the former supervisor's office of the 165-KW Building, the cabinet was one of the very few made of wood and constructed on site.

Purpose

- The wooden cabinet stored hanging construction drawings of the 100-K Area. Prior to copying site drawings on microfiche, these storage units preserved and catalogued important construction drawings. The drawings have been removed and transferred to the Columbia River Exhibition of History, Science, and Technology.

183-KE Building – Water Treatment Filter Plant

Built in 1955, the 183-KE Building was the water quality center for the entire 100-KE Area. In the building, basic operations conducted included chlorination, filtering, and chemical treatment of raw water.

Headhouse Control Panel (183-KE-1)

Physical Description

- Date – 1955; Manufacturer – unknown; Size – approximately 20 feet long by 8 feet high.
- The headhouse control panel was located in the 183-KE Building. It was constructed of metal and glass and consisted of two rows of instruments, gauges, and controls. A vintage style clock adorned the center of the control panel.

Purpose

- The headhouse control panel monitored and regulated the filtering and chemical treatment of Columbia River water flowing through the treatment plant and eventually into the 105-KE reactor. Operations included monitoring the water quality of the entire headhouse (raw water) process and the chlorination of raw water for 100-K Area facilities. When the 105-KE reactor was in operation, the control panel monitored the injection of inhibitors into the water to prevent filming and reduce corrosion in the reactor process tubes.

190-KW Building – Pump House

The 190-KW Building, constructed in 1955, housed all the pumping units that pumped treated water to cool the 105-KW Reactor. The facility also pumped water to support fire and sanitation systems in the 105-KW Area.

“Hear-Here” Telephone Booth and Phone Set (190-KW-00001)

Physical Description

- Date – 1955; Manufacturer – Burgess-Manning Company; Size – 6 feet high by 2 feet 7 inches wide by 3 feet 2 inches deep.

- The “Hear-Here” telephone booth, constructed of steel with a hard plastic phone set, was located in the high bay (warehouse) of the 190-KW Building.

Purpose

- “Hear-Here” acoustic telephone booths, located in industrial shops and warehouses like 190-KW, provided a semi-sound proof area for telephone calls in loud environments at the Hanford Site. Because it is often difficult to hear a telephone ring in a shop or industrial environment, the light in the telephone booth would blink when there was an incoming telephone call.

190-KE Building – Pump House

The 190-KE Building, constructed in 1955, housed all the pumping units that pumped treated water to cool the 105-KE Reactor. The facility also pumped water to support fire and sanitation systems in the 105-KE Area.

Ventilation Control Panel (190-KE-1)

Physical Description

- Date – 1955; Manufacturer – unknown; Size – 6 feet 7 inches high by 2 feet wide by 8 inches deep.

- The ventilation control panel, located in the main warehouse/storage area of the 190-KE Building, was constructed of metal and consisted of three rows of instruments, gauges, and control buttons.

Purpose

- Building operators used the ventilation control panel to regulate ventilation equipment in the 190-KE Building.

1706 KE/KEL Building – Water Studies Test Facility/Chemistry and Waste Treatment Technology Building

Constructed in the early 1950s, the 1706-KE/KEL Building housed the equipment needed to treat water for the process tubes, water corrosion studies, water demineralization process for the 105-KE and KW reactors, and determine the effects of water treatment processes on water effluent activity.

Demineralizer Water Treatment Control Panel (1706-3)

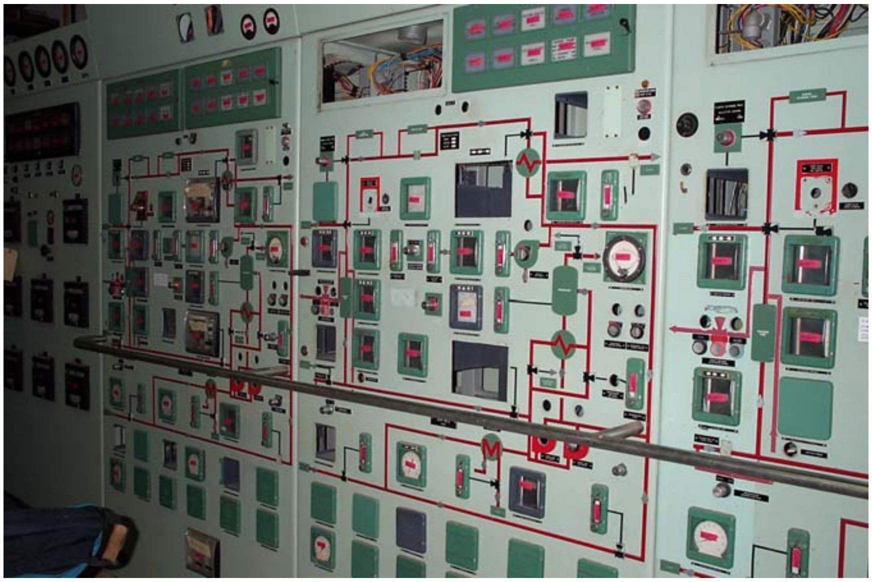
Physical Description

- Date – 1955; Manufacturer – unknown; Size – approximately 6 feet wide by 8 feet high.
- The demineralizer water treatment control panel, located in the 1706-KE/KEL Building, consisted of a schematic of the demineralization system, gauges, dials, switches and controls made of metal, plastic, and glass.

Purpose

- Building operators used the demineralizer water treatment control panel to monitor and regulate demineralization of water for experiments conducted in the 100-K Area reactors, 1706-KE/KEL Building, and in the 100-K Area fuel basins. Operators used the gauges on the panel to identify when water was sufficiently mineral free to the level needed for the experiments.

Reactor Recirculation Water Laboratory Control Room Panels (1706-6)



Physical Description

- Date – 1955; Manufacturer – unknown; Size – approximately 60 feet wide by 15 feet high.
- The reactor recirculation water laboratory control room panels, located in the 1706 Building control room, consisted of dials, gauges, switches, and controls on a schematic at their respective control points. The panels were metal, the gauges glass and metal, and the switches and controls plastic and metal.

Purpose

- Building operators used the control room panels to monitor water corrosion levels and regulate the supplies of treated water to the 105-KE Reactor process tubes.

200 Areas Artifacts

PUREX Plant

202-A Building – PUREX Plant

Completed in 1956, the Plutonium-Uranium Extraction (PUREX) Plant was the fifth and last of the chemical separations plants constructed at the Hanford Site. PUREX was originally designed to reprocess aluminum-clad uranium fuel through the solvent extraction (tributyl phosphate) process and to separate and recover uranium, plutonium, and neptunium from the irradiated nuclear fuel produced by Hanford's single-pass reactors. The plant operated until 1988 with a "temporary" shutdown from 1972-1983. The deactivation of the plant was completed by 1997.

After the startup of N Reactor, PUREX was modified to reprocess zirconium alloy clad fuel elements from the 100-N Area. Other functions conducted in the plant included the recovery and reuse of nitric acid and organic solvents and recycling of waste streams. At its peak, PUREX was the only processing plant in the United States capable of producing fission product concentrates.

PUREX Central Control Room (CP0012)

Physical Description

- Date – 1955; Manufacturer – General Electric Company; Size – 63 feet long by 26 feet wide.

- Centrally located to PUREX processing operations, the PUREX central control room was on the first floor of the service section adjacent to the main lobby and the Aqueous Makeup

Unit. The PUREX central control room contained 17 graphic panels with schematics of the chemical separations process streams illustrated on each panel. The primary panels were situated along three walls, while the secondary panels were located on the fourth wall. The panels were made of metal, the gauges of glass and metal.

Purpose

- It was from the PUREX central control room that operators monitored and regulated the PUREX plant's solvent extraction and diverse chemical process operations.

221-U Building – U Plant

U Plant was one of the three chemical separations plants constructed in 1944 during the Manhattan Project at the Hanford Site, but U Plant never operated as a facility for separating plutonium. Instead it was used for training, decontamination, repairs, and later modified for the recovery of uranium. U Plant, like the other chemical separations buildings, had two separate areas: the galleries and the process sections called "canyons" because of their canyon like appearance. The galleries consisted of electrical equipment, pipe, and operational floors. To protect personnel on these floors from radiological contamination, the galleries were separated from the process areas by 7-foot thick, reinforced concrete walls. The process areas consisted of an open deck or floor with huge, below ground, concrete cells where plutonium was to be extracted and purified from fuel elements irradiated in 100 Area reactors.

Electrical Panel (CP0003)

Physical Description

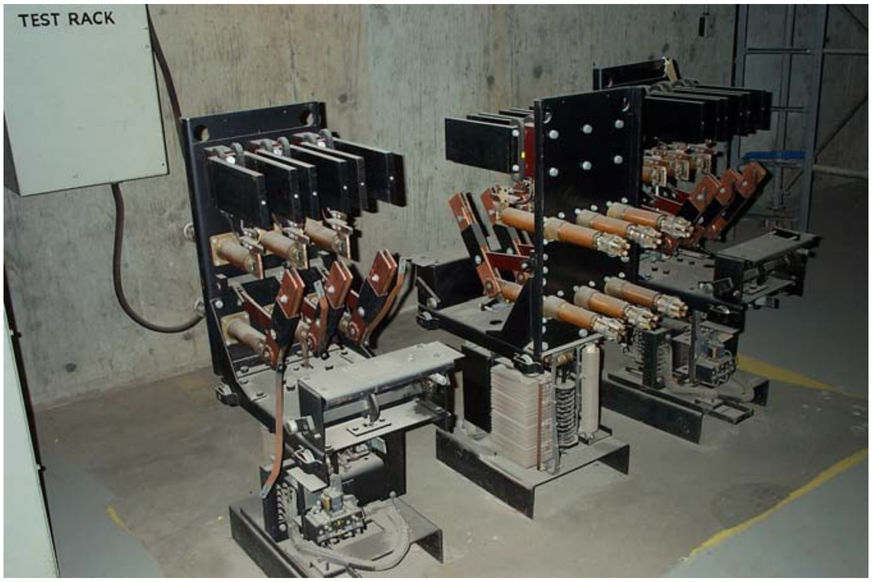
- Date – unknown; Manufacturer – General Electric Company; Size – 7 feet 9 inches high by 7 feet 6 inches wide by 1 foot 8 inches deep.

- The metal electrical panel was located in U Plant's electrical gallery.

Purpose

- Electrical gallery operators used the panel to regulate the transmittal of power to cell operations and other electrical needs in the chemical separations process area.

480 Breaker Unit (CP0002)



Physical Description

- Date – 1944; Manufacturer – E. I. Du Pont de Nemours and Company; Size – approximately 3 feet high by 4 feet 6 inches wide.

- The breaker units, located in the electrical gallery, were made of metal.

Purpose

- Electrical gallery operators used the breaker units for the transmittal of power to cell operations and other electrical needs in the chemical separations process area. The breaker units served the same purpose as a modern circuit breaker—to stop the flow of electricity if an overload or emergency condition caused a spike or disruption in the power supply. The size of the breakers is indicative of the power levels required to operate the separations process.

Process Control Board (CP0007)

Physical Description

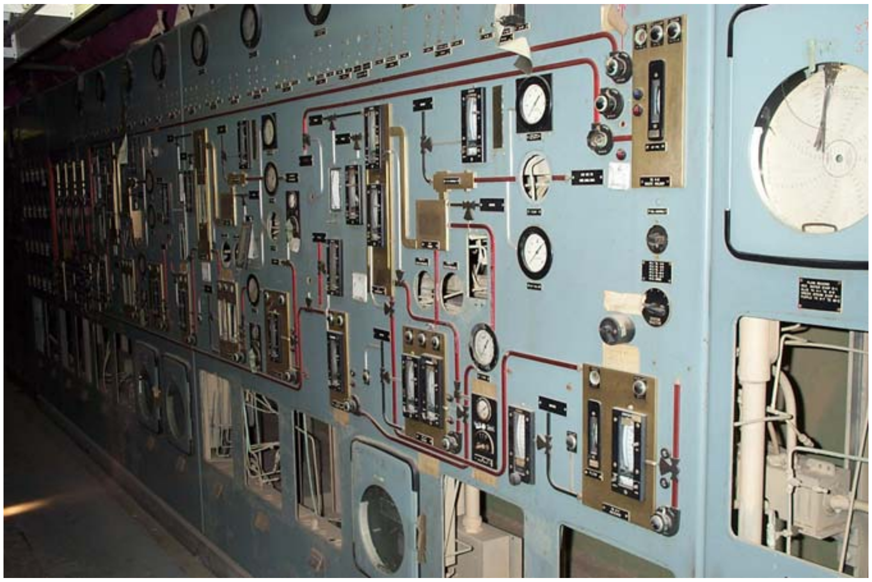
- Date – 1944; Manufacturer – E. I. Du Pont de Nemours and Company; Size – 7 feet 9 inches high by 7 feet 6 inches wide by 1 foot 6 inches deep.

- The process control board, made of metal with gauges of glass and plastic, was located in what was called Section 9 of the Operating Gallery at U Plant.

Purpose

- U Plant operators used the wheels on the process control board to regulate the flow of chemicals used in one of the reprocessing steps to recover uranium and other byproducts from the waste stream diverted to underground tanks located in the process area.

Process Control Board (CP0004)



Physical Description

- Date – 1944; Manufacturer – E. I. Du Pont de Nemours and Company; Size – 33 feet wide by 7 feet 9 inches high.

- The process control board, made of metal with glass and metal gauges and plastic switch buttons, was located in what was called Section 9 of the Operating Gallery at U Plant.

Purpose

- U Plant operators used the process control board to regulate the reprocessing steps for uranium and other byproducts that were recovered from underground tanks located in the process area.

222-S Building – Control Laboratory

The 222-S Building was a multi-purpose facility constructed in 1952 and originally designed to house research facilities for process control of the Reduction-Oxidation (REDOX) Plant. The 222-S Building was a non-reactor nuclear facility with laboratory space for general support, waste handling, and administrative activities. Because chemists tested process solution samples in the building, it was one of the primary waste generators in the 200 West Area.

Fume Hood #2 (222-S-8)

Physical Description

- Date – circa 1944; Manufacturer – unknown; Size – approximately 7 feet high by 3 feet wide.

- Located in Room 2 of the 222-S Building, the fume hood #2 was labeled with tags HEW-USA 401-393 and ERDA FA-02158, which means the fume hood dated from the Hanford Engineer Works/Manhattan Project era and was re-tagged between 1975-1977 during the time the Energy Research and Development Agency was in charge of the Hanford Site. Because REDOX did not come on line until January 1952, this fume hood must have been taken from either B Plant or T Plant—the only separations plants operating in the time period the fume hood was manufactured.

Purpose

- Most exhaust air was drawn into a processing area and exhausted through fume hoods to a high efficiency particulate air (HEPA) filter. Hot cells were also exhausted to HEPA filters but not through the fume hoods. One of 137 fume hoods in the facility, this fume hood was the exhaust vent for low-level radiological experiments. The hood had a HEPA filter and stack.

Glass Cabinet (222-S-7)

Physical Description

- Date – early 1950s; Manufacturer – unknown; Size – approximately 7 feet high by 3 feet wide.

- Located in Room 4P on the first floor of the 222-S Building, the cabinet was made of glass and wood with metal handles.

Purpose

- The glass cabinet stored equipment and supplies needed for the research of radioactive and toxic materials conducted in 222-S Building.

224-B Building – Concentration Facility

The 224-B Building (Concentration Facility or Bulk Reduction Building) was one of three buildings where plutonium was concentrated as part of the chemical separations process. The liquid was transferred in 330-gallon batches from the 200 Area chemical processing plants via an underground pipe to a receiver tank in the 224-B Building. The liquid was removed by centrifugation (a product precipitation). The solid plutonium lanthanum oxide was then dissolved in nitric acid, making plutonium nitrate. By this time, each original 330-gallon batch of plutonium-bearing solution that had entered the 224 buildings was concentrated down to 8 gallons.

Main Process Control Board (CP0016)

Physical Description

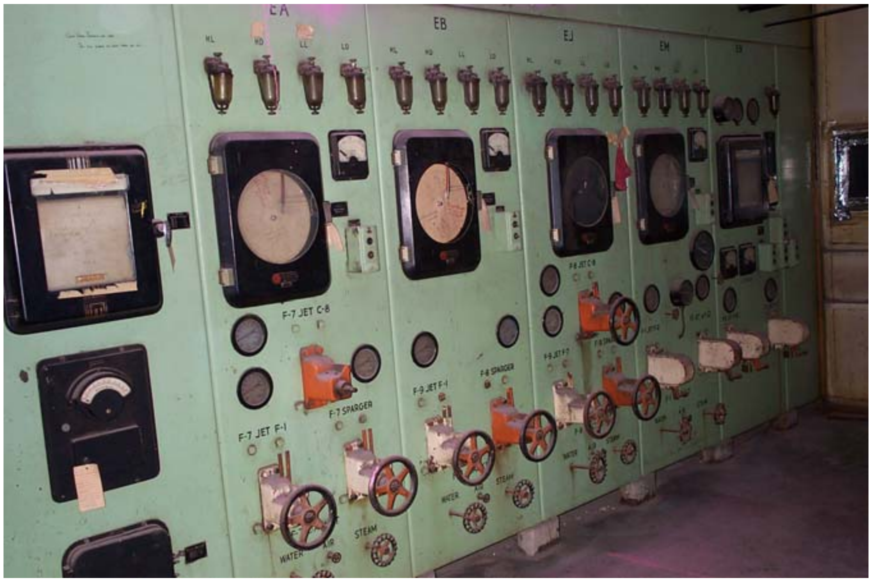
- Date – unknown; Manufacturer – General Electric Company; Size – 43 feet long by 7 feet 10 inches high.

- The main process control board, located on the third floor in the 224-B Building, had metal panels with glass and metal gauges and metal control wheels.

Purpose

- Each of the two concentration facilities/bulk reduction buildings (224-B and 224-T) on the Hanford Site had main process control boards to monitor and regulate each of the concentration steps conducted in the buildings with air flow meters. The tulip shaped meters at the top of the panel controlled the air flow for the process tank dip leg sparges.

F-Cell Loadout Process Control Board (CP0014)



Physical Description

- Date – unknown; Manufacturer – General Electric Company; Size – 20 feet long by 7 feet 6 inches high.

- The F-Cell loadout process control board, located on the west end of the second floor of the 224-B Building, was almost identical to the main process control board with metal panels, glass and metal gauges, and metal control wheels.

Purpose

- Each of the two concentration facilities/bulk reduction buildings (224-B and 224-T) on the Hanford Site had control boards to monitor and regulate the "loadout" process steps conducted in F Cell. When the plutonium nitrate was purified and the volume reduced, it was ready for "loadout." Loadout referred to the transfer by truck of concentrated plutonium nitrate, initially to the 231-Z Building for further concentration and shipment to a weapons plant to be converted to weapons parts. After the Plutonium Finishing Plant was constructed, the nitrate was converted into buttons or oxide at the Hanford Site.

Spray Pump for Centrifuges D and E (CP0017)

Physical Description

- Date – unknown; Manufacturer – General Electric Company; Size – 7 feet 6 inches long by 5 feet 4 inches high by 2 feet 9 inches deep.

- Spray pumps for centrifuges D and E were located in each of the two bulk reduction buildings (224-T and 224-B). In the 224-B Building, the pumps were located on the third floor adjacent to the main process control board.

Purpose

- The pumps injected a precipitation mixture into the centrifuge. The precipitation mixture solidified the targeted material, suspending it in the liquid. The centrifuge was a vessel with a bowl that held approximately 100 gallons of liquid and was mounted on a vertical shaft. When an electric motor spun the bowl, the centrifugal force caused the semi-solids or "cake" that had been precipitated out of the liquid to stick to the side of the bowl. The precipitation process used to extract plutonium from uranium and other fission products reduced the gamma and beta radiation levels in the product.

234-5Z/234-5ZA Building – Plutonium Finishing Plant

During the early Cold War expansion of the Hanford Site, one of the primary objectives was to build a plutonium conversion and fabrication facility at the Hanford Site and, thereby, have all phases of plutonium production on site. Completed in 1949, the building was called the Plutonium Finishing Plant (PFP), 234-5Z/234-5ZA, or Z Plant. In PFP, operators converted plutonium nitrate into metallic plutonium buttons and then into weapons components. PFP was also where plutonium solutions were purified for further processing and plutonium was packed for storage and shipment.

PFP consisted of the Remote Mechanical A Line (RMA), Remote Mechanical B Line (RMB, which became obsolete prior to operation), and the Remote Mechanical C (RMC) Line. Prior to the remote mechanical lines, a rubber glove line was used. The operators manually manipulated the plutonium via ports containing rubber gloves. The RMA and RMC lines played a primary role in carrying out the plutonium conversion and fabrication functions of the plant. The RMC Line, which commenced operations in 1960, was the third remote mechanical line installed at Z Plant after the RMA and RMB lines. By 1963-1964, the RMC Line was conducting the bulk of the plutonium processing at Z Plant. The RMC Line also played a significant role in plutonium recycling and recovery processes as well as the production of non-military oxide blends.

RMA Line Control Room Desk (234-5Z-1798-4)

Physical Description

- Date – circa 1950; Manufacturer – unknown; Size – 24 inches long by 17 inches wide.

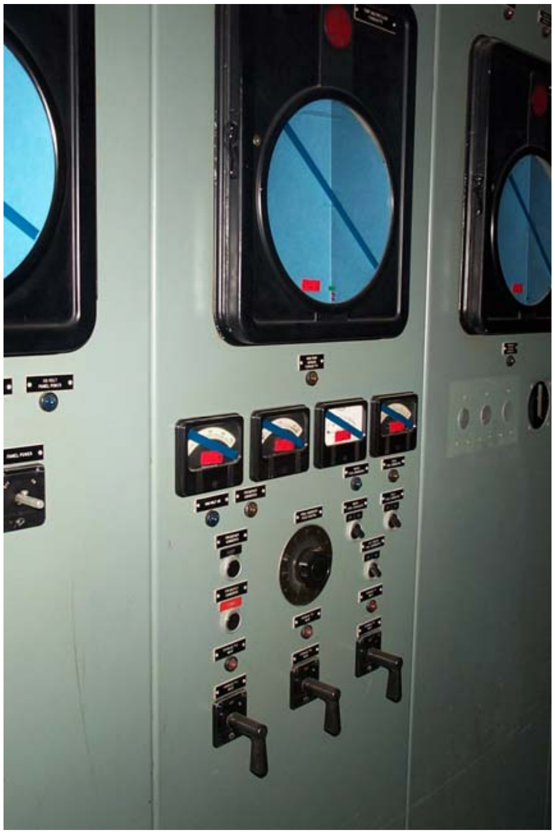
- The RMA Line control room desk was similar to other control room desks on the RMA Line, consisting of mechanical control knobs and a glass and metal gauge.

Purpose and Significance

- From a RMA Line control room desk, operators monitored and regulated the plutonium finishing operations on the RMA Line. The finishing operations converted plutonium nitrate into metal oxide and fabricated plutonium buttons.

- The RMA Line control room desk replaced the manually operated Rubber Glove Line in 1952. The RMA Line desk was representative of the earliest technology in remote mechanized final plutonium processing.

RMA Line Control Room Panel (234-5Z-1798-4)



Physical Description

- Date – circa 1950; Manufacturer – General Electric Company; Size – approximately 80 inches high by 24 inches wide.
- The RMA Line control room panel was similar to other control room panels on the RMA Line with its glass and metal gauges; plastic buttons, dial, and control handles.

Purpose

- RMA Line Control Room operators used the panel to monitor and regulate the line's furnaces and pumps needed to produce the plutonium buttons.

Glove Box Blower (PFP-2002-5)

Physical Description

- Date – circa 1950; Manufacturer – unknown; Size – approximately 2 feet high by 2 feet wide by 3 feet deep.

- Located on the third floor of the 234-5Z Building in Room 320, the glove box blower was a clear box with two ports surrounded by metal rings. The electric blower motor was inside the box, and a metal pipe supplied liquid helium to the box.

Purpose

- The glove box blower serviced the RMA Line. The RMA Line operators used the glove box blower to force feed dry helium to the fabrication portion of each line.

RMC Line Control Room Desk for Button/Crucible Separation (234-5Z-1798-3)

Physical Description

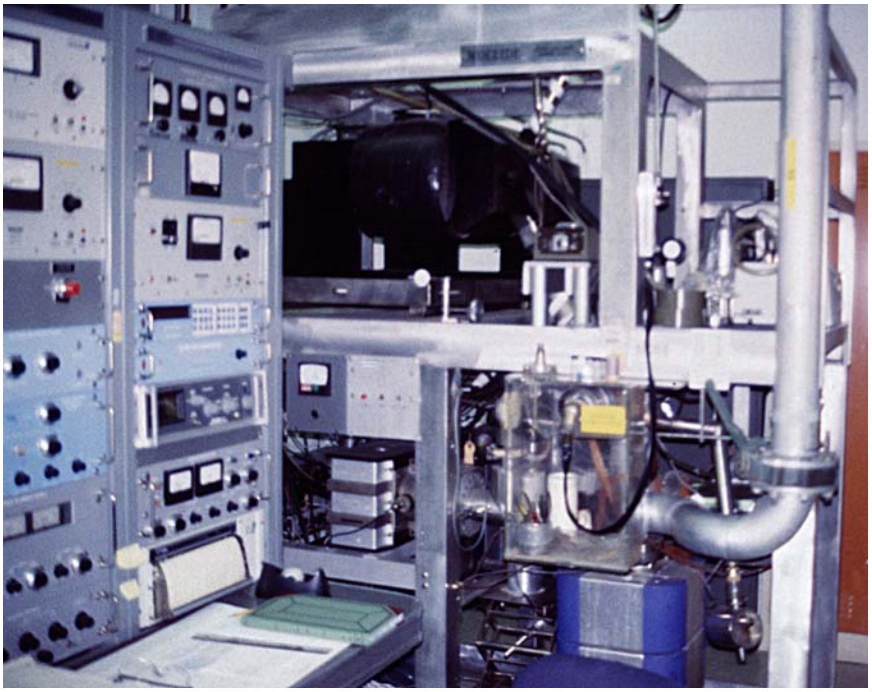
- Date – circa 1950; Manufacturer – General Electric Company; Size – approximately 2 feet wide by 1 foot 6 inches deep by 3 feet high.

- The RMC Line control room desk was similar to other control room desks on the RMC Line, consisting of mechanical control knobs. The control room desk operators were protected from the radioactive process line by a glass enclosed, 1-foot thick wall of water.

Purpose

- Using an assembly-line approach, the operators used the desk's mechanical controls to monitor and guide the steps involved in the metal fabrication process.

Mass Spectrometer (234-5Z-1798-5)



Physical Description

- Date – circa 1950; Manufacturer – unknown; Size – 7 feet high by 4 feet wide by 2 feet deep.

- The mass spectrometer was located in Room 132 of the Analytical Laboratory in the 234-5Z Building. The spectrometer consisted of instruments in the clear container in the center of the photo and the instrument panel on the left side of the photo.

Purpose

- The mass spectrometer was used to determine the mass fractions of plutonium. In the Analytical Laboratory, also known as the sample laboratory or the process control laboratory, researchers analyzed the samples of plutonium products during the various stages of the plutonium finishing process to ensure the materials were within specifications.

236-Z Building – Plutonium Reclamation Facility

At the time of its construction in 1963-1964, the 236-Z Building housed the only plutonium recovery facility of this type in the United States. The facility used a continuous solvent extraction process to convert plutonium-bearing scrap materials into a concentrated plutonium nitrate product suitable for feed back into the RMA and RMC lines in the 234-5Z Building.

Control Room Panels (PRF-2)

Physical Description

- Date – 1963-1964; Manufacturer – General Electric Company; Size – unknown.
- Located on the fourth floor of the 236-Z Building, the control room panels were constructed of steel and consisted of glass and metal gauges attached to measuring instruments and control buttons.

Purpose

- The operators and scientists used the control room panels to monitor and regulate the plutonium recovery process, in particular, the continuous solvent extraction process to produce concentrated plutonium nitrate.

2736-Z Building – Primary Plutonium Storage Facility

After the Hanford Site was chosen to participate in the International Atomic Energy Agency's (IAEA) international safeguards program, the 2736-Z Primary Plutonium Storage Facility was constructed in 1970-1971 for storage and safekeeping of plutonium products and scrap. The principal feature of the 2736-Z Building was its four main rooms or vaults for interim storage of plutonium scrap from Atomic Energy Commission facilities across the nation and for finished plutonium buttons.

Storage Vaults and Contents (2736-Z-1)

Photo unavailable

Physical Description

- Date – unknown; Manufacturer – unknown; Size – each vault measures approximately 28 feet by 28 feet; each cubicle was 1 foot by 2 feet by 8 feet high.

- A storage vault had 68 cubicles with reinforced concrete shielded ceiling, floor, and walls. Each cubicle had pedestal storage rings.

Purpose and Significance

- The vaults stored plutonium oxides and metals and denote the growing awareness and concern with security, storage safeguards, and environmental issues at the Hanford Site and in the national defense complex in the late 1960s and early 1970s.

2736-ZB Building – Primary Plutonium Storage Support Facility

The 2736-ZB Building was constructed in 1980-1981 to provide space for examining, repackaging, measuring, sampling, and storing plutonium-bearing materials prior to their transfer to 2736-Z, 234-5Z, or off site.

Dry Air Glove Box (Not tagged due to contamination)

Photo unavailable

Physical Description

- Date – circa 1980; Manufacturer – unknown; Size – unknown.
- The dry air glove box, constructed of glass and steel components, was located in Room 636 in the 2736-ZB Building.

Purpose

- The operators, outfitted with protective rubber gloves, handled the radioactive plutonium through round ports in the dry air glove box. The glove box provided operators a protected environment to repackage and handle radioactive materials, minimizing their exposure to hazardous substances.

271-U Building – Office and Service Building

The 271-U Building was constructed in 1944. The 271 buildings were attached to the back wall of the 221 chemical separations process buildings they respectively served. The function of the 271 buildings was to receive, store, mix, and deliver the chemicals used in the processing operations and to supply compressed air to the 211, 221, 222, 224, 271, and 291 buildings. The 271 buildings contained large storage rooms, a compressor room, a large chemical preparation room encompassing nearly the entire third floor, a smaller chemical control laboratory to sample the fresh chemical mixtures before they were used in the process plants, heater rooms, a communications signal and control room, locker and rest rooms, shower room, doctor's office, medical laboratory, and two labyrinth access-ways to the 221 buildings.

Exhaust Sand Filter Model (CP0001)

Physical Description

- Date – unknown; Manufacturer – unknown; Size – 11 feet high by 22 inches wide by 22 inches deep.

- The exhaust sand filter model was an enclosed metal and glass rectangle tower located in the basement of the 271-U Building. The model consisted of the same columns of graded earth, arranged in layers from coarse pebbles to fine grades of sand, as that used in the 291-T sand filter installed in 1948.

Purpose

- The exhaust sand filter model was used for training and research purposes. After World War II, sand filters were installed in the chemical separations plants as one of three exhaust filtration systems to dilute exhaust airborne contaminates to tolerance levels. The sand filters removed the majority of radioactive and chemical contaminates from the process and vessel exhaust systems. When the exhaust entered the sand filter, it first went through coarse pebbles and exited through fine grades of sand.

277-W Building – Fabrication Shop

Constructed during the Korean War era expansion of the Hanford Site in 1950-1951, the Fabrication Shop supported REDOX and U Plant's metal recovery process and conducted significant general service work for other 200-West Area facilities. A variety of craft facilities were housed in the 277-W Building, including the sheet metal, pipe fitter, electrical, paint, and millwright shops. Craft workers in the 277-W Shop fabricated tools, maintained and repaired equipment, and had a non-radioactive environment for mockup evaluations.

Toledo Scale (277-8)

Physical Description

- Date – 1943-1945; Manufacturer – Toledo Corporation; Size – scale stands approximately 6 to 7 feet high; scale platform approximately 3 feet long by 2 feet wide.

- Located in the high bay area of the fabrication shop, the Toledo scale was constructed of steel with a glass-covered dial. The Toledo scale was labeled with a Hanford Engineer Works (HEW) tag #428287 and a radiation release sticker, dated June 2, 1962.

Purpose

- Craft workers used the Toledo scale to weigh shop equipment and strategic Hanford mission items fabricated in the shop including evaporators, tube bundles, ion exchange columns, tanks, and burial containers.

300 Area Artifacts

Plutonium Recycle Test Reactor

306-W Building – Materials Development Laboratory

Built in 1956 as the Fuel Fabrication Pilot Plant (later named the Materials Development Laboratory), the 306-W Building was designed to support the development of fuel elements for reactors. The facility supported fuel manufacturing operations in the 313 and 314 buildings and process improvements in single-pass reactor fuel manufacturing. In the 306-W Building, pilot-phase fabrication processes were developed and demonstrated for full-scale production, and new materials concepts were refined and tested. The facility had a complete machine shop that provided services in support of development programs, fuel blending, tool and die work, development and application of machining processes, and fabrication of specialized equipment. The 306-W Building housed a metallurgical research and development laboratory and pilot plant equipment.

Loewy Press Control Panel and Enclosure (306-W-8)

Physical Description

- Date – circa 1954; Manufacturer – Loewy Hydropress, Inc.; Size – 6 feet 6 inches high by 5 feet 3 inches wide by 4 feet deep.

- The Loewy press control panel, located in the main shop area, consisted of glass and metal gauges attached to monitoring instruments and control buttons. The press was surrounded on three sides by a glass and metal enclosure to protect the operator and the panel from press operations.

Purpose

- Operators used the control panel to monitor and direct the feeding of uranium billets into the 1250-ton Loewy extrusion press where the billets were converted into rods for the fuel elements. The heat and pressure of the extrusion process facilitated the formation of a metallic bond between the fuel element cladding and the uranium rod.

Swage Machine (306-W-10)

Physical Description

- Date – circa 1954; Manufacturer – unknown; Size – approximately 10 feet long by 2 feet wide.

- The swage machine, located in the main shop, was made of steel and other metals.

Purpose

- Operators used the swage machine to lengthen fuel elements and uranium billets as well as to bond two different materials together. The machine supported the building's pilot development programs, tool and die work, machining processes, and fabrication of specialized equipment.

308 Building – Plutonium Fabrication Pilot Plant
(Fuels Development Laboratory)

Completed in 1960, the 308 Building and its facilities and equipment played an important role in non-defense nuclear technology and nuclear fuels development. A significant portion of the United States effort to develop alternative, mixed, and breeder nuclear fuels for commercial power took place in the 308 Building. The facility was the setting for the testing and development of standards for Fast Flux Test Facility fuel components, fuel pins, assemblies, and fabrication of plutonium oxide pellets.

Glove Box (308-2)

Physical Description

- Date – circa 1960; Manufacturer – unknown; Size – 22-1/2 feet long by 9-1/2 feet high by 4-1/2 feet deep.

- Located in Room 112 of the 308 Building, the metal fuel pin loading glove box was constructed of glass and steel.

Purpose

- Glove boxes in the 308 Building were used to demonstrate the effectiveness of plutonium oxide and mixed oxide fuels containing blends of plutonium, uranium, and other metals. The nitrogen-controlled glove box allowed operators to work with metals, oxides, and ceramics. Metal fuel pins were loaded through the transfer chambers (at either end of the glove box) for the operators to insert into the open end of zirconium metal fuel rods.

Fuel Pin X-Ray Machine (308-1)

Physical Description

- Date – circa 1960; Manufacturer – unknown; Size – 8 feet high by 32 inches wide by 32 inches deep.

- The fuel pin x-ray machine, located in Room 105 in the 308 Building, was mostly metal.

Purpose

- The x-ray machine was used to determine if fuel pin components were in the proper place. X-rays were taken of the 8-foot long fuel rods to look for pellet gaps inside the pins.

Hopper Control Board (308-3)

Physical Description

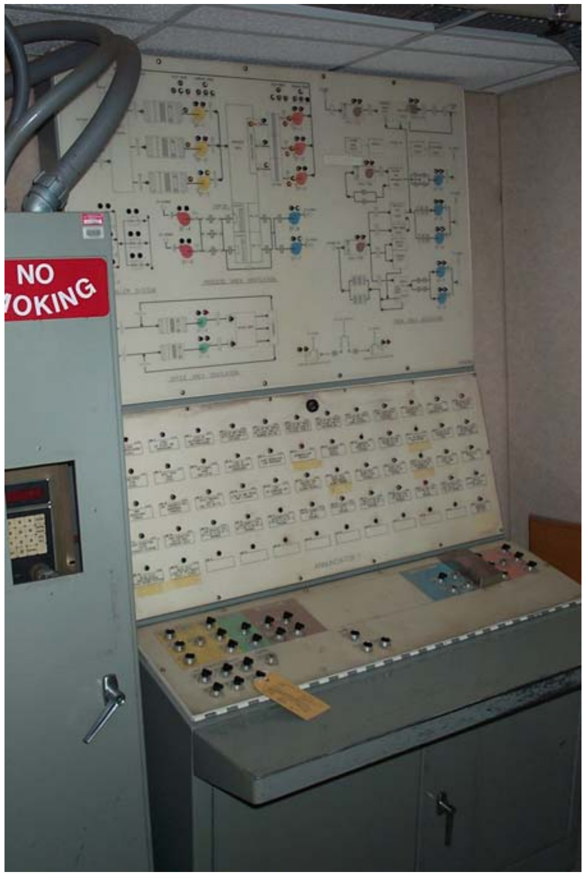
- Date – circa 1960; Manufacturer – unknown; Size – approximately 2 feet wide by 6 feet high.

- Located in Room 126 in the 308 Building, the Hopper control board was adjacent to the pneumatic blending or Hopper station shown behind the glass window. The control board was made of metal with plastic control switches.

Purpose

- The control board monitored and regulated valves and regulated airflow mechanisms inside the pneumatic blending or Hopper station. Scientists used the Hopper station to test experimental oxide fuels for the Fuels and Materials Examination Facility (427 Building) in the 400 Area.

Control Room Panel/Annunciator Board (308-4)



Physical Description

- Date – circa 1960; Manufacturer – unknown; Size – approximately 3 feet wide by 8 feet high.

- The control room panel/annunciator board was located in the Power Operator's control room, Room 204 of the 308 Building. The panel consisted of a flow diagram, indicators, and control knobs.

Purpose

- Operators used the control room panel/annunciator board to monitor the building's exhaust and supply fans, electrical and alarm systems, verification controls, and glove boxes.

309 Building – Plutonium Recycle Test Reactor

Completed in 1960, the 309 Building with its Plutonium Recycle Test Reactor was the operating test reactor facility for the Hanford Plutonium Fuels Utilization Program. The program's purpose was to research methods to stretch and diversify the uranium fuel supply for commercial nuclear reactors by creating oxide fuel blends. This made the 309 Building the setting for pioneer research in non-defense nuclear technology and the nuclear fuel diversification program. The Plutonium Recycle Critical Facility, which operated in the 309 Building and housed the test reactor during the 1970s, assisted in the design of light-water cooled reactors. The building was also the setting for SP-100 or "Star Wars" research during the 1980s.

Personnel Air Lock (309-2)

Physical Description

- Date – 1958; Manufacturer – Henry Pratt Company, Chicago, Illinois; Size – Air lock was 9 feet high by 16 feet long by 8 feet 10 inches wide. The two doors were 6 inches thick.

- The personnel air lock was located at the entrance to the reactor containment dome and made mostly of metal.

Purpose

- The personnel air lock provided access to and from the reactor containment dome. The purpose of the air lock was to isolate airflow between the reactor containment dome and outside work areas and offices. The air lock maintained negative pressure in the dome in case of contaminated air release. The release would remain contained in the dome and exit through HEPA filtered vents.

Interim Examination and Maintenance Cell Manipulators (309-4)

Physical Description

- Date – circa 1960; Manufacturer – unknown; Size – approximately 10 feet high.

- The interim examination and maintenance (IEM) cell manipulators were located outside the cell at the level (5033 level) beneath the ground floor of the Plutonium Recycle Test Reactor.

Purpose

- The IEM cell manipulators remotely handled contaminated items in the cell. The cell was a training facility/mockup for the IEM cell in the Fast Flux Test Facility in the 400 Area.

314 Building – Metallurgical Engineering Laboratory

Completed in 1944, the 314 Building was directly associated with the fuel manufacturing process at the Hanford Site through its extrusion press technology. Beginning in 1945, operators, using the building's 1000-ton extrusion press, fabricated fuel rods into cores for the fuel elements used in the site's single-pass reactors. Along with the 313 Building, the facility was the setting for all the steps in the fuel manufacturing process for single-pass reactors until 1971. After 1971, the building was modified and used for a variety of research projects and craft services.

Baldwin-Tate-Emery Universal Testing Machine (314-7)

Physical Description

- Date – unknown; Manufacturer – Baldwin-Lima-Hamilton Corporation; Size – 6 feet 4 inches high by 5 feet wide by 2 feet 9 inches deep.

- Located in the shop repair area of the 314 Building, the Baldwin-Tate-Emery universal testing machine consisted of a metal hydraulic press with loading, weighing, and indicator systems.

Purpose

- The Baldwin-Tate-Emery universal testing machine was associated with the mission change in the 314 Building. In the 1970s, the 314 Building was modified for a variety of research projects and craft services, including pressure heat studies on reactor tubing, testing for corrosion and stress cracking in reactors and double-shell tanks, design of fuel loading equipment for N Reactor, and miscellaneous equipment mockups that required the use of the Universal Testing machine. The testing machine combined electronic weighing and control systems with the power of hydraulic load frames.

324 Building – Chemical Engineering Laboratory

The 324 Building was constructed in the mid-1960s as a radiochemistry laboratory designed to support the Plutonium Recycle Test Reactor (PRTR) operations by conducting chemical reprocessing and metallurgical examination of PRTR's fuel elements. The 324 Building was a chemical materials engineering laboratory that contained eight hot cells, three of which were located in the building's Special Materials Facility.

Mockup Cell and Manipulator (324-4)

Physical Description

- Date – circa 1965; Manufacturer – unknown; Size – the mockup cell was 7 feet deep by 10 feet wide by 16 feet high. The manipulator was 10 feet high.

- The mockup cell and manipulator were located in Room 139 in the Special Materials Facility of the 324 Building.

Purpose

- Remote control manipulator arms were used to examine radioactive materials in the hot cells. The manipulator and mockup cell provided "hands on" use for staff and the visiting public to gain familiarity with the manipulator in an area of the building that did not require "suiting up" or possible exposure to a radioactive environment.

Transfer Pass-Through Mechanism (324-3)

Physical Description

- Date – circa 1965; Manufacturer – unknown; Size – 5 feet 9 inches long by 1 foot 2 inches wide by 10 inches high.

- The transfer pass-through mechanism was located in Room 139 of the Special Materials Facility in the 324 Building.

Purpose

- Transfer pass-through mechanisms or trays were used to transfer materials to and from hot cells. This specific tray was used to pass smears in and out of cells in the Special Materials Facility to support the Cesium Encapsulation Program.

325 Building – Radiochemistry Laboratory

Completed in 1953 as the Applied Chemistry Laboratory, the 325 Building played an important role as the laboratory site for pioneering technologies in chemical separations, waste verification, and other radiochemistry projects involving hazardous materials. The 325 Building was designed to provide production support and process improvements for the REDOX plant, improvements in the uranium metal recovery process at PUREX, and studies of separation waste treatment aimed at techniques to reduce high-level waste to lower activity levels. Finally, the facility assisted in research of the vitrification process and commercial nuclear waste repository at the Hanford Site.

Equipment Storage Shelves (325-6)

Physical Description

- Date – 1950s-1980s; Manufacturer – unknown; Size – 7 feet high by 4 feet wide by 1 foot 4 inches deep.
- Located in Room 205 (shop) of the 325 Building, the equipment storage shelves were made of metal.

Purpose

- The shelves stored indicators, generators, technique boxes, and equipment manuals associated with Radiochemistry Processing Laboratory missions.

Criticality Panel Alarm (325-12)

Physical Description

- Date – unknown; Manufacturer – unknown; Size – 1 foot 6 inches high by 1 foot wide by 7-1/2 inches deep.
- The criticality panel alarm was located in the basement of the 325 Building and was made of metal with plastic buttons.

Purpose

- The criticality panel signaled an alarm if fissionable material stored in the 325 Building went “critical.”

333 Building – Fuel Cladding Facility

Completed in 1961, the 333 Building Fuel Cladding Facility was the manufacturing center for fuel elements irradiated at N Reactor. N Reactor fuel fabrication was an unprecedented process in which the zirconium alloy exterior was co-extruded or pressed together with the uranium interior. The co-extrusion process provided a more complete bonding resulting in a fuel element superior to previous elements, which were subject to bubbles and other flaws between the bonding layers. The 333 Building was the third and last of the fuel fabrication structures built at the Hanford Site after the 313 and 314 buildings. The new methods of waste acid treatment introduced in the 333 Building were significant in the Hanford Site theme of increasing environmental awareness and protection.

Billet Preheat Furnace/Oven (333-2)

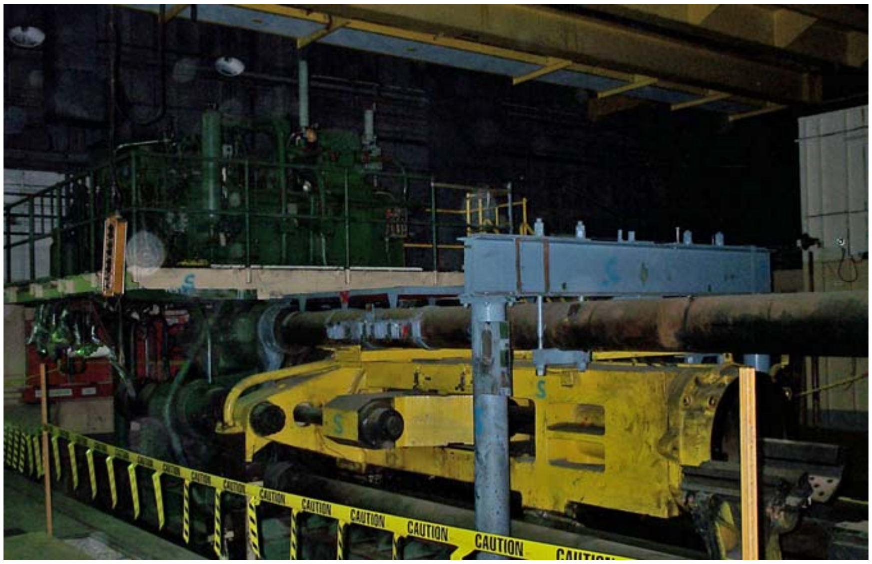
Physical Description

- Date – circa 1960; Manufacturer – unknown; Size – weighed 250 to 350 pounds each.
- The billet preheat furnace/oven was cylindrical and constructed of metal.

Purpose

- The billet preheat furnaces or ovens were an essential part of the manufacturing process of fuel elements for N Reactor. Assembling and preheating the billets prepared the billets for the co-extrusion process. Initially, the uranium billets were manufactured offsite and assembled in the 333 Building. The billets were lubricated and placed in the round, preheated furnaces. In the furnaces, billet assemblies were exposed to extremely hot temperatures that allowed for expansion of the metals. Once heated, the billets were removed from the furnace, fed into the extrusion press, and pressed through a mold where they were formed into rods.

Loewy 2700-Ton Extrusion Press (Not tagged due to contamination)



Physical Description

- Date – circa 1960; Manufacturer – Loewy Hydropress, Inc.; Size – unknown.

- The Loewy 2700-ton extrusion press, constructed of steel and other metals, was located in the fuel fabrication process area (ground floor) of the 333 Building.

Purpose

- Assembled, preheated uranium billets were fed into the Loewy 2700-ton extrusion press and pressed through a die (mold) to form the core of the fuel elements. The heat and pressure of the co-extrusion process not only lengthened the billets but also facilitated the formation of a metallic bond between the zircaloy-2 and uranium in the fuel elements. This decreased the likelihood of bond failure or corrosion (a common fuel element problem) and increased the use of heat transfer once the fuel was in N Reactor.

340 Building – Waste Neutralization Facility

Built in 1953 as part of the Cold War expansion of Hanford operations, the 340 Building, along with the Radioactive Liquid Waste System, the 307 Basins, and the Retention Process Sewer piping system, had to deal with liquid radioactive waste generated in the 300 Area laboratories. The 340 Building received and serviced some of the highest level radioactive waste generated in the 300 Area and played an important role in the initial characterization and treatment of liquid waste from the 300 Area laboratories. The 340 Building contained sampling rooms, wells, and tanks, as well as agitators, valves, and transfer pumps, which were built to receive and sample radioactive liquid waste from 300 Area laboratories.

Main Control Panel (340-3)

Physical Description

- Date – circa 1950; Manufacturer – unknown; Size – approximately 4 feet wide by 7 feet high.

- Located in the 340 Building control room, the main control panel consisted of a schematic with warning lights connected to monitoring instruments and an angled desk with plastic control buttons. The case for the panel was steel.

Purpose

- Operators used the main control panel to monitor and regulate the electrical power needed to neutralize radioactive liquid waste generated in the 300 Area laboratories and to transfer radioactive liquid waste from the 340 Building underground tanks to tanker trucks or rail cars that transported the waste to the 200 Area.

Motor Control Center Panel (340-2)

Physical Description

- Date – circa 1950; Manufacturer – unknown; Size – approximately 6 feet wide by 8 feet high.

- The motor control center panel, located in the control room of the 340 Building, consisted of metal panels with mechanical control handles and glass and metal gauges.

Purpose

- The motor control center panel monitored the motor for the waste neutralization system and transfer of radioactive liquid waste to and from the 340 underground tanks.

3745-B Building – Positive Ion Accelerator Building

Completed in 1954 and initially operated by General Electric's Radiological Physics Group, the 3745-B Positive Ion Accelerator Building provided shielded laboratory space for routine calibration of neutron dosimeters and portable radiation measuring instruments and research and development work using Van de Graaff accelerators.

Electrostatic Tandem Van de Graaff Accelerator (3745-B-1)

Physical Description

- Date – installed in 1972; Manufacturer – Engineering Corporation, Cambridge, MA; Size – The accelerator was 17 feet long and 5 feet wide at its base. The main unit measured approximately 7 feet in length and 3 feet in diameter.

- The electrostatic 2 megavolt tandem Van de Graaff accelerator had a main accelerator unit that was a large, cylindrical, metal tank.

Purpose and Significance

- The electrostatic 2 megavolt tandem Van de Graaff accelerator was a self-contained source of high energy particles connected to a large system of vacuum pumps, beam lines, bending magnets, lenses, chambers, and electronics used to develop and calibrate neutron dosimeters for radiation protection and monitoring on the Hanford Site.

- The significance of the accelerator was as a model of the type of accelerator used in atomic physics and materials research and in cell and molecular biology studies to irradiate individual cells in the 1970s.

Van de Graaff Accelerator Control Panels and Console (3745-B-2)

Physical Description

- Date – 1972; Manufacturer – Engineering Corporation, Cambridge, MA; Size – a single panel was approximately 2 feet wide by 7 feet high.

- The Van de Graaff accelerator control panels and console consisted of five metal panels of glass and metal gauges and controls connected to monitoring instruments.

Purpose

- Building operators used the console and control panels to monitor and regulate the 2 MV tandem positive ion Van de Graaff accelerator. The console and panels had also been used to monitor an earlier positive ion Van de Graaff accelerator. The console and controls were modified extensively in response to evolving technologies as new experimental needs developed.

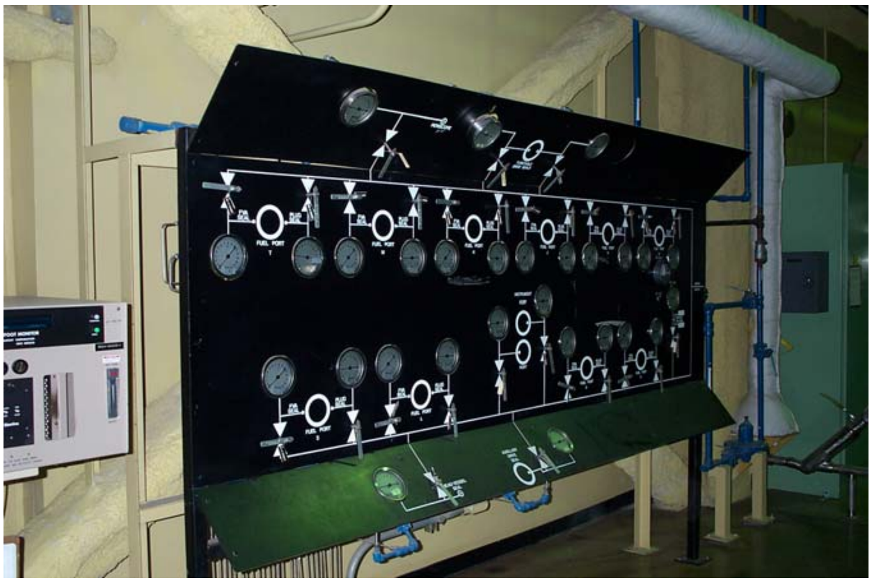
400 Area Artifacts

Fast Flux Test Control Building

403 Building – Fuel Storage Facility in Fast Flux Test Facility

The 403 Building in the Fast Flux Test Facility (FFTF) complex stored the spent fuel assemblies from FFTF. Completed in 1978, FFTF was a prototype/model for the Atomic Energy Commission's (AEC) Liquid Metal Fast Breeder Reactor program. FFTF was to be AEC's key test reactor to assist in the research dedicated to stretching the nation's uranium supply.

Heads Seals Status Panel (FFTF-15)



Physical Description

- Date – circa 1980; Manufacturer – unknown; Size – 11 feet wide by 7 feet 3 inches high by 2 feet deep.
- The heads seals status panel, located in Room 916 of the 403 Building, had a schematic of the heads seals system with gauges of glass and metal.

Purpose

- The facility's below ground cell contained a carbon steel storage vessel that stored up to 466 spent fuel assemblies. Plant operators used the heads seals status panel to monitor the pressure of the valves in the fuel storage facility vessel.

T-3 Shipping Cask (FFTF-25)

Physical Description

- Date – circa 1980; Manufacturer – unknown; Size – unknown.
- Located in the 403 Building, the T-3 shipping casks were steel, lead-lined, and cylindrically shaped.

Purpose

- The T-3 shipping casks transported spent fuel rods from the fuel storage facility to either the 300 Area or the Idaho National Laboratory.

4621-W Building – Auxiliary Equipment Facility

The 4621-W Building, constructed in 1975, contained electrical distribution and switchgear mechanisms crucial to the operations and maintenance of the Fast Flux Test Facility (FFTF). Equipment housed here provided power distribution and emergency backup power to FFTF.

Diesel Generator #2 (FFTF -14)

Physical Description

- Date – unknown; Manufacturer – A. C. Schoonmaker Company (Diesel Engineers and Power Machinery); Size – unknown.

- Diesel generator #2, located in Room 336 of the 4621-W Building, was made of cast iron with numerous metal pipes, instruments, and gauges.

Purpose

- Generators change mechanical energy into electrical energy. Diesel generator #2 was the third backup power source for the entire FFTF.

Electrical Switchgear Panels (FFTF-13)

Physical Description

- Date – circa 1940s; Manufacturer – General Electric Company; Size – each panel measures approximately 3 feet wide by 8 feet high by 1 foot deep.

- Located in Room 369 of the 4621-W Building, the metal electrical switchgear panels consisted of electrical switchgears, meters, and relays made of glass and metal.

Purpose and Significance

- The electrical switchgear panels for the Auxiliary Equipment Facility were the main electrical supply center for controlling the plant's small equipment.

- The panels were manufactured approximately 60 years ago and were installed when the building was completed in 1975. The equipment was a type of electrical transmission technology no longer used at FFTF or other industrial facilities.

4703 Building – Fast Flux Test Facility Control Building

The 4703 Building was the operations center of the Fast Flux Test Facility (FFTF). From the Control Building, constructed in 1978, operators controlled the reactor and heat transport systems of FFTF. FFTF was a liquid metal fast breeder reactor—the first of its kind in the United States. Breeder reactors were designed to create more plutonium than they used, thereby stretching the world's scarce supply of uranium at a time when nuclear power plants were becoming increasingly common as sources of electrical power. The Control Building was a one-story building with the control room occupying the west half of the building. The control room was made of reinforced concrete hardened to resist the velocities and pressures of a tornado.

Control Room Panels (FFTF-20)

Physical Description

- Date – circa 1978; Manufacturer – Honeywell Company; Size – unknown.
- The control room was located in Room 136 of the 4703 Building. The surrounding panels had numerous dials, gauges, instruments, and controls made of metal, glass, and plastic. The unusually large size of the control room allowed for expansion and/or equipment alterations.

Purpose

- The control room panels allowed personnel to evaluate the operation of the reactor control rods, the status of containment isolation systems, airborne radiation monitoring equipment, heating and ventilating systems, chill water controls, pumping speed of the sodium coolant, fan speeds of the dump heat exchangers field pumps, and plant protective system indicators and controls.

700 Area Artifacts

Emergency Decontamination Building

748 Building – Emergency Decontamination Facility

Completed in early 1967, the 748 Building was a one-story building located on the north side of Kadlec Hospital in downtown Richland. The Emergency Decontamination Facility was designed to provide a safe environment for initial and temporary medical and surgical care of Hanford personnel injured and contaminated with radioactivity. It was the only facility of its type in the nation. It facilitated cooperation between medical teams and Hanford radiation protection personnel in the treatment of injured workers contaminated with radioactivity. It was associated with the health and safety of Hanford workers and with Cold War era health and safety planning in the wake of the 1961 nuclear accident at the Idaho National Laboratory.

Harold McCluskey Chair (748-1)

Physical Description

- Date – 1976; Manufacturer – J. C. Penney Co., Inc.; Size – 2 feet 9 inches wide by 3 feet 3 inches deep by 3 feet 8 inches high.

- The Harold McCluskey chair, purchased at J. C. Penney Co., Inc. and located in the 748 Building, was a cushioned recliner covered with a woven fabric.

Purpose

- The chair was purchased for Harold McCluskey, the Hanford worker injured and contaminated in the 1976 accident at the 242-Z Plant on the Hanford Site, during his prolonged stay in the Emergency Decontamination Facility. Mr. McCluskey was confined to the facility for 78 days.

Patient Bed/Shielded Body Wash Tank (748-2)

Physical Description

- Date – 1967; Manufacturer – unknown; Size – 8 feet 6 inches long (including the plumbing) by 2 feet wide by 2 feet 6 inches high by 4 feet 4 inches high from the floor.

- The patient bed/shielded body wash tanks were located in the main care room of the 748 Building. The tanks were constructed of cement and lead lined with a stainless steel cover. Each tank had plumbing and faucets that provided constant flow and draining of sprayed water.

Purpose

- The patient bed/shielded body wash tanks were used to decontaminate Hanford personnel injured and contaminated with radioactivity. Patients were lowered on a gurney into the tank where they were decontaminated by a continuous flow of sprayed water and other medical or surgical procedures.

Hanging Lead Mask/Shield (748-3)

Physical Description

- Date – 1967; Manufacturer – unknown; Size – 1 foot 5 inches wide by 1 foot 6 inches high by 1 foot deep by 2 inches thick.

- The hanging lead masks/shields were located in the 748 Building's main patient care room. One of the masks is now in the Columbia River Exhibition of History, Science, and Technology collection. Constructed of solid lead, the masks weighed 200 to 400 pounds each and were suspended from the ceiling by metal gables.

Purpose

- The doctors and nurses would move the masks along a remote controlled ceiling track to the edge of the patient bath tanks in the Emergency Decontamination Facility. The doctors and nurses stood behind the masks during medical and surgical procedures to reduce their radiation exposures.

Suspension Patient Gurney (748-4)

Physical Description

- Date – 1967; Manufacturer – unknown; Size – 6 feet 5 inches long by 2 feet wide by 1 foot high.

- The suspension patient gurney, made of an aluminum frame with canvas straps, was located in the patient wash tank in the 748 Building's emergency entry area.

Purpose

- The suspension patient gurney was used for patients who could not walk into the facility. A remote control system guided the gurney along a ceiling track to an ambulance outside the emergency entrance where the patient was lifted onto the gurney and transported inside to a wash tank for decontamination.

Resources

The following resources were used in the course of gathering information on the buildings and artifacts:

Gerber MS, DW Harvey, and JG Longenecker. 1997. *The Manhattan Project and Cold War Eras, Plutonium Production at the Hanford Site, December 1942-1990*. DOE/RL-97-02, Rev. 0, U.S. Department of Energy, Richland, Washington. Accessed August 2006 at http://www.hanford.gov/doe/history/mpd/sec5.htm#5.0 dated January 24, 1997.

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U.S. Department of Energy. 1996. *Programmatic Agreement Among the U.S. Department of Energy-Richland Operations Office, the Advisory Council on Historic Preservation, and the Washington State Historic Preservation Office for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site, Washington*. DOE/RL-96-77, Rev. 0, Richland, Washington.

U.S. Department of Energy. 1997-Present. Notes from Walk Throughs of Buildings Listed in "Walkthroughs/Assessments of Buildings/Structures Eligible for Listing in the National Register of Historic Places," Listed in Appendix C, Tables 1 & 2 of the *Programmatic Agreement Among the U.S. Department of Energy-Richland Operations Office, the Advisory Council on Historic Preservation, and the Washington State Historic Preservation Office for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site, Washington*. On File with the U.S. Department of Energy, Richland, Washington.

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