PROGRESS AT THE HANFORD VITRIFICATION PLANT

A publication for the Hanford Tank Waste Treatment and Immobilization Plant (WTP) February 2009

*The Pretreatment Engineering Platform is a quarter-scale demonstration facility that is confirming the efficiency and throughput of select pretreatment processes.*

## PRETREATMENT ENGINEERING PLATFORM BEGINS ADVANCED TESTING

The Pretreatment Engineering Platform (PEP) is performing the job it was designed to do. Advanced testing, known as phase one testing, began January 31, and the PEP is now confirming the effectiveness and throughput of essential waste pretreatment processes that will be used at the Hanford Waste Treatment Plant (WTP), or "vit plant."

The PEP is a quarter-scale demonstration facility for two pretreatment processes: ultrafiltration, which is separating waste solids and liquids, and leaching, which is dissolving elements necessary to divide the low-activity from the high-level waste. Dividing the waste minimizes the number of costly high-level waste canisters produced. These processes will be used when WTP is operational.

Designed and fabricated in Carlsbad, N.M., the PEP is a modular facility that will easily allow for system replacements, reconfigurations and modification as necessary, like the WTP Pretreatment Facility itself. Approximately the size of a basketball court and two levels high, the PEP is located at Pacific Northwest National Laboratory (PNNL) in Richland, Wash., and operated by staff from PNNL, Bechtel National, Inc. and URS-Washington Division.

To prepare for phase one testing, PEP operators completed water shakedown testing, that is, running the entire system process using water, and simulant shakedown testing late last year. This allowed operators to make sure the PEP functions as a complete, integrated system; ensure it produces accurate, reliable data and resolve any technical issues.

Testing has been highly successful, and one of the phase one tests was eliminated because the necessary data were acquired during simulant shakedown testing. Phase one confirmatory testing is scheduled to conclude this spring. The need for additional testing phases is still being evaluated and is largely dependent on the outcome of phase one testing.

## OVERVIEW

A few miles west of the Columbia River, in southeastern Washington state, 53 million gallons of radioactive and chemical waste is stored in 177 underground tanks on the Hanford site. These tanks are a deadly legacy of the Cold War era, and threaten the Columbia River and millions of residents who live downstream.

In response to this serious problem, Bechtel National, Inc. is designing and building the Hanford Tank Waste Treatment and Immobilization (WTP) Plant, also known as the "vit plant," for the U.S. Department of Energy. When operational, the $12.2 billion WTP will use a process called "vitrification" to immobilize Hanford's tank waste.

The waste will be turned into a stable glass form by blending it with silicate and glass-forming chemicals before it is poured into stainless steel canisters. In this form, the waste will remain impervious to the environment as the radioactivity dissipates over hundreds to thousands of years.

WTP spans 65 acres and includes four nuclear facilities -- Pretreatment, Low-Activity Waste Vitrification, High-Level Waste Vitrification and an Analytical Laboratory -- as well as operations and maintenance buildings, utilities and office space.

Nearly 3,300 people are employed by Bechtel National, Inc. and its subcontractors. WTP will be operational in 2019.

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## MASSIVE SHIELD DOORS INSTALLED ON PRETREATMENT FACILITY

Two massive shield doors, which will provide radiological shielding protection to workers, were installed in the Pretreatment (PT) Facility in late January. The 24-ton steel doors are 10 feet high, 11 feet wide and approximately 8 inches thick. They were the first of ten remaining shield doors that will be installed in the facility.

Both of these shield doors will support filter maintenance operations and provide shielding protection in the PT Facility when WTP is operational.

The first door, the cask lidding room shielded airlock door, was installed on January 22 in the southeast corner of the first floor. When WTP is operational, drums filled with waste will be lowered into the cask lidding room through a hatch. There, they will be placed in casks, special transport containers designed to protect workers and the environment, and sealed with lids.

On January 27, the second door, the drum lidding room shielded airlock door, was installed in the southeast corner of the second floor. It provides access for equipment and personnel to enter a radiological-controlled area that will be used to receive waste and package it in 55-gallon drums using remotely operated equipment. The closed shield door will protect workers while radioactive materials are in the controlled area.

*The cask lidding door, like the drum lidding room door, is 10 feet high, 22 feet wide and approximately eight inches thick. These doors will provide radiological shielding protection to workers when the vit plant is operational.*

## LOW-ACTIVITY WASTE MIXER DELIVERED

*The first of two mixers that will be installed in the Low-Activity Waste Facility were delivered in late January. The mixers, which mix the glass-forming chemicals, are integral to the vitrification process.*

The first of two mixers that will be installed in the Low-Activity Waste (LAW) Facility was delivered late last month to the Material Handling Facility (MHF) in Richland, Wash. Fabricated in Minneapolis, Minn., the mixers are the last large pieces of equipment in a large procurement package that also included the Balance of Facilities glass-forming silos. The second mixer is scheduled for delivery later this year.

Each LAW mixer is approximately 15 and a half feet long, 14 and a half feet long and10 and a half feet tall. Made of carbon steel, each mixer weighs 39,000 pounds and will be installed at the 48-foot level in the LAW Facility.

The mixers are integral to the vitrification process. When WTP is operational, dry glass-forming chemicals will be transported from silos via underground pipes to the mixers. The mixers then combine the chemicals and transfer them to be mixed with the waste. From there, the mixture is transported to the melters, where it will be heated 2,100 degrees Fahrenheit and poured into stainless steel storage containers.

A total of four mixers will be installed in the WTP facilities: two in the LAW Facility and two in the High-Level Waste Facility. The HLW mixers will also be delivered later this year.

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## HIGH-LEVEL WASTE FACILITY COMPLETES BOGIE MAINTENANCE CRANE RAILS

*The crane rails will transfer large carts used to transport full waste canisters.*

Crews working on the High-Level Waste (HLW) Facility reached a major milestone last month when they finished installing crane rails in the northeast corner of the facility. The rails, located inside a maintenance room, support an overhead crane that will be used to maintain a transfer bogie, that is, a large cart that will transport full waste canisters throughout the facility. The crane rails are 17 feet long and can withstand loads of up to three tons.

To complete the rails, work had to be carefully coordinated and sequenced because the steel beams and columns that support the rails limit access to an adjacent area in the facility. Therefore, work in the adjacent area had to be completed before the rails could be installed. These activities included installing piping, steel and equipment; completing electrical work; and applying painted coatings.

## PRETREATMENT FACILITY CONTINUES TO RISE

*The Pretreatment Facility now reaches 85 feet in places.*

In late December, crews working on the Pretreatment Facility began installing structural steel at the third elevation, raising the facility's height from 56 feet to 77 feet. The PT Facility now reaches 85 feet in places, including the 2.5-ton vertical steel columns, and associated splice plates that extend from the 77-foot elevation.

When complete, the PT Facility will comprise five total steel elevations, known as tiers, and reach an overall height of 120 feet. It will be the tallest WTP building.

The first tier-three steel column was set on January 9 at the northwest corner of the facility. Steel beams were placed laterally at the 77-foot elevation to compose the structure for the eventual concrete slab placement.

## WTP QUICK FACTS

- WTP construction is currently 46 percent complete.
- It is the largest nuclear construction project in the United States today.
- It is the first nuclear facility to be built in the United States in decades, requiring a re-establishment of the nuclear supply chain.
- It requires a total of 257,000 cubic yards of concrete, more than 4 million feet of electrical cable and more than 985,000 feet of piping.

## ADDITIONAL INFORMATION

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