WASTE TREATMENT AND IMMOBILIZATION PLANT
CHAPTER 4F
HIGH-LEVEL WASTE (HLW) VITRIFICATION FACILITY

CHANGE CONTROL LOG

Change Control Logs ensure that changes to this unit are performed in a methodical, controlled, coordinated, and transparent manner. Each unit addendum will have its own change control log with a modification history table. The "**Modification Number**" represents Ecology's method for tracking the different versions of the permit. This log will serve as an up to date record of modifications and version history of the unit.

Modification History Table

Modification Date	Modification Number
02/06/2026	8C.2025.3F
07/28/2022	8C.2022.3F
10/01/2018	24590-WTP-PCN-ENV-18-003 (8C.2018.Q4)
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CHAPTER 4F
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TABLES

4F High-Level Waste Vitrification Facility

The purpose of this chapter is to describe the major systems associated with the High-Level Waste (HLW) Vitrification Facility. Figure 4A-4 located in Chapter 4A presents a simplified process flow diagram of the HLW vitrification processes. The HLW Facility will consist of several process systems designed to perform the following functions:

- Receive pretreated HLW slurry.
- Convert blended HLW slurry and glass formers into glass.
- Treat melter offgas.
- Handle Immobilized High-Level Waste (IHLW) canisters.
- Store IHLW canisters.
- Provide supporting equipment in the melter cave.
- Handle miscellaneous secondary waste.
- Ventilate the HLW Facility.

The following figures located in Chapter 4A and design drawings found in Appendix 10 provide additional detail for the HLW Facility:

- Waste Treatment Plant (WTP) Simplified Flow Diagram (Figure 4A-1).
- HLW Facility Flow Diagram (Figure 4A-4).
- Typical System Figures (Figures 4A-53 and 4A-54) depicting common features for each regulated system.

Instrumentation, alarms, controls, and interlocks will be provided for the tank systems and miscellaneous treatment systems to indicate or prevent the following conditions, as appropriate:

- Overfilling: Plant items are protected against overfilling by liquid level indication, high-level instrumentation interlocks to shut off feed sources, and process control system control functions backed up by hard wired trips as required.
- Loss of containment: Plant items are protected against containment loss by liquid level indication, and by process control system control and alarm functions as required, including shut-off of feed sources. Tanks or miscellaneous units (MUs) that manage liquid mixed or dangerous waste are provided with secondary containment. Tank and MU system ancillary equipment is provided with secondary containment or is visually inspected for leaks on a daily basis in accordance with Washington Administrative Code (WAC) 173-303-640(4)(f). Some tanks or MUs may utilize daily visual inspection for leak detection. Sumps associated with the management of mixed or dangerous waste are provided with liquid level instrumentation and an ejector or pump to empty the sump as needed.
- Inadvertent transfers of fluids: System sequential operations are properly interlocked to prevent inadvertent transfers at the wrong time or to the wrong location.
- Loss of mixing function: Tank systems are instrumented (air pressure/flow indication) to prevent hydrogen accumulation and solids settling. Tanks with agitators are instrumented to prevent agitator and/or vessel damage at low liquid level.
- Unsafe or off-normal melter operating conditions.
- Degraded emissions control equipment and/or operating conditions.
- Loss of air flow: The ventilation system is designed to create a pressure gradient which causes air to flow through engineered routes from an area of lower contamination potential to an area of higher contamination potential.

- Loss of site power.

In addition to level control, temperature and pressure may be monitored for tank systems and miscellaneous treatment systems in some cases.

Regulated process and leak detection system instruments and parameters will be provided in Dangerous Waste Permit (DWP) Table III.10.E.G for tank systems and in DWP Table III.10.J.C for miscellaneous treatment sub-systems.

Descriptions of the HLW vitrification process, melter offgas treatment systems, and IHLW glass canister handling systems are provided in Sections 4F.2 through 4F.4. Table 4F-1 lists current tank design information (capacity, materials of construction, and dimensions). Table 4F-2 lists the current MU design information. The tanks and MUs are grouped by process systems in these tables.

Tanks or MUs that manage liquid mixed or dangerous waste are provided with secondary containments. Table 4F-3 summarizes the secondary containment rooms/areas and calculated minimum liner heights. Sumps, leak detection boxes, and secondary containment drain systems are listed in Table 4F-4.

4F.1 Containers

This section identifies the containers and container management practices that will be followed at the HLW Vitrification Facility. The term "container" is used as defined in WAC 173-303-040. Note that in this chapter and throughout the permit, terms other than containers may be used, such as canisters, boxes, bins, flasks, casks, and overpacks.

The container storage areas located in the HLW vitrification plant consists of:

- IHLW canister storage cave (immobilized glass) (H-0132).
- HLW east corridor El. 0 ft (secondary waste) (HC-0108/09/10).
- HLW loading area (secondary waste) (H-0130).

Container storage area dimensions at the HLW Vitrification Facility are summarized in Table 4F-5.

The following sections address waste management containers:

- Description of Containers - Section 4F.1.1.
- Container Management Practices - Section 4F.1.2.
- Container Labeling - Section 4F.1.3.
- Containment Requirements for Storing Waste - Section 4F.1.4.
- Prevention of Ignitable, Reactive, and Incompatible Wastes in Containers - Section 4F.1.5.

4F.1.1 Description of Containers

These types of waste will be managed in containers:

- IHLW (immobilized glass).
- Miscellaneous mixed waste (secondary waste).
- Miscellaneous nonradioactive dangerous waste (secondary waste).

The waste form dictates the type of containers used for waste management. The following paragraphs describe these types of containerized waste that are managed at the HLW Vitrification Facility.

Immobilized Glass Waste

The immobilized glass waste is a mixed waste that will be managed in IHLW canisters specially designed to remain stable during receipt of glass waste, and which are capable of remote handling. The Permittees have submitted, and Ecology has approved, a land disposal restrictions and treatability variance petition for the Hanford tank waste.

The IHLW canisters will be approximately 177 inches (in.) high and 24 in. in diameter, with a wall thickness of approximately 0.1345 in. and a nominal capacity of 43 cubic feet (ft^3). The IHLW canisters will be constructed of austenitic (304L) stainless steel.

Based on results from the programs at the Oak Ridge National Laboratory and Savannah River Technology Center, the 304L stainless steel is physically and chemically compatible with the IHLW glass waste.

Miscellaneous Mixed Waste

Generally, miscellaneous mixed wastes are secondary wastes that may include, but are not limited to, the following items:

- Spent or failed equipment.
- Offgas High Efficiency Particulate Air (HEPA) filters.
- Melter consumables.
- Spent melters.

Spent equipment and offgas filters will typically be managed in commercially-available containers such as steel drums or steel boxes, of varying sizes. The containers for miscellaneous mixed waste will comply with transportation requirements, with receiving Treatment, Storage, and Disposal (TSD) Facility waste acceptance criteria, and will be compatible with the miscellaneous mixed waste. These containers may or may not include a liner. Final container selection, container and waste compatibility, and the need for liners, will be based on the physical, chemical, and radiological properties of the waste being managed.

Melter consumables are routinely generated wastes and include spent feed tubes, pressure transducers, bubblers, thermocouples, and discharge risers. HLW melter consumables will be remotely size reduced, if necessary, and placed into steel baskets with lids. The baskets will be placed into drums and the drums placed into shielded casks for export from the facility.

After a spent HLW melter is deemed to meet criteria and regulations for onsite disposal, it will be placed in a welded carbon steel container (overpack) or other acceptable packaging in accordance with waste acceptance criteria for the receiving TSD Facility. Regulatory issues and permitting actions associated with on-site disposal of spent and/or failed melters will be addressed in the future.

Each miscellaneous mixed waste container will have associated documentation that describes the contents, such as waste type, physical and chemical characterization, and radiological characterization. This information will be retained within the plant information network.

Most miscellaneous secondary mixed wastes will be spent equipment and consumables such as pumps, air lances, HEPA filters, etc., and are not expected to contain liquids. If wastes are generated that contain liquids, these wastes may be treated to remove or absorb liquids, to comply with the receiving TSD Facility waste acceptance criteria.

Miscellaneous Nonradioactive Dangerous Waste

Each nonradioactive dangerous waste container will have associated documentation that describes the contents, such as waste type and physical and chemical characterization. Typically, commercially available containers will be used. The types of containers used for packaging nonradioactive dangerous waste will comply with the receiving TSD Facility waste acceptance criteria and transportation requirements. However, final container selection, container and waste compatibility, and the need for liners will be based on the physical and chemical properties of the waste being managed.

4F.1.2 Container Management Practices

The following paragraphs describe how each of the containers used at the HLW Vitrification Facility are managed.

4F.1.2.1 Immobilized Glass Waste Containers

Immobilized glass waste IHLW canisters will be moved remotely due to the high radiation content of the waste. A brief discussion of how the containers move through the WTP is presented below.

IHLW Canisters

The empty canister will be remotely transported to the IHLW pour station located in pour tunnels 1 and 2. The canister will be sealed to the melter pour spout with a pour head. After filling, the canister will be allowed to cool to glass transition temperature (approximately 400°C to 500°C), which characterizes the transformation from an equilibrated melt to a “frozen” glass structure, prior to transportation to the IHLW Canister Handling Cave Containment Building (H-0136) (see Section 4F.3).

The IHLW canister will be transferred to the IHLW Canister Handling Cave Containment Building unit by means of a bogie. Here it will be stored on an open rack for up to three days, until it cools to normal operating temperature. Normal operating temperature is the temperature at which the canister can be lidded. This temperature range is 70°F to 350°F. In addition to providing a cooling area, the IHLW Canister Handling Cave Containment Building unit can be used as a buffer to hold canisters awaiting lid welding or decontamination.

After it has cooled, the volume of glass in the canister will be determined. The canister will then be inspected for glass spatter on its exterior. If glass is found, it will be removed using a needle gun, and the debris generated will be collected with a vacuum system and disposed of as a secondary waste. The lid will be attached by welding, to seal the canister completely and permanently.

The sealed canister will be transported inside the Canister rinse vessel (HDH-VSL-00001) to the canister decon cave (H-B035). In the canister rinse vessel, the canister is washed with de-ionized water to remove any loose contamination. The canister is then placed in canister decon vessel 1 or 2 (HDH-VSL-00002/4), and decontaminated using a cerium nitrate and nitric acid bath. Next, it will be rinsed with nitric acid, followed by a de-ionized water rinse. After decontamination, the canister is removed from the decon vessel and wiped or swabbed with a soft absorbent material in the canister swabbing and monitoring containment building (H-0133). The radiation levels of the swab will be monitored.

The canister will then be moved to the IHLW canister storage cave (H-0132) where it will be stored until transported off-site inside a shielded shipping cask. The canisters will not be stacked. Storage area dimensions and maximum waste storage volumes are summarized in Table 4F-5.

Other IHLW Canister Storage Requirements

As stated in WAC 173-303-630(5)(c), a minimum 30 in. aisle space separation is required between rows of containers holding dangerous waste. In addition, WAC 173-303-340(3) requires maintenance of aisle space to allow unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment in an emergency.

Evaluation of the 30-in. aisle spacing requirement by the United States Department of Energy (USDOE), WTP, the United States Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) for IHLW canisters concluded that aisle spacing in the range of 4 to 16 in. was adequate based on the following factors:

- Personnel access into the immobilized glass canister storage cave will be restricted. High radiation dose rates from immobilized glass waste canisters will preclude personnel entry into the process and storage areas, and inspection of the IHLW canisters will be performed remotely. (See Operating Unit Group 10, Chapter 6.0 for the inspection approach.)
- Water-based fire suppression systems will not be used in the HLW canister storage cave. Because of its inert nature, the glass waste will present a low fire hazard, and a minimal amount of combustible material will be present. The only potentially combustible material that may be present in the immobilized glass waste canister storage cave is insulation on crane motors and associated cables. To ensure no water is introduced into the canister storage cave, a dry chemical fire suppressant system may be installed.
- Spill control equipment will not be necessary within the IHLW canister storage cave. Spills or leaks from the stored canisters will not occur because the glass waste will be in a solid form and will not contain free liquid. The glass transition temperature characterizes the transformation from an equilibrated melt to a “frozen” glass structure.

No stacking of the IHLW canisters will occur. Closed circuit television cameras will enable general viewing of both areas.

Miscellaneous Mixed Waste Containers

Miscellaneous mixed waste (secondary waste) will be managed in:

- HLW East corridor (HC-0108/09/10).
- HLW loading area (H-0130).

Containers will be kept closed unless waste is being added, removed, or sampled while in the containment storage areas. Containers stored in these areas will be placed on pallets, or otherwise elevated to prevent contact with liquid, if present. Table 4F-5 summarizes the dimensions and maximum capacity of miscellaneous mixed waste storage areas. Containers will be managed in designated areas throughout the WTP, and then transferred to a suitable TSD Facility.

The HLW East corridor (HC-0108/09/10) will be located in the eastern portion of the main floor (0 feet [ft] elevation) of the HLW Vitrification Facility. This unit will be used as a storage location prior to export of secondary waste containers out of the facility. Aisle space will be 30 in., and waste containers may or may not be stacked. This unit’s storage capacity is listed in Table 4F-5.

The HLW loading area (H-0130) will be located in the eastern portion on the 0 ft elevation of the HLW Vitrification Facility. The unit will be used for storage of the miscellaneous waste containers prior to shipment to a suitable TSD Facility. The aisle space will be 30 in. and waste containers may or may not be stacked. This unit’s storage capacity is listed in Table 4F-5.

Miscellaneous Nonradioactive Dangerous Waste Containers

Miscellaneous dangerous waste containers will typically be managed in non-permitted waste management units (satellite accumulation areas and less-than-90-day storage areas) located throughout the HLW Vitrification Facility. Containers will be kept closed unless waste is being added, removed, or sampled. They will routinely be moved by forklift or drum cart, and will be managed in a manner that prevents ruptures and leaks.

4F.1.2.2 Waste Tracking

The plant information network interfaces with the integrated control network and is designed to collect and maintain plant information. The plant information network is currently planned to the following systems (all systems used at the plants/facilities and Balance of Facilities (BOF) are provided for information only):

- Plant data warehouse and reporting system.
- Laboratory information management system.
- Waste tracking and inventory system.

Inventory and Batch Tracking

The waste tracking and inventory system will interface with the information system data historian to provide reporting information such as tank volumes, waste characteristics, and facility inventories of process waste. The waste tracking system will also be used to query operations parameters at any time information is needed, as specified by operations, to manage the process system. IHLW canisters will be tracked within the facility using an operations developed system: for example, manually recording on a board, manually inputting into the information network, or if available, automated through the integrated control network.

Secondary Waste Stream Tracking

Containerized secondary waste streams and equipment will be tracked and managed through commercially available database management software. Containers will be mapped in each plant and updated during the inspection process using a commercially available drawing software application.

Laboratory Information Management System

The laboratory information management system (LIMS) will be an integral feature of the plant information network. The LIMS will serve as an essential tool for providing data management of regulatory and processing samples. The chosen LIMS will be a commercial off-the-shelf software package designed for performing laboratory information management tasks as described in ASTM E1578-93, *Standard Guide for Laboratory Information Management Systems (LIMS)*.

The LIMS will track the flow of samples through the laboratory. Samples received in the laboratory will be identified with a unique identification label. The identification label provides details of the sample process stream. Baseline analyses are defined by the requesting plant. Additional analyses, as required, will be input into LIMS by laboratory analysts. Data will be input into LIMS manually or by data transfer using LIMS/instrument interface. Analyses will be performed using approved and validated analytical procedures.

Analytical results will be compiled by the LIMS and held pending checking and approval by appropriate staff. Approved results will be reported to the requesting plant.

4F.1.3 Container Labeling

Immobilized Waste Glass Containers

Due to the radioactivity and handling requirements of the immobilized waste containers, conventional labeling of the immobilized waste containers will not be feasible and an alternative to the standard labeling requirements will be used. This alternative labeling approach will use a unique alphanumeric identifier for the IHLW canister that will be welded onto each immobilized glass waste container.

The welded “identifier” will ensure that the number is always legible, will not be removed or damaged during container handling, will not be damaged by heat or radiation, emits no gas upon heating when waste glass enters the container, and will not degrade over time.

The identifier will be welded onto the shoulder and side wall of each immobilized glass container at two locations approximately 180 degrees apart. Characters will be approximately 2 in. high by 1.5 in. wide. The identifier will be formed by welding on stainless steel filler material at the time of container fabrication. This identifier will be used to track the container from receipt at the WTP, throughout its subsequent path at the WTP, until it leaves the plant to be disposed or stored.

Each identifier will be unique. This unique number will be maintained within the plant information network and will list data pertaining to the waste container including waste numbers and the major risk(s) associated with the waste.

Personnel access into the immobilized glass waste container storage areas will be limited and controlled administratively. Signs designating the hazards associated with the immobilized waste glass will be posted at appropriate locations outside the container storage areas.

Miscellaneous Mixed Waste Containers

The miscellaneous mixed waste containers will be labeled with the accumulation or generation start date, as appropriate, the major risk(s) associated with the waste, and the words "hazardous waste" or "dangerous waste." A waste tracking and inventory system will be implemented. Labels and markings will be positioned so that required information is visible. The label will meet the WAC 173-303-630(3) requirements, and the dangerous waste number will be clearly identified.

The labels on the overpack for the spent melters will carry the accumulation or generation start date, the major risk(s) associated with the waste, and the words "hazardous waste" or "dangerous waste." A waste tracking and inventory system will be implemented. Labels and markings will be positioned so that required information is visible, and the dangerous waste number will be clearly identified.

Miscellaneous Dangerous Waste Containers

The miscellaneous dangerous waste drums will be labeled with the accumulation or generation start date, as appropriate, the major risk(s) associated with the waste, and the words "hazardous waste" or "dangerous waste." A waste tracking and inventory system will be implemented. Labels and markings will be positioned so that required information is visible. The label will meet the WAC 173-303-630(3) requirements, and the dangerous waste number will be clearly identified.

4F.1.4 Containment Requirements for Storing Waste

Secondary containment requirements for the waste managed in the immobilized waste container storage areas and the limited amount of other materials present are discussed below.

4F.1.4.1 Secondary Containment System Design

Secondary containment is required for areas in which containers hold free liquids. It is also required for areas managing wastes exhibiting the characteristics of ignitability or reactivity as defined in WAC 173-303-090(5) and (7).

IHLW

Secondary containment requirements do not pertain to the IHLW canister storage cave, as these canisters will not contain free liquids or wastes that are designated ignitable or reactive.

Miscellaneous Mixed Waste

Miscellaneous mixed waste storage areas may contain waste requiring secondary containment. If wastes containing liquids or wastes exhibiting the characteristics of ignitability or reactivity are generated, portable secondary containment that meets the requirements of WAC 173-303-630(7) will be provided.

Miscellaneous Dangerous Waste

Miscellaneous dangerous waste storage areas may contain waste requiring secondary containment. If wastes containing liquids or wastes exhibiting the characteristics of ignitability or reactivity are generated, portable secondary containment that meets the requirements of WAC 173-303-630(7) will be provided.

4F.1.4.2 System Design

IHLW

There will be one container storage area for the IHLW canisters in the HLW Vitrification Facility, as follows:

- IHLW canister storage cave (H-0132).

The IHLW canister storage cave will be located in the HLW Vitrification Facility, which is designed to be seismically qualified, as outlined in DWP Operating Unit Group 10, Supplement 1. A secondary containment system will not be needed because the immobilized glass waste will not contain liquid. In addition, because liquid will not be present in the IHLW container storage cave, the floor will not be sloped and will not contain drains or sumps.

Liquid will not be present within the IHLW container storage cave for the following reasons:

- Administrative controls will ensure that liquid does not enter inside filled IHLW canisters.
- The IHLW canister storage cave will be completely enclosed with a metal roof.
- Penetrations to the storage area will be sealed to prevent water ingress.
- Rainwater will be directed away using roof drains.

The location of the IHLW canister storage cave is shown on general arrangement drawings in DWP Operating Unit Group 10, Appendix 10.4.

Miscellaneous Mixed Waste

There will be two miscellaneous mixed waste (secondary waste) container storage areas at the HLW Vitrification Facility, as follows:

- HLW east corridor El. 0 ft (HC-0108/09/10).
- HLW loading area (H-0130).

The HLW waste container storage areas will be located within the HLW Vitrification Facility. Therefore, these units will be completely enclosed within the plants, which will have metal roofing, roof insulation, and a vapor barrier. Penetrations to the storage areas will be sealed to prevent water ingress, and rainwater will be directed away using roof drains.

Miscellaneous Dangerous Waste

Containers with liquids will be provided with portable secondary containment meeting the requirements of WAC 173-303-630(7).

4F.1.4.3 Structural Integrity of the Base

The storage areas will be constructed to support storage and transportation of containers within the container storage areas and will be designed with the following:

- Containment system capable of collecting and holding spills and leaks.
- Base will be free of cracks and gaps and sufficiently impervious to contain leaks.
- Positive drainage control.
- Sufficient containment volume.
- Sloped to drain or remove liquid, as necessary.

4F.1.4.4 Containment System Capacity

IHLW

Because liquids will not be present in the IHLW canister storage cave, a containment system capacity demonstration is not required.

Miscellaneous Mixed Waste

The HLW container storage areas do not require secondary containment because storage of liquids in these units is not anticipated. If the waste is found to contain liquid, portable secondary containment will be provided that meets the requirements of WAC 173-303-630(7). The waste container will function as the primary containment while the portable containment device will function as the secondary containment. Each portable secondary containment will have the capacity to contain 10 percent of the volume of all containers within the containment area, or the volume of the largest container, whichever is greater.

Each container holding liquid dangerous waste will be placed into portable secondary containment that meets the requirements of WAC 173-303-630(7). The waste container will function as the primary containment while the portable containment device will function as the secondary containment.

Miscellaneous Dangerous Waste

Each container holding liquid nonradioactive dangerous waste will be placed into portable secondary containment. The waste container will function as the primary containment while the portable sump will function as the secondary containment.

Each portable secondary containment will have the capacity to contain 10 percent of the volume of all containers within the containment area, or the volume of the largest container, whichever is greater. Typically, the waste containers will be steel drums.

4F.1.4.5 Control of Run-On

IHLW

The IHLW container storage cave will be located inside the HLW Vitrification Facility. The requirements for this section do not apply because the immobilized glass waste canister storage cave is within the HLW Vitrification Facility and therefore will not be exposed to run-on.

Miscellaneous Mixed Waste

Run-on will not reach the interior of the miscellaneous mixed waste storage areas, because they will be located within buildings, which will have roof gutters to remove precipitation.

Miscellaneous Dangerous Waste

Run-on will not reach the interior of the miscellaneous dangerous waste storage areas, because waste will be managed in buildings with walls and roof to remove precipitation.

4F.1.4.6 Removal of Liquids from Containment System

IHLW

No liquids will be present in the IHLW canister storage cave, therefore, the requirements of this section do not apply to the immobilized waste glass container storage area.

Miscellaneous Mixed Waste

Portable secondary containment sumps will be provided for individual containers that contain liquids. Hand pumps or similar devices will be used to remove liquid released to the portable secondary containments.

Miscellaneous Dangerous Waste

Portable secondary containment sumps will be provided for individual containers that contain liquids. Hand pumps or similar devices will be used to remove liquid released to the portable secondary containments.

4F.1.4.7 Demonstration that Containment is not Required because Containers do not Contain Free Liquids, Wastes that Exhibit Ignitability or Reactivity, or Wastes Designated F020-023, F026 or F027

IHLW

The IHLW glass canister storage cave will not contain liquids. The vitrification process volatilizes water or other liquid materials existing at ambient conditions in the waste slurry feed that enters the melter.

The waste numbers for ignitability (D001) and reactivity (D003) will not be managed in the immobilized glass canister storage cave. Wastes with the F020-F023, F026, and F027 numbers are not identified for the Double Shell Tank (DST) System unit. Therefore, these waste numbers will not be present at the WTP.

Miscellaneous Mixed Waste

Liquids may be present in wastes in the HLW secondary mixed waste storage areas. Secondary containment will be provided for individual containers that manage liquids. Wastes with the F020-F023, F026, and F027 numbers are not identified for the DST system. Therefore, these waste numbers will not be present at the HLW Vitrification Facility.

Miscellaneous Dangerous Waste

Wastes with the F020-F023, F026, and F027 numbers are not identified for the DST system. Therefore, these waste numbers will not be present at the HLW Vitrification Facility.

4F.1.5 Prevention of Reaction of Ignitable, Reactive, and Incompatible Wastes in Containers

Ignitable, Reactive, or Incompatible IHLW

Immobilized glass waste will not be ignitable, reactive, or incompatible with the wastes managed in the IHLW canister storage cave. The requirements of this section are not applicable to the immobilized glass waste canisters, including spent melters.

Ignitable, Reactive, or Incompatible Miscellaneous Mixed Waste and Miscellaneous Dangerous Waste

Potentially incompatible wastes are not expected to be managed in the miscellaneous mixed waste storage areas. If such wastes are managed in one of these areas, the containers of incompatible waste or chemicals will not be stored in close proximity to each other. Acids and bases will be stored on separate portable secondary containment sumps; oxidizers will be stored in areas separate from combustible materials; and corrosive chemicals will be stored on a separate secondary containment sump. These separate storage areas within the unit will be clearly marked with signs indicating the appropriate waste to be stored in each area. Potentially incompatible waste will be stored at least one aisle width apart.

4F.2 Tank Systems

4F.2.1 High-Level Waste Melter Feed Process

Process flow diagrams of the HLW Melter Feed Process (HFP) System are provided in Appendix 10.1. The following HLW melter feed description is identical for both Melter 1 (HMP-MLTR-00001) and Melter 2 (HMP-MLTR-00002). The HLW melter feed process consists of the following:

- HLW Concentrate Receipt Process (HCP) System.
- HFP System.
- HLW Glass Formers Reagent (GFR) System (the GFR system does not manage dangerous waste and is provided for information only).

HLW Concentrate Receipt Process System

The HCP system consists of the transfer piping from Pretreatment Facility (PTF) to HLW, a sump (HCP-SUMP-00001), and its ancillary equipment.

HLW Melter Feed Process System

The primary function of the HFP system is to receive HLW feed slurry via the HCP from the PTF (Baseline configuration) or directly from the Tank Operations Contractor (TOC) (Direct-Feed High-Level Waste [DFHLW] configuration), mix glass formers with HLW feed to form a uniform blend, and provide a blended feed to the HLW melter. An analysis of a waste sample determines a glass additive formulation for the conversion of the waste to glass. The glass additives specified in the formulation are weighed, transferred to HLW, and mixed with the waste.

The HFP system consists of the following vessels and associated ancillary equipment:

- HLW Feed Preparation Vessel (HFP-VSL-00001/5).
- HLW Melter Feed Vessel (HFP-VSL-00002/6).
- Pumps, demisters, piping, and ancillary equipment.

HLW Feed Preparation Vessel (HFP-VSL-00001/5)

In the Baseline configuration, the HLW Feed Blend Vessel (HLP-VSL-00028) or backup HLW Lag Storage Vessel (HLP-VSL-00027/AB) located in the PTF feed waste through the HLP/HCP underground waste transfer piping to the HLW HFP system Feed Preparation Vessels (HFP-VSL-00001/5). In the DFHLW configuration, HLW feed is transferred from the TOC via underground waste transfer lines to the Feed Preparation Vessels (HFP-VSL-00001/5). The HFP vessels are provided with sample supply and return lines to autosamplers ASX-SMPLR-00029 (HFP-VSL-00001/2) and ASX-SMPLR-00042 (HFP-VSL-00005/6). Samples of the waste are taken from the HLW Feed Preparation Vessel to determine the ratio of glass formers to waste. Blended glass formers are sent to the glass former feed mixers in the HLW facility via the BOF GFR system. The blend may include materials, such as silica, boric acid, calcium silicate, ferric oxide, lithium carbonate, and sucrose. The glass formers are conveyed to the HLW Feed Preparation Vessel (HFP-VSL-00001/5) and blended with the waste to form a uniform slurry.

HLW Melter Feed Vessel (HFP-VSL-00002/6)

The blended slurry is transferred from the HLW Feed Preparation Vessel (HFP-VSL-00001/5) to the corresponding HLW Melter Feed Vessel (HFP-VSL-00002/6) and then to a HLW Melter (HMP-MLTR-00001/2).

All four HFP vessels are equipped with the following:

- Mechanical agitators and pumps.
- Air spargers for purging hydrogen from the vessel head space during off-normal events.
- Demister on the vessel vent line for de-entrainment.
- Cooling jackets.
- Steam ejectors.
- Antifoaming agent addition capability.

- Overflow line to sump HFP-SUMP-00002/5, equipped with flapper valve to prevent air in-leakage.

HLW Glass Formers Reagent System

The HLW GFR system contains glass former feed mixers located at the 73 ft elevation of the HLW Facility. The feed mixers receive blended glass formers by dense-phase pneumatic conveyors from transporters. The transporters are located in the glass formers room within the BOF building.

Following the blending cycle, the glass formers are gravity-fed with a rotary feeder into the HLW Feed Preparation Vessels (HFP-VSL-00001/5), where the blended glass formers are mixed with the waste feed. This GFR equipment is located in an isolated area that serves as a contamination barrier between the Feed Preparation Vessels (HFP-VSL-00001/5) and the glass former supply. The rotary feeder valve controls the rate of glass former addition into the Feed Preparation Vessels (HFP-VSL-00001/5).

The HLW GFR mixers are equipped with filters to remove dust from the air used for pneumatic conveying and blending. It is anticipated that a series of single filter cartridges will be mounted on the top of the mixers. The filters are cleaned by introducing compressed air through the cleaning nozzle to blow accumulated dust back into the mixers. The HLW GFR mixers are equipped with load cells to weigh the glass formers to confirm that the material in the upstream blending silo is conveyed to the feed mixers. The load cells also confirm that the glass formers are transferred out of the feed mixers to the HLW Feed Preparation Vessels (HFP-VSL-00001/5).

4F.2.2 High-Level Waste Melter Process System

Figure 4A-27 located in Chapter 4A presents a simplified process flow diagram of the HLW Melter Process (HMP) System. Process flow diagrams of the HMP system are provided in Appendix 10.1. The primary functions of HMP miscellaneous treatment sub-system are to convert blended waste feed and glass formers into molten glass, deliver molten glass to HLW canisters, fill the canisters with molten glass waste, and monitor and control glass waste level during waste filling. The HMP system is identical for both HLW Melters (HMP-MLTR-00001/2).

The HMP system includes the HLW Melters (HMP-MLTR-00001/2), two discharge chambers and two pour spouts per melter, and primary and secondary canister level detection systems. The melter and pour spout will be remotely operated in the C5/R5 melter cave. There will be no personnel access to this cell after processing of the HLW feed stream begins.

HLW Melters (HMP-MLTR-00001/2)

The two HLW Melters (HMP-MLTR-00001/2), located in melter cave 1 and melter cave 2, respectively, are encased in a rectangular steel shell. Each is lined inside with refractory material as thermal insulation and to withstand corrosion by molten glass. The melter is provided with water cooling to maintain a thermal gradient in the bricks, prevent migration of glass through the bricks, and reduce heat load to the process cell. The lid of the HLW Melter will be sealed to the melter shell in order to provide gas containment. The lid will provide a support structure through which subcomponents can be mounted. Penetrations are sealed by appropriate fittings that allow remote removal and replacement.

Waste feed will be introduced to the melter as a slurry through nozzles in the melter lid. Each feed nozzle will be individually supplied from a slurry pump. The water and volatile feed constituents in the slurry will evaporate, leaving behind a layer of material known as the cold cap. Waste feed components and glass formers will undergo chemical reactions, be converted to their respective oxides, and dissolve into the molten glass. New slurry will be added at about the same rate as the cold cap dissolves, maintaining the quantity of cold cap material at a steady level. The molten glass level in the melter is maintained between the top of the electrodes and below the upper edge of the glass contact refractory blocks. The rate of feed addition to the melter determines the cold cap coverage in the melt pool. The feed addition rate can be controlled based on the average plenum temperature measured by thermocouples mounted in the melter lid. Air injectors may be used to mix molten glass and improve heat distribution.

Each melter (HMP-MLTR-00001/2) includes three internal compartments: the melter chamber (glass pool), two discharge chambers, and a plenum just above the glass pool. Melter pool level measurement is used throughout melter operations in conjunction with alarms for high or low glass pool levels. Each discharge chamber is a heavily insulated box on the south side of the melter, housing the discharge trough and a connection flange for the pour spout assembly. The plenum is lined with refractory to withstand hot corrosive gases, thermal shock, and waste splatter.

The power to the electrodes is regulated by the process control system to maintain the temperature within range. The heat for the initial HLW Melter startup is provided by radiant electric heaters temporarily mounted on the lid of the melter. These heaters melt the glass formers sufficiently to make it ionically conductive between the melter's joule heating electrodes. When a conducting path is established, the melter is heated in a controlled manner by increasing the current between the electrodes through the glass (a process known as *joule heating*). The nominal glass melt pool temperature is approximately 1150°C. As the slurry is fed, molten glass is formed by vitrification of the cold cap materials into the glass melt. When the melt level rises to a predetermined level, it can be discharged into a canister.

The gas produced during melting is mainly steam and contains volatile components and airborne matter that require removal prior to discharge to the atmosphere. This offgas is diluted by air from four sources; air in-leakage through the melter lid and discharge port, instrumentation and sparging, film cooler air, engineered air in-bleeds in the melter shell. The melter plenum is maintained at a vacuum with offgas system blowers and control injection of air into the film cooler near the melter exhaust. This ensures containment and avoids melter pressurization. This vacuum is sensed at a location near the plenum where blockage and feed splatter is unlikely. The sensed vacuum is used to drive a control valve that regulates the in-flow in the melter exhaust line.

The glass level in the melters (HMP-MLTR-00001/2) is maintained between the top of the upper electrodes and below the upper edge of the melter's refractory blocks. The level is determined directly by bubbler tubes that indicate density and glass depth. Thermocouples housed in thermowells that penetrate the cold cap and are immersed in the molten glass also indirectly indicate molten glass level. Level measurement is used throughout melter operations in conjunction with alarms for high or low glass pool levels.

Glass Discharge System

Discharge is achieved by transferring glass from near the bottom of the melt pool up through a riser and out of the melter through a side discharge chamber. Under each of the two discharge chambers there is a pour spout that directs the molten glass flow from the melter discharge chamber to the respective HLW canister.

The glass level in the melter is maintained between the top of the electrodes and the overflow level of the discharge trough. The melter glass pool level will be measured to indicate when to start and stop glass discharge. Each melter has two independently operated glass discharge systems, adjacent to each other on one side of the melter.

Each system includes an airlift riser, an airlift lance, a glass pour trough, and a heated discharge chamber. Glass is discharged by introducing gas into the molten glass in the discharge riser. The gas increases the level in the riser, causing the molten glass to flow down the trough and fall from the tip of the trough into the canister. When the desired level in the canister is reached, the air lift gas is turned off, and the glass level in the riser recedes stopping the flow of glass to the canister. During pouring operations, a remote camera is used to view the pour stream within the pour spout assembly. The camera is for observation only and is not a regulated operation.

<u>Canister Level Detection</u>

The purpose of each canister level detection system is to monitor the molten glass level within the HLW canister and to prevent canister overfilling. During glass pour, the level detection system is used to monitor the glass level to ensure the canister is filled to the desired level. The level detection system also will be able to monitor the rate at which the glass level is rising in the canister. There is a primary and a secondary monitoring system, which is consistent with standard vessel level control. A primary system that operates through the process control system is used for normal operations, and a secondary "hard-wired" system is used to back up the primary system and automatically shut down the fill before the overflow limit is reached. The primary level detection system is a thermal imaging camera that provides continuous level monitoring over the upper 60 percent of the canister. In the event that the primary thermal imaging camera malfunctions, the backup discrete point radiation detection system will indicate a filled canister. The backup system is designed only to detect a discrete high glass level, producing a contact closure when the high-level is sensed. When the high-level has been reached, the system will automatically shut down the melter air lift which, in turn, will stop the glass pour. The system is limited to discrete levels of glass fill, not continuous monitoring.

During glass pour, the canister level detection system will display a thermal image on a monitor and will utilize a serial connection to interface with the process control system for indication and control purposes. The imaging software will be used to continuously monitor the level of glass in the canister and will provide an output of the glass level to control loops in the process control system. A high-level condition will be indicated by the process control system, which will initiate alarms and/or control sequences to control the melter pour. The infrared image will be available through the plant closed circuit television system. The control system will be able to store the level of the glass in a canister between batch pours when the temperature in the canister could be cooled down sufficiently to prevent the thermal imaging system from detecting the glass level. The level is reset to zero with each new canister. The control system will also be used to monitor the average temperature of the glass near the top of the pour. If the temperature is lower than a set point value, an alarm will be initiated by the process control system.

Another function of the system is to detect the rate at which the glass level is rising in the canister. This rate gives an indication of deviation between expected normal pour rates. A deviation could indicate a malfunction of the glass discharge system, and an alarm would be initiated.

Instrumentation, alarms, controls, and interlocks will be provided for the HMP system to indicate or prevent the following conditions:

- The melter cannot pour without verification that the bogie is present.
- The melter cannot pour without verification that the canister is present.
- The melter cannot pour if the canister is greater than 95 percent full.

4F.2.3 Radioactive Liquid Waste Disposal System

The HLW-Radioactive Liquid Waste Disposal (RLD) system includes vessels, piping, pumps, and instrumentation. The vessels include the acidic waste vessel (RLD-VSL-00007), the plant wash and drains vessel (RLD-VSL-00008), and the offgas drains collection vessel (RLD-VSL-00002). The major components (i.e., RLD vessels) of the HLW-RLD system are located in room H-B014 (black cell), which is in the center of the HLW Facility. Sample/transfer pumps (RLD-PMP-00018 and RLD-PMP-00019) and associated piping and valves are located in bulges (RLD-BULGE-00008 and RLD-BULGE-00009) to provide accessibility for maintenance and repairs. The vent bulge RLD-BULGE-00010 enclosure contains and provides access to piping, control valves, and isolation valves, as well as houses RLD transfer lines for the high point venting system.

Process flow diagrams of the RLD System are provided in DWP Appendix 10.1. The primary functions of the RLD tank system are to receive, store, and transfer various effluents from different HLW treatment systems. Various operations, such as neutralization, mixing, and sampling of the waste, are performed by the RLD system as required. Sampling capabilities are provided for the RLD vessels (RLD-VSL-00007/8) by the HLW Facility autosampler ASX-SMPLR-00028. The RLD system includes sample supply and return lines to RLD vessels RLD-VSL-00007/8.

The RLD system contains three tanks located in the HLW Facility wet process cell:

- Acidic Waste Vessel (RLD-VSL-00007).
- Plant Wash and Drains Vessel (RLD-VSL-00008).
- Offgas Drains Collection Vessel (RLD-VSL-00002).

The RLD system receives mixed waste effluent from the HLW Melter Offgas Treatment Process (HOP) System, the HLW Canister Decontamination Handling (HDH) System, and periodic plant and vessel washes within the HLW Facility.

These effluents include the following:

- Purge liquid from the Submerged Bed Scrubbers (SBS) (HOP-SCB-00001/2).
- Drains from the Wet Electrostatic Precipitators (WESP) (HOP-WESP-00001/2).
- Drains from the High-Efficiency Mist Eliminators (HEME) (HOP-HEME-00001A/1B/2A/2B).
- Various plant and vessel washes and sump water.
- Miscellaneous mixed waste streams, including Pulse Jet Ventilation (PJV) line drain, autosampler drains, canister decontamination effluents, and effluents from decontamination of equipment in the HLW Melter Cave Support Handling (HSH) Decontamination Tank (HSH-TK-00001/2).

Acidic Waste Vessel (RLD-VSL-00007)

The acidic waste vessel (RLD-VSL-00007) is designed to collect effluents from the SBS (HOP-SCB-00001/2), the SBS condensate receiver vessels (HOP-VSL-00903/4), the waste neutralization vessel (HDH-VSL-00003), and the decontamination tanks for melter cave 1 and melter cave 2 (HSH-TK-00001/2).

Normally, transfers from the acidic waste vessel (RLD-VSL-00007) are to the pretreatment HLW effluent transfer vessel (PWD-VSL-00043). If vessel PWD-VSL-00043 is full, then the contents of RLD-VSL-00007 are routed to the pretreatment ultimate overflow vessel (PWD-VSL-00033).

The acidic waste vessel has an inside diameter of 13 ft and a tangent (shell) height of 15.5 ft; it is constructed of AL-6XN (6-moly) stainless steel, and is located on the south side of the wet process cell (WPC). The maximum operating volume of the vessel is 15,321 gallons and the total volume of the vessel is 18,051 gallons. The vessel design and construction is in accordance with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section VIII, Division I. The vessel is fitted with pressure, level, and temperature instruments. The level instruments are used to maintain the vessel level within the acceptable operating range, and include permissives and interlocks to preclude effluent transfer to and from the vessel when the level is outside of the normal operating range.

In the unlikely event of an overflow, vessel RLD-VSL-00007 overflows to the WPC sump (HCP-SUMP-00001). Vessel RLD-VSL-00008 also overflows to HCP-SUMP-00001. The overflow lines from both vessels (RLD-VSL-00007/8) are hard piped from the vessels where they are joined into a common overflow line down into HCP-SUMP-00001; a seal loop is included in the overflow line to prevent WPC air from entering the vessels and to prevent escape of vapors, fumes, or other emissions. The seal loop is equipped with level instrumentation and receives Deionized Water (DIW) makeup water via a Plant Wash and Disposal (PWD) System connection, to ensure a column of water in the line. This column prevents

WPC air from entering the vessel and eventually adding to the HOP system load. In addition, the vessels overflow lines provide a secondary function to prevent vessel pressurization upon blockage of the Process Vessel Ventilation (PVV) system.

Vessel RLD-VSL-00007 is equipped with four pulse jet mixers (PJM) (RLD-PJM-00005, RLD-PJM-00006, RLD-PJM-00007 and RLD-PJM-00008); the PJMs provide mixing during normal operations, when there is sufficient liquid present in the vessel.

Plant Wash and Drains Vessel (RLD-VSL-00008)

The plant wash and drains vessel (RLD-VSL-00008) is designed to collect effluents from C3/C5 area sumps, the SBS (HOP-SCB-00001/2), the waste neutralization vessel (HDH-VSL-00003), the decontamination tank for melter cave 1 and melter cave 2 (HSH-TK-00001/2), off-spec effluent from NLD-TK-00006, decontamination booth/glove box drain, and suspect active effluent from plant cooling water.

The plant wash and drains vessel has an inside diameter of 13 ft and a tangent (shell) height of 15.5 ft; it is constructed of AL-6XN (6-moly) stainless steel, and is located on the south side of the WPC. The vessel design and construction are in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division I. The maximum operating volume of the vessel is 15,321 gallons and the total volume of the vessel is 18,051 gallons. The vessel is also fitted with pressure, level, and temperature instruments. The level instruments are used to maintain the vessel level within the acceptable operating range, and include permissives and interlocks to preclude effluent transfer to and from the vessel when the level is outside of the normal operating range.

In the unlikely event of an overflow, vessel RLD-VSL-00008 overflows to the WPC sump (HCP-SUMP-00001). Vessel RLD-VSL-00007 also overflows to HCP-SUMP-00001. The overflow lines from both vessels (RLD- VSL-00007/8) are hard piped from the vessels to a tie where they are joined into a common overflow line down into HCP-SUMP-00001; a seal loop is included in the overflow line to prevent WPC air from entering the vessels and to prevent escape of vapors, fumes, or other emissions. The seal loop is equipped with level instrumentation and a PWD make-up water connection to ensure a column of water in the line. This column prevents WPC air from entering the vessel and eventually adding to the HOP system load. In addition, the vessel overflow lines provide a secondary function to prevent vessel pressurization upon blockage of the PVV system.

Vessel RLD-VSL-00008 is equipped with four PJMs (RLD-PJM-00001, RLD-PJM-00002, RLD-PJM-00003 and RLD-PJM-00004); the PJMs provide mixing during normal operations, when there is sufficient liquid present in the vessel.

Offgas Drains Collection Vessel (RLD-VSL-00002)

This vessel receives condensate from the HOP pipes and PJV drains downstream from the HEME (HOP-HEME-00001A/1B/2A/2B) during off-normal operation. The contents are transferred to the Plant Wash and Drains Vessel (RLD-VSL-00008) in the HLW Facility for processing.

Transfer Pumps

The HLW-RLD transfer pumps (RLD-PMP-00018 and RLD-PMP-00019) are centrifugal pumps used to transfer effluents from RLD-VSL-00007 and RLD-VSL-00008 to vessels PWD-VSL-00033 or PWD-VSL-00043, which are located in the Pretreatment Facility. Each transfer pump has sufficient capacity to ensure the HLW-RLD system can support daily glass production. The RLD transfer pumps also deliver samples from RLD-VSL-00007 and RLD-VSL-00008 to autosampler ASX-SMPLR-00028 for characterization of the effluents that are transferred to the Pretreatment Facility. The transfer pumps are located in individual bulges that are outside and adjacent to the WPC; the bulges provide shielding and confinement but are also accessible to support maintenance/replacement activities. RLD-PMP-00018 is located in RLD-BULGE-00008 and RLD-PMP-00019 is located in RLD-BULGE-00009.

In addition to transfers between RLD-VSL-00007/8 and PWD-VSL-00033/43 and delivering samples to ASX- SMPLR-00028, the transfer pumps are designed to support the following:

- RLD-VSL-00007/8 recirculation.
- RLD system flush using DIW pumps in series and aligned to the suction of RLD-PMP-00018/19.
- Transfers between RLD-VSL-00007 and RLD-VSL-00008.

RLD-VSL-00007 and RLD-VSL-00008 Transfer Bulges (RLD-BULGE-00008 and RLD-BULGE-00009)

These bulges contain transfer pumps RLD-PMP-00018 and RLD-PMP-00019 used to transfer effluent from RLD-VSL-00007 and RLD-VSL-00008. The bulge enclosures provide shielding for personnel while allowing access to maintainable components within the bulge such as valves, pumps, and instrumentation. The piping arrangement allows either pump to transfer from either vessel, and to discharge to the PWD system in the PTF, to an autosampler, or returned to either vessel.

RLD Process Line Vent Bulge (RLD-BULGE-00010)

RLD-BULGE-00010 includes vent lines connected to the high point of the RLD transfer lines to the PTF and to the headspace of RLD-VSL-00007 and RLD-VSL-00008. The vent lines allow for air to be purged from the lines during transfers and for the lines to drain following a transfer. The bulge enclosure provides shielding for personnel while allowing access to maintainable components within the bulge such as valves and instrumentation.

4F.2.4 Immobilized High-Level Waste Glass Canister Handling Process

The IHLW glass canister handling will consist of the following systems:

- HLW Canister Receipt Handling (HRH) System.
- HLW Canister Pour Handling (HPH) System.
- HLW Canister Decontamination Handling (HDH) System.
- HLW Canister Export Handling (HEH) System.

The individual systems and their primary functions are described below:

HLW Canister Receipt Handling System

The HRH system consists of the equipment, controls, and interlocks required for importing a clean canister into the facility. This system consists of the canister import truck bay, the canister import room, and the canister import tunnel. These areas are located on the south side of the facility.

The sequence of operations and the equipment used for canister import are as follows:

- The shipping crates are unloaded from the transport truck with the canister import crane and placed in the staging area.
- The canisters are then individually removed from the shipping crate and set on the canister inspection/rotation table.
- The canister import room roller shutter door is opened and the canister inspection/rotation table rotates the canister to vertical. The canister import monorail hoist and grapple lift and transfer the canister to the canister import room. The canister is either set in the canister import buffer rack or placed in the canister import bogie. When the canister is transferred to the canister import tunnel, the shielded clean canister import hatch is opened and the canister is lowered into the canister import bogie below, and the hatch is closed and sealed.

- The canister import bogie is transferred under the canister handling cave to the shielded canister handling cave import hatch location. The canister handling cave hatch is then opened and the canister handling cave crane and grapple raises the canister into the canister handling cave. The canister handling cave import hatch is closed and the canister import bogie is returned to under the clean canister import hatch.

Instrumentation, alarms, controls, and/or interlocks will be provided for the HRH system.

HLW Canister Pour Handling System

The primary functions of the HPH system are to transport empty product canisters and full IHLW canisters within the facility and perform product canister sampling, canister closure, and canister rework activities. The HPH system supports both HLW Melters (HMP-MLTR-00001/2). The HPH system includes the canister handling cave and pour tunnel 1 and 2. Each melter (HMP-MLTR-00001/2) is provided with a separate pour tunnel 1 or 2, appropriately, where molten glass is poured into the canisters. The crane decontamination and maintenance areas are also part of the HPH system, located west of the canister handling cave. Pour tunnels 1 and 2 include the bogie decontamination and maintenance areas.

The primary functions of the canister handling cave are as follows:

- Receive canisters from HRH system canister receipt handling.
- Transport empty canisters to import racks.
- Transfer empty canisters to pour tunnel 1 or 2 to be filled.
- Transport full canisters to cooling rack.
- Transport canisters to weld station tables.
- Transfer canisters to HDH system canister decontamination handling.
- Provide equipment for canister import and storage.

Pour Tunnel

Pour Tunnel 1 (H-B032) is designed to provide facilities for glass pouring from the HLW Melter 1 and Pour Tunnel 2 (H-B005A) is designed to serve HLW Melter 2. The pour tunnels are located at the -21 ft level and extend from north-south beneath the south end of the melter cave to an area below the canister handling cave. Bogie decontamination is performed in the tunnels, and bogie maintenance areas are provided in a designated shielded area at the south end of the tunnels. The tunnels will have a hatch that segregates the pour tunnels and the canister handling cave. The tunnels will also have a bogie maintenance shield door. The bogie maintenance area has a shield personnel access door and a roof access plug from the corridor above. The pour tunnels are designated as C5 areas.

Canister Transport

Canisters are transported within the canister handling cave by means of an overhead crane. A standby crane is available when the primary overhead crane is out of service. Viewing windows and camera are provided for viewing of equipment and operations within the cave area. Integrated networks of programmable logic controllers, which form part of the process control system, are used to control the mechanical handling.

Clean canisters are transferred from the HRH system to the HPH system through the canister import tunnel hatch. The hatch opens and the handling cave crane raises the canister into the canister handling cave. The hatch is closed and the canister is taken to the buffer storage area racks. When a canister is required for filling, it is taken out of the buffer rack using the canister handling cave crane and transferred above the appropriate pour tunnel hatch. The hatch is opened and the canister is lowered into the pour tunnel bogie below. The grapple is released and raised and the hatch is closed. The bogie travels to a position under the pour spout. As the bogie moves into position under the pour spout, the pour spout glass catch tray is pushed back and signals that a canister is present. A proximity switch detects that the bogie is in position, the bogie is then locked into position, and the canister is filled with glass. Canister filling is controlled and monitored by the canister level detection system (HMP system melter process). After completion of filling, the canister remains at the pour spout for approximately one hour to allow a "skin" to form over the glass that provides a seal to prevent additional offgassing. The filled canister is allowed to cool prior to removal from the pour tunnel.

After cooling, the canister is moved south in the pour tunnel until it is beneath the canister handling cave hatch. The hatch is opened, the canister handling cave crane removes the full canister, and the hatch is closed. The filled canister is then cooled in cooling racks in preparation for welding the lid in place.

After cooling, in the cooling racks, a crane transfers the canister for lid welding, sampling of glass, and/or rework. The canister is lowered into the welding station table and the grapple released from the canister. After the welding station operations, the crane transfers the canister to the buffer storage racks or to the decontamination system rinse bogie, via the decontamination hatch.

The canister handling cave is classified as a C5 area; therefore, activities in the handling cave will be conducted remotely. This will be accomplished with viewing windows, cameras, manipulators, and overhead cranes. Windows are strategically located above the transfer hatches for viewing the canisters as they are raised and lowered. The crane decontamination area is located on the west end of the canister handling cave. The decontamination area is classified as a C3/C5 area. The crane maintenance area is located west of the crane decontamination area. The crane maintenance area is classified as a C3 area.

Canister Weld, Glass Sampling, and Rework

The canister lid welding, glass sampling, canister inspections, and rework will be performed at one of two welding stations located along the south wall of the canister handling cave. Each station is located next to a shield window. Master-slave manipulators (MSMs), closed circuit television, and lights are provided to assist weld station operations.

After the canister is cooled in the canister handling cave, the overhead crane moves the canister from the cooling rack into a port on the welding table. The canister is weighed and confirmed to be below the maximum allowable weight. While the canister is being lowered, cameras inspect the outside of the canister. Typically, glass waste residue is not expected on the exterior of the canister. However, prior to welding the lid on the canister, the canister is inspected. If glass is found on the canister, the glass will be removed using a needle descaler manually operated with the MSM. A vacuum system will be used to capture the removed glass and prevent the spread of debris. The canister is then checked to confirm that its temperature is within the allowable range for welding. This is done using a thermocouple at the weld station. Glass samples are collected using a MSM-operated glass sampling tool that uses a vacuum to draw shards of glass from the top surface. These shards are then transferred into sample vials and transferred to the laboratory using a pneumatic transfer system.

The lid is placed on the canister and welding is performed using an automated welder. The welding parameters are recorded in the plant tracking system. The finished weld is visually inspected using in-cave inspection cameras. Rejected welds may be repaired by re-melting the weld, mechanically removing the weld and re-welding, or welding a secondary lid over the primary lid. The sealed canister is then transferred to the HDH system.

Instrumentation, alarms, controls, and interlocks will be provided for the HLW Canister Handling System to indicate or prevent the following conditions:

- The crane decontamination shield doors are interlocked with the crane maintenance shield door to prevent both sets of doors from being open simultaneously.
- Interlocks will prevent the inadvertent access of personnel or equipment movement.

- The bogie maintenance shield door is interlocked with the shielded personnel access door to ensure that personnel do not enter the bogie maintenance area when the bogie maintenance shield door is open.
- Radiation monitoring equipment is interlocked to the shielded personnel access door to ensure no personnel are able to access the maintenance area if a radiation/contamination source above prescribed limits is present.

HLW Canister Decontamination Handling System

A process flow diagram of the HDH system is provided in Appendix 10.1. The primary function of the HDH system is to decontaminate the IHLW canisters and to swab and monitor decontaminated IHLW canisters for radiological contamination.

The HDH system includes the process and equipment to perform the cerium nitrate canister decontamination process, surface swabbing, and swab monitoring process. The following vessels and their associated ancillary equipment are included in the HDH system:

- Canister Rinse Vessel (HDH-VSL-00001).
- Waste Neutralization Vessel (HDH-VSL-00003).
- Canister Decon Vessels 1/2 (HDH-VSL-00002/4).

The HDH system consists of a canister rinse tunnel, canister decontamination station, swabbing and monitoring station, bogie maintenance areas, crane maintenance area, and canister transfer tunnel. The decontamination system consists of two stations: the decontamination station, which is located in-cave, and a chemical product mixing station, which is located out-cave. Vertical separation between the stations facilitates gravity flow of process solutions from the chemical product mixing station to the Canister Decontamination Vessels (HDH-VSL-00002/4). Beneath the canister decontamination cave is a canister rinse tunnel and a canister storage transfer tunnel. The canister rinse tunnel houses the canister rinse bogie, which transfers the canister from the canister handling cave to the canister decontamination cave while performing a prewash at an intermediate station. The canister storage transfer tunnel houses the canister storage transfer bogie, which transfers the decontaminated canisters from the canister decontamination cave to the canister export cave.

A filled, cooled, and welded IHLW canister is initially transported to the HDH system via a crane located in the canister handling cave. The IHLW canister is loaded into the canister rinse bogie and washed in a sealed vessel using low-pressure demineralized water to remove loose contamination. This water wash is performed in the Canister Rinse Vessel (HDH-VSL-00001) mounted on the canister rinse bogie, which travels from below the canister handling cave to below the canister decontamination cave. After the water wash, the canister is transferred by a crane to the canister decontamination vessel for further decontamination by chemically etching a thin layer of stainless steel from the canister surface, using cerium ion in a dilute nitric acid. The canister is then washed with nitric acid, followed by a second washing with de-mineralized water. After draining de-mineralized water from the Canister Decontamination Vessel (HDH-VSL-00002/4), the canister remains in the vessel to dry. The decontamination fluids are pumped into a Waste Neutralization Vessel (HDH-VSL-00003) to which hydrogen peroxide is added to neutralize remaining cerium ion. Following neutralization, the fluid is transferred to the plant waste stream to recycle back to the pretreatment facility. The decontaminated canister is transported by overhead crane to the canister swabbing and monitoring area.

After decontamination and drying, the canister is swabbed using an automated power manipulator. If the radiological contamination is below acceptable limits, the IHLW canister is placed into a canister storage transfer bogie located below the canister decon cave floor, and transported to the HEH system. IHLW canisters exceeding the acceptable radiological contamination limits are returned to the HDH system for further decontamination.

In addition to the instrumentation, alarms, controls, and interlocks addressed in Section 4F, the following will be provided for the HDH system to indicate or prevent the following conditions:

- Interlocks will be provided on bogie decontamination/maintenance area shield door to protect facility personnel from radiation and contamination exposure.
- Interlocks will be provided on crane maintenance area shield door to protect facility personnel from contamination exposure.

HLW Canister Export Handling System

The primary functions of this system are to store filled IHLW canisters in racks, transfer the IHLW canisters into the canister storage/export cave, load the IHLW canisters into shielded casks, evaluate casks for radiological contamination, and load IHLW casks into transport vehicles. The HEH system consists of a canister storage/export cave, a cask handling tunnel, a cask loading area, and a truck bay, and is equipped to support both HLW Melters.

Decontaminated IHLW canisters are transferred to the canister storage/export cave from the HDH system using a bogie and an overhead crane and placed in the canister storage racks. When an IHLW canister is ready for exporting to an appropriate Hanford Site TSD unit, a dedicated transport vehicle is dispatched to the IHLW truck bay. The empty shielded cask is removed from the vehicle and placed on a cask transfer bogie located in the cask handling tunnel. The bogie transfers the cask to a lid lifting station where the lid is removed, and then to a canister receiving station. The IHLW canister is visually inspected in the canister storage cave and its identification confirmed. After the inspection information is recorded, the canister is lifted by overhead crane and placed into the empty shielded cask. The bogie then returns the cask to the lid lifting station where the lid is replaced and bolted. The loaded cask is then transferred to the export station where the cask is lifted by an overhead crane and placed on the transport vehicle. The cask exterior is verified to be below the acceptable radioactive contamination and activity levels, the cask is transported to a Hanford Site Storage Facility.

Closed circuit television cameras will provide general viewing of the canisters and the storage area. Descriptions of inspections of IHLW canister storage areas are included in Chapter 6.0 of this permit. An IHLW canister tracking system will retain required information such as the IHLW identification number, weight, and dimensions of the IHLW canisters.

In addition to the instrumentation, alarms, controls, and interlocks addressed in Section 4F, the following will be provided for the HEH system to indicate or prevent the following conditions:

- Interlocks to prevent the canister storage/export cave import and export hatches from being open at the same time.
- Gamma monitoring/interlocks to prevent the cask export hatch from opening when high radiation levels exist.
- Gamma monitoring/interlocks to prevent cask handling bogie travel to the cask export hatch unless the cask lid is properly installed.
- Interlock to prevent both truck bay “exit” and “entrance” (external) roller shutter doors from being open at the same time.
- Interlock to prevent the truck bay inner roller shutter door from being open at the same time as either of the “exit” or “entrance” roller shutter doors.
- The shielded personnel access door in the canister export cave crane maintenance area is interlocked with the canister export cave crane maintenance horizontal and vertical shield door. The shielded personnel access door is also interlocked with a gamma monitor to prevent opening when a source is present.

- The process crane is prevented from striking the crane maintenance area shield door by end of travel and over-travel limit switches.

4F.2.5 High-Level Waste Melter Cave Mechanical Systems

Each HLW Melter Cave Mechanical System will consist of the following individual systems:

- HLW Melter Handling (HMH) System.
- HSH System.

The individual systems and their primary functions are described below:

HLW Melter Handling System

The primary function of the HMH system is identical for both Melters (HMP-MLTR-00001/2). The HMH system provides the equipment and controls necessary to:

- Transport new melter units into the HLW melter cave in conjunction with the HSH system.
- Remove spent melter units from the HLW melter cave.
- Decontaminate and monitor the spent melter overpacks.

A melter transporter will be used to move a new HLW Melter to the HLW Facility loading dock. The melter will be transferred through the rollup doors to the melter cave airlock, transferred through the airlock, and docked to the melter cave shield door. After opening the shield and overpack doors, the melter will be moved out of its overpack and installed in the melter cave.

The process of removing a spent HLW Melter from a cave and loading it back into its overpack is the reverse of the installation. The overpack will provide a shielded disposal/storage canister for the spent melter. After the outside surfaces of the overpack have been checked for radiological contamination and decontaminated as required, the spent melter and its overpack will be moved through the melter airlock through the rollup doors and placed on the transporter, to be moved out of the HLW Vitrification Facility.

Decontamination of the overpack in the C3/C5 airlock, before it is exported, will be performed manually using moist cloths. The HLW Melter overpack's primary function is to serve as a shielded, box-like enclosure for the storage, transport, and disposal of the HLW Melter. The overpack performs a radiological shielding function of the highly radioactive spent HLW Melter. Due to the high radiation levels associated with a spent HLW Melter, the walls on all sides of the HLW Melter overpack will be seal-welded and have a nominal thickness of approximately 8 in. of carbon steel. The estimated weight of the HLW Melter overpack is 250 tons with an empty melter, and 350 tons when carrying a payload of the HLW Melter full of glass. The spent melter weight when full of glass is a worst case in the event that the residual glass removal described in Section 4F.2.4 cannot be performed. After approximately 5 years of service, an HLW Melter is expected to reach the end of useful life service, and will be placed in the overpack before removing it from the HLW Vitrification Facility. The overpack, with the spent HLW Melter inside, will be moved to the HLW failed melter storage facility prior to land disposal. The overpack with spent HLW Melter will be disposed at the Hanford Site if it meets the land disposal facility waste acceptance criteria. Regulatory issues and permitting actions associated with on-site disposal of spent and/or failed HLW Melters will be addressed in the future.

Justification for on-site burial of the 8 in. carbon steel overpack results from a corrosion study of submarine reactors based on chemical content, resistivity, aeration, and burial methods. The predicted maximum pitting corrosion penetration for a 100-year period was 0.350 in. for reactors buried in geologic conditions similar to those in which the overpacks will be buried. (*Prediction of Pitting Corrosion Performance of Submarine Reactor Compartments After Burial at Trench 94, Hanford, Washington, March 1992*).

Prior to disposal, the spent melter will be stored in the failed melter storage facility. If a melter fails to meet the receiving TSD waste acceptance criteria, it will be stored until the HLW facility operating conditions are suitable for the spent melter to be returned to the melter cave for further decontamination, treatment, repackaging, and/or other process to enable the spent melter to meet the receiving facility's waste acceptance criteria.

HLW Melter Cave Support Handling System

The primary function of this system is to provide remotely operated equipment to perform these support activities in each melter cave:

- Melter maintenance and replacement.
- Melter component and consumable maintenance and replacement.
- Melter component and consumable dismantling, sorting, and loading.
- Equipment decontamination and hands-on maintenance.

Decontamination Tanks 1 and 2 (HSH-TK-00001/2) and associated ancillary equipment are included in the HSH system.

Each melter cave will contain an HLW Melter (HMP-MLTR-00001/2), Feed Preparation Vessels (HFP-VSL-00001/5), and HLW Melter Feed Vessels (HFP-VSL-00002/6), and the following offgas system components:

- Offgas Film Cooler/Standby Insert (HOP-FCLR-00001/2/3/4).
- SBS (HOP-SCB-00001/2).
- HEME (HOP-HEME-00001A/1B/2A/2B).

Overhead cranes, hoists, and master-slave and power manipulators will be the primary equipment used to carry out various replacement, size reduction, and packaging tasks. Auxiliary tools will include impact wrenches, nut-runners, and hydraulic shears.

In addition, the HSH system will provide the means to dismantle and reduce the size of spent melter components or consumables for export out of the cave in waste canisters. Various size reduction tools will be used to cut down the equipment. The waste will be placed on a sorting table for screening and segregation prior to packaging and export.

Prior to melter replacement, residual glass heel will normally be removed from a spent melter. Lid heaters will keep the glass pool at the desired temperature ranges. Air and vacuum lines will be inserted to draw the molten glass into a canister. The spent melter will then be disconnected and prepared for transport out of the cave.

A consumable bucket will be used to import and export melter consumables. The HFP vessels will be designed and organized such that power manipulators can disconnect connections and prepare failed vessels and components for export. Components of the HOP system found in this cave will also be designed and organized for similar activities.

The HSH system will provide a Decontamination Tank (HSH-TK-00001/2) in the equipment decontamination pit, to allow for decontamination of consumables and equipment before hands-on maintenance in the crane maintenance area. In the Decontamination Tank, the equipment will be soaked in demineralized water and/or nitric acid. The equipment decontamination pit will be used to additionally decontaminate equipment using manipulators before items can be removed for hands-on maintenance. A crane decontamination area is located above the C3/C5 airlock.

4F.2.6 High-Level Waste Filter Cave Handling System

The HLW Filter Cave Handling (HFH) system provides the remote maintenance capability for the equipment inside the filter cave located in Room H-0104. The filter cave houses the HOP, PJV, and primary C5 Ventilation HEPA filters. The filter cave contains the spent filter export hatch, which interfaces with the drum transfer tunnel. The filter cave also contains a pair of shield doors at the interface between the filter cave and the crane maintenance area. The shield doors provide the barrier between the filter cave and the man-accessed maintenance area. The filter cave is designated as a C5 area. A decontamination area is located near the southeast corner of the filter cave with capabilities to perform radiological decontamination of the loaded filter disposal basket and other items, such as power manipulator, tools, and crane hook. Specialized decontamination equipment such as carbon dioxide or compressed air spray wands are provided to perform cleaning operations.

The filter housings will be of stainless steel. The filter lids will be flush with a stainless steel clad false floor (filter cave deck) that covers the entire cave at 14 ft elevation. The following equipment will be used for replacement of HEPA Filters and with other in-cave activities.

- Power manipulators.
- Crane and cable reeling system.
- Spent filter export hatch.

Spent HEPA filters will be placed in a waste disposal basket sized to fit inside a 55 gal drum. Full waste disposal baskets will be lowered through the export hatch and into a drum located on a bogie inside the drum transfer tunnel. System Radioactive Solid Waste Handling (RWH) provides the final packaging and export of the solid wastes generated in the filter cave.

4F.2.7 Radioactive Solid Waste Handling System

The HLW RWH system retrieves, transports, packages, and removes secondary solid waste from the HLW melter and filter caves. The primary functions are to:

- Provide waste disposal drums and shielded casks for removal of miscellaneous secondary solid waste from the HLW melter caves and filter cave.
- Transport filled and empty waste disposal drums and shielded casks.
- Provide external radiological monitoring of waste disposal drums and shielded casks.
- Decontaminate waste drums as required.
- Load waste drums into transport casks.

The RWH system consists of three major operational areas: the drum transfer tunnel, the swabbing and monitoring area, and the cask handling area. Mixed waste is generated in melter caves 1 and 2, the canister handling cave, and the filter cave. Mixed waste generated in the canister handling cave is transferred to either melter cave via the pour tunnels and then exported from the melter caves to the drum transfer tunnel. The drum transfer tunnel runs beneath these areas and provides a common area for receipt of waste to consolidate the separate waste streams into a single export path. The RWH system receives waste from the HSH system (melter caves 1 and 2) and the HFH system (filter cave) contained in lidded waste baskets that are lowered through the transfer ports in the ceiling of the drum transfer tunnel.

The RWH system introduces empty 55-gallon drums into the HLW Facility for packaging radioactive solid waste for disposal. Empty 55-gallon drums are placed into shielded casks in the canister export truck bay. The cask is transferred on the cask transport vehicle into the cask import/export area for ultimate transfer from the facility.

The cask is positioned under the monorail hoist. It is then lifted, transferred to, and positioned onto the cask transfer bogie. A shield door is opened, and the bogie is moved to the cask lidding station. The cask lid pintle is aligned with the lifting claw of the cask lidding machine and the cask lid is removed. The cask is then positioned under the cask transfer hatch. The drum, lid, and clamping ring are imported into the swabbing and monitoring area and manually staged on a stand in front of the shield window.

The drum transfer bogie rolls to position beneath a transfer hatch of either melter cave 1, melter cave 2, or the filter cave. With the drum positioned under the selected cave transfer port, a loaded waste disposal basket is lowered into the drum by the interfacing cave system's crane and grapple. With the waste disposal basket located in the drum, the grapple is detached and raised by the system crane. The full 55-gallon drum is relocated back to the position under the drum transfer hatch to the swab and monitoring area. The drum is lifted into the swab and monitoring area using the overhead crane and drum grapple.

The RWH system transports loaded drums into the lidding, swabbing, and monitoring area for lidding, swabbing, external monitoring, and decontamination (if required). The system then exports the filled 55-gallon drums through the import/export area.

The following drum swabbing, monitoring, and export operations are performed:

- The crane lifts the drum to the swabbing and monitoring station. Two MSMs will be mounted on the wall of the swabbing and monitoring area and will provide the operator interface for installation of the drum outer lid and clamping ring while the drum is positioned on the drum turntable.
- The robotic swabbing arm and turntable swab the surface of the drum. The swabs are placed in the shielded posting port of the swab analyzing station. Following preliminary measurement of the swab, the posting port is actuated to move the swab into the swabbing and monitoring glovebox where the sample is analyzed and bagged out for disposal.
- If the swabs are within acceptable limits, the crane lifts the drum from the drum swabbing turntable and positions the drum over the cask transfer hatch and places it in the shielded cask on the cask transport bogie.
- If the drum requires decontamination, additional swabbing of the drum will be performed to remove the contamination. Remote-handled decontamination equipment is available in the cave to be used if additional swabbing is insufficient to meet disposal requirements.
- The cask transfer bogie moves to the cask lidding station where the cask lid is replaced onto the cask. The bogie then moves to a gamma monitor where radiation levels are verified before the import/export shield door is opened and the cask transfer bogie moves into the import/export area. Once the cask is in the import/export area and the import/export shield door is closed, operators enter to bolt the lid onto the cask. The monorail then moves the cask to the cask handling truck. The cask handling truck positions the cask under the truck bay crane. From the cask import/export area, the crane positions the cask on a vehicle for transfer from the facility.

4F.3 Containment Buildings

This section describes how these units are designed and operated, in accordance with the requirements of WAC 173-303-695, which incorporates 40 Code of Federal Regulations (CFR) 264 Subpart DD, *Containment Buildings*, by reference. Regulatory citations in this section list the applicable section of the CFR to make it easier for readers to find the requirement. A typical containment building is illustrated in Chapter 4A, Figure 4A-59.

There are nine containment buildings in the HLW Vitrification Facility. The regulated units in the HLW Vitrification Facility are:

- HLW Melter Cave 1 Containment Building (H-0117, H-0116B, H-0310A).

- HLW Melter Cave 2 Containment Building (H-0106, H-0105B, and H-0304A).
- IHLW Canister Handling Cave Containment Building (H-0136).
- IHLW Canister Swabbing and Monitoring Cave Containment Building (H-0133).
- HLW C3 Workshop Containment Building (H-0311A, H-0311B).
- HLW Filter Cave Containment Building (H-0104).
- HLW Pour Tunnel 1 Containment Building (H-B032).
- HLW Pour Tunnel 2 Containment Building (H-B005A).
- HLW Drum Swabbing and Monitoring Area Containment Building (H-0126A, H-0126B, H-B028).

Table 4F-6 summarizes the units within the HLW Vitrification Facility. The following figures and drawings found in DWP Operating Unit Group 10 provide further detail for the containment buildings:

- Figure 4A-59 depicting common features of containment buildings.
- General arrangement figures and drawings showing locations of containment buildings.
- Waste management area figures showing containment building locations to be permitted.

Control of fugitive emissions from containment buildings is described in Chapter 4.0 “Process Information,” Section 4.2.9 Air Emissions.

The following sections address each of the containment buildings.

4F.3.1 High-Level Waste Melter Cave 1 Containment Building (H-0117, H-0116B, H-0310A) and High-Level Waste Melter Cave 2 Containment Building (H-0106, H-0105B, H-0304A)

The HLW melter cave 1 and HLW melter cave 2 containment buildings are located in the central portion of the HLW Vitrification Facility. Each of the containment buildings will house an HLW melter cave, an overpack C3/C5 airlock, and an equipment decontamination pit.

Typical waste management activities performed in these containment buildings include the dismantling and packaging of spent consumables and decontamination of equipment for hands-on maintenance. The types of spent consumables will include waste recirculators, lid heaters, bubblers, thermocouples, and jumpers. When spent consumables are ready for change out, they will be placed on a consumable storage rack while awaiting size reduction. The consumables will be reduced in size by dismantling or cutting the spent equipment, or both. This process will be remotely conducted on tables in the containment building. The spent consumables will be placed in baskets and lowered into containers in a transfer tunnel that passes under the HLW melter cave 1 and 2 containment buildings (H-0117, H-0116B, H-0310A and H-0106, H-0105B, H-0304A). The C3/C5 airlocks will be used for packing or unpacking melters or their components.

In case of a HLW melter failure, the melter will be evaluated for meeting the receiving TSD waste acceptance criteria, particularly in terms of the radiological contamination in the HLW glass residue present in the melter, before it is placed in an overpack.

The equipment decontamination pit located within the melter cave containment building will house the Decontamination Tanks (HSH-TK-00001/2) where equipment removed from the melter cave will be decontaminated prior to maintenance. The equipment will be initially decontaminated by soaking in the decontamination tank. After evaluation, additional decontamination may be performed using manipulators before the levels are acceptable for hands-on maintenance.

Located within the melter cave containment building will be the HLW Melter; the SBS and HEMEs, which will function as part of the melter offgas system, the Feed Preparation Vessels (HFP-VSL-00001/5), and the HLW Melter Feed Vessels (HFP-VSL-00002/6). These tank systems will have secondary containment.

HLW Melter Cave 1 and HLW Melter Cave 2 Containment Building Design

The two HLW melter containment buildings are completely enclosed within the HLW Vitrification Facility. Each of the melter cave containment buildings will house an HLW melter cave, an overpack C3/C5 airlock cell, and an equipment decontamination pit. Both melter cave containment buildings are designed to prevent the release of dangerous constituents and exposure to the outside environment. The design and construction of the HLW Vitrification Facility exterior will prevent water from running into the facility. The roof of the HLW Vitrification Facility will be metal. Runoff will be collected by roof drains and a drainage system with overflow roof drains. Approximate dimensions of the HLW melter cave 1 and 2 containment buildings are summarized in Table 4F-6.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because the liquid dangerous wastes managed in the HLW melter containment building are addressed under tank systems.

HLW Melter Cave 1 and HLW Melter Cave 2 Containment Building Structure

The HLW melter cave no. 1 and 2 containment buildings will be a fully enclosed, concrete-walled structure within the HLW Vitrification Facility. Therefore, its structural requirements will be met by the design standards of the HLW Vitrification Facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW Vitrification Facility meet or exceed the Uniform Building Code Seismic Design Requirements.

HLW Melter Cave 1 and HLW Melter Cave 2 Containment Building Materials

The HLW melter cave 1 and 2 containment buildings will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be lined with stainless steel, except for the C3/C5 airlock. The height of the lining is summarized in Table 4F-3.

Use of Incompatible Materials for the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

A partial stainless steel liner will be provided for the containment buildings, except for the C3/C5 airlock. The C3/C5 airlock will be partially lined with a protective coating. The stainless steel will be compatible with the wastes that will be managed, which will include spent melters and consumables, including air spargers, metallic parts, and refractory bricks. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the HLW Cave Melter 1 and HLW Melter Cave 2 Containment Buildings

The HLW melter cave 1 and 2 containment buildings are designed to withstand loads from the movement of personnel (C3/C5 Airlock), wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the HLW melter containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained.

The requirements of 40 CFR 264.1101(b) do not apply to this design because liquid dangerous wastes present in the containment building will be managed in tank systems with secondary containment systems.

Operation of the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

Operational and maintenance controls and practices will be established and followed to ensure containment of the wastes within the HLW melter containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

The partial stainless steel lining of the containment building will be designed and constructed in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The liner will be welded at each seam. The stainless steel liner will be free of corrosion or other deterioration because it will be compatible with materials that will be managed in the containment building, which will include spent melters and spent equipment. Only decontamination chemicals that are compatible with the liner will be used.

Waste containers managed in the containment building will not be stacked. In general, waste will be placed in containers and removed from the containment building.

Measures to Prevent Tracking Wastes from the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Building

The HLW melter cave 1 and 2 containment building design and operating methods include several measures that will prevent wastes from being tracked from the unit. Measures that will be implemented include:

- Limiting the movement of personnel and material from the C3/C5 airlock.
- Using shield doors to prevent the inadvertent spread of contamination.
- Decontaminating materials or containers before they are released from the unit.
- Using C5 ventilation as a primary containment method.

Personnel access to the HLW melter caves, which are classified as a C5 contamination area, will be restricted. Personnel operating in melter cave C3/C5 airlocks will not be in contact with spent melters because they will be encased in overpack containers.

Export of equipment from the melter caves will be kept to a minimum by performing in-cave maintenance to the maximum extent possible. The design of the cave and equipment includes MSMs, special tools, and a tool import port that will enable maintenance operations to be conducted remotely without removing the equipment from the cave. When equipment must be removed for hands-on maintenance, it will be transferred through shield doors into the Decontamination Tank (HSH-TK-00001/2) or the crane decontamination area (C3/C5) above the C3/C5 airlock. The equipment will be transferred to the maintenance room only after it has been decontaminated in Decontamination Tank HSH-TK-00001/2, and in the equipment decontamination pit, if needed.

Spent consumables and wastes will be size-reduced in the cave and exported to drums through an air lock, which is designed to provide containment of contamination between the C5 melter cave and the C3 drum transfer tunnel. Export of spent melters will be controlled to prevent the spread of contamination. Melters will be transferred into overpack containers that are docked with the shield doors to the C3/C5 airlock.

Procedures in the Event of Release or Potential for Release from the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

Conditions that could lead to a release from the HLW melter cave 1 and HLW melter cave 2 containment buildings will be corrected on a schedule intended to preclude a release that could be hazardous to public health or the environment.

In the unlikely event of a release of dangerous wastes from either containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the HLW melter cave 1 and HLW melter cave 2 containment buildings. The inspection and monitoring schedule and methods that will be used to detect a release from the unit are included in DWP Operating Unit Group 10, Chapter 6A.

4F.3.2 Immobilized High-Level Waste Canister Handling Cave Containment Building (H-0136)

The HLW Canister Handling Cave Containment Building will be located in the southern portion of the HLW Vitrification Facility. Typical waste management activities performed within this containment building include the storage of waste canisters and containerized secondary waste. Located within the containment building will be two cooling and buffer storage areas and two container welding and rework stations. IHLW canisters that have cooled enough to leave the pour areas will be transported to the canister handling cave containment building by means of an overhead crane. The IHLW glass waste will continue to cool in the buffer storage areas. When adequately cooled, canisters will be moved to one of the two weld and rework stations, where the lid will be welded onto the canister. The IHLW canister will then be decontaminated in the HDH system and transported to the IHLW canister swabbing and monitoring cave containment building. Container management practices are discussed in Section 4F.1. The IHLW Canister Handling Cave Containment Building will provide secondary containment for tank system ancillary equipment (piping).

The containment building design requirements of 40 CFR 264.1101(b) do not apply because the liquid dangerous wastes managed in the IHLW Canister Handling Cave Containment Building are addressed under tank systems.

IHLW Canister Handling Cave Containment Building Design

The IHLW Canister Handling Cave Containment Building will be completely enclosed within the HLW Vitrification Facility. The design and construction of the HLW Vitrification Facility exterior will prevent water from running into the facility. The roof of the HLW Vitrification Facility will be metal. Runoff will be collected by roof drains and a drainage system with overflow roof drains. The unit is designed to prevent the release and exposure of dangerous constituents to the outside environment. Its approximate dimensions are summarized in Table 4F-6.

IHLW Canister Handling Cave Containment Building Structure

Because the IHLW Canister Handling Cave Containment Building will be a concrete-walled structure fully enclosed within the HLW Vitrification Facility, its structural requirements will be met by the design standards of the HLW Vitrification Facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW Vitrification Facility meet or exceed the Uniform Building Code Seismic Design Requirements.

IHLW Canister Handling Cave Containment Building Unit Materials

The IHLW Canister Handling Cave Containment Building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be lined with stainless steel. The height of the lining will be a minimum of 0.5 ft.

Use of Incompatible Materials for the IHLW Canister Handling Cave Containment Building

The partial stainless steel liner will be provided for the IHLW containment building that will be compatible with the steel canisters that will be managed. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used in the unit.

Primary Barrier Integrity in the IHLW Canister Handling Cave Containment Building

The HLW Vitrification Facility is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the IHLW Canister Handling Cave Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the IHLW Canister Handling Cave Containment Building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containers with free liquid will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the IHLW Canister Handling Cave Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the IHLW Canister Handling Cave Containment Building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the IHLW Canister Handling Cave Containment Building

The partial stainless steel lining of the containment building will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration.

The stainless steel liner will be welded at each seam, and will be free of corrosion or other deterioration because it will be compatible with materials that will be managed in the containment building, including the stainless steel containers. Only decontamination chemicals that are compatible with the liner will be used.

Waste containers that will be managed in the containment building will not be stacked higher than the unit wall; however, wastes are not anticipated to be stacked.

Measures to Prevent Tracking Wastes from the IHLW Canister Handling Cave Containment Building

The IHLW Canister Handling Cave Containment Building is designed to store cooling IHLW glass waste containers and weld the lids onto the containers.

The outside of the canister will be inspected to see whether glass is present on the container. If glass is found, it will be removed using a needle gun or other mechanical method. The glass shards will be collected for disposal in a shop-type vacuum and disposed of as a secondary waste. The containment building will be classified as a C5 contamination area, and therefore personnel access will be restricted. Wastes leaving the unit will be within containers.

<u>Procedures in the Event of Release or Potential for Release from the IHLW Canister Handling Cave Containment Building</u>

Conditions that could lead to a release from the IHLW Canister Handling Cave Containment Building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

<u>Inspections of the IHLW Canister Handling Cave Containment Building</u>

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the IHLW Canister Handling Cave Containment Building. The inspection and monitoring schedule and methods that will be used to detect a release from the unit are included in DWP Operating Unit Group 10, Chapter 6A.

4F.3.3 Immobilized High-Level Waste Canister Swab and Monitoring Cave Containment Building (H-0133)

The IHLW Canister Swab and Monitoring Cave Containment Building is located in the southeast portion of the HLW Vitrification Facility (Room H-0133). The systems associated with the swabbing and monitoring activities in the cave include overhead crane, grapples, power manipulator, swabbing turntable, and swabbing waste storage container.

After decontamination in the Canister Decon Vessels (HDH-VSL-00002/4), the canister is moved to the canister swab and monitoring building and placed on the turntable. The turntable provides a base on which the canister is set and rotated while the surface swabbing is performed. When surface radiological cleanliness has been verified, the canister is placed in the canister storage bogie and transferred to the canister storage cave.

<u>IHLW Canister Swab and Monitoring Cave Containment Building Design</u>

The IHLW Canister Swab and Monitoring Cave Containment Building will be completely enclosed within the HLW Vitrification Facility, and will be designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the HLW Vitrification Facility exterior will prevent water from running into the facility.

The roof of the HLW Vitrification Facility will consist of metal roofing, roof insulation, and a vapor barrier. Runoff will be collected by roof drains and a drainage system with overflow roof drains. Unit dimensions are summarized in Table 4F-6.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because any dangerous waste containers with free liquid will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

<u>IHLW Canister Swab and Monitoring Cave Containment Building Structure</u>

Because the IHLW canister swab and monitoring cave building will be a concrete-walled structure fully enclosed within the HLW Vitrification Facility, its structural requirements will be met by the design standards of the HLW Vitrification Facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW Vitrification Facility meet or exceed the Uniform Building Code Seismic Design Requirements.

IHLW Canister Swab and Monitoring Cave Containment Building Unit Materials

The IHLW Canister Swab and Monitoring Cave Containment Building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be covered with epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the IHLW Canister Swab and Monitoring Cave Containment Building

Treatment reagents that could cause the protective coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the IHLW Canister Swab and Monitoring Cave Containment Building

The IHLW canister swab and monitoring cave building is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the IHLW Canister Swab and Monitoring Cave Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the IHLW Canister Swab and Monitoring Cave Containment Building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containers with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the IHLW Canister Swab and Monitoring Cave Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the IHLW Canister Swab and Monitoring Cave Containment Building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the IHLW Canister Swab and Monitoring Cave Containment Building

The protective coating of the containment building will be maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. Only decontamination chemicals that are compatible with the protective coating will be used. Wastes are not expected to be stacked within the unit.

Measures to Prevent Tracking Wastes from the IHLW Canister Swab and Monitoring Cave Containment Building

The IHLW Canister Swab and Monitoring Cave Containment Building is designed to manage canisters that are swabbed to determine whether they meet the surface radiological requirements. The containment building will be classified as a C3 contamination area with limited personnel access. The air from the unit passes through HEPA filtration prior to discharge out of the plant stack.

Personnel access to the canister swab and monitoring cave containment building will be limited. Therefore, personnel moving into and out of the unit will not track contamination out of the unit.

Procedures in the Event of Release or Potential for Release from the IHLW Canister Swab and Monitoring Cave Containment Building

Conditions that could lead to a release from the IHLW Canister Swab and Monitoring Cave Containment Building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the IHLW Canister Swab and Monitoring Cave Containment Building

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to release of wastes from the IHLW Canister Swab and Monitoring Cave Containment Building. The inspection and monitoring schedule and methods that will be used to detect a release are included in DWP Operating Unit Group 10, Chapter 6A.

4F.3.4 C3 Workshop Containment Building (H-0311A, H-0311B)

The C3 Workshop Containment Building will be located in the northeast section of the HLW Vitrification Facility at elevation 37 ft.

Typical waste management activities performed in this containment building include decontamination, size reduction, and packaging of spent equipment. Equipment will be transported to the unit contained in shielded containers, drums, or in a standard waste box. In the workshop, the equipment will be decontaminated to enable hands-on maintenance. Spent equipment parts will be bagged and placed in standard waste containers or boxes for disposal. Size reduction may be performed to facilitate packaging. Other spent equipment will be packaged in drums or standard waste boxes.

C3 Workshop Containment Building Design

The C3 Workshop Containment Building will be designed as a completely enclosed area within the HLW Vitrification Facility. It will be designed to prevent the release of dangerous waste and their exposure to the outside environment. The design and construction of the HLW Vitrification Facility exterior will prevent water from running into the facility. The roof of the HLW Vitrification Facility will consist of metal roofing, roof insulation, and vapor barrier. Rainwater runoff will be collected by roof drains and drainage systems with overflow roof drains. The approximate dimensions of the unit are summarized in Table 4F-6.

C3 Workshop Containment Building Structure

The C3 Workshop Containment Building will be a concrete-walled structure fully enclosed within the HLW Vitrification Facility. Therefore, structural requirements for the containment building will be met by the design standards of the HLW Vitrification Facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure.

DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW Vitrification Facility meet or exceed the Uniform Building Code Seismic Design Requirements.

C3 Workshop Containment Building Materials

The C3 Workshop Containment Building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be covered with epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials in the C3 Workshop Containment Building

The epoxy coating will be provided for this unit which will be compatible with the equipment and wastes that will be managed. Activities in the unit will be limited to decontamination, size reduction, and packaging the waste components into drums or waste boxes. Treatment reagents that could cause the liner or coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the C3 Workshop Containment Building

The C3 Workshop Containment Building is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the C3 Workshop Containment Building

Prior to initial receipt of dangerous and mixed waste, a certification by a qualified registered professional engineer that the C3 Workshop Containment Building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containers with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the C3 Workshop Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the dangerous wastes within the C3 Workshop Containment Building unit as required by 40 CFR 264.1101(c)(1).

Maintenance of the C3 Workshop Containment Building

The concrete and protective coating, where used, will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The concrete and protective coating, where used, will remain free of corrosion or other deterioration because it is compatible with materials that will be managed in the containment building. The failed equipment that will be managed in the containment building unit will be compatible with the concrete or protective coating, where used. Only decontamination chemicals that are compatible with the concrete or protective, where used, will be applied.

Measures to Prevent Tracking Wastes from the C3 Workshop Containment Building

The C3 Workshop Containment Building will be designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Personnel access to a C3 contamination area will be limited. Very little dust is expected to be generated in the unit.

The containment building will be classified as a C3 contamination area, which allows only limited access by personnel. Personnel access will be via a C2/C3 subchange room. Equipment will enter and exit the workshop via a C2/C3 airlock. Wastes leaving the unit will be enclosed within containers. If necessary, the containers will be decontaminated in the unit prior to transportation to a permitted storage area. Equipment leaving the unit will be decontaminated, when necessary, before being released for removal from the cells.

Procedures in the Event of Release or Potential for Release from the C3 Workshop Containment Building

The design and operation of the unit makes it very unlikely that releases will occur. The design and operational measures will minimize the generation of dust and contain it within the unit. In the unlikely event that a release of dangerous wastes from the containment building is detected, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste. These methods will be followed to repair conditions that could lead to a release.

Inspections of the C3 Workshop Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the C3 Workshop Containment Building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6A.

4F.3.5 Filter Cave Containment Building (H-0104)

The Filter Cave Containment Building is located in the northwest portion of the facility. The Filter Cave Containment Building will manage spent HEPA filters via an overhead crane. The crane transports the spent filters to a disposal container. The disposal container is then transported via cart, through an air lock and shield doors and to a load-out area for storage pending final disposal.

Filter Cave Containment Building Design

The Filter Cave Containment Building will be completely enclosed within the HLW Vitrification Facility, and will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the HLW Vitrification Facility exterior will prevent water from running into the facility. The roof of the HLW Vitrification Facility will consist of metal roofing, roof insulation, and a vapor barrier. Run-on will be collected by roof drains and a drainage system with overflow drains. The approximate dimensions of the containment building are summarized in Table 4F-6.

Filter Cave Containment Building Structure

Because the Filter Cave Containment Building will be a concrete-walled structure fully enclosed within the HLW Vitrification Facility, its requirements will be met by the design standards of the HLW Vitrification Facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW Vitrification Facility meet or exceed the Uniform Building Code Seismic Design Requirements.

Filter Cave Containment Building Materials

The Filter Cave Containment Building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls will be covered with epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the Filter Cave Containment Building

The concrete structure and protective coating, where used, will be compatible with the wastes that will be managed in the unit, which will include spent HEPA filters. Activities in the unit will be limited to HEPA filter change out and waste packaging. Treatment reagents that could cause concrete or protective coating, where used, to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the Filter Cave Containment Building

The Filter Cave Containment Building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment.

The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the Filter Cave Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the Filter Cave Containment Building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containers with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the Filter Cave Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the Filter Cave Containment Building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the Filter Cave Containment Building

The concrete floor and walls of the unit will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The concrete structure will be compatible with materials that will be managed in the containment building, which will include spent HEPA filters. No decontamination chemicals that are incompatible with the concrete will be used.

Measures to Prevent Tracking Wastes from the Filter Cave Containment Building

The Filter Cave Containment Building is designed to manage spent HEPA filters. Conducting these activities in a C5 contamination zone will prevent the spread of contaminated materials. Controlled movement of equipment into and out of the unit will decrease the possibility that waste will be tracked from the unit. Personnel access to a C5 contamination area will be restricted.

Procedures in the Event of Release or Potential for Release from the Filter Cave Containment Building

Conditions that could lead to a release from the Filter Cave Containment Building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the Filter Cave Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the Filter Cave Containment Building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6A.

4F.3.6 High-Level Waste Pour Tunnel 1 Containment Building (H-B032) and High-Level Waste Pour Tunnel 2 Containment Building (H-B005A)

HLW pour tunnels 1 and 2 containment building contain bogies that transport empty canisters to the melter pour spout. Each of the two pour tunnels extends from the south end of the melter caves in a north-south direction to an area below the canister handling cave. The glass pouring into canisters takes place in the north half of the HLW pour tunnels 1 and 2 containment buildings. After filling with glass, the canisters are allowed to cool down prior to being transported to the south portion of the HLW pour tunnels 1 and 2 containment buildings and transferred through the hatch to the canister handling cave located above. The south portion of the HLW pour tunnels 1 and 2 containment buildings can be used for bogie decontamination, if required, prior to handling in the bogie maintenance area. The bogie maintenance area is segregated from HLW pour tunnels 1 and 2 containment buildings by a shield door. Bogie decontamination is not considered a dangerous waste management activity performed within the boundary of the HLW pour tunnels 1 and 2 containment buildings. Contaminated liquids which accumulate in the sumps located in the pour tunnels will be sent to RLD-VSL-00008.

HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Building Design

The HLW pour tunnels 1 and 2 containment buildings will be completely enclosed within the HLW Vitrification Facility, and will be designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the HLW Vitrification Facility exterior will prevent water from running into the facility. The roof of the HLW Vitrification Facility will consist of metal roofing, roof insulation, and a vapor barrier. Runoff will be collected by roof drains and a drainage system with overflow roof drains. Unit dimensions are summarized in Table 4F-6.

The HLW pour tunnel 1 containment building will provide secondary containment for tank system ancillary equipment (piping). The containment building design requirements of 40 CFR 264.1101(b) do not apply because the liquid dangerous waste containers managed in the HLW pour tunnel 1 containment building will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

The HLW pour tunnel 2 containment buildings' design requirements of 40 CFR 264.1101(b) do not apply because any dangerous waste containers with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Building Structure

Because the HLW pour tunnels 1 and 2 containment buildings will be concrete-walled structures fully enclosed within the HLW Vitrification Facility, their structural requirements will be met by the design standards of the HLW Vitrification Facility. The design will ensure that the units have sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW Vitrification Facility meet or exceed the Uniform Building Code Seismic Design Requirements.

HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Building Unit Materials

The HLW pour tunnels 1 and 2 containment buildings will be constructed of steel-reinforced concrete. The interior floors and a portion of the walls of the units will be lined with stainless steel to protect the insulation and concrete from the effects of high temperatures.

Use of Incompatible Materials for the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

The partial stainless steel liner will be provided for the HLW pour tunnels 1 and 2 containment buildings that will be compatible with the steel canisters that will be managed. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used in the unit. There will be no incompatible dangerous wastes managed within the HLW pour tunnels 1 and 2 containment buildings.

Primary Barrier Integrity in the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

The HLW pour tunnels 1 and 2 containment buildings are designed to withstand loads from the movement of wastes and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the HLW pour tunnels 1 and 2 containment buildings meet the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) to this design because any dangerous waste containers with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the HLW pour tunnels No. 1 and No. 2 containment buildings, as required by 40 CFR 264.1101(c)(1).

Maintenance of the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

The partial stainless steel liner will be installed in the HLW pour tunnels 1 and 2 containment buildings to protect insulation and concrete from the effects of high temperatures. Waste canisters will not be stacked within the unit.

Measures to Prevent Tracking Wastes from the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

The HLW Vitrification Facility HLW pour tunnels 1 and 2 containment buildings will be designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Very little dust is expected to be generated in the unit.

The HLW pour tunnel 1 and 2 containment buildings will be classified as C5 contamination areas with personnel access restricted. Personnel access to the HLW pour tunnels 1 and 2 containment buildings will not be allowed because of high radiation.

Control of Fugitive Dust from the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

Operational controls of the HLW Vitrification Facility ventilation system will be used to control fugitive dust emissions from the units to meet the requirements of 40 CFR 264.1101(c)(1)(iv). The following measures will be used to prevent fugitive dust from escaping the HLW pour tunnels 1 and 2 containment buildings:

- A cascading air flow from areas of least to greatest potential contamination (that is, C2 to C3 to C5).
- Greater negative air pressure in the unit, compared to adjacent C3 units, to pull air into the unit and prevent backflow.
- Intake air through controlled air in-bleed units with backflow prevention dampers.
- Safety interlocks to shut down C3 extract fans to prevent backflow if the C5 system shuts down.
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack.
- A multiple fan extraction system, designed to maintain negative pressure and cascading air flow, even during fan maintenance and repair.

Procedures in the Event of Release or Potential for Release from the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

Conditions that could lead to a release from the HLW pour tunnels 1 and 2 containment buildings will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment buildings, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the HLW pour tunnel containment buildings. The inspection and monitoring schedule and methods that will be used to detect a release are included in DWP Operating Unit Group 10, Chapter 6A.

4F.3.7 High-Level Waste Drum Swabbing and Monitoring Area Containment Building (H-0126A, H-0126B, and H-B028)

The HLW Drum Swabbing and Monitoring Area Containment Building is located in the northeast section of the HLW Vitrification Facility. Typical waste management activities performed in this containment building include the remote handling of 55 US gallon drums. The drums will be swabbed for surface contamination and decontaminated if needed.

Upon arrival in the HLW drum swabbing and monitoring area, the 55 US gallon drums are weighed, monitored, and then transferred through a hatch and placed into a shielded cask in the cask handling area.

In the cask handling area, drum transport casks are remotely lidded and moved to the truck loading bay for removal from the facility.

Drum Swabbing and Monitoring Area Containment Building Design

The Drum Swabbing and Monitoring Area Containment Building will be completely enclosed within the HLW Vitrification Facility, and will be designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the HLW Vitrification Facility exterior will prevent water from running into the facility. The roof of the HLW Vitrification Facility will consist of metal roofing, roof insulation, and a vapor barrier. Runoff will be collected by roof drains and a drainage system with overflow roof drains. Unit dimensions are summarized in Table 4F-6.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because any dangerous waste with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

HLW Drum Swabbing and Monitoring Area Containment Building Structure

Because the HLW drum swabbing and monitoring area will be a concrete-walled structure fully enclosed within the HLW Vitrification Facility, its structural requirements will be met by the design standards of the HLW Vitrification Facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW Vitrification Facility meet or exceed the Uniform Building Code Seismic Design Requirements.

HLW Drum Swabbing and Monitoring Area Containment Building Unit Materials

The HLW Drum Swabbing and Monitoring Area Containment Building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be covered with epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the HLW Drum Swabbing and Monitoring Area Containment Building

There will be no incompatible reagents or dangerous wastes managed within the HLW Drum Swabbing and Monitoring Containment Building.

Primary Barrier Integrity in the HLW Drum Swabbing and Monitoring Area Containment Building

The HLW Drum Swabbing and Monitoring Area Containment Building is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the HLW Drum Swabbing and Monitoring Area Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the HLW Drum Swabbing and Monitoring Area Containment Building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the HLW Drum Swabbing and Monitoring Area Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the HLW Drum Swabbing and Monitoring Area Containment Building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the HLW Drum Swabbing and Monitoring Area Containment Building

Personnel access to the containment building will not be allowed because of high radiation. Drums are not normally expected to be stacked within the unit.

Measures to Prevent Tracking Wastes from the HLW Drum Swabbing and Monitoring Area Containment Building

The HLW Drum Swabbing and Monitoring Area Containment Building will be classified as a C3/C5 contamination area with limited personnel access. The HLW drum swabbing and monitoring containment building will be designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Very little dust is expected to be generated in the unit.

Control of Fugitive Dust from the HLW Drum Swabbing and Monitoring Area Containment Building

Operational controls of the HLW Vitrification Facility ventilation system will be used to control fugitive dust emissions from the unit to meet the requirements of 40 CFR 264.1001(c)(1)(iv). The following measures will be used to prevent fugitive dust from escaping the HLW Drum Swabbing and Monitoring Area Containment Building:

- A cascading air flow from areas of least to greatest potential contamination (that is, C2 to C3 to C5).
- Greater negative air pressure in the unit, compared to adjacent C3 units, to pull air into the unit and prevent backflow.
- Intake air through controlled air in-bleed units with backflow prevention dampers.
- Safety interlocks to shut down C3 extraction fans to prevent backflow, if the C5 system shuts down.
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack.
- A multiple fan extraction system, designed to maintain negative pressure and cascading air flow, even during fan maintenance and repair.

Procedures in the Event of Release or Potential for Release from HLW Drum Swabbing and Monitoring Area Containment Building

Conditions that could lead to a release from the HLW Drum Swabbing and Monitoring Area Containment Building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment. In the unlikely event of a release of mixed or dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken.

Administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the HLW Drum Swabbing and Monitoring Area Containment Building

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the HLW Drum Swabbing and Monitoring Area Containment Building. The inspection and monitoring schedule and methods that will be used to detect a release are included in DWP Operating Unit Group 10, Chapter 6A.

4F.4 Air Emission Control

4F.4.1 High-Level Waste Facility Ventilation

The HLW Facility will be divided into four numbered zones listed and defined below, with the higher number indicating greater radiological hazard potential and, therefore, a requirement for a greater degree of control or restriction. The zoning of the ventilation system will be based on the classifications assigned to building areas for potential radiological contamination. Zones classified as C5 are potentially the most contaminated and include the pour caves, buffer storage area, and process cells. Zones classified as C1 are uncontaminated areas.

Containment will be achieved by maintaining C5 areas at the greatest negative pressure, with airflows cascaded through engineered routes from C2 areas to C3 areas and on to the C5 areas. The cascade system, in which air passes through more than one area, will reduce the number of separate ventilation streams and, hence, the amount of air requiring treatment. Adherence to this concept in the design and operation of the HLW Facility will ensure that the facility air does not become a significant source of exposure to operators, and that the air emissions do not endanger human health or the environment.

An exhaust air radiation monitoring system, consisting of sensors to monitor radiation in the exhaust air stream, or a representative sampling system is provided in the discharge header downstream of the exhaust fans. A monitoring system would consist of probe assemblies, vacuum pumps, a stack flow sensor, temperature sensor, and radiation sensors. A temperature transmitter is also provided in the discharge header downstream of the exhaust fans for continuous monitoring of exhaust air temperature.

C1 Ventilation (C1V) System

C1 areas will typically consist of offices, workshops, control rooms, and equipment rooms. They will be slightly pressurized if they are adjacent to areas with higher contamination potential to eliminate backflow from those areas.

C2 Ventilation (C2V) System

C2 areas will typically consist of operating areas, equipment rooms, stores, access corridors, and facility rooms adjacent to areas with higher contamination potential. The C2V is served by dedicated exhaust fans. Air supplied to the C2 areas that is not cascaded to the C3 or C5 areas is discharged to the atmosphere by the exhaust fans. Both exhaust fans are provided with variable frequency drives. A manual isolation damper is provided upstream of each exhaust fan, and a pneumatically actuated isolation damper is provided downstream. Each damper is provided with local/remote position monitoring.

C3 Ventilation (C3V) System

C3 areas are normally unoccupied, but allow operator access, for instance during maintenance. C3 areas will typically consist of filter facility rooms, workshops, maintenance areas, and monitoring areas. Air will generally be drawn from C2 areas and, wherever possible, cascaded through the C3 areas into C5 areas, or alternatively exhausted from the C3 areas by the C3 exhaust system. In general, air cascaded into the C3 areas will be from adjacent C2/C3 subchange rooms. When sufficient air cannot be cascaded into C3 areas, a dedicated C2 supply equipped with appropriate backflow prevention will be used.

C5 Ventilation (C5V) System

Where there is in-bleed air from the C3 to C5 system, fan cascade trip interlocks protect the system from backflow.

The C5 areas in the HLW Facility will be composed of the following:

- Pour tunnels 1 and 2.
- Drum transfer tunnel.
- Canister handling cave.
- Melter caves 1 and 2.
- Filter cave.
- Wet process cell.
- SBS drain collection cells 1 and 2.
- Active services cell 1 and 2.

Air will be cascaded into the C5 areas and exhausted by the C5 exhaust system. Engineered duct entries (air in-bleeds) through the C5 confinement boundary will be protected by backflow filter isolation dampers, with penetrations through the boundary sealed.

4F.4.2 Melter Offgas Treatment Process System

Process flow diagrams of the HOP system are provided in Appendix 10.1. The HOP system is composed of vessels and MUs (sub-systems), separated into the primary and secondary melter offgas treatment systems.

Melter offgas is generated from the vitrification of HLW in the joule-heated melter. The rate of generation of gases in the melter is dynamic depending on water content and not steady. Each HLW Melter (HMP-MLTR-00001/2) generates offgas resulting from decomposition, oxidation, and vaporization of feed material. The typical constituents contained in the HLW offgas stream are as follows:

- Nitrogen oxides from decomposition of metal nitrates in the melter feed.
- Chloride, fluoride, and sulfur as oxides, acid gases, and salts.
- Entrained feed material and glass.

In addition, the HLW Melters (HMP-MLTR-00001/2) generate small quantities of other volatile compounds including iodine-129, carbon-14, tritium, and volatile organic compounds (VOCs). The carbon-14 and tritium emissions are in the form of carbon dioxide and water, respectively.

The HOP system is divided into a primary system and a secondary system. The purpose of the HOP system is to cool and treat the melter offgas and vessel ventilation offgas to a level that is protective of human health and the environment. The offgas system must also provide a pressure confinement boundary that will control melter pressure and prevent vapor releases inside the plant. The design of the melter offgas system must accommodate changes in offgas flow from the Melter (HMP-MLTR-00001/2) without causing the melter to pressurize.

Controls developed to prevent or mitigate equipment malfunction are incorporated into the design. The *Description of HLW Vitrification Bypass Events*, 24590-HLW-PER-PR-03-001 (Appendix 10.18), identifies operating conditions that would divert the melter offgas to an alternate flow path. The bypasses are automatically activated via interlocks or remotely operated via a valve when an upset or maintenance situation occurs.

Initial treatment of offgas from the melter is provided by the primary offgas treatment system. This primary offgas system is designed to handle intermittent surges of up to seven times steam normal flow and up to three times non-condensable flow from feed. Each primary offgas system consists of a film cooler, SBS, a WESP, a HEME, and HEPA filters. This system cools the offgas and removes aerosols and particulates.

Additionally, a standby line from the Melter (HMP-MLTR-00001/2) to the SBS (HOP-SCB-00001/2) is provided in the unlikely case that the primary offgas line plugs. This standby line includes an actuated valve as the isolation device. As soon as the melter vacuum decreases to a set point, the valve is actuated open and offgas flow is allowed through both lines to the SBS, thereby preventing melter pressurization. In the event that a melter surge is much higher than the system is designed to handle, a pressure relief valve acts as the pressure relief point venting the offgas to the melter cave. Any offgas that diverts to the melter cave is drawn through C5V HEPA Filters to remove particulates and then is discharged through the stack to the atmosphere. Once the melter pressure is relieved, the valve closes.

Offgas from PVV system consists primarily of air, water vapor, and minor amounts of aerosols generated by the mixing or movement of vessel contents. The vessel ventilation header joins the primary offgas system after the WESP (HOP-WESP-00001/2) and prior to the HEMEs. After the HEPA Filters (HOP-HEPA-00001A/1B/2A/2B/7A/7B/8A/8B), the offgas is routed to the secondary offgas treatment system.

The following sections provide descriptions of major melter offgas treatment components and are identical for both Melter 1 (HMP-MLTR-00001) and Melter 2 (HMP-MLTR-00002).

4F.4.2.1 Primary Melter Offgas Treatment System

The purpose of the primary offgas treatment system is to cool the melter offgas and to remove offgas aerosols and particulates generated by the Melter (HMP-MLTR-00001/2) and from the vessel ventilation air. This treatment system consists of the following:

Tank System:

- SBS Condensate Receiver Vessel (HOP-VSL-00903/4).

Miscellaneous Treatment Units (Sub-Systems):

- Offgas Film Cooler (HOP-FCLR-00001/2) and Standby Offgas Insert (HOP-FCLR-00003/4).
- SBS (HOP-SCB-00001/2).
- WESP (HOP-WESP-00001/2).
- HEME (HOP-HEME-00001A/1B/2A/2B).
- HEPA Preheater (HOP-HTR-00001B/2A/5A/5B).
- HEPA Filters (HOP-HEPA-00001A/1B/2A/2B/7A/7B/8A/8B).

Film Cooler (HOP-FCLR-00001/2/3/4)

The function of the Film Cooler (HOP-FCLR-00001/2) is to cool the offgas and entrained molten glass droplets below the glass adhesion temperature to minimize glass deposition on the offgas piping walls. The offgas exits the Melter (HMP-MLTR-00001/2) and is mixed with air in the offgas Film Cooler. The Film Cooler is a double-walled pipe designed to introduce injected gas axially along the walls of the offgas pipe through a series of holes or slots in the inner wall. Each melter has a single Film Cooler.

A mechanical reamer may be mounted on the Film Cooler (HOP-FCLR-00001/2) to periodically remove solids build-up on the inner film cooler wall. The reaming device (wire brush or drill) would be periodically inserted into the film cooler for mechanical solids removal.

SBS (HOP-SCB-00001/2)

The offgas from the HLW melter Film Cooler (HOP-FCLR-00001/2) enters the SBS (HOP-SCB-00001/2) for further cooling and solids removal. The SBS is a passive device designed for removal of large entrained particulate from melter offgas, cooling and condensation of melter vapor emissions, and interim storage of condensed fluids. It will also quench the offgas to a desired discharge temperature using cooling coils/jacket.

The SBS (HOP-SCB-00001/2) has two offgas inlets. The offgas normally enters the SBS through the primary inlet pipe that runs down through the center of the bed to the packing support plate. The bed-retaining walls extend below the support plate, creating a lower skirt to allow the formation of a gas bubble underneath the packing. The entire bed is suspended off the floor of the SBS to allow the scrubbing solution to circulate freely through the bed. After formation of the gas bubble beneath the packing, the offgas then buoys up through the packed bed. The packing breaks larger bubbles into smaller ones to increase the gas to water contacting surface, thereby increasing particulate removal and heat transfer efficiencies.

To maintain a constant liquid level within the SBS (HOP-SCB-00001/2), it will be equipped with an overflow line that allows for the continuous discharge of offgas condensate and some scrubbed particulates to the SBS Condensate Receiver Vessels (HOP-VSL-00903/4). The SBS Condensate Receiver Vessels are also equipped with a cooling jacket. The rate of condensate discharge is determined by how much the offgas temperature is lowered below its dew point.

To minimize the buildup of the solids in the bottom of the SBS, condensate from the SBS Condensate Receiver Vessels (HOP-VSL-00903/4) will be re-circulated back to the SBS and injected through multiple lances to agitate and suspend solids on the SBS vessel floor. The solids will then be pumped directly off the SBS vessel floor to the Acidic Waste Vessel (RLD-VSL-00007) or Plant Wash and Drains Vessel (RLD-VSL-00008). This purging and recycling process occurs simultaneously. Venting of this condensate receiver vessel is via the SBS into the main offgas discharge pipe.

The scrubbed offgas discharges through the top of the SBS and is routed to the WESP (HOP-WESP-00001/2) for further particulate removal.

WESP (HOP-WESP-00001/2)

The SBS offgas is routed to the WESP (HOP-WESP-00001/2) for removal of aerosols down to and including submicron size. The offgas enters the unit and passes through a distribution plate. The evenly distributed saturated gas then flows up through the tubes which act as the positive electrodes. Each of these tubes has a single negatively charged electrode, which runs down the centerline of each tube. A high-voltage, direct current transformer supplies the power to the electrodes. A strong electric field generated along the electrodes gives a negative charge to the aerosols. The negatively charged particles move toward the positively charged tube walls for collection. Collected particles are then washed from the tube walls along with collected mists. As the gas passes through the tubes, the first particles captured are the water droplets. As the water droplets gravity drain through the electrode tubes the collected particles are washed off and the final condensate is collected in the WESP dished bottom area. A water spray may be used periodically to facilitate washing collected aerosols from the tubes. The tube drain and wash solution is routed to the SBS Condensate Receiver Vessels (HOP-VSL-00903/4).

HEME (HOP-HEME-00001A/1B/2A/2B)

Further removal of aerosols is accomplished using the HEME. The HEMEs also reduce the particle loading rate on the HEPA filters. Each HEME is a high-efficiency demister that has a removal efficiency of greater than 99% for aerosols down to the submicron size. As the offgas passes through the HEME (HOP-HEME-00001A/1B/2A/2B), the liquid droplets and other aerosols within the offgas interact with HEMEs filter elements. As the aerosols contact the filaments they adhere to the filaments surface by surface tension. As the droplets agglomerate and grow, they eventually acquire enough mass to fall by gravity to the bottom of the unit. These collected droplets are estimated to contain the majority of the water soluble offgas radioactivity and will be collected in the bottom of the HEMEs (HOP-HEME-00001A/1B/2A/2B). The collected condensate will gravity drain into the SBS Condensate Receiver Vessel (HOP-VSL-00903/4). As the condensate flows down through the bed, a washing action is initiated that will help collect solids from the filter elements. However, some solids may accumulate in the bed over time, causing the differential pressure drop across the bed to increase. When the pressure drop across the HEMEs reaches a predefined level, it is washed with water to facilitate removal of accumulated solids. Some insoluble solids may remain, and their accumulation will eventually lead to the replacement of the HEMEs filter elements.

<u>HEPA Preheater (HOP-HTR-00001B/2A/5A/5B) and Filters (HOP-HEPA-00001A/1B/2A/2B/7A/7B/8A/8B)</u>

Next, the offgas is heated using HEPA Preheaters (HOP-HTR-00001B/2A/5A/5B) to avoid condensation in the HEPA Filters a temperature above the gas streams dew point and then passed through a dual set of HEPA Filters (HOP-HEPA-00001A/1B/2A/2B/7A/7B/8A/8B) to provide high-efficiency submicron removal.

When the differential pressure drop across the filters becomes too high, they will be remotely changed out. The system is composed of two parallel HEME/HEPA Preheater/HEPA Filter trains. The offgas passes through one train while the other remains available as an installed backup.

<u>Maintenance Ventilation Bypass</u>

A maintenance bypass will also be installed, allowing the melter offgas to bypass the Film Cooler (HOP-FCLR-00001/2), the SBS (HOP-SCB-00001/2), and the WESP (HOP-WESP-00001/2). The bypass line would feed into the HEME/HEPA filtration and other gas cleaning steps. Prior to initiating use of the maintenance ventilation line, waste feed would be secured, and the melter placed into an idle condition. No waste feed would be fed to the affected melter when the maintenance ventilation line is in use. The *Description of HLW Vitrification Bypass Events*, 24590-HLW-PER-PER-03-001 (Appendix 10.18), provides additional information on HLW bypass events.

4F.4.2.2 Secondary Offgas Treatment System

There is one secondary offgas treatment train for each HLW Melter. The combined primary offgas stream and vessel ventilation offgas stream is discharged to the secondary offgas treatment system. The secondary offgas system will treat the combined offgas to a level protective of human health and the environment. Specifically, the secondary offgas treatment system will remove radioactive iodine, oxides of nitrogen (NO_x), VOCs, and acid gases, as required, to meet the facility's air discharge requirements. The secondary offgas treatment system consists of the following miscellaneous treatment sub-systems:

- Booster Extraction Fans (HOP-FAN-00001A/1B/1C/9A/9B/9C).
- Activated Carbon Adsorber (HOP-ADBR-00001A/1B/2A/2B).
- Silver Mordenite Preheater (HOP-HX-00002/4).
- Silver Mordenite Column (HOP-ABS-00002/3).
- Catalyst Skid Preheater (HOP-HX-00001/3).
- Catalyst Skid Electric Heater (HOP-HTR-00001/7).
- Thermal Catalytic Oxidizer (HOP-SCO-00001/4).
- NO_x Selective Catalytic Reducer (SCR) (HOP-SCR-00001/2).
- Stack Extraction Fans (HOP-FAN-00008A/8B/8C/10A/10B/10C).

Activated Carbon Adsorber (HOP-ADBR-00001A/1B/2A/2B)

The Activated Carbon Adsorber MU (sub-system) removes mercury from the offgas. The activated carbon adsorber will contain a total of four units (two per Melter). The offgas from each melter normally flows through two activated carbon adsorber units in series. When gaseous mercury is detected breaking through the leading unit, the offgas flow is manually changed to place the trailing unit into the lead. In this configuration, only one adsorber is used while the exhausted adsorber media in the off-line unit is removed and replaced. The newly loaded unit is then placed back on-line in the lag position.

The new activated carbon media are gravity batch loaded into the top of the unit. The spent activated carbon is gravity unloaded at the bottom of the unit into containers for disposal. Each activated adsorber is provided with a means to add water for the fire suppression system.

Silver Mordenite Column (HOP-ABS-00002/3)

Two Silver Mordenite Column assemblies (one for each melter) will be located in the HLW Vitrification Facility. The Silver Mordenite Columns will be used to remove gaseous radioactive iodine (I-129) and other gaseous halogens, such as fluorine and chlorine.

The Silver Mordenite Columns (HOP-ABS-00002/3) will consist of approximately 36 silver mordenite adsorbers mounted in a bank configuration to a mounting frame within a housing. Offgas will enter the upper (or inlet) plenum of each Silver Mordenite Column, flow in parallel through the adsorbers to the lower (or exit) plenum, pass through a replaceable roughing filter, and exit. The columns' design will allow manual removal and replacement of adsorbers. Adsorbers will be sized to fit into standard 55-gallon waste drums for disposal.

The silver mordenite adsorbers are essentially cartridges filled with silver mordenite. Silver mordenite is a silver zeolite adsorption media in the form of cylindrical pellets. Halogens will react with the silver in the bed and become trapped within the matrix. Halogens are not loaded uniformly within the Silver Mordenite Adsorber cartridges. Adsorption reactions occur within an action zone (or mass transfer zone) that varies in length depending on the temperature of the bed and the gas velocity through the bed. Halogens will begin loading at the beginning of the silver mordenite beds and progressively load the silver through the column until breakthrough is reached at the end of the column. Once halogen breakthrough occurs or a predetermined lifespan is reached, the silver mordenite adsorbers will require replacement.

Thermal Catalytic Oxidizer (HOP-SCO-00001/4) and NO_x Selective Catalytic Reducer (HOP-SCR-00001/2)

The offgas is passed through catalytic oxidizer/reducer skids (HOP-SKID-00005/7) housing a heat recovery exchanger (HOP-HX-00001/3), an electric heater (HOP-HTR-00001/7), Thermal Catalytic Oxidizer (HOP-SCO-00001/4), and NO_x Selective Catalytic Reducer (HOP-SCR-00001/2) miscellaneous treatment unit sub-systems to remove VOCs, carbon monoxide, nitrogen oxide compounds, and acid gases in the offgas stream.

The heat recovery exchange first raises the offgas temperature using the hot offgas from the catalyst beds. The electric heater is used to supplement the heat recovery exchange primarily during start-up and when operating with low NO_x concentrations. The heated offgas is passed through the VOC catalyst to oxidize VOCs and carbon monoxide to carbon dioxide and water vapor. The offgas is then injected with a mixture of ammonia vapor and C3 air from an ammonia/air dilution skid. Following ammonia injection, the offgas is passed through the SCR catalyst to reduce NO_x to nitrogen and water vapor. The reduction reaction is exothermic, significantly increasing the offgas temperature. The outgoing hot offgas is cooled down in the heat exchanger and concurrently serves as the heating media for the incoming offgas. The cooled offgas stream is then directed to the exhaust stack through the stack monitoring system.

4F.4.3 Process Vessel Vent System

The process vessel vent system consists of vessel ventilation piping and the header that is combined with the primary offgas treatment system. The vessel ventilation header joins the primary offgas system after the WESPs (HOP-WESP-00001/2) prior to entering high efficiency mist eliminators (HOP-HEME-00001A/B/2A/B). The vessel ventilation system offgas consists primarily of air, water vapor, and minor amounts of aerosols generated by the movement of vessel contents.

The process vessel vent system provides a vacuum on connected vessels relative to the hot cell. The vacuum is controlled by an automatic pressure control valve system on the vessel vent header. The vessels attached to the vessel vent system are the melter feed and feed preparation vessels (HFP-VSL-00001/2/5/6), waste neutralization vessel (HDH-VSL-00003), acidic waste vessel (RLD-VSL-00007), and the Plant Wash and Drains Vessel (RLD-VSL-00008) indirectly via the acidic waste vessel.

4F.4.4 High-Level Waste Pulse Jet Ventilation System

A process flow diagram of the PJV system is provided in Appendix 10.1. The PJV system consists of the following miscellaneous treatment units (sub-systems):

- HEPA Filter (PJV-HEPA-00004A/4B/5A/5B).
- Pulse Ventilation HEPA Electric Preheater (PJV-HTR-00002).
- Pulse Vent Extraction Fan (PJV-FAN-00002A/B).

The PJV system draws exhaust air from selected HLW vessels, primarily those that use fluidic equipment, PJMs and reverse flow diverters (RFDs), for mixing and transfer of process fluids out of vessels for processing or sampling. Fluidic equipment use a column of air to lift and drop the liquid level in pulse jet mixer or RFD vessels, which are located inside process vessels. Fluidic equipment will produce gaseous exhaust air as part of their normal operations. Fluidic exhaust air from individual vessels combines in a common header. Prior to discharge to the atmosphere, the exhaust air is heated in the pulse ventilation electric preheater (PJV-HTR-00002) to eliminate aerosols and reduce relative humidity of the gas stream and filtered by the HEPA filters (PJV-HEPA-00004A/4B/5A/5B) to remove particulates that may be present. The exhaust air is then pulled through the pulse jet extraction fans (PJV-FAN-00001A/B) and discharged through a dedicated stack. The HLW vessels attached to the PJV system are SBS condensate receiver vessels (HOP-VSL-00903/904), SBS (HOP-SCB-00001/2), acidic waste vessel (RLD-VSL-00007), Plant Wash and Drains Vessel (RLD-VSL-00008) and canister decontamination vessels (HDH-VSL-00002/4).

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Table 4F-1 High-Level Waste Vitrification Facility Tank Systems

No.	System	Vessel Number/Location	Description	Material	Total Volume (US Gallons)	Approximate Dimensions (Inside Diameter) × Height or Length in feet and inches (tangent line/tangent line)
1	HOP	HOP-VSL-00903 H-B021	Melter 1 SBS Condensate Receiver Vessel 1	Hastelloy	9,891	23’ x 7’ 9”
2	HOP	HOP-VSL-00904 H-B005	Melter 2 SBS Condensate Receiver Vessel 2	Hastelloy	9.891	23’ x 7’ 9”
3	HDH	HDH-VSL-00001 H-B039B	Canister Rinse Vessel	Stainless Steel	3,314	5’ 11” x 17’
4	HDH	HDH-VSL-00003 H-B035	Waste Neutralization Vessel	Stainless Steel	5,315	7’ x 17’
5	HDH	HDH-VSL-00002 H-B035	Canister Decon Vessel 1	Titanium	630	2’ 6” x 16’ 9”
6	HDH	HDH-VSL-00004 H-B035	Canister Decon Vessel 2	Titanium	630	2’ 6” x 16’ 9”
7	RLD	RLD-VSL-00007 H-B014	Acidic Waste Vessel	Stainless Steel	18,051	13’ x 15’ 6”
8	RLD	RLD-VSL-00008 H-B014	Plant Wash and Drains Vessel	Stainless Steel	18,051	13’ x 15’ 6”
9	RLD	RLD-VSL-00002 H-B014	Offgas Drains Collection Vessel	Stainless Steel	334	3’ 6” x 4’
10	HFP	HFP-VSL-00001 H-0117	HLW Melter 1 Feed Preparation Vessel	Stainless Steel	8,311	11’ x 9’ 6”
11	HFP	HFP-VSL-00002 H-0117	HLW Melter 1 Feed Vessel	Stainless Steel	8,311	11’ x 9’ 6”
12	HFP	HFP-VSL-00005 H-0106	HLW Melter 2 Feed Preparation Vessel	Stainless Steel	8,311	11’ x 9’ 6”
13	HFP	HFP-VSL-00006 H-0106	HLW Melter 2 Feed Vessel	Stainless Steel	8,311	11’ x 9’ 6”
14	HSH	HSH-TK-00001 H-0310A	Decontamination Tank Melter Cave 1	Stainless Steel	4,000	6’ x 22’ 10”

Table 4F-1 High-Level Waste Vitrification Facility Tank Systems

No.	System	Vessel Number/Location	Description	Material	Total Volume (US Gallons)	Approximate Dimensions (Inside Diameter) × Height or Length in feet and inches (tangent line/tangent line)
15	HSH	HSH-TK-00002 H-0304A	Decontamination Tank Melter Cave 2	Stainless Steel	4,000	6’ x 22’ 10”

Table 4F-2 High-Level Waste Vitrification Facility Miscellaneous Units (Systems and Sub-Systems)

No.	System/ Subsystem	Component Number/Location	Description	Material	Total Volume (US Gallons)
HLW Vitrification Facility					
1	HMP	HMP-MLTR-00001 H-0117	HLW Melter 1	Stainless Steel/Alloys	1,078
2	HMP	HMP-MLTR-00002 H-0106	HLW Melter 2	Stainless Steel/Alloys	1,078
3	HOP	HOP-WESP-00001 H-0308	Melter 1 Wet Electrostatic Precipitator	6% Molybdenum/Stainless Steel	N/A
4	HOP	HOP-WESP-00002 H-0302	Melter 2 Wet Electrostatic Precipitator	6% Molybdenum/Stainless Steel	N/A
5	HOP	HOP-SCO-00001 (located on Catalyst Skid HOP-SKID-00005) H-A123	Thermal Catalytic Oxidizer	Stainless Steel	N/A
6	HOP	HOP-SCO-00004 (located on Catalyst Skid HOP-SKID-00007) H-A123	Thermal Catalytic Oxidizer	Stainless Steel	N/A
7	HOP	HOP-SCR-00001 (located on Catalyst Skid HOP-SKID-00005) H-A123	NO_x Selective Catalytic Reducer	Stainless Steel	N/A
8	HOP	HOP-SCR-00002 (located on Catalyst Skid HOP-SKID-00007) H-A123	NO_x Selective Catalytic Reducer	Stainless Steel	N/A

Table 4F-2 High-Level Waste Vitrification Facility Miscellaneous Units (Systems and Sub-Systems)

No.	System/ Subsystem	Component Number/Location	Description	Material	Total Volume (US Gallons)
9	HOP	HOP-ABS-00002 H-B001B	Silver Mordenite Column	Calcium Silicate/Stainless Steel	N/A
10	HOP	HOP-ABS-00003 H-B001B	Silver Mordenite Column	Calcium Silicate/Stainless Steel	N/A
11	HOP	HOP-FCLR-00001 H-0117	Melter 1 Offgas Film Cooler	Stainless Steel	N/A
12	HOP	HOP-FCLR-00002 H-0106	Melter 2 Offgas Film Cooler	Stainless Steel	N/A
13	HOP	HOP-FCLR-00003 H-0117	Melter 1 Standby Offgas Insert	Stainless Steel	N/A
14	HOP	HOP-FCLR-00004 H-0106	Melter 2 Standby Offgas Insert	Stainless Steel	N/A
15	HOP	HOP-HEPA-00001A H-0104	Primary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	N/A
16	HOP	HOP-HEPA-00001B H-0104	Primary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	N/A
17	HOP	HOP-HEPA-00002A H-0104	Secondary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	N/A
18	HOP	HOP-HEPA-00002B H-0104	Secondary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	N/A
19	HOP	HOP-HEPA-00007A H-0104	Primary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	N/A
20	HOP	HOP-HEPA-00007B H-0104	Primary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	N/A
21	HOP	HOP-HEPA-00008A H-0104	Secondary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	N/A
22	HOP	HOP-HEPA-00008B H-0104	Secondary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	N/A
23	HOP	HOP-HTR-00001B H-0104	HEPA Preheater	Stainless Steel	N/A

Table 4F-2 High-Level Waste Vitrification Facility Miscellaneous Units (Systems and Sub-Systems)

No.	System/ Subsystem	Component Number/Location	Description	Material	Total Volume (US Gallons)
24	HOP	HOP-HTR-00002A H-0104	HEPA Preheater	Stainless Steel	N/A
25	HOP	HOP-HTR-00005A H-0104	HEPA Preheater	Stainless Steel	N/A
26	HOP	HOP-HTR-00005B H-0104	HEPA Preheater	Stainless Steel	N/A
27	HOP	HOP-HX-00001 (located on Catalyst Skid HOP-SKID-00005) H-A123	Catalyst Skid Preheater	Stainless Steel	N/A
28	HOP	HOP-HX-00002 H-0104	Silver Mordenite Preheater	Stainless Steel	N/A
29	HOP	HOP-HX-00003 (located on Catalyst Skid HOP-SKID-00007) H-A123	Catalyst Skid Preheater	Stainless Steel	N/A
30	HOP	HOP-HX-00004 H-0104	Silver Mordenite Preheater	Stainless Steel	N/A
31	HOP	HOP-FAN-00001A H-B001C	Booster Extraction Fan	Stainless Steel	N/A
32	HOP	HOP-FAN-00001B H-B001C	Booster Extraction Fan	Stainless Steel	N/A
33	HOP	HOP-FAN-00001C H-B001C	Booster Extraction Fan	Stainless Steel	N/A
34	HOP	HOP-FAN-00008A H-0429	Stack Extraction Fan	Stainless Steel	N/A
35	HOP	HOP-FAN-00008B H-0429	Stack Extraction Fan	Stainless Steel	N/A
36	HOP	HOP-FAN-00008C H-0329	Stack Extraction Fan	Stainless Steel	N/A
37	HOP	HOP-FAN-00009A H-B001C	Booster Extraction Fan	Stainless Steel	N/A

Table 4F-2 High-Level Waste Vitrification Facility Miscellaneous Units (Systems and Sub-Systems)

No.	System/ Subsystem	Component Number/Location	Description	Material	Total Volume (US Gallons)
38	HOP	HOP-FAN-00009B H-B001C	Booster Extraction Fan	Stainless Steel	N/A
39	HOP	HOP-FAN-00009C H-B001C	Booster Extraction Fan	Stainless Steel	N/A
40	HOP	HOP-FAN-000010A H-0429	Stack Extraction Fan	Stainless Steel	N/A
41	HOP	HOP-FAN-000010B H-0429	Stack Extraction Fan	Stainless Steel	N/A
42	HOP	HOP-FAN-000010C H-0429	Stack Extraction Fan	Stainless Steel	N/A
43	HOP	HOP-ADBR-00001A (located on Activated Carbon Adsorber Skid HOP-ADBR-00001) H-A123	Activated Carbon Adsorber	Stainless Steel	N/A
44	HOP	HOP-ADBR-00001B (located on Activated Carbon Adsorber Skid HOP-ADBR-00001) H-A123	Activated Carbon Adsorber	Stainless Steel	N/A
45	HOP	HOP-ADBR-00002A (located on Activated Carbon Adsorber Skid HOP-ADBR-00002) H-A123	Activated Carbon Adsorber	Stainless Steel	N/A
46	HOP	HOP-ADBR-00002B (located on Activated Carbon Adsorber Skid HOP-ADBR-00002) H-A123	Activated Carbon Adsorber	Stainless Steel	N/A
47	HOP	HOP-HEME-00001A H-0117	Melter 1 High Efficiency Mist Eliminator	Packed Fiber Bed/Stainless Steel	N/A
48	HOP	HOP-HEME-00001B H-0117	Melter 1 High Efficiency Mist Eliminator	Packed Fiber Bed/Stainless Steel	N/A
49	HOP	HOP-HEME-00002A H-0106	Melter 2 High Efficiency Mist Eliminator	Packed Fiber Bed/Stainless Steel	N/A

Table 4F-2 High-Level Waste Vitrification Facility Miscellaneous Units (Systems and Sub-Systems)

No.	System/ Subsystem	Component Number/Location	Description	Material	Total Volume (US Gallons)
50	HOP	HOP-HEME-00002B H-0106	Melter 2 High Efficiency Mist Eliminator	Packed Fiber Bed/Stainless Steel	N/A
51	HOP	HOP-SCB-00001 H-0117	Melter 1 Submerged Bed Scrubber	Ceramic Packing/Hastelloy	4,516
52	HOP	HOP-SCB-00002 H-0106	Melter 2 Submerged Bed Scrubber	Ceramic Packing/Hastelloy	4,516
53	HOP	HOP-HTR-00001 (located on Catalyst Skid HOP-SKID-00005) H-A123	Catalyst Skid Electric Heater	Stainless Steel	N/A
54	HOP	HOP-HTR-00007 (located on Catalyst Skid HOP-SKID-00007) H-A123	Catalyst Skid Electric Heater	Stainless Steel	N/A
55	PJV	PJV-HEPA-00004A H-0104	PJV System HEPA Filter (Primary)	Synthetic Fibrous Materials/Stainless Steel	N/A
56	PJV	PJV-HEPA-00004B H-0104	PJV System HEPA Filter (Standby Primary)	Synthetic Fibrous Materials/Stainless Steel	N/A
57	PJV	PJV-HEPA-00005A H-0104	PJV System HEPA Filter (Primary)	Synthetic Fibrous Materials/Stainless Steel	N/A
58	PJV	PJV-HEPA-00005B H-0104	PJV System HEPA Filter (Standby Primary)	Synthetic Fibrous Materials/Stainless Steel	N/A
59	PJV	PJV-HTR-00002 H-0104	Pulse Ventilation HEPA Electric Preheater	Stainless Steel	N/A
60	PJV	PJV-FAN-00002A H-0424	Pulse Vent Extraction Fan	Stainless Steel	N/A
61	PJV	PJV-FAN-00002B H-0424	Pulse Vent Extraction Fan	Stainless Steel	N/A

Table 4F-3 High-Level Waste Vitrification Facility Secondary Containment Rooms/Areas

<table>
<tr><th>Room/Area</th><th>Approximate Room/Area Dimensions (L×W, in feet)</th><th>Miscellaneous Treatment Units or Tanks in Room/Area (Largest Plant Item)</th><th>Volume of Largest Plant Item in Room/Area (US Gallons)</th><th>Minimum Secondary Containment Height (feet)</th></tr>
<tr><td colspan="5">HLW Vitrification Facility</td></tr>
<tr><td>1. H-B014 Wet Process Cell</td><td colspan="4" rowspan="15">Minimum secondary containment for these cells/caves has been deleted and superseded by Flooding Volume for HLW Facility, 24590-HLW-PER-M-02-003 (DWP, Operating Unit Group 10, Appendix 10.8).</td></tr>
<tr><td>2. H-B021 SBS Drains Collection Cell 1</td></tr>
<tr><td>3. H-B035 Canister Decon Cave</td></tr>
<tr><td>4. H-B039A, Canister Rinse Bogie Maintenance Room</td></tr>
<tr><td>5. H-B039B, Canister Rinse Tunnel</td></tr>
<tr><td>6. H-0304A, Melter 2 Equipment Decon Pit</td></tr>
<tr><td>7. H-0117, Melter Cave 1</td></tr>
<tr><td>8. H-0310A, Melter 1 Equipment Decon Pit</td></tr>
<tr><td>9. H-0106, Melter Cave 2</td></tr>
<tr><td>10. H-0302, Melter 2 - Active Services Cell</td></tr>
<tr><td>11. H-0308, Melter 1 - Active Services Cell</td></tr>
<tr><td>12. H-B005, SBS Drains Collection Cell 2</td></tr>
<tr><td>13. H-0115 Shielded Pipeway</td></tr>
<tr><td>14. H-0121 Shielded Pipeway</td></tr>
<tr><td>15. H-0136 Canister Handling Cave</td></tr>
<tr><td>16. H-0137 Shielded Pipeway</td><td colspan="4" rowspan="4">Secondary containment for ancillary equipment, no minimum liner height required.</td></tr>
<tr><td>17. H-B032 Pour Tunnel 1</td></tr>
<tr><td>18. HCH14 Melter Cave No 1 Vertical Pipe Chase</td></tr>
<tr><td>19. HCH15 Melter Cave No 2 Vertical Pipe Chase</td></tr>
</table>

Table 4F-3 High-Level Waste Vitrification Facility Secondary Containment Rooms/Areas

Room/Area	Approximate Room/Area Dimensions (L×W, in feet)	Miscellaneous Treatment Units or Tanks in Room/Area (Largest Plant Item)	Volume of Largest Plant Item in Room/Area (US Gallons)	Minimum Secondary Containment Height (feet)
20. Autosampling System (ASX) Sampler Cabinets • ASX-SMPLR-00028 (H-0305A) • ASX-SMPLR-00029 (H-0315) • ASX-SMPLR-00042 (H-0318)	Secondary containment liners for Isolok flush tubing, no minimum liner height required. The HLW ASX sampler upper secondary containment area liner dimensions are approximately 33" x 34". The lower containment area liner dimensions are approximately 39" x 68".			
21. Bulges • RLD-BULGE-00008 (HCB006) • RLD-BULGE-00009 (HCB006) • RLD-BULGE-00010 (H-0316)	Secondary containment for ancillary equipment flows to associated process cell sumps, no minimum liner height required			

Table 4F-4 High-Level Waste Vitrification Facility Sumps, Leak Detection Boxes, and Floor Drains/Lines

Sump/Leak Detection Box or Floor Drain/Line I.D.#, Room, and Elevation	Maximum Sump/Leak Detection Box Capacity (US Gallons)	Sump/Leak Detection Box Level Detection Type	Sump/Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction	Piping and Instrumentation Diagram Number
HLW Vitrification Facility				
Sumps				
HCP-SUMP-00001 H-B014 (Wet Process Cell, El. -21')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00015001
RLD-SUMP-00001 H-B014 (Wet Process Cell, El. -21')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00015001

Table 4F-4 High-Level Waste Vitrification Facility Sumps, Leak Detection Boxes, and Floor Drains/Lines

Sump/Leak Detection Box or Floor Drain/Line I.D.#, Room, and Elevation	Maximum Sump/Leak Detection Box Capacity (US Gallons)	Sump/Leak Detection Box Level Detection Type	Sump/Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction	Piping and Instrumentation Diagram Number
HOP-SUMP-00003 H-B021 (SBS Drain Collection Cell 1, El. -21’)	75	Radar	30” Dia. x 18” Deep Stainless Steel	<u>**24590-HLW**</u> -M6-RLD-00015001
HOP-SUMP-00008 H-B005 (SBS Drain Collection Cell 2, El. -21’)	75	Radar	30” Dia. x 18” Deep Stainless Steel	<u>**24590-HLW**</u> -M6-RLD-20004001
HDH-SUMP-00001 H-B039B (Canister Rinse Tunnel, El. -16.5’)	75	Radar	30” Dia. x 18” Deep Stainless Steel	<u>**24590-HLW**</u> -M6-RLD-00016001
HDH-SUMP-00002 H-B039A (Canister Rinse Bogie Maintenance Room, El. -16’)	75	Radar	30” Dia. x 18” Deep Stainless Steel	<u>**24590-HLW**</u> -M6-RLD-00016001
HDH-SUMP-00003 H-B035 (Canister Decon Cave, El. -16’)	75	Radar	30” Dia. x 18” Deep Stainless Steel	<u>**24590-HLW**</u> -M6-RLD-00004002
HFP-SUMP-00002 H-0117 (Melter Cave 1, El. 5’)	50	Radar	30” x 24” x 16” Deep Stainless Steel	<u>**24590-HLW**</u> -M6-RLD-00008002
HFP-SUMP-00005 H-0106 (Melter Cave 2 El. 5’)	50	Radar	30” x 24” x 16” Deep Stainless Steel	<u>**24590-HLW**</u> -M6-RLD-20005001
HSH-SUMP-00003 H-0117 (Melter Cave 1, El. 3’)	50	Bubbler	20.5” x 20.5” x 16” Deep Stainless Steel	<u>**24590-HLW**</u> -M6-RLD-00008002
HSH-SUMP-00007 H-0106 (Melter Cave 2, El. 3’)	50	Bubbler	20.5” x 20.5” x 16” Deep Stainless Steel	<u>**24590-HLW**</u> -M6-RLD-20005001
HSH-SUMP-00008 H-310A (Melter 1 Equipment Decon Pit, El. 0’)	50	Radar	20.5” x 20.5” x 16” Deep Stainless Steel	<u>**24590-HLW**</u> -M6-RLD-00003001

Table 4F-4 High-Level Waste Vitrification Facility Sumps, Leak Detection Boxes, and Floor Drains/Lines

Sump/Leak Detection Box or Floor Drain/Line I.D.#, Room, and Elevation	Maximum Sump/Leak Detection Box Capacity (US Gallons)	Sump/Leak Detection Box Level Detection Type	Sump/Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction	Piping and Instrumentation Diagram Number
HSH-SUMP-00009 H-0304A (Melter 2 Equipment Decon Pit, El. 0')	50	Radar	20.5" x 20.5" x 16" Deep Stainless Steel	**24590-HLW** -M6-RLD-20003001
HPH-SUMP-00001 H-0136 (Canister Handling Cave, El. -3')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00016001
HPH-SUMP-00005 H-0136 (Canister Handling Cave, El. -3')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00004001
HPH-SUMP-00003 H-B032 (Pour Tunnel 1, El. -21')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00016001
Floor Drain Lines				
RLD-ZF-03330-S11B-03 Floor Drain Line H-B021 (SBS Drain Collection Cell 1, El. -21')	N/A	N/A	3" Dia. 316L Stainless Steel	**24590-HLW** -M6-RLD-00017001
RLD-ZF-03447-S11B-03 Floor Drain Line H-B005 (SBS Drain Collection Cell 2, El. -21')	N/A	N/A	3" Dia. 316L Stainless Steel	**24590-HLW** -M6-RLD-20005001
RLD-FD-0186 Floor Drain/Line RLD-ZF-00033-S11B-03 H-0308 (Melter 1 - Active Services Cell, El. 37')	N/A	N/A	3" Dia. Stainless Steel	**24590-HLW** -M6-RLD-00015001
RLD-FD-0187 Floor Drain/Line RLD-ZF-003428-S11B-03 H-0302 (Melter 2 - Active Services Cell, El. 37')	N/A	N/A	3" Dia. Stainless Steel	**24590-HLW** -M6-RLD-20004001
Autosampler Drain Lines				
RLD-ZH-10922-S11B-03 ASX Sampler 00028 Lower Containment Drain Line (H-0305A, El. 37')	N/A	Thermal Dispersion	3" Dia. Stainless Steel	**24590-HLW** -M6-RLD-00002002

Table 4F-4 High-Level Waste Vitrification Facility Sumps, Leak Detection Boxes, and Floor Drains/Lines

Sump/Leak Detection Box or Floor Drain/Line I.D.#, Room, and Elevation	Maximum Sump/Leak Detection Box Capacity (US Gallons)	Sump/Leak Detection Box Level Detection Type	Sump/Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction	Piping and Instrumentation Diagram Number
RLD-ZF-04119-S11B-03 ASX Sampler 00029 Lower Containment Drain Line (H-0315, El. 37’)	N/A	Thermal Dispersion	3” Dia. Stainless Steel	**24590-HLW** -M6-HFP-00001004
RLD-ZF-04120-S11B-03 ASX Sampler 00042 Lower Containment Drain Line (H-0318, El. 37’)	N/A	Thermal Dispersion	3” Dia. Stainless Steel	**24590-HLW** -M6-HFP-20001004

Table 4F-5 High-Level Waste Vitrification Facility Container Storage Areas

Container Storage Area	Maximum Waste Volume (US Gallons)[1]	Approximate Dimensions (L × W × H, in feet)[2]
HLW Vitrification Facility		
1. IHLW Canister Storage Cave (H-0132)	163,599	66’ x 22’ x 15’
2. HLW East Corridor El. 0’ (HC-0108/09/10)	183,721	(30’ x 34’ x 10’) + (65’ x 16’ x 10’) + (12’ x 32’ x 10’)
3. HLW Loading Area (H-0130)	142,204	70’ x 32’ x 10’

[1]The conversion factor used to convert from cubic feet to gallons is 7.4805 gal/ft^3.

[2]The dimension for height (H) is based on the height of the largest waste container stored in the area (i.e., Low-Activity Waste container is 7.5 ft, HLW canister is 15 ft, melters are assumed to be 16 ft, and a B-25 box is 5 ft - stacked a maximum of two high is 10 ft).

Table 4F-6 High-Level Waste Vitrification Facility Containment Buildings Summary

Location	Approximate Room Dimensions (L × W × H in feet)
HLW Vitrification Facility	
1. HLW Melter Cave 1 Containment Building:	
H-0117 Melter Cave 1	75 x 32 x 54
H-0116B Melter Cave 1 C3/C5 Airlock	24 x 25 x 54
H-0310A Melter Cave 1 Equipment Decon Pit	20 x 9 x 69
2. HLW Melter Cave 2 Containment Building:	
H-0106 Melter Cave No 2	75 x 32 x 54
H-0105B Melter Cave 2 C3/C5 Airlock	24 x 25 x 54
H-0304A Melter Cave 2 Equipment Decon Pit	20 x 9 x 69
3. H-0136 IHLW Canister Handling Cave Containment Building	18 x 140 x 54
4. H-0133 IHLW Canister Swab and Monitoring Cave Containment Building	41 x 11 x 54
5. HLW C3 Workshop Containment Building:	
H-0311A C3 Workshop	19 x 30 x 22
H-0311B C3 MSM Maintenance Workshop	58 x 69 x 22
6. H-0104 HLW Filter Cave Containment Building	105 x 36 x 36
7. H-B032 HLW Pour Tunnel 1 Containment Building	85 x 11 x 30
8. H-B005A HLW Pour Tunnel 2 Containment Building	85 x 11 x 30
9. HLW Drum Swabbing and Monitoring Area Containment Building:	
H-0126A Crane Maintenance Room	15 x 20 x 31
H-0126B Swabbing and Monitoring Room	30 x 18 x 31
H-B028 Cask Import/Export Room	15 x 45 x 43