WASTE TREATMENT AND IMMOBILIZATION PLANT
~~APPENDIX~~ CHAPTER 4E
LOW-ACTIVITY WASTE (LAW) 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
12/15/2016	8C.2016.Q3

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~~APPENDIX~~ CHAPTER 4E
LOW-ACTIVITY WASTE (LAW) VITRIFICATION FACILITY

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~~APPENDIX~~ CHAPTER 4E
LOW-ACTIVITY WASTE (LAW) VITRIFICATION FACILITY

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4E Low-Activity Waste (LAW) Vitrification Facility

~~The purpose of this appendix is to describe the major systems associated with the LAW vitrification facility.~~This chapter describes the WTP Low-Activity Waste (LAW) vitrification facility, including processes and systems associated with management of tank systems, miscellaneous units, and containment buildings. The LAW vitrification facility has major processes, systems, permitted tanks, miscellaneous units (MUs), containment building units, and support systems. Figure 4A-3 located in ~~Appendix~~ Chapter 4A presents a simplified process flow diagram of the LAW vitrification processes. ~~This~~The LAW vitrification facility ~~will consist of several process~~processes and systems ~~designed to~~ perform the following functions:

- Receive and store pretreated LAW feed.
- Convert blended LAW feed and glass formers into glass.
- ~~Provide melter offgas treatment systems.~~
- Treat melter offgas.
- Handle Immobilized Low Activity Waste (ILAW) containers.
- Store ILAW containers.
- Provide supporting equipment in the melter gallery.
- Handle miscellaneous secondary waste.
- Ventilate the LAW vitrification facility.

The following figures located in ~~Appendix~~ Chapter 4A and drawings found in Dangerous Waste Permit (DWP) Operating Unit Group 10, Appendix 9, provide additional detail for the LAW vitrification facility:

- Simplified flow diagrams for the Waste Treatment Plant (WTP) and the LAW vitrification facility.
- Process flow figures and drawings for process information.
- Typical system figures depicting common features for each regulated system.
- General arrangement figures and drawings showing locations of regulated equipment.
- Waste management area figures and drawings showing facility locations to be permitted.

Instrumentation, alarms, controls, and interlocks will be provided for the tank systems and miscellaneous treatment unit sub-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~~and miscellaneous units (MUs) that manage liquid mixed and/or dangerous waste ~~is~~are provided with secondary containment. Ancillary equipment and miscellaneous unit ancillary equipment ~~is~~are provided with secondary containment or ~~is~~are visually inspected for leaks on a daily basis in accordance with Washington Administrative Code (WAC) 173-303-640(4)(f). Some LAW vitrification facility tanks and/or MUs utilize daily visual ~~inspection~~inspections for leak detection. Sumps associated with the management of mixed and/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 systems are 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 unit systems in some cases. Additional information may be found in the system logic descriptions located in DWP Operating Unit Group 10, Appendix 9.13. Regulated process and leak detection system instruments and parameters will be provided in DWP Table III.10.E.F for tank systems and in DWP Table III.10.H.C for miscellaneous treatment unit sub-systems.

Descriptions of the LAW vitrification process, melter offgas treatment systems, and ILAW glass container handling systems are provided in Sections 4E.2 through 4E.4. Table 4E-1 lists current tank design information (capacity, materials of construction, and dimensions). Table 4E-2 lists the current miscellaneous unit design information. The tanks and miscellaneous units are grouped by process systems in these tables.

Tanks or miscellaneous units that manage liquid mixed or dangerous waste are provided with secondary containments. Table 4E-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 4E-4.

4E.1 Containers

~~This section identifies the containers and container management practices that will be followed at the LAW vitrification facility. The term “container” is used as defined in WAC 173-303-040. Note that in this appendix and throughout the permit, terms other than containers may be used, such as canisters, boxes, bins, flasks, casks, and overpacks.~~

~~The following sections address waste management containers:~~

- ~~Description of Containers - Section 4E.1.1~~
- ~~Container Management Practices - Section 4E.1.2~~
- ~~Container Labeling - Section 4E.1.3~~
- ~~Containment Requirements for Storing Waste - Section 4E.1.4~~

~~Prevention of Ignitable, Reactive, and Incompatible Wastes in Containers - Section 4E.1.5~~The LAW Vitrification Facility does not have permitted container storage areas. The dangerous and mixed waste generated at the LAW Vitrification Facility is managed in containment buildings, as described in section 4E.3. In addition, containerized secondary waste is managed in 90-day accumulation areas and satellite accumulation areas pursuant to the requirements in WAC 173-303-200, generating dangerous waste on-site. All waste anticipated to be dangerous or mixed waste is managed in accordance with WAC 173-303-170, requirements for generators of dangerous waste, through WAC 173-303-230, special conditions. The dangerous and mixed waste is labeled and characterized in accordance with requirements in WAC 173-303-070, designation of dangerous waste. Information on all 90-day accumulation areas and satellite accumulation areas is maintained as required in the Hanford Dangerous Waste Permit, Part II General Facility Conditions, permit condition III.I.1.a.

4E.1.1 Description of Containers

~~These~~The following types of waste will be managed in containers:

- ILAW (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~~ are examples of ~~containerized~~ the generated secondary waste ~~that are managed at the LAW vitrification facility.~~

- ~~Immobilized Glass Waste~~
- ~~The immobilized glass waste is a mixed waste that will be managed in ILAW containers specially designed to remain stable during receipt of glass waste, and which are capable of remote handling.~~
- ~~The ILAW containers will be approximately 90 inches (in.) high and 48 in. in diameter, with a wall thickness of approximately 0.187 in. and a nominal capacity of 90 cubic feet (ft^3). ILAW containers will be constructed of austenitic (304L) stainless steel.~~
- ~~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
- Spent maintenance materials
- Melter consumables
- Personal Protective Equipment
- ~~Spent melters~~

~~Spent equipment and offgas filters will typically be managed in commercially available containers such as steel drums or steel boxes, of varying size. 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. LAW melter consumables will be placed into approved disposal containers of varying size.~~

~~The LAW Locally Shielded Melter (LSM) will be classified as hazardous debris for land disposal restrictions purposes. After a spent 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 onsite 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.~~

4E.1.2 Container Management Practices

The following paragraphs describe how each of the containers used at the LAW vitrification facility are managed.

4E.1.2.1 ~~Immobilized Glass Waste~~ ILAW Containers

Immobilized glass waste ILAW containers 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~~.~~

~~ILAW Containers~~

An empty container will be transported to a LAW glass pour cave and placed on a turntable designed to hold three containers. There are two LAW pour caves at each melter, each with the capacity to manage three containers at a time. The container will be sealed to the melter discharge with a pour head connection. The glass waste will fill the container during the course of approximately 10 hours.

The filled ILAW container will be lowered back onto the turntable. The filled container will cool for 10 to 30 hours to reach glass transition temperature (approximately 400°C to 500°C), which characterizes the transformation from an equilibrated melt to a "frozen" glass structure. At this stage, the waste glass does not contain liquid and is in a viscous state that ultimately stabilizes to a solid. Once the container has cooled, it will be rotated to the transfer position. The container will then be lifted by a remotely operated monorail hoist, moved to the transfer tunnel, lowered onto a container transfer bogie, and transported to a position within the transfer tunnel below the finishing line. In the event the finishing line becomes backed up, the container may be transported to the LAW container buffer storage containment building. The containers will not be stacked.

The container will be transported to the LAW container finishing line (see Section 4E.3), where the level of waste glass will be measured and additional inert filler will be added, if needed.

A sample of the glass may also be collected in this location prior to inert filling. Glass within the neck of the container will be removed by abrasion and the lid will be attached to the container. The debris generated from residual glass removal will be collected with a vacuum system and disposed of as a secondary waste.

After the lid is mechanically sealed, the container will be moved to the decontamination cell where contamination will be removed. Using a turntable, the container will revolve while a power manipulator tracks the entire surface with decontamination equipment. The dry decontamination process will use carbon dioxide pellets. The container will then be transported to the swabbing cell, where its surface will be swabbed. The radiation levels of the swab will be remotely monitored, and the results will determine whether the ILAW container will be ready for transportation to the disposal site, or go through decontamination again.

Other ILAW Container Storage Requirements

As stated in WAC 173-303-630(5)(c), a 30 in. separation is required between aisles of containers holding dangerous waste~~.~~ in permitted container storage areas. In addition, WAC 173-303-340(3) requires a 30 in. separation 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 (DOE), WTP, the United States Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) for ILAW containers 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 ILAW containers 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 ILAW container buffer storage containment building. 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 ILAW container buffer storage containment building. 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.

The ILAW containers will be stored in a storage rack to allow airflow. No stacking of the ILAW containers will occur. Closed circuit television cameras will enable general viewing of both areas.

~~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 LAW 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.~~

4E.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 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. ILAW containers 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 American Standard Test Method (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.

~~**4E.2 Container Labeling**~~

~~**4E.3 Immobilized Waste Glass Containers**~~

~~**4E.4 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 numeric identifier for the ILAW container that will be welded onto each immobilized glass waste container.**~~

~~**4E.5 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.**~~

~~**4E.6 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.**~~

~~**4E.7 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.**~~

~~**4E.8 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.~~

~~4E.9 Miscellaneous Mixed Waste Containers~~

~~4E.10 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.~~

~~4E.11 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.~~

~~4E.12 Miscellaneous Dangerous Waste Containers~~

~~4E.13 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.~~

~~4E.14 Containment Requirements for Storing Waste~~

~~4E.15 Secondary containment requirements for the waste are discussed below.~~

~~4E.16 Secondary Containment System Design~~

~~4E.17 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).~~

~~4E.18 Miscellaneous Mixed Waste~~

~~4E.19 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.~~

~~4E.20 Miscellaneous Dangerous Waste~~

~~4E.21 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.**~~

~~**4E.22 System Design (Reserved)**~~

~~**4E.23 Miscellaneous Dangerous Waste**~~

~~**4E.24 Containers with liquids will be provided with portable secondary containment meeting the requirements of WAC 173-303-630(7).**~~

~~**4E.25 Structural Integrity of the Base**~~

~~**4E.26 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:**~~

~~**4E.27 Containment system capable of collecting and holding spills and leaks.**~~

~~**4E.28 Base will be free of cracks and gaps and sufficiently impervious to contain leaks.**~~

~~**4E.29 Positive drainage control.**~~

~~**4E.30 Sufficient containment volume.**~~

~~**4E.31 Sloped to drain or remove liquid, as necessary.**~~

~~**4E.32 Containment System Capacity**~~

~~**4E.33 Miscellaneous Mixed Waste**~~

~~**4E.34 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.

4E.35 Each portable secondary containment will have the capacity to contain 10% of the volume of all containers within the containment area, or the volume of the largest container, whichever is greater.

4E.36 Miscellaneous Dangerous Waste

4E.37 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.

4E.38 Each portable secondary containment will have the capacity to contain 10% 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.

4E.39 Control of Run On

4E.40 Miscellaneous Mixed Waste

4E.41 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.

4E.42 Miscellaneous Dangerous Waste

4E.43 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.

4E.44 Removal of Liquids from Containment System

4E.45 Miscellaneous Mixed Waste

4E.46 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.

4E.47 Miscellaneous Dangerous Waste

4E.48 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.

4E.49 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

4E.50 Miscellaneous Mixed Waste

4E.51 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 double shell tank (DST) system. Therefore, these waste numbers will not be present at the LAW vitrification facility.

4E.52 Miscellaneous Dangerous Waste

4E.53 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 LAW vitrification facility.

4E.54 Prevention of Reaction of Ignitable, Reactive, and Incompatible Wastes in Containers

4E.55 Ignitable, Reactive, or Incompatible Miscellaneous Mixed Waste and Miscellaneous Dangerous Waste

4E.56 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.**~~

~~4E.57~~4E.2 Tank Systems

~~4E.57.1~~4E.2.1 LAW Melter Feed Process

The LAW melter feed consists of the following systems:

- LAW concentrate receipt process system (LCP)
- LAW melter feed process system (LFP)
- Glass former reagent system (GFR) (the GFR system does not manage dangerous waste and is provided for ~~information~~informational purposes only)

Process flow diagram of the LAW Concentrate Receipt Process (LCP) System and the LAW Melter Feed Process (LFP) System are provided in DWP Operating Unit Group 10, Appendix 9.1. The LCP and LFP systems prepare feed for the LAW melters to produce a vitrified immobilized low-activity waste (ILAW) product. An analysis of the waste ~~determines a~~is conducted to determine the appropriate glass additive formulation for the conversion of the waste to glass. The glass additives specified in the formulation are weighed and mixed with the waste. There are two melter feed trains to supply the two LAW melters. Each melter feed train consists of a melter concentrate receipt vessel, a melter feed preparation vessel, and a melter feed vessel.

The LCP system includes the melter concentrate receipt vessels. The LFP system includes the melter feed preparation vessel and the melter feed vessel for each of the two melters.

The LCP tank system consists of the following tanks and their associated ancillary equipment:

- Melter Concentrate Receipt Vessels (LCP-VSL-00001/2)

The LFP tank system consists of the following tanks and their associated ancillary equipment:

- Melter Feed Preparation Vessels (LFP-VSL-00001/3)
- Melter Feed Vessels (LFP-VSL-00002/4)

Melter Concentrate Receipt Vessels (LCP-VSL-00001/2)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the Melter Concentrate Receipt Vessels (LCP-VSL-00001/2). The ~~Melter Concentrate Receipt Vessels~~melter concentrate receipt vessels in LCP system receive ~~melter~~LAW feed concentrate from the ~~pretreatment~~Pretreatment facility~~.~~ ~~The Melter Feed Preparation Vessels are~~, LAWPS, and EMF. One of these vessels is located in each of the two functional process cells~~, and each~~. There is also one MFPV and one melter feed vessel in each of the two functional process ~~cell contains a Melter Concentrate Receipt Vessel, a Melter Feed Preparation Vessel, and a Melter Feed Vessel. The vessels are~~ cells. These vessels are described below. Each concentrate receipt vessel is equipped with the following:

- Mechanical agitator
- ~~Pumps~~Pump with installed spare to transfer ~~LAW~~ concentrate feed
- Instrumentation for liquid level, temperature, pressure, and density measurements
- Internal rotary spray ~~wash~~ nozzles for periodic washdown
- Overflow ~~nozzle~~ to C3/C5 ~~Drains/ Sump Collection Vessel (RLD-VSL-00004)~~drain/sump collection vessel~~Spare nozzles~~
- Vent to the LAW secondary offgas system (LVP) via the vessel vent header

- Plant service air purge to control flammable gas accumulation, with instrumentation and alarm to monitor for low purge airflows
- Backup air supply connection.

Valves are located in valve bulges LCP-BULGE-00001/2/3. ~~Valving in LCP-BULGE-00001~~ Valve alignment receives LAW concentrate from the PTF in the baseline configuration, and from LAWPS, and EMF in the Direct Feed LAW (DFLAW) configuration, and directs it to the LAW Concentrate Receipt Vessels (LCP-VSL-00001/2). ~~Valving~~Valve alignment in bulges LCP-BULGE-00001/3 allows the LAW concentrate to be routed to the Melter Feed Preparation Vessels (LFP-VSL-00001/3), or to the Plant Wash Vessel (RLD-VSL-00003) if the Melter Concentrate Receipt Vessels (LCP-VSL-00001/2) are being cleaned out or if the contents of the vessels cannot be satisfactorily processed. In addition, LAW concentrate can be transferred between the two Melter Concentrate Receipt Vessels (LCP-VSL-00001/2), or directs it to the Autosampling System (ASX) system for sampling (ASX-SMPLR-00012/13).

Transfer of out-of-specification LAW concentrate from the LAWPS~~s~~ to LAW is prevented by batch sampling and prior acceptance by WTP before a batch transfer begins, in addition, feed transfers have radiation monitoring and interlock.

Glass Former Reagent (GFR) System

The GFR system contains the glass former feed mixers that receive blended glass formers and sucrose by dense-phase pneumatic conveyors from the glass former system.

The feed mixers are equipped with filters to remove the dust from air used for pneumatic conveying and blending. 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 hoppers.

The feed 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 hoppers and to confirm that the glass formers are transferred out of the feed hoppers to the Melter Feed Preparation Vessels.

The glass formers are gravity-fed with a rotary feeder into the Melter Feed Preparation Vessels, where the glass formers are mixed with the waste feed. This equipment is located in an isolated area that serves as a contamination barrier between the melter feed preparation vessels and the glass former supply. The rotary valve controls the rate of glass former addition into the melter feed preparation vessels.

Melter Feed Preparation Vessels (LFP-VSL-00001/3)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the Melter Feed Preparation Vessels (LFP-VSL-00001/3). The Melter Feed Preparation Vessels mix LAW concentrate from the Melter Concentrate Receipt Vessels (LCP-VSL-00001/2) with glass formers and sucrose from the glass former feed hoppers. ~~The vessels are equipped with~~ The LFP Melter Feed Preparation Vessels (LFP-VSL-00001/3), their internal components, and the associated ancillary equipment include the following:

- ~~Mechanical~~One mechanical agitator (LFP-AGT-00001/3)
- ~~Pumps~~
- ~~Instrumentation for~~Two vertical pumps (LFP-PMP-00001A/B) or (LFP-PMP-00003A/B)
- Instruments, including liquid level measurement
- Internal spray wash nozzles
- Overflow ~~nozzle~~line to the common header to C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004)
- ~~Spare nozzles~~

- Vent line to the vessel vent collection header
- Sample lines to auto samplers (ASX-SMPLR-00012/13)
- Valve bulges LFP-BULGE-00001/2.

The ~~Vessel~~vessel pumps LFP-PMP-00001A/B and LFP-PMP-00003A/B transfer ~~wastes~~waste using valve bulges, LFP-BULGE-00001/2. Valves in the bulge allow melter feed to be routed to the associated Melter Feed Vessel (LFP-VSL-00002/4) or to the Plant Wash Vessel (RLD-VSL-00003) if the Melter Feed Preparation Vessels (LFP-VSL-00001/3 are being cleaned out. The vessel contents can be circulated through the pump and injected back into the vessel in the recirculation mode. In addition, melter feed can be pumped between the two Melter Feed Preparation Vessels (LFP-VSL-00001/3), or ~~directs it~~directed to the ASX system for sampling (ASX-SMPLR-00012/13).

Melter Feed Vessels (LFP-VSL-00002/4)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the Melter Feed Vessels (LFP-VSL-00002/4). The Melter Feed Vessels receive blended melter feed, consisting of LAW concentrate and glass formers, from the Melter Feed Preparation Vessels (LFP-VSL-00001/3). ~~The vessels~~ Each Melter Feed Vessel (LFP-VSL-00002/4) are equipped with the following:

- ~~Mechanical~~One mechanical agitator (LFP-AGT-00002/4)
- Six Air ~~displacement supply~~Displacement Slurry (ADS) pumps ~~to transfer feed to the corresponding LAW melter~~(LFP-PMP-00007 through 12) or (LFP-PMP-00013 through 18)
- ~~Feed vessel~~One vertical pump (LFP-PMP-00002/4)
- ~~Instrumentation for liquid level measurement~~
- ~~Miscellaneous solution addition line~~
- Internal spray wash nozzles
- Instruments, including liquid level measurement
- Overflow ~~nozzle~~lines to the common header to C3/C5 Drains/Sump Collection Vessel ~~(~~RLD-VSL-00004~~)~~
- ~~Spare nozzles~~
- Vent line to the vessel vent collection header
- Sample lines to auto samplers (ASX-SMPLR-00012/13)
- Valve bulges (LFP-BULGE-00001/2)

The feed vessel pumps (LFP-PMP-00002/4) transfer waste feed through the valve bulges LFP-BULGE-00001/2. ~~Valving~~Valve alignment in the bulges allows the waste feed to be pumped between all four vessels: the two Melter Feed Preparation Vessels (LFP-VSL-00001/3) and the two Melter Feed Vessels (LFP-VSL-00002/4). Waste feed can also be transferred from the Melter Feed Vessels to the Plant Wash Vessel (RLD-VSL-00003) for vessel cleanout, or directs it to the ASX system for sampling (ASX-SMPLR-00012/13). Normally, ADS pumps transfer the melter feed from the melter feed vessel to the melter.

~~4E.57.2~~4E.2.2 LAW Melter Process (LMP) System ~~(LMP)~~

Figure 4A-21 located in ~~Appendix~~ Chapter 4A presents a simplified process flow diagram of the LAW Melter Process (LMP) System. DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the LAW Melter Process (LMP) System ~~(LMP)~~. The purpose of the LMP system is to convert a blended slurry of liquid LAW feed and glass former additives into a durable ILAW product. The locally shielded LAW melter system design is based on operating two joule-heated melters located in a C3 environment. Key functions of LMP include containment, joule heated melting, melter feed, and glass discharge.

Miscellaneous Treatment Unit Sub-Systems

Each LAW Melter (LMP-MLTR-00001/2) includes the following major components:

- Melter shell
- Refractory
- Electrodes
- Discharge systems
- Instruments, including level detection, density, temperature, and pressure measurements
- Offgas lines (LOP system)

The LAW Melters (Chapter 4A, Figure 4A-48) have a nameplate capacity of 15 metric tons of glass per melter per day.

The melter shell is comprised of the base, walls, lid, and gas barrier plates structurally supported by the enclosure. Each LAW Melter has a single internal glass chamber with a rectangular surface area. The melter shell inner surface will also minimize the release of melter gases and contaminants in the event of the melter pressurization. A small air purge will be provided for the annular space between the cooling panels and the shell to reduce the deposition of materials. This purge will be driven by melter vacuum.

The melters are equipped with ceramic refractory that ~~has~~have two unique sections. These sections are the refractory in contact with the molten glass pool (glass pool refractory), and the refractory surrounding the gas space above the glass pool (plenum refractory). Glass pool refractory is designed to withstand corrosion from molten glass. The glass pool refractory, used in conjunction with active cooling provided by a water jacket, will provide glass containment, thermal insulation, and electrical isolation. The plenum is lined with refractory designed to withstand hot corrosive gases, thermal shock, and glass and feed splatter. ~~Key functions of LMP include containment, joule heated melting, melter feed, and glass discharge.~~

- ~~Miscellaneous Treatment Unit Sub-SystemsLAW Melters (LMP-MLTR-00001/2)~~

~~The LAW Melters (Appendix 4A, Figure 4A-48) have a nameplate capacity of 15 metric tons of glass per melter per day. Each LAW Melter has a single internal glass chamber with a rectangular surface area.~~ The melter is powered by three pairs of electrodes that are ~~mounded~~mounted opposite each other along the long axis of each melter. The glass is discharged through either of two discharge chambers located within one of the long axis walls of the melter. The lid of the melter is composed of layers of refractory backed by a corrosion-resistant metal plate and support structure. The lid also supports the components that are submerged in the melt pool and suspended in the melter plenum. The melter is encased in an integral shielding and secondary containment enclosure. The melter plenum is maintained at a controlled vacuum with offgas system fans and injection of air into the offgas line near the melter exhaust. This assures containment and avoids pressurization.

~~The refractory is part of the melter containment and can be described as two separate sections. These sections are the refractory in contact with the molten glass pool and the refractory surrounding the gas space above the glass pool, which is referred to as the plenum. The glass pool refractory, used in conjunction with active cooling provided by a water jacket, will provide glass containment, thermal insulation, and electrical isolation. The plenum refractory is primarily designed to resist thermal breakdown, resist corrosion by offgases, and resist corrosion by splashed feed and glass.The melter shell is comprised of the base, walls, lid, and gas barrier plates structurally supported by the enclosure. The melter shell inner surface is designed to allow operation of the melter at a negative pressure. This inner surface will also minimize the release of melter gases and contaminants in the event of melter pressurization. A small air purge will be provided for the annular space between the cooling panels and the shell to reduce the deposition of materials. This purge will be driven by melter vacuum.~~The LAW melter system has been designed to shield and contain the melter so that no additional shielding or contamination control will be required for normal operations. This has been accomplished by enclosing the melter assembly in a steel box. Shielding is provided by the entire enclosure. Access panels are provided through the external shielding. When removed, these panels will allow access to equipment such as jack-bolts, electrodes, electrode thermocouples, viewing cameras.

~~The heat for the LAW melter~~Electrodes/Joule Heating

The LAW Melters (LMP-MLTR-00001/2) are powered by three pairs of electrodes that are located opposite each other. The heat for the LAW Melters (LMP-MLTR-00001/2), startup is provided by temporarily installed radiant electric heaters mounted on the roof of the melter. ~~These heaters melt 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 passing ~~more and more~~ current between the electrodes through the glass (a process known as *joule heating*). After some time, the ~~melter reaches its~~LAW Melters (LMP-MLTR-00001/2) reach the operating temperature and slurry feeding can start. ~~As water evaporates, the feed forms a "cold cap" on the surface of the melt. As more slurry is fed, molten~~The nominal glass melt pool temperature is approximately 1,150 °C. This is ~~formed by dissolution and melting of the cold cap materials~~measured with thermocouples in thermowells submerged into the ~~glass melt. When the melt level rises~~pool at various locations. The power to ~~a predetermined level, it~~ the electrodes is ~~discharged into a container~~ regulated to maintain the temperature within a selected range.

~~The melter plenum is maintained at a controlled vacuum with offgas system fans and injection of air into the offgas line near the melter exhaust. This assures containment and avoids pressurization.~~~~Joule Heating~~

~~The joule heating system contains the melter electrodes, melter electrode power supplies, melter glass pool thermocouples, and the melter electrode control system.~~

~~The electrode configuration for each LAW Melter will consist of three pairs of plate electrodes mounted parallel to each other on the long axis of the melter.~~ The electrodes will have forced~~-~~ air cooled electrode extensions. The extensions will penetrate the side of the melter below the glass level to minimize the effects of thermal expansion and to minimize the potential for corrosion by sulfate.

Active cooling of the extensions and the use of a water~~-~~ cooling jacket will prevent glass from migrating through the refractory package adjacent to the electrode extension penetrations. ~~Power to the electrodes will be single-phase alternating current applied across opposing electrodes. The nominal glass melt pool temperature is approximately 1,150°C. This is measured with thermocouples in thermowells submerged into the pool at various locations. The power to the electrodes is regulated to maintain the temperature within a selected range.~~

Melter Feed System

Feed will be introduced to the melter as a slurry through nozzles in the melter lid. Water and volatile constituents in the slurry will evaporate, leaving behind a layer of material known as the cold cap. Waste feed components in the cold cap will undergo chemical reactions, be converted to their respective oxides, and dissolve in the molten glass. The feed rate determines the cold cap coverage on the glass melt pool. The feed rate can be controlled based on the average plenum temperature measured by plenum thermocouples mounted in the melter lid. 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. Air injectors will be used to mix and agitate the molten glass. When the melt level rises to a predetermined upper limit, an air lift mechanism is actuated and glass is discharged to a container.

~~Glass Discharge System~~A list of conditions that stop the waste feed to the LAW Melters (LMP-MLTR-00001/2) is provided below.

- Melter plenum high pressure

- LVP header high pressure
- Loss of offsite power
- High differential pressure across the offgas HEPA filters
- Melter glass pool ~~level measurement will be used to indicate when to start and stop glass discharge. It also provides alarms for high or low glass pool levels. Each LAW Melter has~~ high level
- Low flow in caustic scrubber recirculation line
- High temperature in either melter lid cooling cavity
- High level in the associated melter feed vessel
- Low/high level in the associated SBS vessel
- High SBS condensate temperature
- Low differential temperature from the offgas/vessel vent and the filter train inlet
- High differential COx concentrations across the mercury mitigation skid.

Glass Discharge System

Each of the melters (LMP-MLTR-00001/2) have two identical ~~and~~ independently operated glass discharge systems ~~located adjacent to each other on one side of the melter. Each of these systems includes~~to include an airlift riser, a glass pour trough, a ~~heated~~ discharge chamber~~,~~ and other components and instruments needed to control the discharge of glass~~.~~ into the ILAW container. The melter glass pool level measurement will be used to indicate when to start and stop glass discharge. It also provides alarms for high or low glass pool levels. When a container is required for filling, it is retrieved from the clean container staging area and lowered through the import hatch onto one of the two pour turntable bogies. The bogie travels to a position in front of one of the pour caves. The container is retrieved by one of the four monorail hoists and transported to one of the four pour cave turntables. The container is then rotated into the pour position. A through-wall position sensor confirms that the container is in position prior to lock pin engagement. A through-wall lock pin engages the turntable in its pour position and prevents accidental rotation while the container elevator raises the container to the melter seal head and the container is filled with glass. The level of glass in the container is controlled by an infrared camera and the container load cell.

The glass discharge from the melter is initiated by injecting air or an inert gas at the bottom of the airlift riser. As the gas bubbles rise in the glass they will entrain glass in the riser, which is replaced by glass flowing in from the pool through the riser throat. The glass is lifted to the inlet of the trough, where the air bubbles disengage and the entrained glass flows into the trough. The glass then flows down the trough due to gravity and falls from the pour tip at the end of the trough into the container. The rate of glass discharge is controlled by adjusting the rate at which air is injected into the bottom of the riser.

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

- Decrease or loss of melter plenum vacuum.
- Glass temperature that is too high or too low.
- Electrode extension temperature too high.
- Loss of melter cooling water.
- Plugged feed nozzle.
- Overfilling of glass container.

4E.57.34E.2.3 Radioactive and Nonradioactive Liquid Waste Disposal (RLD and NLD) Systems

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the Radioactive and Nonradioactive Liquid Waste Disposal (RLD and NLD) System. The RLD receives LAW vitrification process effluents for storage and transferThe functional purpose of the LAW RLD system is to receive mixed waste effluent for interim storage and to transfer the mixed waste effluent to the PTF or the EMF. In addition, mixing and sampling of the mixed waste effluent may be performed in this system as required.

The RLD tank system consists of three main vessels:

The LAW RLD system receives mixed waste effluent, overflow, drains, condensate, and tank washes from process and building support systems. The LAW RLD tanks collect, store, mix, provide samples to the auto sampling system (ASX), and transfer the mixed waste effluent to the PWD and TLP systems in the PTF or EMF. The LAW facility liquid waste that is non-dangerous/ non-radioactive is not normally routed to the RLD system. The LAW mixed waste effluent is collected in one of three permitted RLD tanks:

- Plant Wash Vessel (RLD-VSL-00003)
- LAW C3/ C5 Drains/ Sump Collection Vessel (RLD-VSL-00004)
- SBS Condensate Collection Vessel (RLD-VSL-00005)

The SBS Condensate Collection Vessel (RLD-VSL-00005) and the Plant Wash Vessel (RLD-VSL-00003) are located in the LAW effluent cell. The C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004) is located below grade to provide fire protection water collection and to collect effluents from the wet electrostatic precipitator, and C3/C5 gravity floor drains and sumps.

Sources of effluents into the RLD system are production and nonproduction-related activities. Production effluents are mixed waste liquids or slurries routinely or periodically generated by the waste treatment process. These effluents are routed directly or indirectly to the SBS Condensate Collection Vessel (RLD-VSL-00005). Liquid effluent from nonproduction activities, such as vessel, equipment and cell/ cave washes, and sump discharges, are routed to one of the three vessels, depending on the nature of the effluent. Dangerous or mixed waste is routed to either the Plant Wash Vessel (RLD-VSL-00003) or the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004). Liquid that is nondangerous/nonradioactive is routed to the C1/C2 Floor Drain/Sump Collection Tank in the NLD system.

The functional purpose of the RLD system is to receive effluents for interim storage and to transfer the effluent to the pretreatment facility. In addition, mixing and sampling of the effluent may be performed in this system as required.

Plant Wash Vessel (RLD-VSL-00003)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the Plant Wash Vessel (RLD-VSL-00003).

This vessel is designed to receive the total volume of either the largest vessel in the LAW vitrification facility or the largest volume from the vessel/equipment wash or drain in the LAW vitrification facility. The largest volume is from the Submerged Bed Scrubber (SBS) Condensate Collection Vessel (RLD-VSL-00005). Effluent sources for the The Plant Wash Vessel (RLD-VSL-00003) are vesselis normally empty, but infrequently can receive plant-washes from the following sources:

- Sumps (RLD-SUMP-00028 through 32), (RLD-SUMP-00035 and 36)
- Vessel washes or off-specification material from process vessels (LCP-VSL-00001/2) and (LFP-VSL-00001/2/3/4)
- Drains from the overflow berm surrounding Caustic Collection Vessel (LVP-TK-00001)

- Suspect radioactive material from the C1/C2 Drains/Sump Collection Vessel (NLD-VSL-00005)
- Transfers from the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004)
- Off-normal transfers from the SBS Condensate Collection Vessel (RLD-VSL-00005)~~.~~
- Overflows from the SBS Condensate Collection Vessel (RLD-VSL-00005)

Plant Wash Vessel (RLD-VSL-00003) has two vertical cantilever pumps (RLD-PMP-00001A/B) for transfer and sampling and one mechanical agitator (RLD-AGT-00001) for mixing of effluent. The Plant Wash Vessel (RLD-VSL-00003) is equipped with internal spray nozzles for flushing the tank interior, if needed.

The contents of the LAW Plant Wash Vessel (RLD-VSL-00003) are normally transferred to the Plant Wash Vessel PWD-VSL-00044 in the PTF or to the EMF. In addition, the contents can also be routed to the LAW SBS Condensate Receipt Vessel TLP-VSL-00009A/B in the PTF, SBS Condensate Collection Vessel (RLD-VSL-00005) or EMF. Content of the LAW Plant Wash Vessel (RLD-VSL-00003) is analyzed via auto sampler (ASX-SMPLR-00012) before transferred to the PTF or EMF.

The vessel is fitted with level instrumentation. The vessel is vented into a common vessel ventilation header that drains into the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004). ~~During normal operation, the effluent characterized in the Plant Wash Vessel (RLD-VSL-00003) is expected to be transferred to the pretreatment facility.~~

LAW C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the LAW C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004).

The RLD C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004), its internal components, and the associated ancillary equipment include the following:

- Recirculation/transfer pumps (RLD-PMP-00002A/B) located in (RLD-BULGE-00001)
- Three mixing eductors (RLD-EDUC-00001A/B/C)
- Vessel overflow line to secondary containment (RLD-SUMP-00028)
- Vent line to a common header
- Sample line to and from auto sampler (ASX-SMPLR-00013)
- Instruments, including liquid level measurement
- Valve and Pump Bulge (RLD-BULGE-00001)

The C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004) normally receives liquid effluent from the following sources:

- Melter 1/2 WESP (LOP-WESP-00001/2) drains
- Overflows from other LAW process tanks through the overflow header
- Sump contents from the filter room and floor drains from C3/C5 areas
- Drains from the LVP vessel vent header
- Drains from auto sampler (ASX-SMPLR-00012/13)
- HVAC condensate drains

This vessel is designed to contain the maximum amount of fire protection water and the volume equivalent to the largest C3/C5 floor area wash. The C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004) routinely collects liquid drained from the Melter Wet Electrostatic Precipitators (LOP-WESP-00001/2). The overflow from the Melter Concentrate Receipt Vessels (LCP-VSL-00001/2) is also routed to the C3/C5 Drains/Sump Collection Vessel.

Routine process-related effluent from Wet Electrostatic Precipitator drains will be routed from this vessel to the SBS Condensate Collection Vessel. Effluent generated from other sources will drain to the Plant Wash Vessel (RLD-VSL-00003) until it reaches a predetermined level to maintain adequate capacity for fire protection water.

~~The C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004) is fitted with level instrumentation. The C3/C5 Drains/Sump Collection Vessel is vented into a common vessel ventilation header. Condensate that forms in the header drains into the C3/C5 Drains/Sump Collection Vessel. Sampling capability is provided using a sampling leg off the pump recirculation line to an autosampler unit.~~

The C3/C5 Drains/Sump Collection Vessel is located in an enclosed C3/C5 cell area. The C3/C5 Drains/ Sump Collection Vessel overflows to a sump in the same cell. During normal operation, the effluent characterized in the C3/C5 Drains/Sump Collection Vessel is expected to be transferred to the Treated LAW Evaporation System (TLP) system via the SBS Condensate Collection Vessel (RLD-VSL-00005).

SBS Condensate Collection Vessel (RLD-VSL-00005)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the SBS Condensate Collection Vessel (RLD-VSL-00005).~~ This~~

SBS Condensate Collection Vessel (RLD-VSL-00005), its internal components, and the associated ancillary equipment include the following:

- Two transfer pumps per vessel ~~is designed~~ (RLD-PMP-00003A/B)
- One mechanical agitator (RLD-AGT-00002)
- Vessel overflow line to ~~store SBS column purge effluent.~~ the Plant Wash Vessel (RLD-VSL-00003)
- Vent line to a common header
- Instruments, including liquid level measurement
- Valve and Pump Bulge (RLD-BULGE-00004)

The SBS Condensate Collection Vessel (RLD-VSL-00005) ~~routinely~~ receives effluent from the ~~Submerged Bed Scrubber~~ following sources:

- SBS Scrubbers (LOP-SCB-00001/2) ~~and the~~
- SBS Condensate Vessels (LOP-VSL-00001/2)
- C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004).

The SBS Condensate Collection Vessel is fitted with level instrumentation and is vented into a common vessel ventilation header that drains into the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004). ~~Sampling capability is provided using a sampling leg off the pump recirculation line to an autosampler unit.~~ The SBS Condensate Collection Vessel ~~overflows to the Plant Wash Vessel~~ (RLD-VSL-~~00003). During normal operation, the effluent characterized in the~~00005) is equipped with two vertical cantilever pumps (RLD-PMP-00003A/B) for recirculation, transfer, and sampling, and one mechanical agitator (RLD-AGT-00002) for mixing. Sampling capability is provided to an auto sampler (ASX-SMPLR-00012). The SBS Condensate Collection Vessel~~ is expected to be transferred to the TLP system~~ (RLD-VSL-00005) has two internal spray nozzles for flushing the tank interior, if needed.

The contents of the SBS Condensate Collection Vessel (RLD-VSL-00005) are normally transferred to the LAW SBS Condensate Receipt Vessels (TLP-VSL-00009A/B) in the PTF or to the EMF. Transfers can be routed to the PTF Plant Wash Vessel (PWD-VSL-00044), LAW Plant Wash Vessel (RLD-VSL-00003), or to the EMF. Content of the SBS Condensate Collection (Vessel RLD-VSL-00005) can be analyzed via auto sampler (ASX-SMPLR-00012).

The SBS Condensate Collection Vessel overflows to the Plant Wash Vessel (RLD-VSL-00003).

~~4E.57.4~~4E.2.4 LAW Radioactive Solid Waste Handling (RWH) System

The ~~primary functions of this~~LAW RWH system ~~will be~~does not include permitted tanks or MUs. The purpose of the RWH system is to provide equipment ~~for the~~to facilitate change out ~~of LAW~~ and packaging of secondary radioactive solid waste (RSW) in the LAW facility. The typical RSW in the LAW facility include the melter consumables, such as melter bubblers, spent HEPA filters, and failed process ~~vessels and other miscellaneous mixed wastes. This~~ cell equipment. The LAW RH~~S~~W system provides ~~the equipment to move waste out of the building~~ crane coverage to support these activities.

The vessels are designed for 40 years of service. However, in the event of a failure, the process vessel will be prepared for export by rinsing, disconnection of the process lines, and decontamination. The vessel will be lifted out of the process cell and covered to prevent a spread of contamination. The vessel will be placed in an approved package staged for vessel receipt. Once closed and secured, the package, containing the vessel, will be delivered to an appropriate TSD facility. A similar process in reverse will be used for the introduction and installation of new LAW process vessels.

It is anticipated that LAW Melters will require periodic replacement. When the end of a melter's operational life is reached, as much residual molten glass as is practical will be removed as immobilized glass product. The LAW Melter will be allowed to cool and then will be disconnected. Openings in the melter shell will be seal welded, and the melter shell will be decontaminated if required, and transported to an appropriate TSD facility.

Disposal of miscellaneous mixed waste streams created during operation will be done by packaging at the point of generation. Localized collection points and disposal routes will be established at logical and optimal locations to accommodate maintenance and operations. Waste containers will be transferred to a staging area where packages will be weighed, labeled, and decontaminated for nonfixed contamination, if needed, prior to export. The packaged waste will then be stored at the WTP, and as needed transported to a Hanford site or off-site commercial treatment facility prior to final disposal at the Hanford site.

~~4E.57.5~~4E.2.5 ILAW Glass Container Handling

The ILAW glass container handling systems are support systems that do not include permitted tanks or MUs. The ILAW glass container handling systems provide equipment to import the ILAW containers, transfer within the LAW facility, and export for treatment and disposal. The ILAW glass container handling activities will consist of the following systems:

- LAW container receipt handling (LRH) system ~~(LRH)~~
- LAW container pour handling (LPH) system ~~(LPH)~~
- LAW container finishing handling (LFH) system ~~(LFH)~~
- LAW container export handling (LEH) system ~~(LEH)~~

The individual systems and their primary functions are described below:

<u>LAW Container Receipt Handling (LRH) System</u>

The primary function of the LRH system ~~takes delivery of new ILAW containers and provides a means~~ is to provide mechanical handling equipment to transfer ~~these~~ empty containers from initial receipt in the LSH system truck bay to the pour tunnel. The LRH system accepts empty ILAW containers into the LAW facility and transports the containers to the LPH ~~transfer bogie (wheeled cart for container transfer).~~system where glass-filling operations are performed.

Container Receipt

After removal of the shipping over-wrap and initial receipt inspection, the containers are placed on a conveyor system and transferred into the facility as needed. New containers are then logged into the tracking system.

Container Import

Prior to the need for additional containers, a final inspection and transfer takes place in the container import bay. Each new container is moved to a container inspection stand. This allows an operator to assess the upper head/lifting flange area, including the "fill" opening, and to observe the inside of the container with a light.

The rest of the container is inspected as required, then the container is placed on the import line 1 or 2 staging conveyer, and the tracking log is updated. If the container inspection fails, it is logged and tagged appropriately and set aside.

Each time a container is placed on the conveyor, an operator initiates a conveyor transfer. The transfer serves to index containers on the staging conveyor forward so there is always a container in the "pickup" position on the airlock conveyor.

Container import instrumentation, alarms, controls, and/or interlocks will be provided as follows:

- The hatches are interlocked with the hoist and bogies so the hatch cannot be opened unless a process crane is positioned above the hatch. Conversely, the process cranes cannot leave hatch positions unless the hatch is closed and locked.
- The hatches are interlocked with the bogies so that the hatches cannot open unless a bogie is positioned below the hatch. The interlock prevents the bogie from leaving the hatch position unless the hatch is closed.

LAW Container Pour Handling (LPH) System

~~Each of the LAW melters has two glass discharges~~The LPH system receives empty containers from the LRH system, positions empty containers for filling, and transfers filled and cooled containers to the LFH system. Typical activities within the LPH system include container transfers from the container transfer bogies into the buffer storage area, container transfers within the buffer storage area, transfer from the buffer storage area to the transfer tunnel, and for container rework, if necessary. Each of the LAW melters has two glass discharge systems that operate independently. Each melter discharge chamber is aligned with a glass pour cave under the melter cell with associated features for filling a container with glass. Containers can be filled using one pour cave, using alternating caves, or both caves at the same time using alternating lifts. ~~The LPH system handles and positions product containers for filling with LAW glass product.~~ The major pieces of equipment include the container turntable, container elevator, transfer bogies, and monorail hoists.

Container Turntable, Container Elevator, Glass Pour Seal Head

A container turntable is provided in each pour cave for handling containers. The turntable accommodates three containers and rotates to position them at three stations: the container transfer station, the container fill station, and the container cooling station. At each container location in the turntable is a lower overpack section that locates the containers and provides support. Containers remain in the overpack during the elevating and glass filling cycle.

As containers are filled and cooled, the turntable rotates to the transfer station where container changeout occurs. Cooled, full product containers are removed from the turntable and replaced with empty containers. The turntable is rotated to position the empty container at the fill station. The container elevator raises the empty container and lower overpack up to the glass pour seal head for container filling.

The elevator is equipped with features to provide a weight of the product container being supported. Weight is used to verify that a container is present and that it is empty. The weight must be between established minimum and maximum values for glass pouring to occur. Additionally, the weight can be used to ensure that container filling is occurring and to provide the rate of glass pouring. The elevator weight is not intended to give an accurate weight of the container; it is merely used as an indication of container presence and condition.

The glass pour seal head is the interface between the melter discharge chamber and the product container during glass pouring. The seal head consists of a metal bellows arrangement that is connected to the melter discharge chamber with the other end of the bellows open for interface with product containers.

Container fill level is monitored by a thermal imaging camera. The camera provides a view of the diameter and the upper one-half of a container. The thermal imaging camera indicates container fill level for primary control of fill rate and pour shut off. In the event of primary level detection failure, a gamma detector activates a high-high level shutdown.

The container is filled using several pours. The pour process occurs more quickly than glass can be made in the melter, resulting in lag time between pours. Rapid pouring allows molten glass to flow out to all edges of the container. Following the final glass pour batch, the container remains in position to provide initial container cooling and containment of final glass discharges. The container is then lowered to the turntable. The turntable is again rotated, placing the recently filled container at the cooling/venting station. Container cooling continues while another container undergoes the fill cycle. Once cooled, the container is rotated to the transfer position for export and the process is repeated.

Container Transportation

Another function of the LPH system is to provide product container transportation between the container transfer bogie and the pour cave turntable. The system transfers empty product containers from the container transfer bogie to the melter turntable, and transfers full product containers from the turntable to the transfer bogie in a manner that supports the facility throughput goals.

Concrete walls separate the pour caves from the bogie transfer tunnel. These walls have doorways large enough to allow the hoist units loaded with new or filled product containers to pass through them. The doorways are fitted with steel shield doors.

Concrete walls also separate the monorail maintenance facility from the bogie transfer tunnel. These walls have openings sized to prevent an ILAW container from entering the maintenance area. These doorways are also fitted with steel shield doors that provide radiological shielding from sources in the transfer tunnel during hands-on maintenance activities in the monorail maintenance facility.

Pour cave transfer operations are conducted remotely with only a few exceptions. Maintenance and recovery operations in the bogie transfer tunnel, such as a jammed grapple, may require hands-on intervention. Monorail hoist maintenance operations conducted in the maintenance facility are completely hands-on. Monorail hoist recovery operations can become a hands-on/remote combination depending on the failure details.

Buffer Storage Area

The LPH system provides a buffer storage area for ILAW containers in the event downstream processing lines become backed up. ~~Additionally, ILAW container rework is conducted in the~~ The buffer storage area includes the container rework area. Anticipated activities include ILAW container transfers into the buffer storage area from the container transfer bogies, container transfers within the buffer storage area, container ~~transfer~~transfers from the buffer storage area to the transfer tunnel, and container transfers to the container rework area, where ILAW container rework is conducted. The buffer storage area is adjacent to a crane maintenance facility. The crane maintenance area is shielded from the buffer storage area to allow hands-on maintenance in the crane maintenance facility and transfer tunnel while containers are present in the buffer storage area.

The LPH transfer tunnel runs from the bogie maintenance area on the west end of the facility to the buffer storage area at the east end of the building. The buffer storage area import/export positions are located within the container transfer corridor. Concrete walls with passages for ILAW containers separate the north and south buffer storage areas and the container transfer corridor. The passages are equipped with manually operated steel shield doors to support maintenance or bogie recovery operations that might be required in this portion of the transfer tunnel. The LFH hoists operating in the lidding area above this section of the container transfer corridor transfer ILAW containers to and from the buffer storage area import/export position.

Buffer storage area container transfer operations are conducted with the use of a bridge crane. The crane rails begin in the crane maintenance facility adjacent to the north end of the buffer storage area and extend south. The runway provides crane coverage to the crane maintenance area, the ILAW container buffer storage area, the container transfer corridor, and the two container import/export positions. There are container storage positions in the north and south portions of the ~~store~~buffer storage area, and one rework position also in the south portion of the ~~store~~buffer storage area. The rework position is located in the southeast corner of the ILAW container buffer storage area/rework area. The rework position can be fitted with a powered turntable, a pair of master-slave manipulators. A shielded window is located in this area. Directly east of the rework position, on the cold side of the buffer storage area, is a rework area operating platform that provides operator access to the master-slave manipulators and shielded window.

A winch is provided to support maintenance operations on the buffer storage area bridge crane. A steel shield door and a concrete wall separate the crane maintenance facility from the buffer storage area, allowing maintenance operations to be conducted while the buffer storage area contains full ILAW containers.

LAW Container Finishing Handling (LFH) System

Figure 4A-24 located in ~~Appendix~~ Chapter 4A presents a simplified process flow diagram of the LAW container finishing handling system (LFH). There are two LFH finishing lines. The functions of the LFH system are to verify the container fill level, determine if inert fill is required, complete closure of the ILAW container, decontaminate the exterior of the container, and verify surface contamination levels before exporting the container. The system also has the ability to sample the solidified glass, place the glass shards in a vial, and make these vials available for transfer to the laboratory.

The filled containers are raised from the transfer tunnel into one of two finishing lines and placed on a bogie. The bogie is used to shuttle the container between lidding area stations and the container decontamination station. The bogie with the container travels to the shard sampling station. A sample of the glass may be taken with the glass shard sampler. Based on the measured level in the container, inert fill is added as needed. From there the bogie travels to the container lidding station where the lid is mechanically secured to the container. After mechanically sealing the lid to the container, the bogie travels to the decontamination ~~area.~~

~~At the decontamination station, the container is decontaminated with carbon dioxide pellets. Debris produced during decontamination is collected with a HEPA filtered exhaust system. This gas stream is then routed to the plant vent system where it is passed through the facility's HEPA filters before being discharged through the stack.~~

~~Once the container is decontaminated, it is transported to the swabbing station where it is surveyed for loose surface contamination to verify it meets the contamination requirements. The swabbing machine uses a power manipulator to maneuver the swabs over the surface. The contaminated swabs are then monitored to determine gamma-beta levels for smearable contaminates. If contamination levels exceed C2 contamination criteria, the container can go through the carbon dioxide decontamination station.~~

~~ILAW containers can be routed back through the decontamination stations until the radiological contamination levels are within specification~~ station. Once the container meets C2 contamination criteria, the bogie moves into the monitoring/export station.

~~The container is transported into the monitoring/export station from the swabbing station, and the gamma monitor measures the surface dose rate of the decontaminated container.~~ The container is then exported for shipment to the disposal site. If the container exceeds the dose rate, it is classified as an out-of-specification container. ~~Otherwise, the dose rate is measured and is recorded with the container's records. The container is then exported for shipment to the disposal site.~~

In the off-normal event that an out-of-specification ILAW container is generated, the container will be segregated and a corrective action plan generated. Container characterization data will be evaluated to ~~determine if it~~verify that the ILAW container can be disposed in accordance with approved Hanford Site Solid Waste Acceptance Criteria (HSSWAC).

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

- Opening of personnel access door when container is present in the line transfer station.
- Opening of personnel access door when either line transfer trap doors are open.
- Opening of both line transfer trap doors at the same time.
- Opening of personnel access door if airborne contamination levels are higher than design contamination classification within the line transfer station.

Decontamination Station

A decontamination station is located within each of the finishing lines in the LAW vitrification facility. After the ILAW container has been sealed, it is transported to the decontamination station. Equipment items located in the decontamination station include the carbon dioxide decontamination manipulator, turntable, and exhaust system. Most other items are located outside of the decontamination station, including the carbon dioxide pelletizer, the transport air compressor, and the liquid carbon dioxide storage and delivery system, exhaust fans, and HEPA filters.

The containers are decontaminated using carbon dioxide pellets. The carbon dioxide decontamination manipulator is fitted with an exhaust recovery hood to recover the effluent from the decontamination operation. Debris produced during decontamination is collected with a HEPA filtered exhaust system. This gas stream is then routed to the plant vent system where it is passed through the plant's HEPA filters before being discharged through the stack.

Once the container is decontaminated, it is transported from the decontamination station to the swabbing station.

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

- Opening of the decontamination or decontamination/ swabbing containment door during decontamination.
- Opening of the decontamination and decontamination/ swabbing containment door at the same time.

Swabbing and Swabbing-Monitoring Station

At the swabbing station, containers are surveyed for loose surface contamination to verify that they meet the contamination requirement. The swabbing machine maneuvers the swabs over the container surface. After a prescribed area is covered, the contaminated swabs are exported away from radioactive source for monitoring to determine gamma-beta levels for smearable contaminates. If contamination levels exceed

C2 criteria, the container is transported back into the decontamination station for rework. If the container meets C2 criteria, the turntable bogie moves into the export station.

Once the container is transported into the monitoring/export station from the swabbing station, a gamma monitor measures the dose rate of the decontaminated container.

If the container exceeds the specified dose requirement, it is classified as an out-of-specification container; otherwise, the dose rate is measured and is recorded within the container's records. The container is then exported out of the monitoring/export station for shipment to the disposal site.

Instrumentation, alarms, controls, and interlocks will be provided for the swab monitoring station to indicate or prevent the following conditions:

- Personnel access when a container is present in swab monitoring station.
- Opening of decontamination/ swabbing or swabbing/ export containment door during swabbing.
- Opening of personnel access door when container is present in the swabbing station.
- Opening of personnel access door if airborne contamination levels are higher than design contamination classification within the decontamination area.
- Opening of personnel access door if high concentration of carbon dioxide is present within the decontamination area.
- Rotation of ~~posting turntable~~pour turntable during swabbing.
- Export of swab if radiation levels from swab are higher than design radiation classification in the operational area.

LAW Container Export Handling (LEH) System

The purpose of the LEH system is to load ILAW containers onto a transportation vehicle for transfer to a Hanford Site TSD unit. This system is contained in a truck bay on the east end of the LAW vitrification facility.

Under normal operations the ILAW container will be received from the LFH system through a hatch. Radiological dose rate and contamination level are determined and verified to be within limits prior to entering the LEH system. An overhead crane lifts the ILAW container through the hatch and places it on the transportation vehicle.

Operations are remote and maintenance is "hands-on" in the LEH system. The overhead crane is provided with closed circuit television cameras for operation when radiological conditions do not permit personnel access during the ILAW container loading.

~~4E.57.6~~4E.2.6 LAW Melter Equipment Support Handling (LSH) System

The primary function of the LSH system is to provide the equipment and support necessary to complete maintenance tasks on all melters and equipment in the melter gallery of the LAW vitrification facility. The primary equipment used in support of the maintenance efforts are:

- Consumable change-out boxes
- Consumable change-out boxes storage racks
- Consumable change-out boxes preparation stand
- Melter gallery process cranes
- Consumable change-out boxes handler
- Lifting head
- Melter gamma gate

- Shield cover removal tool

Melter consumables will be removed through the top of the melter shielding. Melter consumable items will be those that require routine and nonroutine maintenance, but provide necessary functions to continue melter operations. The routine consumable items will include bubbler assemblies. New bubbler assemblies will be shipped to the facility and will be installed into the melter.

Spent bubblers will be extracted from the melter, and transferred into a consumable change-out box (CCB) and then transferred into a box for treatment and disposal.

Refractory thermocouples, airlifts, level detectors, feed nozzles, and film coolers will be removed, bagged and loaded into the CCB and then transferred to a disposal box. These waste management tasks will be considered nonroutine and are replaced on an as-needed basis~~ according to~~. The waste is disposed of as secondary waste~~ management procedures and with appropriate LSH equipment.~~ according to secondary waste management procedures.

~~4E.57.7~~4E.2.7 LAW Melter Handling (LMH) System

The ~~Low Activity Waste (~~LAW~~)~~ ~~melter handling~~ LMH system ~~(LMH)~~ does not include permitted tanks or MUs. The LAW LMH system provides the mechanical handling equipment associated with the import of new Locally Shielded Melters (LSMs) and the export of failed or spent LSMs. The LMH system also provides specific facility structures to support LAW LSMs import and export operations, as well as miscellaneous mechanical handling equipment to support operations.

The function of System LMH include:

- Transfer new LAW melter from equipment pad to LAW Melter operating position (L-0112).
- Transfer equipment between C1/C2 airlock (L-0113) and monorail hoist maintenance rooms (L-B023A/ L-B023B).
- Transfer spent melters that are seal-welded and ready for transport from operating position (L-0112) to equipment pad.

The LAW Assembly/Staging Pad Area is located external to the LAW Facility at an elevation of +3'-0". New melters are assembled in the assembly/staging pad area. The East side of the pad is configured as a loading dock to permit transfer of a spent LAW melter to the Tank Operating Contractor (TOC) supplied melter transport system. The pad incorporates LAW melter rails and provides multiple embed locations to mount a winch assembly.

The LAW Winch Assembly provides the motive force for transferring the new or spent LSM along fixed melter rails. The winch assembly operates in conjunction with pulley block assemblies to transfer an LSM. The winch assembly is only installed for LSM transfer operations and then is removed and stored.

When the LAW melter has reached the end of its operating life, it is disconnected from all systems and all penetrations on the enclosure are seal welded before it is be moved out of the LAW vitrification facility. Prior to deployment the LSM is surveyed and decontaminated as required and is loaded on the TOC melter transport system.

~~4E.58~~4E.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 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 ~~Appendix~~ Chapter 4A, Figure 4A-59.

There are twenty-one containment buildings at the WTP: five located within the pretreatment facility; six in the LAW vitrification facility; and ten in the HLW vitrification facility. The regulated units in the LAW vitrification facility are:

- LAW LSM gallery containment building (L-0112)
- ~~LAW~~ ILAW container finishing containment building (L-0109B, L-0109C, L-0109D, L-0109E, L-0115B, L-0115C, L-0115D, L-0115E, L-0116A)
- LAW vitrification facility consumable import/export containment building (L-0119B)
- LAW vitrification facility C3 workshop containment building (L-0226A)
- LAW pour cave containment building (L-~~B015A~~B009B, L-~~B013C~~B011B, L-~~B013B, L-~~B011C, L~~-B011B, and L-B009B~~-B013B, L-B013C, L-B015A)
- ~~LAW~~ILAW container buffer storage containment building (L-B025C, L-B025D)

Table 4E-5 summarizes the units within the LAW 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 *Fugitive Emissions Control Description* (24590-WTP-PER-HV-02-001) located in Operating Unit Group 10 Appendix 7.15.

The following sections address each of the containment buildings.

~~4E.58.1~~4E.3.1 LAW LSM Gallery Containment Building (L-0112)

There will be six containment buildings in the LAW vitrification facility. The first is the LAW locally shielded melter (LSM) gallery containment building, which will house the two LAW Melters. The LAW Melters are designed to include a roller or wheel assembly that travels on rails that will be used to move the melters in and out of the containment building. Spent LAW Melters will be disconnected from the offgas system, feed lines, electrical lines, and instrumentation. Open ports will be seal welded. The sealed exterior of the melter will be decontaminated, if needed, prior to removal from the containment building.

LAW LSM Gallery Containment Building Design

The LAW LSM gallery containment building will be completely enclosed within the LAW vitrification facility. The unit will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent water from running into the facility.

The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Rainwater run-off will be collected by roof drains and a drainage system with overflow drains. The approximate dimensions of the unit are summarized in Table 4E-5.

The melter feed slurry will be introduced to the LAW melters through stainless steel feed lines and specialized reinforced flex hoses. The feed lines in between the melter feed vessel and the melter will pass through the Melter Feed Encasement Assembly (LMP-LDB-00001/00002) that functions as secondary containment and provides leak detection. The encasement assembly and associate bellows are provided with a conductivity cable lead detection system. A drain within the assembly has also been incorporated into the design to allow drainage to a sump located in the adjacent process room.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because any dangerous wastes with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7). The only anticipated source of liquids in the LSM gallery are the waterlines to the two film cooler pipes, and the melter and melter lid cooling water piping systems. These clean water lines (isolated from contact with dangerous wastes) will be instrumented to detect leaks. The melter annulus and the gas barrier contain cooling liquids within the locally shielded melter and are both provided with leak detection. The melter lid cooling system is also a clean water system that is provided with temperature indication, level transmitters, and flow and pressure indicators to identify a potential leak. A rupture of either water line or a waste feed line would be an abnormal event and the liquid would be contained within the locally shielded melter or in the encasement assembly and corrective measures would be initiated. Corrective action would start with closure of the supply line and draining of remaining water outside the melter, and could require feed cutoff and melter idling or shut down.

LAW LSM Gallery Containment Building Structure

The LAW LSM gallery containment building will be fully enclosed within the LAW vitrification facility. Therefore, structural requirements for the containment building will be met by the design standards of the LAW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. Within the containment building will be partitions between the LSMs. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

LAW LSM Gallery Containment Building Materials

The LAW LSM gallery containment building will be constructed of steel-reinforced concrete. The interior floor and the walls of the unit will be covered with an epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the LAW LSM Gallery Containment Building

The epoxy coating will be applied to the concrete floor and a portion of the walls of the unit. The coating will be compatible with the wastes that will be managed in the containment building. The wastes to be managed in this containment building will include LAW LSM melters and consumables, which may be metallic parts and failed equipment. Reagents that could impact the epoxy ~~decontamination~~ coating will not be used within the unit.

Primary Barrier Integrity in the LAW LSM Gallery Containment Building

The LAW LSM gallery 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 LAW LSM Gallery Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the LAW LSM gallery 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 containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the LAW LSM Gallery Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the waste within the LAW LSM gallery containment building, as required by 40 CFR 264.1101(c)(1). Activities in the building will be remotely conducted.

Maintenance of the LAW LSM Gallery Containment Building

The epoxy ~~decontamination~~ coating will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The concrete coating 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 glass waste and containerized or ~~uncontainerized~~un-containerized waste and equipment.

Measures to Prevent Tracking Wastes from the LAW LSM Gallery Containment Building

The unit is designed to manage LAW melters. ~~The melters will be~~When the LAW melter has reached the end of its operating life, it is disconnected from ~~systems when determined to be~~ all waste~~. The ports where the melter was attached to systems will be sealed~~ feed and utility systems and all penetrations on the enclosure are seal welded so glass waste will be contained within the melter. This design will prevent waste from entering the containment building and thus from being tracked from the unit.

The unit will be classified as a C3 contamination area, which allows only limited personnel access. Access will be required only for non-routine events such as when melters are determined to be waste, approximately every 5 years, or when equipment must be dismantled. Dry decontamination methods will be used to decontaminate the melter and gallery areas.

Procedures in the Event of Release or Potential for Release from the LAW LSM Gallery Containment Building

Conditions that could lead to a release from the LAW LSM gallery containment building 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 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. The methods will be followed to repair conditions that could lead to a release.

Inspections of the LAW LSM Gallery Containment Building

An inspection program will be established to detect conditions that could lead to release of wastes from the LAW LSM gallery 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 6.0.

~~4E.58.2~~4E.3.2 ~~LAW~~ILAW Container Finishing Line Containment Building (L-0109B, L-0109C, L-0109D, L-0109E, L-0115B, L-0115C, L-0115D, L-0115E)

The ~~LAW~~ILAW container finishing line containment building will be located in the LAW vitrification facility. It will be used for managing ILAW containers that have cooled sufficiently to be closed and prepared for finishing. Typical waste management activities performed in this containment building include storage of open waste containers and container decontamination.

An ILAW container is transported from an inert filling and lidding room, to a decontamination room, and finally to a swab and monitor room, and then out of the containment building. This sequence of rooms is considered a finishing line. There are two finishing lines within the ILAW container finishing line containment building.

~~LAW~~ILAW Container Finishing Containment Building Design

The ~~LAW~~ILAW container finishing containment building will be completely enclosed within the LAW vitrification facility. It will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent water from running into the facility. The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Roof drains and drainage system with overflow drains will collect run-off. The approximate dimensions of the unit are summarized in Table 4E-5.

~~LAW~~ILAW Container Finishing Containment Building Structure

Because the ~~LAW~~ILAW container finishing containment building will be a concrete-walled structure fully enclosed within the LAW vitrification facility, its structural requirements will be met by the design standards of the LAW 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 LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

~~LAW~~ILAW Container Finishing Containment Building Materials

The ~~LAW~~ILAW container finishing containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the decontamination rooms will be coated with an epoxy coating to facilitate decontamination of the concrete.

Use of Incompatible Materials for the ~~LAW~~ILAW Container Finishing Containment Building

The primary concrete barrier will have an epoxy ~~decontamination~~ coating. This epoxy coating will be compatible with the waste managed in the unit. The waste to be managed includes vitrified waste glass within the stainless steel containers. This coating will be present in the two inert fill ~~rooms, the fixative application room, and~~ rooms and the two swab and monitor rooms.

The epoxy coating will be provided to protect the concrete and facilitate decontamination. The coating will be compatible with the wastes that will be managed, which will include filled ILAW containers. Glass waste is not expected to be present on the exterior of the containers, due to the design of the melter pour stations. The interior is the only portion of the container that will be exposed to the glass waste. Additionally, the removal of glass will occur in the inert fill and lidding rooms. Carbon dioxide pellets, compatible with the stainless steel container, will be used to remove contamination from the container surface. Reagents that could cause the decontamination coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the ~~LAW~~ILAW Container Finishing Containment Building

The ~~LAW~~ILAW 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 ~~LAW~~ILAW Container Finishing Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the ~~LAW~~ILAW 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 containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the ~~LAW~~ILAW Container Finishing Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the ~~LAW~~ILAW containment building, as required by 40 CFR 264.1101(c)(1). Activities in the building will be remotely conducted.

Maintenance of the LAWILAW Container Finishing Containment Building

The epoxy decontamination coated concrete floor and walls of the 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 coated concrete 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 ILAW containers, containerized secondary waste, and failed equipment. Waste containers managed in the containment building will not be stacked.

Measures to Prevent Tracking Wastes from the LAWILAW Container Finishing Containment Building

The LAWILAW containment building is designed to sample, mechanically seal, and decontaminate the filled ILAW containers. Conducting these activities in a C3 zone prevents the spread of contaminated materials from the unit as air flow is managed in the LAW vitrification facility ventilation system. The containment building is under negative pressure. Air flow through this containment building goes to a C5 air system, which passes through HEPA filters before exiting the facility stack.

A vacuum cleanup system, located in the two inert fill rooms, is expected to be infrequently used to collect dust from the inert filling activities, and thereby minimize the potential for dust to be tracked from the unit. The dust will be disposed of as secondary waste.

Additionally, personnel access to the containment building, which is classified as a C3 contamination area, will be allowed only under limited circumstances, reducing the potential for contacting the waste and tracking it from the unit.

Procedures in the Event of Release or Potential for Release from the LAWILAW Container Finishing Containment Building

Conditions that could lead to a release from the LAWILAW containment building 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 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. The methods will be followed to repair conditions that could lead to a release.

Inspections of the LAWILAW Container Finishing Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the LAWILAW container finishing 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 6.0.

4E.58.34E.3.3 LAW Consumable Import/Export Containment Building (L-0119B)

The LAW vitrification facility consumable import/export containment building will be located in the west end of the LAW vitrification facility on the 3 ft elevation. Typical waste management activities performed in this containment building include decontamination, size reduction, and packaging of spent equipment.

Simple dryDry wipe down decontamination of components will be performed to allow contact handling. Waste streams generated within the consumable import/export containment building will be transferred into a consumable change-out box (CCB) equipped with an internal bagging capabilities, and then packaged into a box for disposal. Waste typically generated in the consumable import/export area are managed in large waste boxes.

LAW Vitrification Facility Consumable Import/Export Containment Building Design

The LAW vitrification facility consumable import/export containment building will be designed as a completely enclosed area within the LAW vitrification facility. It is designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent water from running into the facility. The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and vapor barrier. Rainwater run-off will be collected by roof drains and drainage systems with overflow roof drains. The approximate dimensions of the unit are summarized in Table 4E-5.

LAW Vitrification Facility Consumable Import/Export Containment Building Structure

The LAW vitrification facility consumable import/export containment building will be a concrete-walled structure fully enclosed within the LAW vitrification facility. Therefore, structural requirements for the containment building will be met by the design standards of the LAW 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 LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

LAW Vitrification Facility Consumable Import/Export Containment Building Materials

The LAW vitrification facility consumable import/export containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be coated with an epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials in the LAW Vitrification Facility Consumable Import/Export Containment Building

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

Primary Barrier Integrity in the LAW Vitrification Facility Consumable Import/Export Containment Building

The LAW vitrification facility consumable import/export 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 LAW Vitrification Facility Consumable Import/Export Containment Building

Prior to receipt of dangerous and mixed waste, a certification by a qualified registered professional engineer that the LAW vitrification facility consumable import/export 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 containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the LAW Vitrification Facility Consumable Import/Export Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the wastes within the LAW vitrification facility C3 containment building unit as required by 40 CFR 264.1101(c)(1).

Maintenance of the LAW Vitrification Facility Consumable Import/Export Containment Building

The epoxy ~~decontamination~~ coating of the unit will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The coating 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 and packaged in the containment building unit will be compatible with the protective coating. Only decontamination chemicals that are compatible with the coating will be used.

Measures to Prevent Tracking Wastes from the LAW Vitrification Facility Consumable Import/ Export Containment Building

The LAW vitrification facility consumable import/export containment building will be designed to package failed equipment to prevent the spread of contaminated materials. 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. Wastes leaving the unit will be enclosed within containers. If necessary, these containers will be decontaminated in the unit prior to release and transportation to a permitted treatment and disposal area.

Procedures in the Event of Release or Potential for Release from the LAW Vitrification Consumable Import/Export 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. The ventilation system will also use negative air pressure to keep contamination from spreading to areas of lesser contamination.

Inspections will identify conditions that could lead to a release. Such conditions 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 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 LAW Vitrification Facility Consumable Import/Export Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the LAW vitrification facility consumable import/export 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 6.0.

~~4E.58.4~~4E.3.4 LAW C3 Workshop Containment Building (L-0226A)

The C3 workshop containment building will be located in the west side of the LAW vitrification facility at elevation 28 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 waste boxes. In the workshop, the equipment will be decontaminated to enable hands-on maintenance.

Spent equipment and 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 waste boxes.

C3 Workshop Containment Building Design

The C3 workshop containment building will be a completely enclosed area within the LAW 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 LAW vitrification facility exterior will prevent water from running into the facility. The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and vapor barrier. Rainwater run-off will be collected by roof drains and drainage systems with overflow roof drains. The approximate dimensions of the unit are summarized in Table 4E-5.

C3 Workshop Containment Building Structure

The C3 workshop containment building will be fully enclosed within the LAW vitrification facility. Therefore, structural requirements for the containment building will be met by the design standards of the LAW 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 LAW 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 a steel-reinforced epoxy coated concrete floor and plasterboard partition walls. The floor will be coated with an epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials in the C3 Workshop Containment Building

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 epoxy 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 containing 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 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 epoxy coated concrete will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration.

The concrete 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 coated concrete. Only decontamination chemicals that are compatible with the concrete coating will be used.

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. Very little dust is expected to be generated in the unit.

The containment building is classified as a C3 contamination area, which allows only limited access by personnel. Personnel access will be via a C2/C3 sub-change room. Equipment will enter and exit the workshop via a C2/C3 airlock. Repaired equipment leaving the unit will be decontaminated, when necessary, before being released for removal from the containment building. Wastes leaving the unit will be packaged in waste containers or waste boxes. If necessary, the containers will be decontaminated in the unit prior to transportation to a permitted treatment or disposal area.

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. The ventilation system will also use negative air pressure to keep contamination from areas of lesser contamination. Offgas will be routed to the LAW offgas treatment system.

Inspections will identify conditions that could lead to a release. Such conditions 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 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 6.0.

~~4E.58.5~~4E.3.5 LAW Pour Cave Containment Building (L-B009B, L-B011B, L-B011C, L-B013B, L-B013C, L-B015A)

The LAW pour cave containment building (rooms L-B009B, L-B011B, L-B011C, L-B013B, L-B013C, L-B015A) will be located in the LAW vitrification facility, elevation -21 ft. It will be used for managing ILAW containers as they are filled with glass from the LAW Melters (LAW-MLTR-00001/2). The filled ILAW containers will be allowed to cool with the lids off the container. Cooled ILAW containers will be transferred to the ~~LAW~~ILAW container finishing line containment building for lidding and preparation for export to a storage facility.

LAW Pour Cave Containment Building Design

The LAW pour cave containment building will be completely enclosed within the LAW vitrification facility, which will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent precipitation from entering into the facility. The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Roof drains and drainage system with overflow drains will collect run-off. The approximate dimensions of the unit are summarized in Table 4E-5.

LAW Pour Cave Containment Building Structure

Because the LAW pour cave containment building will be a concrete-walled structure fully enclosed within the LAW vitrification facility, its structural requirements will be met by the design standards of the LAW 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 LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

LAW Pour Cave Containment Building Materials

The LAW pour cave containment building will be constructed of steel-reinforced concrete that is provided with an insulated stainless steel liner to protect the concrete from thermal damage and support decontamination.

Use of Incompatible Materials for the LAW Pour Cave Containment Building

The waste to be managed includes vitrified waste glass within the stainless steel containers and insulated stainless cladding. No glass waste is expected to be present on the exterior of the containers, due to the design of the melter pour stations. The interior is the only portion of the container that will be exposed to the glass waste. Reagents that could cause corrosion or other failure will not be used within the unit.

Primary Barrier Integrity in the LAW Pour Cave Containment Building

The LAW pour cave containment building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in *RPP-WTP Compliance with Uniform Building Code Seismic Design Requirements*, 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 LAW Pour Cave Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the LAW pour 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 with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the LAW Pour Cave Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the LAW pour cave containment building, as required by 40 CFR 264.1101(c)(1). Activities in the building will be remotely conducted during normal operation when ILAW containers are present.

Maintenance of the LAW Pour Cave Containment Building

The insulated stainless steel clad concrete 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 containerized glass waste and equipment.

Measures to Prevent Tracking Wastes from the LAW Pour Cave Containment Building

The LAW pour cave containment building is designed to manage the filling and movement of ILAW containers. Conducting these activities in a C5 zone prevents the spread of contaminated materials from the unit as airflow is managed in the LAW vitrification facility ventilation system. The containment building is under negative pressure. Airflow through this containment building goes to a C5 air system, which passes through HEPA filters before exiting the facility stack. Personnel access will be restricted during normal operation since it is classified as a C3 contamination area. The containment building may be reclassified as a C3 area for equipment maintenance.

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

Conditions that could lead to a release from the LAW pour cave containment building 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 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. The methods will be developed to repair conditions that could lead to a release.

Inspections of the LAW Pour Cave Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the LAW pour 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 6.0.

~~4E.58.6~~4E.3.6 LAW Container Buffer Storage Containment Building (L-B025C, L-B025D)

The LAW container buffer storage containment building (rooms L-B025C, L-B025D) will be located in the LAW vitrification facility, elevation -21 ft. It will be used for managing ILAW containers ~~as~~ after they are filled with glass from the LAW Melters (LAW-MLTR-00001/2). The filled ILAW containers will be allowed to cool with the lids off the container. Cooled ILAW containers will be transferred to the ~~LAW~~ILAW container finishing line containment building for lidding and preparation for export to a storage or disposal facility.

LAW Container Buffer Storage Containment Building Design

The LAW container buffer storage containment building will be completely enclosed within the LAW vitrification facility, which will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent precipitation from entering into the facility. The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Roof drains and drainage system with overflow drains will collect run-off. The approximate dimensions of the unit are summarized in Table 4E-5.

LAW Container Buffer Storage Containment Building Structure

Because the LAW container buffer storage containment building will be a concrete-walled structure fully enclosed within the LAW vitrification facility, its structural requirements will be met by the design standards of the LAW 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 LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

LAW Container Buffer Storage Containment Building Materials

The LAW container buffer storage containment building will be constructed of steel-reinforced concrete provided with an epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the LAW Container Buffer Storage Containment Building

The waste to be managed includes vitrified waste glass within the stainless steel containers. No glass waste is expected to be present on the exterior of the containers. The interior is the only portion of the container that will be exposed to the glass waste. Reagents that could cause corrosion or other failure of the epoxy coating will not be used within the unit.

Primary Barrier Integrity in the LAW Container Buffer Storage Containment Building

The LAW container buffer storage containment building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in *RPP-WTP Compliance with Uniform Building Code Seismic Design Requirements*, 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 LAW Container Buffer Storage Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the LAW container buffer storage 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 containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the LAW Container Buffer Storage Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the LAW container buffer storage containment building, as required by 40 CFR 264.1101(c)(1). Activities in the building will be remotely conducted during normal operation when ILAW containers are present.

Maintenance of the LAW Container Buffer Storage Containment Building

The epoxy coated concrete 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 containerized glass waste and equipment. Wastes containers managed in the containment building will not be stacked.

Measures to Prevent Tracking Wastes from the LAW Container Buffer Storage Containment Building

The LAW container buffer storage containment building is designed to manage the movement and storage of ILAW containers. Conducting these activities in a C5 zone prevents the spread of contaminated materials from the unit as airflow is managed in the LAW vitrification facility ventilation system. The containment building is under negative pressure. Airflow through this containment building goes to a C5 air system, which passes through HEPA filters before exiting the facility stack. Personnel access will be restricted during normal operation since it is classified as a C5 contamination area. The containment building may be reclassified as a C3 area for equipment maintenance.

Procedures in the Event of Release or Potential for Release from the LAW Container Buffer Storage Containment Building

Conditions that could lead to a release from the LAW container buffer storage containment building 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 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. The methods will be developed to repair conditions that could lead to a release.

Inspections of the LAW Container Buffer Storage Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the LAW container buffer storage 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 6.0.

4E.594E.4 Air Emission Control

4E.59.14E.4.1 LAW Vitrification Facility Ventilation

The LAW vitrification facility will be divided into four numbered zones (the C4 designation is not used) 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 LAW vitrification facility will ensure that the ventilation 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 are normally occupied. C1 areas will typically consist of administrative offices, control rooms, conference rooms, locker rooms, rest rooms, and equipment rooms are expected to remain free of contamination. C1 areas will be operated slightly pressurized relative to atmosphere and other adjacent areas.

The C1V system consists of AHUs, change rooms exhaust fan, ductwork, and accessories. Areas served by this system include:

- Office spaces
- Control Room
- Incident Command Post (ICP) [During DFLAW operations]
- Lunch Room
- Restrooms
- Change Rooms
- Truck Bays
- LAW Switchgear Building

C2 Ventilation (C2V) System

C2 areas will typically consist of non-process operating areas, equipment rooms, stores, access corridors, and plant rooms adjacent to areas with higher contamination potential. The C2V is served by dedicated air handling units and exhaust fans. Ventilation air supplied to C2 areas will be exhausted by the C2 exhaust system and cascaded into adjacent C3 areas. The sum of the volumetric flow rates exhausted by the C2 exhaust system and cascaded into adjacent C3 areas will be greater than the volumetric flow rate supplied to C2 areas. This will cause the C2 areas to maintain a nominal negative pressure relative to atmosphere. C2 exhaust will pass through one stage of HEPA filters and be discharged to the atmosphere by the exhaust fans. Supply and exhaust fans are provided with variable frequency drives.

C3 Ventilation (C3V) System

C3 areas are normally unoccupied, but allow operator access, for instance during maintenance. C3 areas will typically consist of filter plant 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. C3 exhaust will pass through one stage of HEPA filters and be discharged to the atmosphere by the exhaust fans. C3 exhaust fans are provided with variable frequency drives.

C5 Ventilation (C5V) System

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

The C5 areas in the LAW vitrification facility will be composed of the following:

- Pour caves
- Container transfer tunnel
- Buffer storage area
- C3/ C5 drains/ sump collection vessel room
- Process cells
- Finishing line

Air will be cascaded into the C5 areas and exhausted by the C5 exhaust system. Engineered ventilation pipe entries (air in-bleeds) through the C5 confinement boundary will be protected by backflow isolation dampers. C5 exhaust will pass through two stages of HEPA filters and be discharged to the atmosphere by the exhaust fans. C5 exhaust fans are provided with variable frequency drives.

~~4E.59.2~~4E.4.2 LAW Melter Offgas System

The LAW Melter Offgas System consists of the following process systems:

- LAW Primary Offgas Process (LOP) System
- LAW Secondary Offgas/Vessel Vent Process (LVP) System

Process flow ~~diagram~~diagrams of the ~~LAW Primary Offgas Process (~~LOP~~)~~ System are provided in DWP Operating Unit Group 10, Appendix 9.1. The LOP tank system consists of the following tanks and miscellaneous treatment unit sub-systems and their associated ancillary equipment:

Tank System

- LAW Melter SBS Condensate Vessels (LOP-VSL-00001/2)
- Pumps
- Eductor (LOP-EDUC-00001)

Miscellaneous Treatment Unit Sub-Systems

- Melter 1 and Melter 2 Primary and Standby Film Coolers (LOP-FCLR-00001/2/3/4), one set for each melter
- Melter 1 and Melter 2 Submerged Bed Scrubbers (SBS)(LOP-SCB-00001/2)
- Melter 1 and Melter 2 Wet Electrostatic Precipitators (WESP) (LOP-WESP-00001/2)

Process flow diagram of the LAW Secondary Offgas/Vessel Vent Process (LVP) System are provided in DWP Operating Unit Group 10, Appendix 9.1. The LVP tank system consists of the following tanks and miscellaneous treatment unit sub-systems and their associated ancillary equipment.

Tank System

- LAW Caustic Collection Tank (LVP-TK-00001)

Miscellaneous Treatment Unit Sub-Systems

- Melter Offgas HEPA Preheaters(LVP-HTR-00001A/1B)
- Melter Offgas HEPA Filters (LVP-HEPA-00001A/1B/2A/2B/3A)
- Offgas Mercury Adsorbers (LVP-ADBR-00001A/1B)Catalytic Oxidizer Electric Heater (LVP-HTR-000002)
- Thermal Catalytic Oxidizer Skid (LVP-SKID-00002)
- Selective Catalytic Oxidizer (SCO) (LVP-SCO-00001)
- NOx Selective Catalytic Reduction Unit (SCR) (LVP-SCR-00001)
- Catalytic Oxidizer Heat Recovery Unit (LVP-HX-00001)Melter Offgas Exhausters (LVP-EXHR-00001A/B/C)
- Melter Offgas Caustic Scrubber (LVP-SCB-00001)
- Catalytic Oxidizer Electric Heater (LVP-HTR-000002)

Melter offgas is generated from the vitrification of LAW feed in the two joule-heated ceramic melters and the vessel ventilation system. The rate of generation of gases in the melter is dynamic. The melters generate offgas resulting from decomposition, oxidation, and vaporization of feed material. Constituents of the offgas include:

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

In addition, the LAW Melters generate small quantities of other volatile compounds including iodine-129, carbon-14, tritium, and volatile organic compounds. Carbon-14 and tritium are in the form of carbon dioxide and water, respectively.

The purpose of the LAW Melter offgas 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 provideprovides a pressure confinement boundary that will control melter pressure and prevent vapor release to the cell. The design of the melter offgas system must accommodateaccommodates -changes in offgas flow from individual melters without causing either melter to pressurize and without allowing variations in the flow from one melter to impact the other melter.

Separate systems are provided for the initial treatment of offgas from each melter. This is considered the primary offgas treatment system. This primary offgas system is designed to handle intermittent surges of seven times the normal steam generation rate and three times the normal non-condensable gas generation rate from the melter feed without causing interruption of melter operations. The primary system consists of Film Coolers (LOP-FCLR-00001/3), Submerged Bed Scrubbers (LOP-SCB-00001/2), and a Melter Wet Electrostatic Precipitator (LOP-WESP-00001/2). This system cools the offgas and removes particulates.

There is a second offgas line from the Melter to the Submerged Bed Scrubbers (LOP-SCB-00001/2) consisting of a Standby Film Cooler (LOP-FCLR-00002/4) and a butterfly valve as the isolation device. The melter is operated under negative pressure. In the event that the primary offgas line plugs or the melter surges beyond design basis, the butterfly valve opens allowing offgas flow to the submerged bed scrubber through the second offgas line, thereby preventing melter pressurization. The line is also designed to handle surges up to seven times the normal steam generation rate and three times the non-condensable gas generation rate from melter feed without causing interruption in melter operations. In the event that the melter surge exceeds the pressure relief set point, the pressure relief device opens venting the offgas to the process cell. The pressure relief device closes as the melter pressure approaches the desired set point. Offgas from the wet process cell is drawn through C5V HEPA Filters to remove particulates before discharged to the atmosphere.

The vessel ventilation system offgas consists primarily of air, water vapor, and minor amounts of aerosols generated by the agitation or movement of vessel contents. The vessel ventilation system header joins the primary offgas system after the Wet Electrostatic Precipitators (LOP-WESP-00001/2), and the combined offgas is routed to the secondary offgas treatment system.

The secondary offgas system (from HEPA preheater to final discharge) is designed to handle maximum sustained flowrate from the two melters assuming both melters are operating. The system is also capable of operating effectively if only one melter is running. The secondary offgas system consists of Melter Offgas Preheater (LVP-HTR-00001A/1B) with Melter Offgas HEPA Filter trains (LVP-HEPA-00001A/1 2A/3A and 00001B/2B), and the Melter Offgas Exhausters (LVP-EXHR-00001A/B/C). The balance of the secondary offgas system includes the Offgas Mercury Adsorbers (LVP-ADBR-00001A/B), LVP-SKID-00002 made up of a Thermal Catalytic Oxidizer (LVP-SCO-00001)/Selective CatalyticReducer (LVP-SCR-00001), the Catalytic Oxidizer Heat Recovery Unit (plate and frame heat exchanger) (LVP-HX-00001), Catalytic Oxidizer Electric Heater (LVP-HTR-00002), the catalyst for volatile organic compound oxidation and the catalyst for nitrogen oxides reduction; and a Melter Offgas Caustic Scrubber (LVP-SCB-00001).

The melter offgas exhausters will be located downstream of the LVP Caustic Scrubber (LVP-SCB-00001) and maintain negative pressure across the LVP primary and secondary offgas equipment upstream of the exhausters. The following sections provide descriptions of major melter offgas treatment components.

4E.59.2.14E.4.2.1 LAW Primary Offgas Process (LOP) System

Process flow diagram of the LAW Primary Offgas Process (LOP) System are provided in DWP Operating Unit Group 10, Appendix 9.1. The purpose of the LOP tank system and miscellaneous treatment unit sub-systems is to cool the offgas and remove aerosols generated by each of the two LAW melters. The primary components consist of a film cooler, submerged bed scrubber, and a wet electrostatic precipitator.

Melter Film Coolers (LOP-FCLR-00001/2/3/4)

The primary function of the Film Cooler miscellaneous treatment unit sub-system is to cool the offgas and entrained molten glass droplets below the glass sticking temperature to minimize glass deposition on the offgas piping walls. The offgas exits the melter and is mixed with steam or steam/air mixture in the offgas Film Cooler. The Film Cooler is a double-walled pipe designed to introduce air/steam axially along the walls of the offgas pipe through a series of holes or slots in the inner wall. Each melter has a primary and a standby Film Cooler.

Melter Submerged Bed Scrubber (LOP-SCB-00001/2)

Each LAW Melter has a dedicated Submerged Bed Scrubber miscellaneous treatment unit sub-system. After each primary Film Cooler (LOP-FCLR-00001/3), the offgas enters the Submerged Bed Scrubber column for further cooling and solids removal. The Submerged Bed Scrubber is a passive device designed for aqueous scrubbing of entrained particulates 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 through the use of cooling coils/jacket. The offgas leaves the Submerged Bed Scrubber in approximate thermal equilibrium with the scrubbing solution.

The Submerged Bed Scrubbers (LOP-SCB-00001/2) have two offgas inlets, one for the normal operations line and one for the standby line. Standby Film Coolers (LOP-FCLR-00002/4) can be routed to either Submerged Bed Scrubber. Each Standby Film cooler is normally routed to its respective submerged bed scrubber; however, each film cooler can be routed to the alternate submerged bed scrubber. The offgas enters the Submerged Bed Scrubber through the appropriate 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 Submerged Bed Scrubber to allow the scrubbing solution to circulate freely through the bed. After formation of the gas ~~bubble~~bubbles beneath the packing, the injected offgas ~~then~~ bubbles up through the packed bed. The rising gas bubbles also cause the scrubbing liquid to circulate up through the packed bed, resulting in a general recirculation of the scrubbing solution. The packing breaks larger bubbles into smaller ones to increase the gas to water contacting surface, thereby increasing particulate removal and heat transfer efficiencies. The warmed scrubbing solution then flows downward outside of the packed bed past the cooling coils/jacket.

To maintain a constant liquid level within the Submerged Bed Scrubbers (LOP-SCB-00001/2), ~~it will be equipped with~~ overflow lines will be installed that ~~allows~~allow for the continuous discharge of offgas condensate and some scrubbed particulates to the Melter SBS Condensate Vessels (LOP-VSL-00001/2), located next to the Submerged Bed Scrubber. The Melter SBS Condensate Vessels are equipped with a cooling jacket. The rate of condensate discharge is determined by how much the offgas temperature is lowered below its dew point. The condensate and some collected particulates overflow into the Melter SBS Condensate Vessels.

To minimize the buildup of the solids in the bottom of the Submerged Bed Scrubber, condensate from the Melter SBS Condensate Vessels (LOP-VSL-00001/2) will be re-circulated back to the Submerged Bed Scrubber and injected through multiple lances to agitate and suspend solids on the submerged bed scrubber floor. The collected solids will then be pumped directly off the Submerged Bed Scrubber vessel floor to the Melter SBS Condensate Collection Vessel (RLD-VSL-00005). This purging and recycling process occurs simultaneously. Submerged Bed Scrubber condensate from the SBS Condensate Collection Vessels (LOP-VSL-00001/2) ultimately flows to the TLP system. Venting of the Melter SBS Condensate Vessels is via the Submerged Bed Scrubber into the main offgas discharge pipe.

The scrubbed offgas discharges through the top of the Submerged Bed Scrubbers (LOP-SCB-00001/2) and is routed to the Melter Wet Electrostatic Precipitators (one per melter) (LOP-WESP-00001/2) for further particulate removal.

In addition to the instrumentation, alarms, controls, and interlocks addressed in ~~Appendix~~ Chapter 4E, the following will be provided for the Submerged Bed Scrubber to indicate or prevent the following conditions:

- High scrubber liquid temperature
- Low and High scrubber liquid level
- High condensate vessel liquid level
- Loss of chilled water supply
- Differential pressure across the unit

Melter Wet Electrostatic Precipitators (LOP-WESP-00001/2)

The Submerged Bed Scrubber (LOP-SCB-00001/2) discharge is routed to the Melter Wet Electrostatic Precipitator miscellaneous treatment unit sub-system for removal of aerosols down to and including submicron size. Each melter system has a dedicated Melter Wet Electrostatic Precipitator (LOP-WESP-00001/2). The offgas enters the unit and passes through a distribution plate. The evenly distributed saturated gas then flows up through tubes which act as positive electrodes. Each of the tubes has a single negatively charged electrode, which runs down the center of the tube. A high voltage, direct current transformer supplies power to the electrodes. A strong electric field is generated along the electrodes giving a negative charge to the aerosols passing through the tubes. The negatively charged particles move towards the positively charged tube walls for collection. Collected particles are continuously washed from the tube walls along with collected mists. The final condensate continuously drains to the dished bottom area of the Melter Wet Electrostatic Precipitators' (LOP-WESP-00001/2) ~~dished bottom area~~. A water spray may be used periodically to facilitate the washing of collected aerosols from the tubes. The tube drain and wash solution are routed to the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004).

In addition to the instrumentation, alarms, controls, and interlocks addressed in ~~Appendix~~ Chapter 4E, ~~the following~~ a standby offgas line and a maintenance bypass line will be provided for the Melter Wet Electrostatic Precipitators ~~to~~. The lines indicate or prevent the following conditions:

- Loss of electrical power to the unit
- High differential pressure across the unit
- Accumulation of liquid
- Loss of process water supply

Standby Offgas Line

The standby offgas line consists of an offgas pipe from the melter to a Submerged Bed Scrubber (LOP-SCB-00001/2), a Standby Film Cooler (LOP-FCLR-00002/4), and a butterfly valve ~~as the~~ isolation device.

During an off-normal melter surge or if the primary offgas pipe becomes plugged, ~~this~~the butterfly valve will open rapidly, ~~providing~~and provide an alternative path for the melter offgas to flow to the Submerged Bed Scrubbers (LOP-SCB-00001/2). With this alternative routing, pressure control on the melter plenum can be maintained. This standby offgas pipe will extend to the bottom of the Submerged Bed Scrubber packed bed, identical to the main offgas line. It is the same size as the main offgas line, thus providing a doubling of flow cross-section for melter-generated gases.

Maintenance Bypass Line

The LAW Melters are also equipped with a maintenance bypass line, allowing offgases from one melter to be routed to the other's Submerged Bed Scrubber for cooling. The gas will be processed through both a primary and secondary offgas treatment system in the same manner as the normal path. The purpose of this line is to provide melter ventilation during idling conditions in the unlikely event that a Submerged Bed Scrubber (LOP-SCB-00001/2) or Melter Wet Electrostatic Precipitator (LOP-WESP-00001/2) requires maintenance. Prior to initiating use of the maintenance bypass line, waste feed ~~would~~ will be secured, and the melters placed into an idle condition. ~~No waste~~Waste feed ~~would be fed~~ to ~~the~~ melters will not occur when the maintenance bypass line is in use.

Idling emissions from the melter are mainly heated air at a lower gas volume than expected during slurry feeding. The gas will be processed through secondary offgas treatment system that includes HEPA filtration, thermal catalytic oxidation, and selective catalytic reduction.

~~4E.59.2.2~~4E.4.2.2 LAW Secondary Offgas/Vessel Vent Process (LVP) System

Process flow diagram of the LAW Secondary Offgas/Vessel Vent Process (LVP) System are provided in DWP Operating Unit Group 10, Appendix 9.1. The ~~offgas~~LVP system prevents migration of waste contaminants into the process cells and ~~potentially~~ operating areas. It does this by maintaining the various LAW process vessels under a slight vacuum relative to the cell. The composition of the vessel ventilation air is expected to be primarily ambient air with slight mixed waste particulate contamination.

The vessel ventilation air is combined with the melter offgas prior to entering the secondary offgas system HEPA filter electric preheaters. The combined air streams are treated together in the remaining sections of the secondary offgas treatment systems. A pressure control valve is used to regulate the pressure between the vessel ventilation offgas system and the melter offgas system.

The melter offgas stream that is treated through the primary offgas system is combined with the vessel ventilation offgas stream and treated through the LVP tanks and miscellaneous treatment sub-systems. The secondary offgas system removes the remaining particulate, mercury and miscellaneous acid gases, gaseous nitrogen oxide compounds, carbon monoxide, and volatile organic compounds.

Descriptions of the tanks and miscellaneous treatment sub-systems comprising the LVP are provided below:

Melter Offgas HEPA Filters, HEPA Preheaters, and Exhausters

The purpose of ~~these~~the miscellaneous treatment unit sub-systems is to provide a final protection against dispersion of particulate and to protect the downstream equipment from particulate contamination. The combined offgas stream is first passed through the LAW Melter Offgas HEPA Preheaters (LVP-HTR-00001A/1B). Preheating increases the gas temperature sufficiently above its dew point to avoid condensation in the melter offgas HEPA filters. The offgas then passes through radial flow HEPA Filters (LVP-HEPA-00001A/2A/3A or 00001B/2B). The system is composed of two parallel trains of two filter banks in series.

The offgas passes through one train while the other remains available as an installed backup. Motive force for the ventilation is provided by the Melter Offgas Exhausters (LVP-EXHR-00001A/B/C). The melter offgas exhausters will be located downstream of the LVP Caustic Scrubber (LVP-SCB-00001) and maintain negative pressure across the LVP primary and secondary offgas equipment upstream of the exhausters.

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

- High or low differential pressure across a HEPA filter alarms.
- Loss of electric heater element.

Additional information to the instrumentation, alarms, controls, and interlocks associated with a bypass of the LVP system addressed in ~~Appendix~~ Chapter 4E are described in the *LAW Vitrification Offgas Bypass Analysis*, 24590-LAW-PER-PR-03-001.

Offgas Mercury Adsorber (LVP-ADBR-0001A/B)

The Offgas Mercury Adsorbers (LVP-ADBR-00001A/B) make up LVP-SKID-00001 and are the miscellaneous treatment sub-system that removes volatile mercury, iodine, and some acid gases from the offgas. The offgas flows through two internal activated carbon beds normally operated in series. When breakthrough gaseous mercury is detected ~~breaking through~~ in the leading activated carbon bed, ~~indicating that~~ the carbon is loaded. In response, the offgas flow is manually changed to make the trailing bed the leading bed. Only one activated carbon bed is used when the spent activated carbon media is removed~~,~~ and replaced. ~~The~~After replacement, the flow is ~~then~~ changed to make the fresh activated carbon bed the trailing bed.

The activated carbon is batch loaded into the adsorber by gravity. The spent activated carbon media is batch transferred by gravity into waste containers. The spent activated carbon media is managed as secondary waste.

Instrumentation, alarms, controls, and interlocks will be provided for the Offgas Mercury Adsorbers (LVP-ADBR-00001A/B) to indicate or prevent the following conditions:

- Mercury breakthrough in the leading carbon bed, signaling to switch ~~to the~~the trailing carbon bed.
- With the detection of high carbon monoxide/carbon dioxide concentrations, the inlet and outlet valves are closed, isolating the carbon media and bypassing the carbon beds from the offgas stream. This limits the available oxygen to a carbon bed fire and is the primary fire suppression control.
- A water suppression system is available in the event of a carbon bed fire. Alarms notify an operator allowing the connection of the water fire suppression system and manual activation of the suppression system if needed.

Thermal Catalytic Oxidizer (TCO) (LVP-SCO-00001) and NOx Selective Catalytic Reduction Unit (SCR) ~~Unit~~ (LVP-SCR-00001)

The offgas passes through the catalytic oxidizer/reducer skid (LVP-SKID-00002), housing a heat recovery unit (LVP-HX-00001), an electric heater (LVP-HTR-00002), VOC catalyst (LVP-SCO-00001), and SCR catalyst (LVP-SCR-00001) miscellaneous treatment unit sub-systems to remove volatile organic compounds, carbon monoxide, nitrogen oxide compounds 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 Caustic Scrubber for acid gas removal and final cooling.

Instrumentation, alarms, controls, and interlocks will be provided for the Thermal Catalytic Oxidizer / Selective Catalytic Reducers to indicate or prevent the following conditions:

- High differential pressure across each catalyst bed.
- Loss of ammonia gas supply to the nitrogen oxides selective catalytic reduction unit.
- Failure of the electric heater.
- Ammonia analyzer to indicate ammonia slip in the outlet.
- Low offgas temperature entering the unit.
- High temperature differential across the unit.
- High nitrogen oxide concentration in the unit outlet stream.
- High volatile organic compound concentration in the unit outlet stream.

Offgas Caustic Scrubber (LVP-SCB-00001)

The LAW Melters' offgas Caustic Scrubber miscellaneous treatment unit sub-system further treats the offgas by removing iodine and acid gases and providing final offgas cooling. The offgas stream enters the bottom of the scrubber and flows upward through a packed bed. Contaminants in the offgas stream are absorbed into the liquid stream through interaction of the gas, liquid, and packing media. To neutralize the collected acid gases, a sodium hydroxide solution is added periodically to the LAW Caustic Collection Tank (LVP-TK-00001). The clean offgas is then discharged through an internal mist eliminator to prevent droplet carryover. The scrubbing liquid flows downward through the packing bed and drains into the LAW Caustic Collection Tank (LVP-TK-00001). The contents of this tank are periodically transferred to the ~~pretreatment facility~~PTF or the EMF. After passing through the Caustic Scrubber (LVP-SCB-00001) and the Melter Offgas Exhausters (LVP-EXHR-00001A/B/C), the offgas is released to the environment via a flue in the plant stack.

In addition to the instrumentation, alarms, controls, and interlocks addressed in ~~Appendix~~ Chapter 4E, the following will be provided for the Caustic Scrubber to indicate or prevent the following conditions:

- Loss of recirculation pump
- Loss of caustic supply
- Loss of process water supply
- High differential pressure across the column
- Low scrubbing liquid level
- High scrubbing liquid level
- Loss of transfer pump
- Low pH
- High specific gravity (density)

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Table 4E-1 LAW 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	LCP	LCP-VSL-00001 L-0123	LAW Melter 1 Concentrate Receipt Vessel	Stainless Steel	18,130	14’-0” 12’-9”
2	LCP	LCP-VSL-00002 L-0124	LAW Melter 2 Concentrate Receipt Vessel	Stainless Steel	18,130	14’-0” 12’-9”
3	LFP	LFP-VSL-00001 L-0123	Melter 1 Feed Preparation Vessel	Stainless Steel	9,123	11’-0” 10’-6”
4	LFP	LFP-VSL-00002 L-0123	Melter 1 Feed Vessel	Stainless Steel	9,123	11’-0” 10’-6”
5	LFP	LFP-VSL-00003 L-0124	Melter 2 Feed Preparation Vessel	Stainless Steel	9,123	11’-0” 10’-6”
6	LFP	LFP-VSL-00004 L-0124	Melter 2 Feed Vessel	Stainless Steel	9,123	11’-0” 10’-6”
7	LVP	LVP-TK-00001 L-0218	LAW Caustic Collection Tank	Stainless Steel	14,232	13’-0’ (od) 14’-4”
8	LOP	LOP-VSL-00001 L-0123	LAW Melter 1 SBS Condensate Vessel	Hastelloy	9,056	12’-0” 8’-2”
9	LOP	LOP-VSL-00002 L-0124	LAW Melter 2 SBS Condensate Vessel	Hastelloy	9,056	12’-0” 8’-2”
10	RLD	RLD-VSL-00003 L-0126	Plant Wash Vessel	6% Mo/Stainless Steel	25,780	16’-0” 15’-5”

Table 4E-1 LAW 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)
11	RLD	RLD-VSL-00004 L-B001B	LAW C3/C5 Drains/Sump Collection Vessel	Stainless Steel/Inconel 625	7,696	10’-0” 11’-0”
12	RLD	RLD-VSL-00005 L-0126	SBS Condensate Collection Vessel	6% Mo/Stainless Steel	25,780	16’-0” 15’-5”

Table 4E-2 LAW Vitrification Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US Gallons)**
LAW Vitrification Facility					
1	LOP	LOP-FCLR-00001 L-0112	Melter 1 Primary Film Cooler	Stainless Steel	NA
2	LOP	LOP-FCLR-00002 L-0112	Melter 1 Standby Film Cooler	Stainless Steel	NA
3	LOP	LOP-FCLR-00003 L-0112	Melter 2 Primary Film Cooler	Stainless Steel	NA
4	LOP	LOP-FCLR-00004 L-0112	Melter 2 Standby Film Cooler	Stainless Steel	NA
5	LOP	LOP-SCB-00001 L-0123	Melter 1 Submerged Bed Scrubber	Ceramic Packing/Hastelloy	4,948
6	LOP	LOP-SCB-00002 L-0124	Melter 2 Submerged Bed Scrubber	Ceramic Packing/Hastelloy	4,948
7	LOP	LOP-WESP-00001 L-0123	Melter 1 Wet Electrostatic Precipitator	6% Molybdenum/Stainless Steel	N/A
8	LOP	LOP-WESP-00002 L-0124	Melter 2 Wet Electrostatic Precipitator	6% Molybdenum/Stainless Steel	N/A
9	LMP	LMP-MLTR-00001 L-0112	LAW Melter 1	Stainless Steel/Alloys	1,860
10	LMP	LMP-MLTR-00002 L-0112	LAW Melter 2	Stainless Steel/Alloys	1,860
11	LVP	LVP-SCB-00001 L-0304F	Melter Offgas Caustic Scrubber	Hastelloy/Metal Intalox Packing/Stainless Steel	TBD

Table 4E-2 LAW Vitrification Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US Gallons)**
12	LVP	LVP-HEPA-00001A L-0304H	Melter Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
13	LVP	LVP-HEPA-00001B L-0304H	Melter Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
14	LVP	LVP-HEPA-00002A L-0304H	Melter Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
15	LVP	LVP-HEPA-00002B L-0304H	Melter Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
16	LVP	LVP-HEPA-00003A L-0304H	Melter Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
17	LVP	LVP-SCO-00001 (located on LVP SKID-00002) L-0304F	Thermal Catalytic Oxidizer	Stainless Steel	NA
18	LVP	LVP-SCR-00001 (located on LVP SKID-00002) L-0304F	NOx Selective Catalytic Reduction Unit	Stainless Steel	NA
19	LVP	LVP-HTR-00001A L-0304H	Melter Offgas HEPA Preheater	Stainless Steel/Incoloy 800	NA
20	LVP	LVP-HTR-00001B L-0304H	Melter Offgas HEPA Preheater	Stainless Steel/Incoloy 800	NA
21	LVP	LVP-HTR-00002 (located on LVP SKID-00002) L-0304F	Catalytic Oxidizer Electric Heater	Stainless Steel	NA
22	LVP	LVP-HX-00001 (located on LVP SKID-00002) L-0304F	Catalytic Oxidizer Heat Recovery Unit	Stainless Steel	NA

Table 4E-2 LAW Vitrification Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US Gallons)**
23	LVP	LVP-ADBR-00001A (located on LVP-SKID-00001) L-0304F	Offgas Mercury Adsorber	Stainless Steel	NA
24	LVP	LVP-ADBR-00001B (located on LVP-SKID-00001) L-0304F	Offgas Mercury Adsorber	Stainless Steel	NA
25	LVP	LVP-EXHR-00001A L-0304C	Melter Offgas Exhausters	Stainless Steel	NA
26	LVP	LVP-EXHR-00001B L-0304D	Melter Offgas Exhausters	Stainless Steel	NA
27	LVP	LVP-EXHR-00001C L-0304E	Melter Offgas Exhausters	Stainless Steel	NA

Table 4E-3 LAW 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)
LAW Vitrification Facility				
1. L-0123, Melter 1 Process Cell	Minimum secondary containment for these cells has been deleted and superceded by *Flooding Volume for LAW Facility*, 24590-LAW-PER-M-02-002 (DWP, Operating Unit Group, Appendix 9.8).			
2. L-0124, Melter 2 Process Cell				
3. L-0126, Effluent Cell				
4. L-B001B, C3/C5 Drains/Sump Collection Vessel Room				
5. L-0218, Caustic Scrub Blowdown Collection Berm				
6. L-0304 F, Caustic Scrubber Curb Area				
7. ASX Sampler Cabinets • ASX-SMPLR-00012 (L-0301) • ASX-SMPLR-00013 (L-0301)	Secondary containment liners for Isolok flush tubing, no minimum liner height required. The LAW ASX sampler upper secondary containment area liner dimensions are approximately 33” X 34”. The lower containment area liner dimensions are approximately 39” X 68”			
8. Bulges • LCP-BULGE-00001 (L-0202) • LCP-BULGE-00002 (L-0202) • LCP-BULGE-00003 (L-0202) • LFP-BULGE-00001 (L-0202) • LFP-BULGE-00002 (L-0202) • LOP-BULGE-00001 (L-0202) • LOP-BULGE-00002 (L-0202) • RLD-BULGE-00001 (L-B001A) • RLD-BULGE-00004 (L-0202)	Secondary containment for ancillary equipment, no minimum liner height required			

Table 4E-4 LAW 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
LAW Vitrification Facility				
Sumps				
RLD-SUMP-00028 L-B001B (C3/C5 Drains/Sump Collection Vessel Cell, El. –21')	59	Radar	24" Dia. x 30" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00002005
RLD-SUMP-00029 L-0123 (Process Cell, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003002
RLD-SUMP-00030 L-0123 (Process Cell, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003002
RLD-SUMP-00031 L-0124 (Process Cell Sump, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003002
RLD-SUMP-00032 L-0124 (Process Cell, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003002
RLD-SUMP-00035 L-0126 (Effluent Cell, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003003

Table 4E-4 LAW 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-SUMP-00036 L-0126 (Effluent Cell, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003003
Bulges/Floor Drains				
RLD-FD-00001 Floor Drain L-B001B (RLD-BULGE-00001 Drain, El. -21')	N/A	N/A	2" Dia. 316L	**24590-LAW** -M6-RLD-00002003
RLD-FD-00035 Floor Drain L-0126 (RLD-BULGE-0000-4 Drain, El. 3')	N/A	N/A	2" Dia. 6% Mo	**24590-LAW** -M6-RLD-00001005
LOF-FD-00001 Floor Drain L-0123 (LOP-BULGE-00001 Drain, El. 3)	N/A	N/A	2" Dia. 6% Mo	**24590-LAW** -M6-LOP-00001003
LCP-FD-00001 Floor Drain L-0123 (LCP-BULGE-00001 Drain, El. 3')	N/A	N/A	2" Dia. 316L	**24590-LAW** -M6-LCP-00001001
LCP-FD-00002 Floor Drain L-0123 (LCP-BULGE-00002 Drain, El. 3')	N/A	N/A	2" Dia. 316L	**24590-LAW** -M6-LCP-00001004
LFP-FD-00001 Floor Drain L-0123 (LFP-BULGE-00001 Drain, El. 3)	N/A	N/A	2" Dia. 316L	**24590-LAW** -M6-LFP-00001005
LOP-FD-00002 Floor Drain L-0124 (LOP-BULGE-00002 Drain, El. 3)	N/A	N/A	2" Dia. 6% Mo	**24590-LAW** -M6-LOP-00002003
LCP-FD-00003 Floor Drain L-0124 (LCP-BULGE-00003 Drain, El. 3)	N/A	N/A	2" Dia. 316L	**24590-LAW** -M6-LCP-00002001
LFP-FD-00002 Floor Drain	N/A	N/A	2" Dia.	**24590-LAW**

Table 4E-4 LAW 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
L-0124 (LFP-BULGE-00002 Drain, El. 3)			316L	-M6-LFP-00003005
LVP-FD-00001 Floor Drain L-0218 (Berm floor drain for LVP-TK-00001, El. 28’)	N/A	N/A	4” Dia. 316L	**24590-LAW** -M6-LVP-00002003
RLD-FD-00025 Floor Drain L-0304F (Curb floor drain for LVP-TK-00001, El. 48’)	N/A	N/A	4” Dia. 316L	**24590-LAW** -M6-RLD-00003001
Drain Lines				
RLD-WS-20037-S11B-01 Drain Line L-0123 (Melter 1 Encasement Assembly Drain, El. 3’)	N/A	N/A	1” Dia. 316L	**24590-LAW** -M6-LMP-00012001
RLD-WS-20033-S11B-11 Drain Line L-0124 (Melter 2 Encasement Assembly Drain, El. 3’)	N/A	N/A	1” Dia. 316L	**24590-LAW** -M6-LMP-00042001
Autosampler Drain Lines				
RLD-WU-22123-S11B-03 ASX Sampler 00012 Lower Containment Drain Line (L-0301, El. 48’)	N/A	Thermal Dispersion	3” Dia. Stainless Steel 316L	**24590-LAW** -M6-RLD-00003001
RLD-WU-22117-S11B-03 ASX Sampler 00013 Lower Containment Drain Line (L-0301, El. 48’)	N/A	Thermal Dispersion	3” Dia. Stainless Steel 316L	**24590-LAW** -M6-RLD-00003001

Table 4E-5 LAW Vitrification Facility Containment Buildings Summary

Location	Approximate Room Dimensions (L × W × H in feet)
LAW Vitrification Facility	
1. L-0112 LAW LSM Gallery Containment Building	150 x 62 x 24
2. ~~LAW~~ILAW Container Finishing Containment Building:	
L-0109B Swabbing Area Line 2	21 × 15 × 24
L-0109C Decontamination Area Line 2	18 × 15 × 24
L-0109D Inert Fill Area Line 2	55 × 15 × 24
L-0115B Swabbing Area Line 1	21 × 15 × 24
L-0115C Decontamination Area Line 1	18 × 15 × 24
L-0115D Inert Fill Area Line 1	55 × 15 × 24
L-0109E Container Monitoring/Export Area	19 × 18 × 14
L-0115E Container Monitoring/Export Area	19 × 18 × 14
3. L-0119B LAW Consumable Import/Export Containment Building	30 x 28 x 17
4. L-0226A LAW C3 Workshop Containment Building	34 x 22 x 19
5. LAW Pour Cave Containment Building:	
L-B015A Melter 1 Pour Cave	16.5 × 20 x 23
L-B013C Melter 1 Pour Cave	16.5 × 20 x 23
L-B013B Melter 2 Pour Cave	16.5 × 20 x 23
L-B011C Melter 2 Pour Cave	16.5 × 20 x 23
L-B011B Future Melter 3 Pour Cave	16.5 × 20 x 23

Table 4E-5 LAW Vitrification Facility Containment Buildings Summary	
Location	**Approximate Room Dimensions (L × W × H in feet)**
L-B009B Future Melter 3 Pour Cave	16.5 × 20 x 23
6. ~~LAW~~ILAW Container Buffer Storage Containment Building:	
L-B025C Container Buffer Store	22 x 22 x 23
L-B025D Container Rework	22 x 14 x 23

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