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Effluent Management Facility (EMF) Design Description and System Design Descriptions (ACV, C1V, DEP, DVP)

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☑ System Design Description

☑ Facility Design Description

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Validation*

Appl.	Requirement Area	Requirement Developer	Signature	Date
☐	Architectural Design			
☐	Civil/Structural Design			
☐	Controls & Instrumentation Design			
☐	Electrical Design & AHJ			
☐	Fire Protection Engineering			
☐	HVAC Design			
☐	Mechanical Handling Design			
☐	Mechanical Systems Design			
☐	Plant Design			
☐	Process Engineering			
☐	Interface (External)			
☐	Interface (Internal)			
☐	System Functions and Requirements			
☐	Equipment Environmental Qualification			
☐	Materials Engineering / Technology			
☐	Plant Software Design			
☐	Environmental Permitting (ESH)			
☐	Nuclear Safety Engineering			
☑	Chemical Safety	P. Townsend	Email concurrence 6/9/2020	
☐	Criticality Safety			
☐	Radiological Engineering			
☐	Industrial Safety/Hygiene (ESH)			
☐	Mission (WTP Contract functional/ performance rqmts)			
☐	Operations Requirements Document (Plant Ops)			
☐	Quality Assurance			
☐	Safeguards & Security			
☐	Startup			
☐	Transportation & Logistics			

* Validation signatures above are for new requirements and/or changes to requirements reflected in this SDD revision only. Validation signatures from previously-approved requirements are documented in previous revisions and/or change notices as appropriate.

History Sheet

Rev	Reason for revision	Revised by
0	Initial issue.	H. Carroll, R. Moeslein
1	Incorporated 24590-BOF-3ZN-25-00001. Incorporated impacts associated with Condition Report 24590-WTP-GCA-MGT-16-00865. Incorporated impacts associated with 24590-WTP-EIE-SYSE-16-0045, 24590-LAW-EIE-NS-15-0005, 24590-WTP-EIE-SYSE-16-0042, 24590-BOF-EIE-PR-16-0003, 24590-BOF-EIE-ENG-16-0001 and 24590-WTP-EIE-SYSE-17-0001. Links for the EIE documents listed against 24590-BOF-3ZD-25-00001 should be removed in InfoWorks. Incorporated impacts associated with 24590-WTP-ORDCN-OP-16-002 and 24590-WTP-ORDCN-OP-16-013. Incorporated Section 4 content not included in previous revision. Incorporated updates to Section 3 requirements for consistency with upper-tier requirements documents Incorporated general updates to existing Section 1-3 descriptive text for clarity and consistency with current design.	R. Moeslein
2	Incorporated the Phase 2A work scope, including: • Removed code/standard requirements already in the Code of Record • Aligned Section 3 requirements with upper tier document changes • Updated Sections 4.1.1 through 4.1.4 to align with the current design • Originated Section 4.1.6 • Revised test criteria in Appendices A, B, and C Reclassified the previous “LAW effluent electrical building ventilation system” as the C1V system to align with the nomenclature used by the Design Agency. Revised the functional diagrams and general description in Section 2 based on the current EMF design. Updated the system boundaries based on the latest design documentation. Added orphan requirements not captured in previous revisions that are applicable to the EMF/DFLAW design. The following ATSs were reviewed for incorporation and can be closed: • 24590-WTP-ATS-MGT-15-0584 • 24590-WTP-ATS-MGT-15-0585 • 24590-WTP-ATS-MGT-15-0630 • 24590-WTP-ATS-MGT-17-0192 • 24590-WTP-ATS-MGT-17-0194 • 24590-WTP-ATS-MGT-17-0195 • 24590-WTP-ATS-MGT-17-0197 • 24590-WTP-ATS-MGT-17-0281 • 24590-WTP-ATS-MGT-17-0285 The following EIEs were incorporated: • 24590-BOF-EIE-MS-18-0030 (Updated EMF-BSA system description) • 24590-BOF-EIE-PR-16-0003 (No impacts – this EIE was incorporated in the previous revision) • 24590-LAW-EIE-NS-15-0005 (No impacts – the LAW PDSA has been superseded by the LAW DSA) • 24590-LAW-EIE-NS-18-0005 (Removed references to the LAW PDSA due to the issuance of the LAW DSA)	P. Suyderhoud

- 24590-WTP-EIE-SYSE-15-0059 (No impacts – the requirements modified by 24590-WTP-ORDCN-OP-15-015 are not allocated to this document)
- 24590-WTP-EIE-SYSE-16-0097 (Incorporated requirements associated with NOC 1043)
- 24590-WTP-EIE-SYSE-16-0098 (No impacts – requirements are already in alignment with 24590-WTP-ORDCN-OP-16-013)
- 24590-WTP-EIE-SYSE-17-0008 (No impacts – 24590-WTP-BODCN-ENG-17-0007 requirements for vertical chases do not apply to the EMF)
- 24590-WTP-EIE-SYSE-17-0012 (Revised requirement 3.5.1.1.6 and added new requirement 3.15.1.2.7 to align with 24590-WTP-BODCN-ENG-17-0008)
- 24590-WTP-EIE-SYSE-17-0026 (Revised crane/hoist requirements to align with 24590-WTP-ORDCN-OP-16-012)
- 24590-WTP-EIE-SYSE-17-0043 (No impacts – 24590-WTP-BODCN-ENG-17-0011 does not change requirements as they are written this document)

The following EIEs are rolled forward to the next revision:

- 24590-BOF-EIE-MS-18-0111
- 24590-BOF-EIE-PR-18-0001

3	Incorporated 24590-BOF-3ZN-25-00002. Incorporated 24590-BOF-3ZN-25-00003: updated to align with the BOF related requirements in the current updated WA7890008967_WTP_DWP (Hanford Facility RCRA Permit Dangerous Waste Portion) and Interface Control Document, WTP-ICD-MG-01-006. Incorporated 24590-BOF-3ZN-25-00004: added Section 3.18 to facilitate the development of a Specialized RVM that is submitted to Washington State Department of Ecology in support of construction certification. Incorporated 24590-BOF-3ZN-25-00006. Incorporated 24590-WTP-3ZN-20-00001 to support DSA to CSMPD transition. Incorporated the following EIEs: • 24590-BOF-EIE-ENG-18-0002 Rev 000 • 24590-BOF-EIE-MS-18-0131 Rev 000 • 24590-BOF-EIE-MS-18-0196 Rev 000 • 24590-BOF-EIE-MS-18-0206 Rev 001 • 24590-BOF-EIE-PR-18-0001 Rev 000 • 24590-WTP-EIE-SYSE-19-0009 Rev 000 • 24590-BOF-EIE-MS-18-0111 Rev 000 • 24590-BOF-EIE-FP-19-0004, Rev 000 • 24590-BOF-EIE-J-19-0021, Rev 000 • 24590-WTP-EIE-SYSE-19-0022, Rev 000 Edits were made to address the following: • 24590-WTP-ATS-MGT-18-0062 Aligned descriptions of the facility/systems in Sections 2 and 4 with changes to the design. The following EIE is rolled forward to the next revision: • 24590-WTP-EIE-SYSE-17-0016- Rev 000	P. Townsend

Contents

Appendices

Tables

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1 Introduction

1.1 Facility and System Identification

This facility design description (FDD) and system design description (SDD) document defines the technical and functional/performance requirements of the Hanford Tank Waste Treatment and Immobilization Plant (WTP) Effluent Management Facility (EMF), the Direct Feed Low-Activity Waste (DFLAW) EMF Process System (DEP), the DFLAW EMF Vessel Vent Process System (DVP), the Active Confinement Ventilation System (ACV), the C1 Ventilation System (C1V) at the EMF, and all underground waste transfer lines within the scope of the DEP system.

This document defines the US Department of Energy (DOE) Contract DE-AC27-01RV14136 (WTP Contract) requirements, waste acceptance criteria, feed and effluent transfer systems, regulatory compliance requirements, and authorization basis requirements for the EMF as currently known and understood. This document describes the operating modes pertinent to the EMF.

1.2 Limitations and Scope

The scope of this document is to provide an authoritative source for the collected set of requirements applicable to the EMF, all internal process systems within the EMF, and all waste transfer lines within the scope of the DEP system. The integrated FDD/SDD is prepared in accordance with 24590-WTP-3DP-G04B-00093, *System and Facility Design Descriptions*. The intended use of these collected requirements is to establish the following:

- Inform the overall facility and system design effort.
- Provide a validated basis upon which to confirm implementation of design requirements.
- Provide the expected means of verification for requirements, including those that are post-construction (i.e., startup and commissioning test objectives and acceptance criteria).

All requirements established in this document are intended to be verified as implemented in design and/or physical configuration using a graded approach commensurate with importance and risk.

Where numeric values are provided within requirements in Section 3, these values are provided without additional margin. For example, if a value is established in 24590-WTP-DB-ENG-01-001, *Basis of Design* (BOD), no attempt is made to remove any margin that may or may not have gone into the establishment of that value, nor has any margin been added. Where values are stated as minimums or maximums, there is no expectation that any additional margin be applied in the verifications that the design requirements have been met. Testing required to be performed in accordance with external codes and standards must follow the rules established in those documents.

This document is intended to be used in support of design development, design verification, turnover, start-up testing, and commissioning activities. This document is intended to be maintained current relative to changes to source requirements documents. Updates shall be made concurrent with changes to source requirements or implementation, or shall be tracked for completion in accordance with 24590-WTP-GPG-ENG-0170, *Impact Evaluation.*

Engineers are expected to be able to use the requirements in Section 3 of this document as input for design development without recourse to the upper-tier source documents or searches of the Technical Requirements Management System supported by Technical Requirements Search Application. Design engineers are still required to ensure that requirements contained within the discipline/functional standards incorporated by reference in Section 3 are followed. These documents contain additional criteria that are based on applications of external codes/standards, corporate best practices, and engineering management expectations for a consistent approach to design.

Certain requirement statements in this document are preceded by a [**HOLD**] notation. This notation is used when there are unresolved technical issues, known inconsistencies among source requirements, or other management suspensions of work requiring resolution. Requirements with the [**HOLD**] notation may be used to proceed with preliminary or committed design but shall not be used in support of fabrication or construction until the [**HOLD**] is removed.

The contents of Section 4, *System Description*, are being developed in a phased approach in support of future operations and maintenance. At this revision, only the contents of Section 4.1.1 through 4.1.6 have been updated and verified. Sections 4.2.1 through 4.2.6, 4.3, and 4.4 are reserved during this phase and will be updated in a later phase after work to support completion of these sections has been completed.

1.3 Ownership and Maintenance

The Design Authority (DA) organization is responsible for the preparation and maintenance of this document through turnover of the included systems to Operations. Thereafter, maintenance of this document is the responsibility of the Plant Engineering organization; however, the Engineering DA organization retains responsibility for the establishment and definition of design requirements.

1.4 Definitions/Glossary

Confinement – For consistency - regardless of usage elsewhere - confinement is used in this document to denote the controls used to prevent or minimize the release or migration of airborne contaminants, including aerosols, hazardous vapors, or gases.

Containment – For consistency - regardless of usage elsewhere - containment is used in this document to denote the controls used to prevent or minimize the release or migration of liquid or liquid-entrained contaminants.

Miscellaneous Unit – A dangerous waste management unit where dangerous waste is treated, stored, or disposed of and that is not a container, tank, surface impoundment, pile, land treatment unit, landfill, incinerator, boiler, industrial furnace, underground injection well with appropriated technical standards under 40 CFR Part 146, containment building, corrective action management unit, temporary unit, staging pile, or unit eligible for a research, development, and demonstration permit under Washington Administrative Code (WAC) 173-303-809.

Passive components – Components with no moving parts or active controls (e.g., vessels, piping, ductwork, electrical raceways, hangers and supports, building structure, etc.).

Primary confinement – Structures, systems, or components (SSCs) and their associated boundaries that confine airborne contaminants, including aerosols, hazardous vapors, or gases, under normal conditions.

Primary containment – Structures, systems, or components (SSCs) and their associated boundaries that contain liquid or liquid-entrained contaminants under normal conditions.

Secondary confinement – Structures or other design features that capture and prevent further spread or migration of airborne contaminants, including aerosols, hazardous vapors, or gases, after they have escaped primary confinement.

Secondary containment – Structures or other design features that capture and prevent further spread or migration of liquid or liquid-entrained contaminants after they have escaped primary containment.

Tank system – A dangerous waste storage or treatment tank and its associated ancillary equipment and containment system.

Tertiary confinement– Structures or other design features that capture and prevent further spread or migration of airborne contaminants, including aerosols, hazardous vapors, or gases, after they have escaped secondary confinement.

Tertiary containment– Structures or other design features that capture and prevent further spread or migration of liquid or liquid-entrained contaminants after they have escaped secondary containment.

Vessel – An engineering term denoting a storage unit with a more robust construction than a typical mixed waste storage or treatment tank. Within the context of this document, a vessel is defined as any component or item of equipment that contains "-VSL-" as part of its component tag number.

1.5 Acronyms and System Designators

1.5.1 Acronyms

ACU	air conditioning unit
ADR	ALARA design review
AHU	air handling unit
ALARA	as low as reasonably achievable
ASD	adjustable speed drive
BARCT	best available radionuclide control technology
BOD	*Basis of Design*
BOF	Balance of Facilities
COM	Commissioning
COR	Code of Record
C&I	control and instrumentation
CCN	correspondence control number
CS	chemical safety
CSMPD	Chemical Safety Management Program Description
DA	design authority
D&D	decontamination and decommissioning
DBA	design basis accident
DFLAW	Direct Feed Low-Activity Waste
DSA	documented safety analysis
DST	double-shell tank
DWP	*Dangerous Waste Permit*
DX	direct expansion
EAC	effluent acceptance criteria
EC	evaporative cooling
EMF	Effluent Management Facility
ENG	Engineering
EPC	Engineering, Procurement, and Construction

ETF	Effluent Treatment Facility
FCR	facility control room
FCU	fail coil unit
FDD	facility design description
GTC	general test criteria
HC	hazard category
HEPA	high-efficiency particulate air
HLW	High-Level Waste (Facility)
IBC	*International Building Code*
ICD	interface control document
ICN	Integrated Control Network
IDLH	immediately dangerous to life and health
IFC	*International Fire Code*
IQRPE	independent, qualified, registered professional engineer
Lab	Analytical Laboratory
LAW	Low-Activity Waste (Facility)
LCO	limiting condition for operation
LERF	Liquid Effluent Retention Facility
NFPA	National Fire Protection Association
NPH	natural phenomenon hazard
OPS	Operations
ORD	*Operations Requirements Document*
P&ID	piping and instrumentation diagram
PC	performance category
PCM	personnel contamination monitor
PT	Pretreatment (Facility)
SAC	specific administrative control
SBS	submerged bed scrubber
SC	safety class
SC-IV	seismic category-IV
SCR	standby control room
SDD	system design description
SRD	*Safety Requirements Document, Volume II*
SSC	structure, system, and component
TAC	test acceptance criteria
TOC	Tank Operations Contractor
TSR	technical safety requirement
UBC	*Uniform Building Code*
VOIP	Voice Over Internet Protocol
WAC	Washington Administrative Code
WDOH	Washington State Department of Health
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1.5.2 System Designators

ACV	active confinement ventilation system
AFR	antifoam reagent system

BSA	breathing service air system
C1V	C1 ventilation system
CME	communications electrical system
DEP	DFLAW effluent management facility process system
DIW	demineralized water system
DOW	domestic (potable) water system
DVP	DFLAW effluent management facility vessel vent process system
EMJ	environmental monitoring system
FDE	fire detection and alarm system
FNJ	facility network infrastructure system
FPW	fire protection water system
GRE	grounding and lightning protection electrical system
HPS	high pressure steam system
HTE	heat trace electrical system
ISA	instrument service air system
LCP	LAW concentrate receipt process system
LPS	low pressure steam system
LTE	lighting electrical system
LVE	low voltage electrical (480/208/120 V) system
LVP	LAW secondary offgas and vessel vent process system
MVE	medium voltage electrical (13.8/4.16 kV) system
NLD	nonradioactive liquid waste disposal system
PCJ	process control system
PCW	plant cooling water system
PSA	plant service air system
PSW	process service water system
PWD	plant wash and disposal system
RLD	radioactive liquid waste disposal system
RPJ	radiological personnel monitoring system
SCW	steam condensate water system
SDJ	stack discharge monitoring (radioactive and nonradioactive) system
SHR	sodium hydroxide reagent system
SNR	sodium nitrite reagent system
TCP	treated LAW concentrate storage process system
TLP	treated LAW evaporation process system
UPE	uninterruptible power electrical system

2 General Overview

The Low-Activity Waste (LAW) Facility receives treated low-activity waste for vitrification from the following:

- The WTP Pretreatment (PT) Facility in the baseline configuration
- The Tank Operations Contractor (TOC) in the DFLAW configuration

In the DFLAW configuration, treated low-activity waste from the TOC is transferred to the LAW Facility via a direct underground transfer line, as illustrated in Figure 2-1. The characteristics of the waste feed conveyed from the TOC to the LAW concentrate receipt process system (LCP) are governed by 24590-WTP-ICD-MG-01-030, *ICD 30 – Interface Control Document for Direct LAW Feed*. The TOC samples the waste at Tank Farms and is granted permission for transfer to the LAW Facility pending confirmation of the feed sample characteristics by WTP. Once transfer permission is granted, the feed is transferred to the LCP system. The underground transfer line runs between the interface point at Node 13 of the site boundary and the existing transfer line from the PT Facility to the LAW Facility. The tie-in with this existing line occurs within the LAW Facility. The portion of the transfer line between the site boundary interface point and the battery limit of the LAW Facility is within the scope of the DEP system. This transfer line also includes a tie-in point at the EMF used to recycle concentrated effluent from the DEP system and to add sodium hydroxide from the sodium hydroxide reagent (SHR) system for corrosion mitigation in the pipe. Isolations for waste feed from the TOC and concentrated effluent return to the LCP system from EMF, as well as the monitoring equipment associated with the transfer of the waste feed, are within the scope of the DEP system. The DFLAW configuration is independent of the baseline configuration and is only used prior to PT Facility startup or in the event of a prolonged PT Facility outage.

The liquid effluents accumulated in the LAW radioactive liquid waste disposal system (RLD) vessels and the LAW secondary offgas/vessel vent process system (LVP) tank that are routed to the PT Facility in the baseline configuration are diverted to the DEP system for the DFLAW configuration, as illustrated in Figure 2-1. Valves, spools, flanges, and other isolation features in the LAW Facility divert the effluents to either the PT Facility or the EMF. The liquid accumulated in the Analytical Laboratory (Lab) C3 radioactive liquid waste disposal system (RLD) vessel that is normally routed to the PT Facility in the baseline configuration is also diverted to the DEP system for the DFLAW configuration. Transfer lines used for the delivery of liquid effluents from the LAW Facility and Lab to the EMF are within the scope of the LAW RLD, Lab RLD, and LAW LVP systems. The boundary between the LAW RLD, Lab RLD, and LAW LVP systems and the DEP system are described in Section 2.3, *Basic Operational Overview*.

Once the EMF receives secondary effluents from the LAW Facility and Lab, the DEP system concentrates the effluent through the removal of water content. The concentrated effluent is collected in storage vessels and is held for return to the LCP system for vitrification. Alternatively, in off-normal scenarios, the DEP system includes the capability to transfer the concentrate to Tank Farms, in accordance with the requirements of 24590-WTP-ICD-MG-01-031, *ICD 31 – Interface Control Document for DFLAW Effluent Returns to Double-Shell Tanks*, or to a tanker truck (following an as low as reasonably achievable [ALARA], viability, and safety study). The transfer lines between the TOC and the LAW Facility and between the EMF and Tank Farms are flushed and drained following effluent transfers. Dilute effluent, which is comprised primarily of the water content removed from the effluent stream via an evaporation/condensation cycle, is also collected in storage vessels and is held for transfer from the WTP to the Liquid Effluent Retention Facility (LERF)/Effluent Treatment Facility (ETF). Transfers of dilute effluent to LERF/ETF are executed in accordance with 24590-WTP-ICD-MG-01-006, *ICD-06 – Interface Control Document for Radioactive, Dangerous Liquid Effluents*. The entire transfer line between the EMF and the site boundary, as well as the leak detection box located at the site boundary, is within the scope of the DEP system until completion of the PT Facility.

All buildings (inclusive of most SSCs) within the EMF are non-safety, seismic category-IV (SC-IV). The risk to the public or co-located worker due to an accident or release of the material at risk within the EMF is sufficiently low that no controls have been elevated to safety class (SC) or safety significant (SS) to protect against such accidents/releases. There is only one component associated with the EMF facility that has been designated as chemical safety (CS) -- the sodium hydroxide delivery pressure relief valve in the SHR system. However, this component is part of a system that does not interface with any other EMF systems and is covered in the scope of 24590-WTP-3ZD-SHR-00001, *System Design Description for the WTP Process Reagent Systems (AFR, MXR, NAR, SHR, SNR, SPR, STR)*. The EMF (inclusive of all SSCs) is also a hands-on maintenance facility, meaning no remote features are required for decontamination and no remote manipulation is required for maintenance or inspection.

The EMF consists of four buildings. The LAW effluent process building (Building 25) houses the main DEP and DVP system process equipment and is where radiological liquid effluent is collected and processed. The LAW effluent drain tank building (Building 25A) houses the low-point drain vessel and its associated supporting equipment. The LAW effluent utility building (Building 26) houses HVAC equipment and various Balance of Facilities (BOF) utility system equipment. The LAW effluent electrical building (Building 27) houses the EMF electrical equipment, the uninterruptible power electrical system (UPE) batteries, and controls and instrumentation (C&I) equipment. The following general design objectives are applied to the overall facility layout, arrangement of internal processing areas, and design of the facility envelope.

- The facility provides the required process, utility, logistical, and other interfaces needed to carry out its operational mission and support activities.
- The facility provides space, structural support, and anchorage for processes, utilities, and maintenance equipment, and activities.
- The facility protects processes, utilities, and maintenance equipment from natural phenomena and accident conditions, using a graded approach, mission importance, and risk associated with the SSCs.
- The facility provides the enclosure and enclosure integrity to allow for environmental control of temperature, humidity, and pressure within the various spaces of the facility.
- The facility provides a roof, walls, floors, anchors, and liners designed with the capability to help prevent or mitigate the release of hazardous wastes.
- The facility layout provides space for operations, maintenance, radiological control, and other support functions.
- The facility design meets ALARA objectives to limit personnel exposure to hazardous or sensitive work areas and equipment, as well as to provide shielding to protect workers.
- The facility design provides the space needed to manage solid secondary waste generated by processes, utilities, and operational or maintenance activities.
- The facility is designed as a process facility in accordance with 24590-WTP-COR-MGT-15-00001, *Engineering, Procurement, Construction (EPC) Code of Record*.
- The EMF provides a level of fire protection that is sufficient to fulfill the requirements of the best protected class of industrial risks (“Highly Protected Risk”, per DOE G 420-1.3) and provides protection to achieve defense-in-depth. Defense-in-depth shall be achieved when a balance of each of the following elements is provided:
  - Rapidly detecting fires and promptly controlling and extinguishing those fires that do occur, thereby limiting damage and consequences.
  - Providing a level of fire protection for SSCs so that a fire that is not promptly extinguished will not prevent essential facility functions from being performed.

The HVAC systems supply conditioned air to each building. The EMF facility uses a cascading ventilation system in process and utility areas wherein air cascades from areas of less potential for contamination to areas of greater potential for contamination. A brief description of the ventilation system design (including the C1V system, the ACV system, and the DVP system) is provided in Section 2.3.

The following figures and tables represent an overall view of the EMF functions relative to new and existing facilities, interfaces with existing systems, and new or modified systems. The functional analysis is provided to help ensure there is full understanding and agreement on the systems functions that need to be supported by the designs. Figure 2-1 is an overview of the overall process flow as it relates to the EMF systems and facilities. Figure 2-2 is a context diagram for the EMF used in support of functional and performance definition at the facility level. Figure 2-3 is a context diagram for the DEP system within the LAW effluent process and LAW effluent drain tank buildings. Figure 2-4 is the context diagram for the C1V system, Figure 2-5 is the context diagram for the ACV system, and Figure 2-6 is the context diagram for the DVP system. These diagrams are provided in support of the subsequent functional block diagrams and tables, which provide further description and breakdown of the functions.

Throughout this SDD, any reference to “safety” is to be understood for the EMF facility as being in support of chemical or industrial safety as there are no identified nuclear safety controls.

Figure 2-1 DFLAW Overview

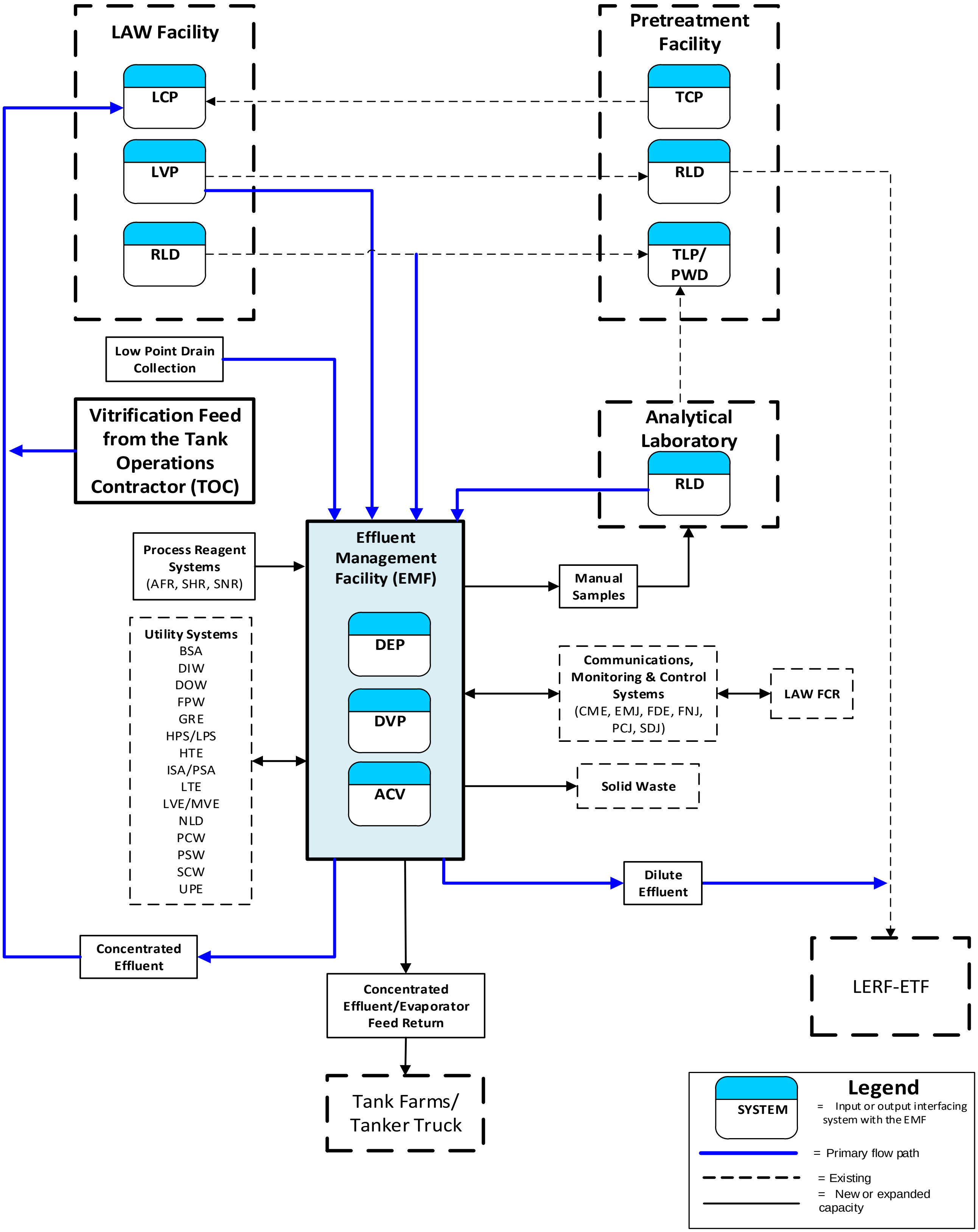


Figure 2-2 Effluent Management Facility Context Diagram

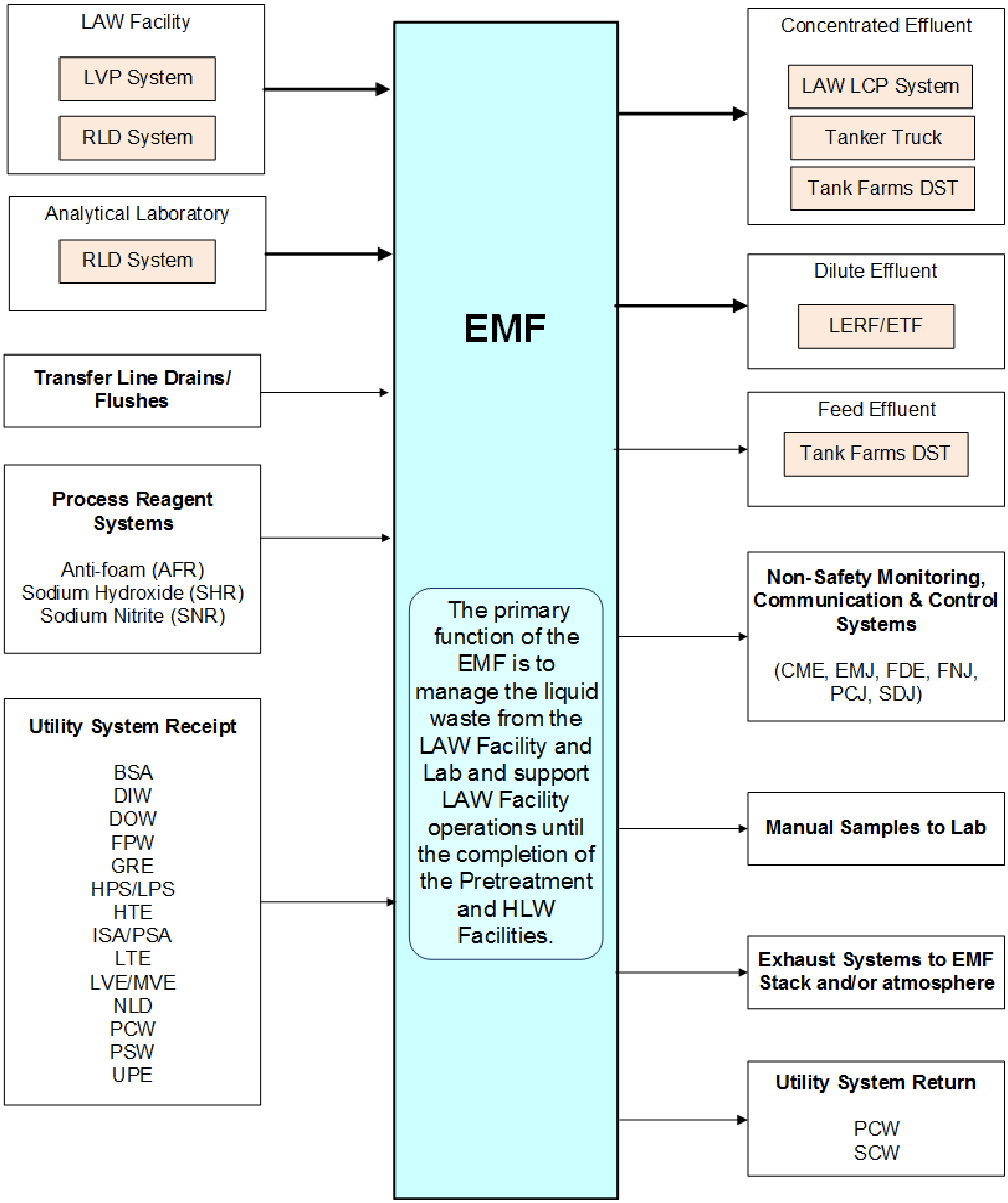


Figure 2-3 DEP System Context Diagram

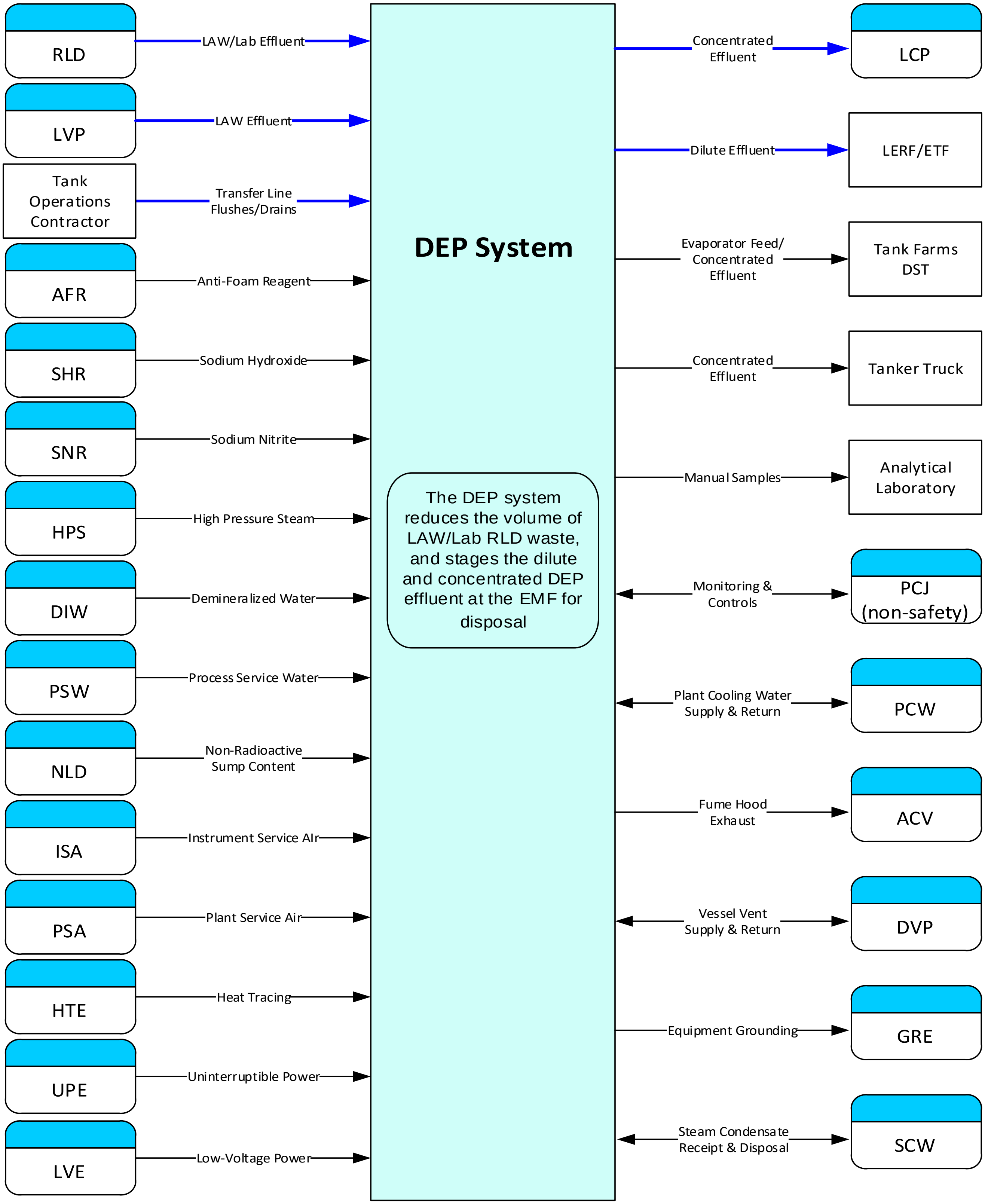


Figure 2-4 C1V System Context Diagram

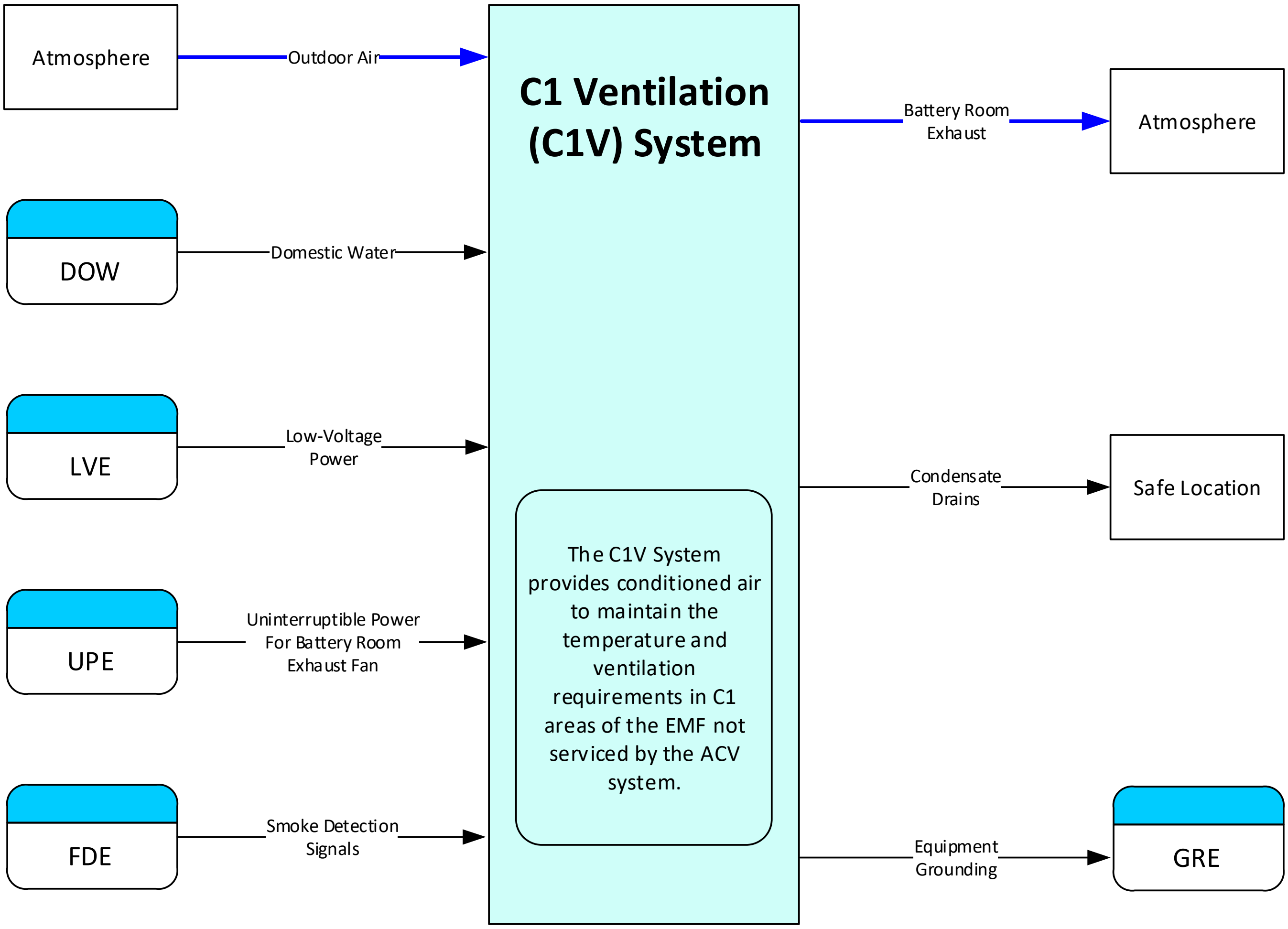


Figure 2-5 ACV System Context Diagram

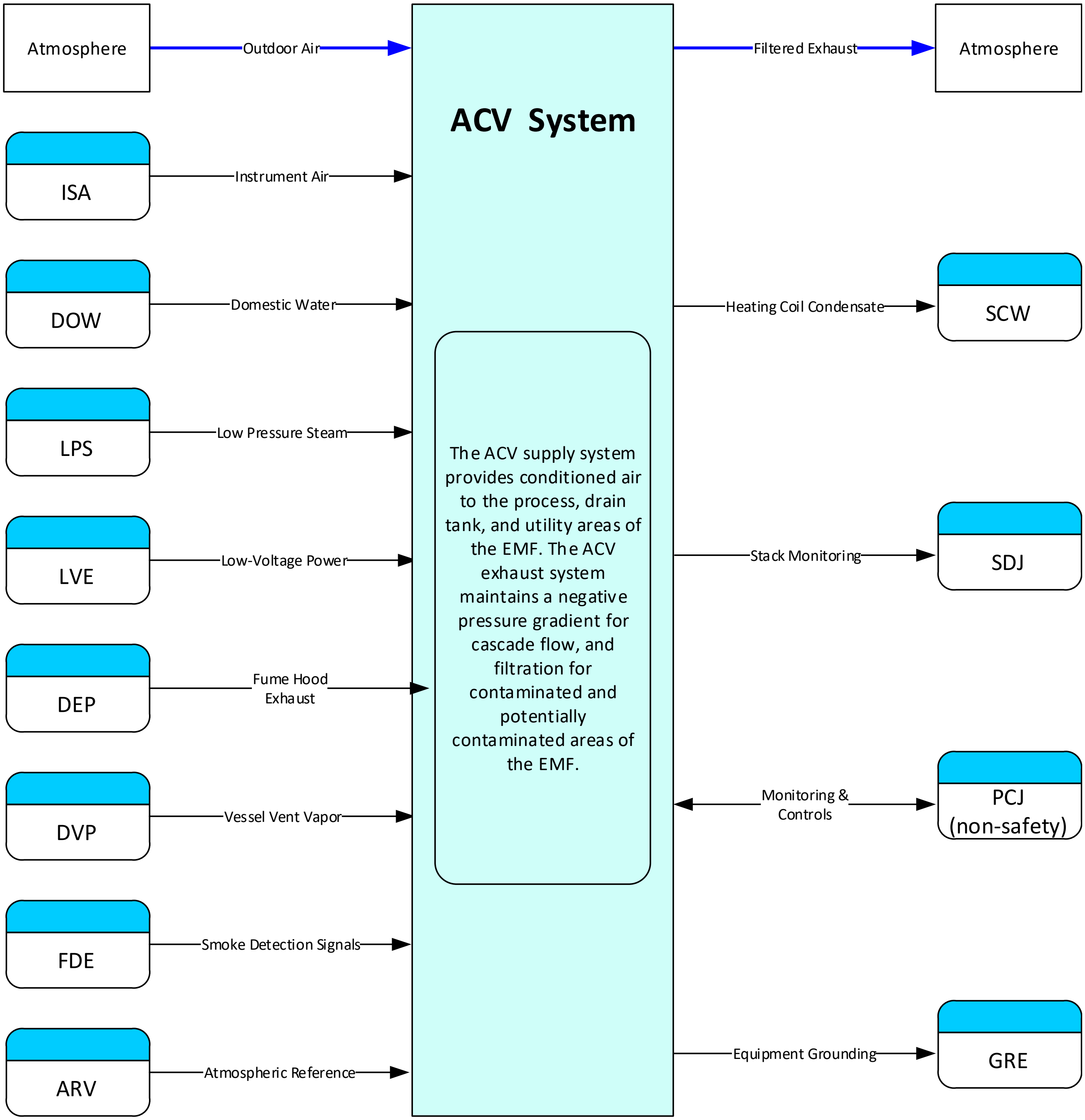
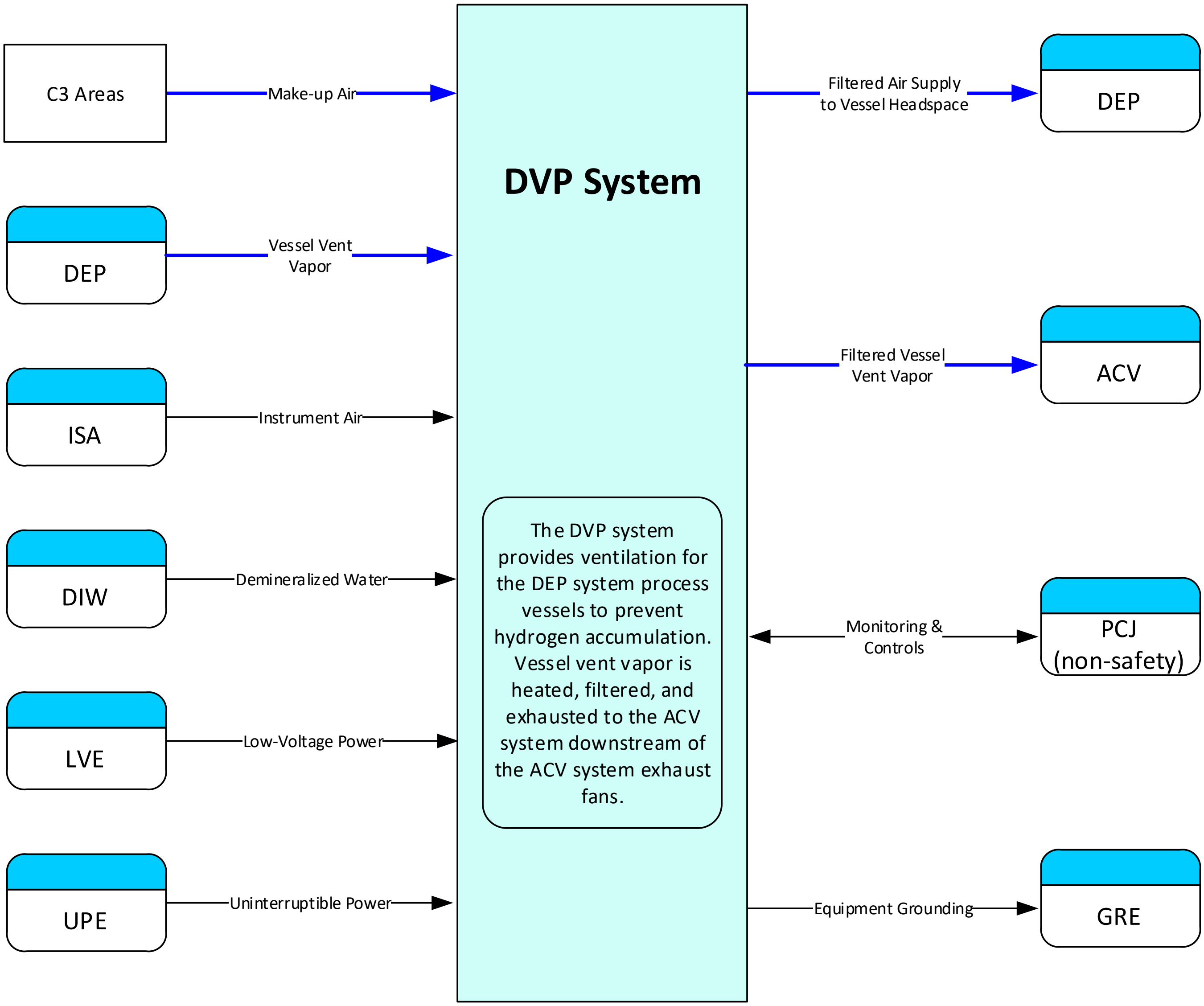


Figure 2-6 DVP System Context Diagram

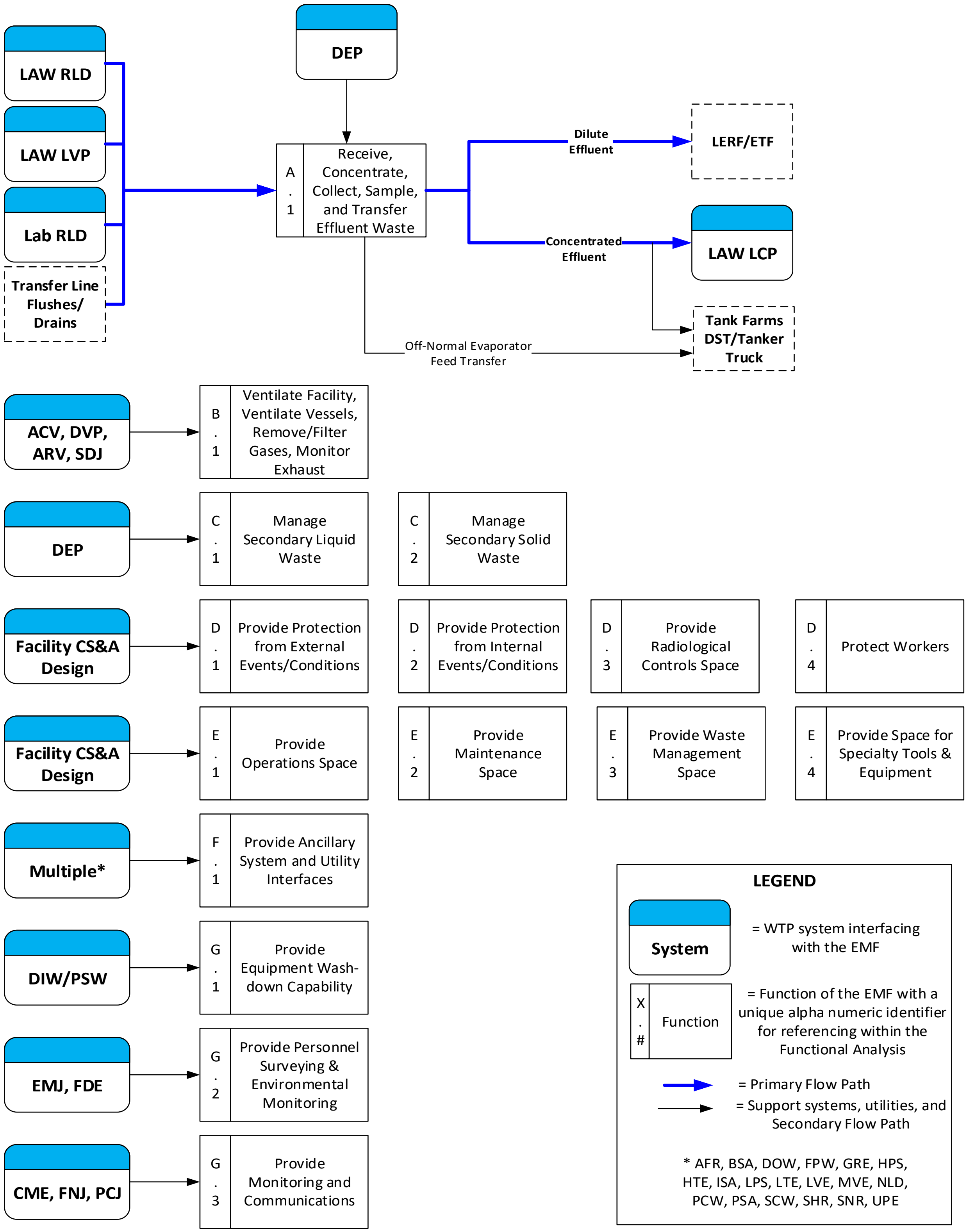


2.1 System Functions/Safety Functions

This section defines the EMF and ACV, C1V, DEP, and DVP system functions and attributes that need to be addressed by the facility and system design. Section 3 provides the design and performance requirements to meet both functional and other requirements. System interfaces are provided for reference only. Refer to Section 1.5.2 for the list of relevant system designators.

The following figures and tables provide the functional analyses for the individual systems within the overall DFLAW configuration. Figure 2-7 shows the EMF functional block diagram, indicating the internal and external systems and utilities that provide the primary support or interface for that function. Section 3 provides the design requirements to meet both functional and other requirements.

Figure 2-7 Effluent Management Facility Functional Block Diagram



The functions included in Figure 2-7 and further described in Table 2-1 are the preliminary and secondary level functions of the EMF. Where appropriate to support the definition of functional and design requirements, functions have been further decomposed and additional levels of supporting functions are also described. The requirement section number provides the location of the applicable functional analysis incorporated into system requirements.

Table 2-1 Functional Analysis and Crosswalk to Requirements for EMF Functions

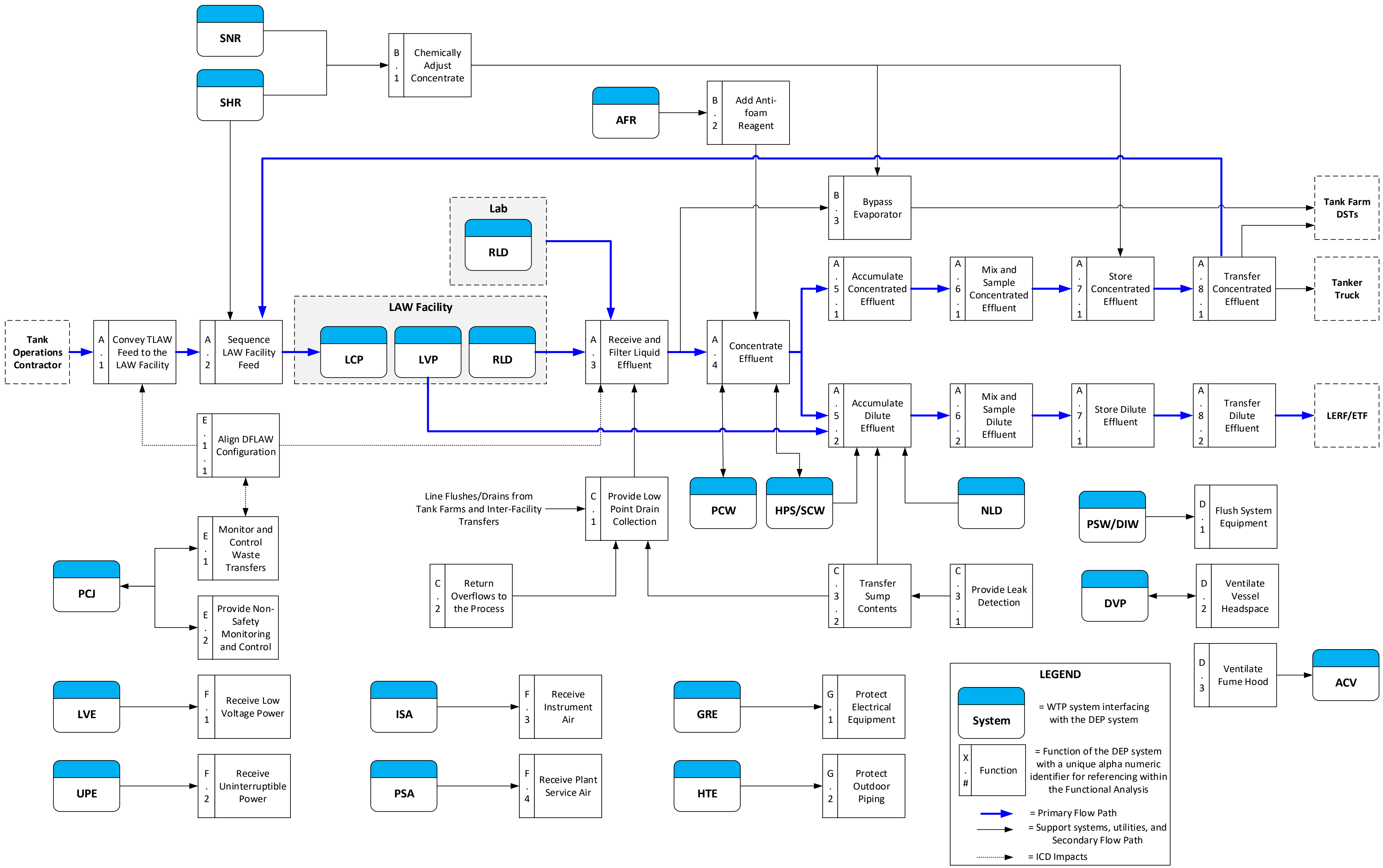
Reference	Functional Analysis Description	Requirement Section No.
A.	**Manage Effluent Waste**	**N/A**
A.1	Receive, Concentrate, Collect, Sample, and Transfer Effluent Waste - The EMF provides the facilities necessary to receive, concentrate, collect, sample, and transfer effluent waste.	3.4.1.1.1 3.4.4.1 3.4.4.2 3.4.4.4
B.	**Ventilate Facility, Remove or Treat Gases, and Monitor Exhaust**	**N/A**
B.1	Ventilate Facility, Ventilate Vessels, Remove/Filter Gases, Monitor Exhaust – The EMF provides ventilation of facility areas and process vessels to control the spread of contamination, prevent the build-up of hazardous gases, and maintain environment conditions in facility areas. Facility exhaust is monitored for compliance with nuclear safety, ALARA, environmental, and regulatory requirements.	3.4.3.3.1 3.4.3.3.14
C.	**Manage Waste**	**N/A**
C.1	Manage Secondary Liquid Waste – The EMF provides the capability to manage and disposition secondary liquid wastes (e.g., liquids collected in sumps) for compliance with secondary containment provisions of the Dangerous Waste Permit (DWP), nuclear safety, ALARA, environmental, and regulatory requirements.	3.4.3.3.2 3.4.3.3.3 3.4.3.3.4 3.4.3.3.5 3.4.3.3.6 3.4.3.3.7 3.4.3.3.8 3.4.3.3.9 3.4.3.3.10 3.4.3.3.11 3.4.5.2.1 3.4.6.1.1
C.2	Manage Secondary Solid Waste – The EMF provides the capability to manage and disposition secondary solid waste wastes (e.g., pumps, filter media, spent reagents) for compliance with secondary waste management provisions of the DWP, nuclear safety, ALARA, environmental, and regulatory requirements.	3.4.5.5.1 3.4.6.1.2

Reference	Functional Analysis Description	Requirement Section No.
D.	**Support Safety and Environmental Containment/Confinement Requirements**	**N/A**
D.1	Provide Protection from External Events/Conditions – The EMF structure provides protection/survivability for SSCs from external natural phenomena hazard (NPH) / external design basis accident (DBA) events/conditions.	3.4.2.1.1 3.4.2.2.1 3.4.2.2.4 3.4.2.2.5 3.4.3.3.1 3.4.4.9 3.4.6.4.17
D.2	Provide Protection from Internal Events/Conditions – The EMF interior design includes features that provide protection/survivability for SSCs from internal DBA events/conditions.	3.4.2.3.1 3.4.2.3.3 3.4.3.3.1 3.4.4.9
D.3	Provide Radiological Controls Space – The EMF provides radiological controls space to support radiological activities in facility areas.	3.4.3.2.1 3.4.3.2.5
D.4	Protect Workers – The EMF provides the capability to protect workers by minimizing exposure to radiological sources, to the greatest extent practicable, in accordance with ALARA principles of design. Shielding is provided to ensure worker dose rates are within acceptable limits and ALARA.	3.4.3.2.2 3.4.3.2.3 3.4.3.2.4 3.4.3.2.5 3.4.3.2.6 3.4.3.2.7 3.4.3.3.3 3.4.3.3.4 3.4.3.3.5 3.4.3.3.6 3.4.3.3.7 3.4.3.3.8 3.4.3.3.9 3.4.3.3.10 3.4.3.3.11 3.4.3.3.14 3.4.3.3.15
E.	**Support Operations and Maintenance**	**N/A**
E.1	Provide Operations Space – The EMF provides space to accommodate operational functions and associated SSCs, including clearances and access for anticipated operating activities.	3.4.5.5.1 3.4.5.5.13 3.4.5.6.1
E.2	Provide Maintenance Space – The EMF provides space to accommodate maintenance activities for SSCs where maintenance is required, including clearances and access for anticipate maintenance activities.	3.4.5.5.1 3.4.5.6.1
E.3	Provide Waste Management Space – The EMF provides space to accommodate waste management activities (e.g., waste accumulation, handling, packaging, surveying, and staging).	3.4.5.5.1 3.4.6.1.2

Reference	Functional Analysis Description	Requirement Section No.
E.4	Provide Space for Specialty Tools & Equipment – The EMF provides space for specialty tools and support equipment (e.g., specialty carts for equipment transfer, and below-the-hook lifting devices).	3.4.5.5.1 3.4.5.5.5 3.4.5.5.20
F.	**Support Ancillary and Utility System Interfaces**	**N/A**
F.1	Provide Ancillary and Utility System Interfaces – Other WTP systems supporting facility operations, including internal distribution and support systems, are integrated into the design of the EMF.	3.4.4.7 3.4.4.8 3.4.5.5.3 3.4.6.1.3
G.	**Support Equipment Decontamination, Monitoring, Controls, Communications, and Protection**	**N/A**
G.1	Provide Wash-down Capability – The EMF provides the capability to flush, rinse, and wash-down equipment and surfaces to lower dose rates to workers to support contact maintenance in the facility.	3.4.3.2.2 3.4.5.5.11
G.2	Provide Personnel Surveying & Environmental Monitoring – The EMF provides personal surveying and environmental monitoring to monitor radiation and contamination levels within the facility.	3.4.3.2.1 3.4.3.3.15
G.3	Provide Monitoring and Communications – The EMF provides monitoring and communications to ensure worker safety and support the effluent treatment process.	3.4.3.2.5 3.4.5.3.1 3.4.5.3.2 3.4.5.3.3 3.4.5.4.1

Figure 2-8 provides the functional block diagram for the DEP system, indicated the internal and external systems and utilities that provide the primary support or interface for that function. Section 3 provides the design requirements to meet both functional and other requirements. System interfaces are provided for reference only.

Figure 2-8 DEP System Functional Block Diagram



The functions included in Figure 2-8 and further described in Table 2-2 are the preliminary and secondary level functions of the DEP system. Where appropriate to support definition of functional and design requirements, functions have been further decomposed and additional levels of supporting functions are also described. The requirement section number provides the location of the applicable functional analysis incorporated into system requirements. Section B.1 provides a further decomposition of system functions, including initiating, terminating, and integrating events and functions.

Table 2-2 Functional Analysis and Crosswalk to Requirements for DEP System Functions

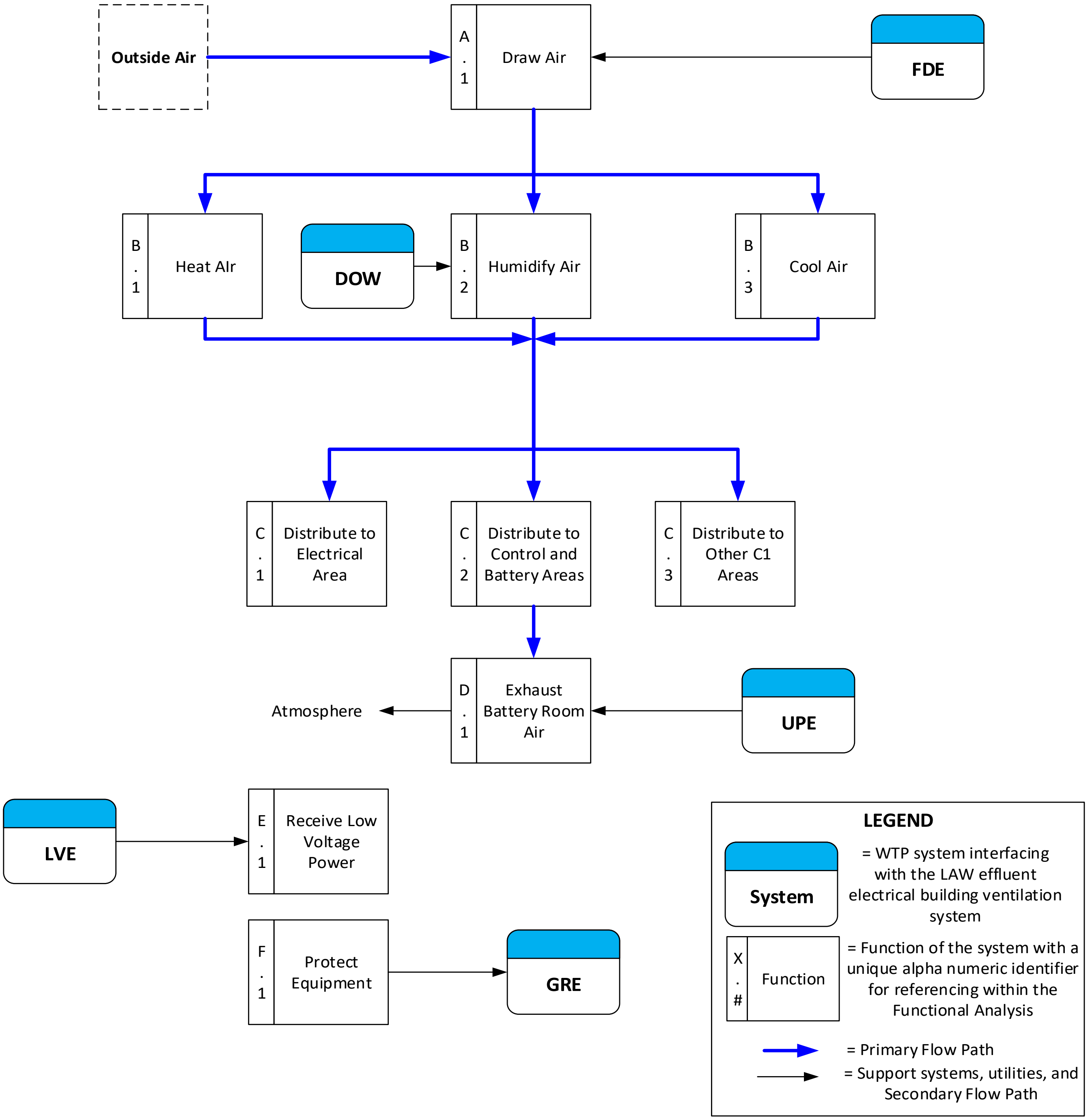
Reference	Functional Analysis Description	Requirement Section No.
A.	**Receive, Concentrate, Sample, and Transfer Effluent**	**N/A**
A.1	Convey Treated Low-Activity Waste Feed to the LAW Facility – The DEP system provides the capability to transfer treated feed from the TOC to the LAW Facility.	3.14.1.2.1 3.14.1.2.2 3.14.1.2.3 3.14.1.2.4
A.2	Sequence LAW Facility Feed – The sequenced transfer system to the LCP system is designed to alternate TOC treated feed and DEP system recycled feed.	3.15.1.2.7
A.3	Receive and Filter Liquid Effluent – The DEP system receives and filters waste streams including radioactive mixed waste effluents from the LAW RLD system, the Lab RLD system, and line flushes/drains from Tank Farms and inter-facility transfers.	3.5.1.1.2
A.4	Concentrate Effluent – The DEP system has the capability to process the waste stream and produce both concentrate and dilute mixed waste effluent.	3.5.1.1.5
A.5	Accumulate Effluents	N/A
A.5.1	Accumulate Concentrated Effluent – The DEP system collects concentrate for further treatment or to recycle to the LAW Facility.	3.6.1.1.2
A.5.2	Accumulate Dilute Effluent – The DEP system collects dilute evaporator effluent and scrubber effluent from the LVP system.	3.6.1.1.2
A.6	Mix and Sample Effluents	N/A
A.6.1	Mix and Sample Concentrated Effluent – Evaporator concentrate is sampled to determine if the acceptance criteria are met for transfers.	3.5.4.8 3.6.6.1.1
A.6.2	Mix and Sample Dilute Effluent – Dilute evaporator condensate is sampled to determine if the acceptance criteria are met for disposal to LERF/ETF.	3.5.4.8 3.6.6.1.1
A.7	Store Effluent	N/A
A.7.1	Store Concentrated Effluent – The DEP system provides a minimum of 48 hours of concentrated effluent storage capacity.	3.6.1.1.1
A.7.2	Store Dilute Effluent – The DEP system provides a minimum of 48 hours of dilute effluent storage capacity	3.6.1.1.1
A.8	Transfer Effluent	N/A
A.8.1	Transfer Concentrated Effluent – The DEP system transfers evaporator concentrate to the LAW Facility, Tank Farms, or a tanker truck.	3.5.1.1.4 3.6.4.1.2 3.14.1.3.1

Reference	Functional Analysis Description	Requirement Section No.
		3.14.1.3.2 3.14.1.3.3 3.14.1.3.4
A.8.2	Transfer Dilute Effluent – The DEP system transfers evaporator condensate to LERF/ETF.	3.6.4.1.3 3.14.1.4.1 3.14.1.4.2 3.14.1.4.3
B.	**Adjust Effluent Characteristics**	**N/A**
B.1	Chemically Adjust Effluent – The DEP system adds sodium hydroxide and sodium nitrite from the SHR and SNR systems to allow for transfer to Tank Farms or the LCP system.	3.5.4.2 3.5.4.3
B.2	Add Anti-foam Reagent – The DEP system adds anti-foam reagent from the AFR system to minimize entrainment of aerosols with the overhead vapor.	3.6.2.1.2
B.3	Bypass Evaporator – The DEP system includes the capability to bypass the evaporator when it is unavailable.	3.6.2.1.3
C.	**Collect Drains, Flushes, Overflows, and Spills**	**N/A**
C.1	Provide Low Point Drain Collection – Overflows, spills, and line flushes/drains from Tank Farm and inter-facility transfer are routed to the low point drain vessel in the LAW effluent drain tank building.	3.5.1.1.2 3.6.1.2.1 3.14.1.1.2
C.2	Return Overflows to the Process – The vessel overflows are routed back to the waste treatment process.	3.6.1.2.1
C.3	Collect Leaks and Spills	N/A
C.3.1	Provide Leak Detection – The DEP system provides leak detection instrumentation to detect leaks in transfer lines and process area sumps.	3.6.5.4.4 3.7.1.1 3.15.1.1.1
C.3.2	Transfer Sumps Contents – The DEP system transfers sump contents in a timely manner.	3.6.4.1.1
D.	**Maintain Proper Operation of Equipment**	**N/A**
D.1	Flush System Equipment – The DEP system receives water from the PSW and DIW systems to flush system components.	3.5.4.5 3.6.1.4.1 3.6.5.4.2 3.14.1.1.3
D.2	Ventilate Vessel Headspace – The DEP system interfaces with the DVP system to purge hydrogen from the headspace of the DEP system vessels.	3.12.1.2
D.3	Ventilate Fume Hood – The ACV system provides an exhaust path for the working space of the DEP system sampling station fume hood.	3.11.1.1.1
E.	**Provide Monitoring & Control Functions**	**N/A**
E.1	Monitor and Control Waste Transfers – The transfers of feed, concentrate, and dilute effluent are monitored and controlled in accordance with ICD-06, ICD-30, ICD-31, and the Dangerous Waste Permit (DWP).	3.15.1.1.1 3.15.1.2.1 3.15.1.2.2

Reference	Functional Analysis Description	Requirement Section No.
		3.15.1.2.3 3.15.1.2.4 3.15.1.2.5 3.15.1.2.6 3.15.1.3.1 3.15.1.3.2 3.15.1.3.3 3.15.1.3.4 3.15.1.4.1 3.15.1.4.2
E.1.1	Align DFLAW Configuration – The DEP system control logic includes the capability to route concentrated or dilute effluent to their intended destinations.	N/A
E.2	Provide Non-Safety Monitoring and Control – The process control system (PCJ) provides controls and interlocks necessary for continuous operation of DEP system SSCs and other facility status monitoring and control functions.	3.5.4.9 3.7.1.1 3.7.1.2.1 3.7.1.3.1
F.	**Receive Utilities**	**N/A**
F.1	Receive Low-Voltage Power – The low voltage electrical system (LVE) provides low-voltage power to DEP system SSCs as required.	N/A
F.2	Receive Uninterruptible Power – The UPE system provides uninterruptible power to DEP system SSCs as required	N/A
F.3	Receive Instrument Air – The instrument service air system (ISA) provides instrument air for remote valve actuation.	3.5.4.9
F.4	Receive Plant Service Air – The plant service air system (PSA) provides plant service air for pump operation, filter back-flush, and utility stations.	N/A
G.	**Protect System Equipment**	**N/A**
G.1	Protect Electrical Equipment – The grounding and lightning protection electrical system (GRE) provides grounding/lightning protection for DEP system electrical equipment.	3.4.4.9
G.2	Protect Outdoor Piping – The heat trace electrical system (HTE) provides heat tracing on outdoor piping. DEP system waste transfer lines are buried for freeze protection.	3.5.4.14 3.14.1.1.5

Figure 2-9 provides the functional block diagram for the C1V system, indicated the internal and external systems and utilities that provide the primary support or interface for that function. Section 3 provides the design requirements to meet both functional and other requirements. System interfaces are provided for reference only.

Figure 2-9 C1V System Functional Block Diagram



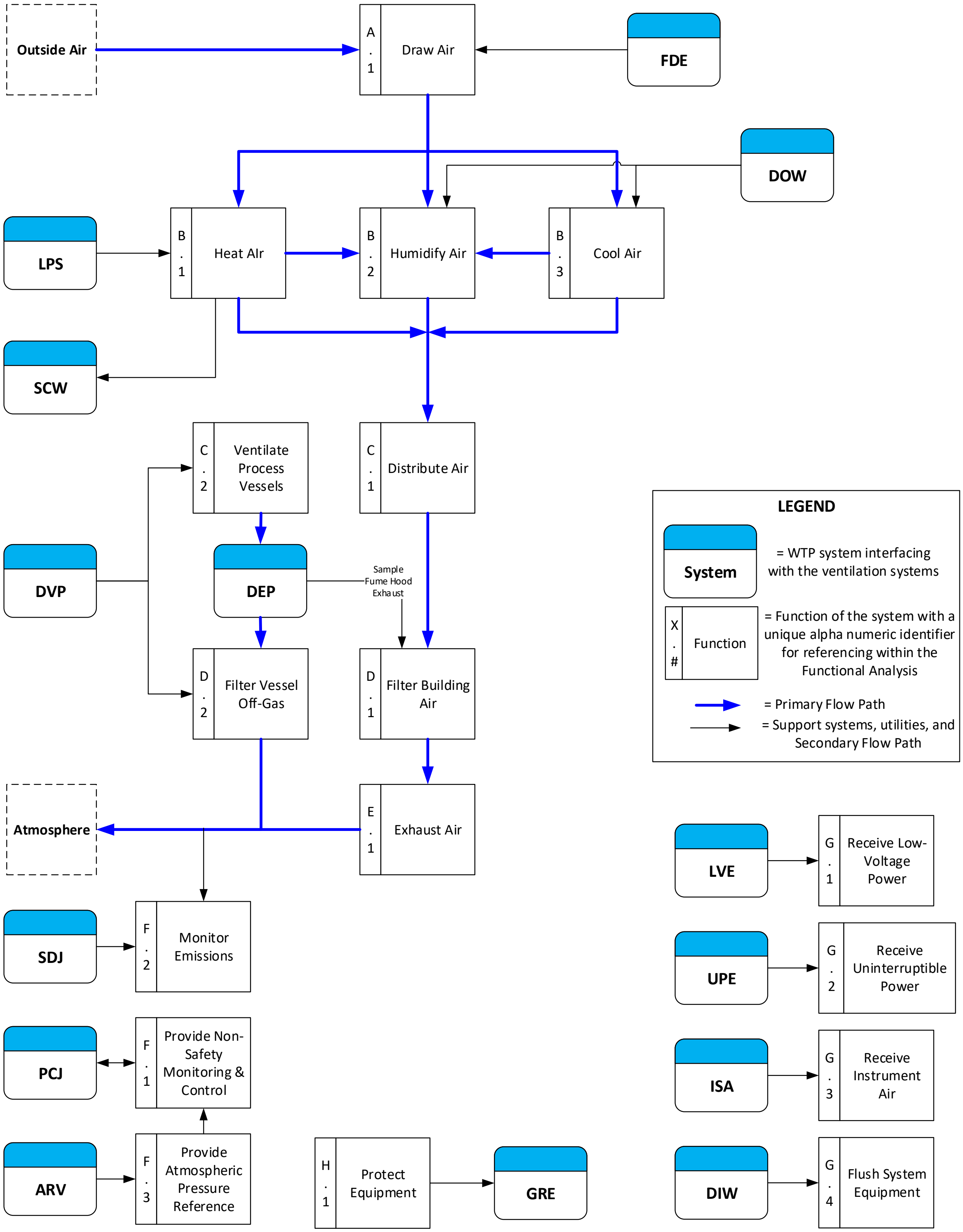
The functions included in Figure 2-9 and further described in Table 2-3 are the preliminary and secondary level functions of the C1V system. Where appropriate to support definition of functional and design requirements, functions have been further decomposed and additional levels of supporting functions are also described. The requirement section number provides the location of the applicable functional analysis incorporated into system requirements. Section B.2 provides a further decomposition of system functions, including initiating, terminating, and integrating events and functions.

Table 2-3 Functional Analysis and Crosswalk to Requirements for C1V System Functions

Reference	Functional Analysis Description	Requirement Section No.
A.	**Draw Air**	**N/A**
A.1	Draw Air – The C1V system draws air to maintain select C1 area internal design conditions. The fire detection & alarm system (FDE) sends a signal to shut down the supply unit upon detection of smoke.	3.9.1.2.2
B.	**Condition Air**	**N/A**
B.1	Heat Air – The C1V system heats air to maintain temperatures in ranges to protect equipment and provide suitable worker conditions.	3.9.1.4.3
B.2	Humidify Air – The C1V system humidifies air using water from the domestic water system (DOW) to maintain humidity in the ranges to protect electronic equipment and provide suitable worker conditions.	3.9.1.4.4
B.3	Cool Air – The C1V system cools air to maintain temperatures in ranges to protect all electronic equipment and provide suitable worker conditions.	3.9.1.4.3
C.	**Distribute Air**	**N/A**
C.1	Distribute to Electrical Area – The C1V system distributes conditioned air to electrical areas within the LAW effluent electrical building.	3.9.1.2.1 3.9.1.4.1
C.2	Distribute to Control and Battery Areas – The C1V system distributes conditioned air to control and battery areas within the LAW effluent electrical building. This distribution is independent of the distribution to the electrical areas.	3.9.1.2.1 3.9.1.4.2
C.3	Distribute to Other C1 Areas – The C1V system distributes conditioned air to other C1 areas of the EMF that are not supplied by the ACV system.	N/A
D.	**Exhaust Air**	**N/A**
D.1	Exhaust Battery Room Air – The C1V system exhausts battery room air to prevent hydrogen accumulation. UPE system power is available upon a loss of normal power.	3.9.1.5.1
E.	**Receive Power**	**N/A**
E.1	Receive Low-Voltage Power – The C1V system utilizes non-safety power from the LVE system for operation of all equipment.	N/A
F.	**Protect Equipment**	**N/A**
F.1	Protect Equipment – The GRE system provides grounding/lightning protection for C1V system electrical equipment.	3.4.4.9

Figure 2-10 provides the functional block diagram for the ACV and DVP systems, indicated the internal and external systems and utilities that provide the primary support or interface for that function. Section 3 provides the design requirements to meet both functional and other requirements. System interfaces are provided for reference only.

Figure 2-10 ACV and DVP Systems Functional Block Diagram



The functions included in Figure 2-10 and further described in Table 2-4 are the preliminary and secondary level functions of the ACV and DVP systems. Where appropriate to support definition of functional and design requirements, functions have been further decomposed and additional levels of supporting functions are also described. The requirement section number provides the location of the applicable functional analysis incorporated into system requirements. Section B.3 provides a further decomposition of system functions, including initiating, terminating, and integrating events and functions.

Table 2-4 Functional Analysis and Crosswalk to Requirements for ACV and DVP System Functions

Reference	Functional Analysis Description	Requirement Section No.
A.	**Draw Air**	**N/A**
A.1	Draw Air – The ACV system draws outdoor air to maintain internal design conditions. The FDE system sends a signal to shut down the supply unit upon detection of smoke.	3.10.1.2.1
B.	**Condition Air**	**N/A**
B.1	Heat Air – The ACV system heats the outdoor air to protect equipment and provide suitable conditions for workers.	3.10.1.4.1
B.2	Humidify Air – The ACV system humidifies air to maintain humidity and provide suitable conditions for workers.	3.10.1.4.2
B.3	Cool Air – The ACV system cools air to protect equipment and provide suitable conditions for workers.	3.10.1.4.1
C.	**Distribute Air**	**N/A**
C.1	Distribute Air – The ACV system distributes conditioned air to designated EMF areas.	3.8.1.1.1 3.10.1.2.1
C.2	Ventilate Process Vessels – The DVP system ventilates the DEP system process vessels to prevent the accumulation of hydrogen gas in the vessel headspace.	3.12.1.2
D.	**Filter Air**	**N/A**
D.1	Filter Building Air – The ACV system filters building and fume hood exhaust air to remove radioactive contaminate in accordance with permit conditions.	3.11.1.3.1
D.2	Filter Vessel Off-Gas – The DVP system filters off-gas removed from the headspace of the DEP system process vessels and evaporation process.	3.12.1.1
E.	**Exhaust Air**	**N/A**
E.1	Exhaust Air – The ACV system exhausts air from building areas in accordance with permit conditions to achieve appropriate dispersion to protect workers. The exhaust is combined with the filtered DVP system exhaust and discharged to the atmosphere.	3.11.1.1.1 3.11.1.5.1 3.11.1.5.2 3.11.1.5.4 3.12.1.1
F.	**Provide Monitoring, Control, and Communication Functions**	**N/A**
F.1	Provide Non-Safety Monitoring & Control – The ACV and DVP systems interface with the PCJ system for monitoring of ventilation system conditions.	3.13.1.1 3.13.1.2 3.13.1.4 3.13.2.1 3.13.2.2 3.13.2.3 3.13.4.2

Reference	Functional Analysis Description	Requirement Section No.
F.2	Monitor Emissions – The ACV system interfaces with the SDJ system to monitor emissions in accordance with permit conditions.	3.11.1.6.1
G.	**Receive Utilities**	**N/A**
G.1	Receive Low-Voltage Power – The ventilation systems utilize non-safety power from the LVE system for operation of all HVAC systems and functions.	N/A
G.2	Receive Uninterruptible Power – The ventilation systems utilize battery power for monitoring and limited control of select SSCs in the event of loss of offsite power.	N/A
G.3	Receive Instrument Air – The ventilation systems utilize instrument air for the remote operation of pneumatic valves and dampers.	N/A
G.4	Flush System Equipment – The DVP system receives water from the DIW system to support maintenance activities.	3.8.4.2
H.	**Protect Equipment**	**N/A**
H.1	Protect Equipment – The ACV and DVP systems interface with the GRE system to provide grounding/lightning protection for ACV and DVP system electrical equipment.	3.4.4.9

2.2 System/Facility Classification

The EMF, ACV, C1V, DEP, and DVP systems contain components with the following classifications:

- ☐ Safety Class
- ☐ Safety Significant
- ☒ Chemical Safety
- ☒ Dangerous Waste Permit Affecting
- ☒ Air Permit Affecting
- ☐ Waste Acceptance Impacting
- ☒ General

2.3 Basic Operational Overview

When operating in the DFLAW configuration, treated low-activity waste from the TOC is batch transferred to the WTP LAW Facility for vitrification. Compliance with the feed acceptance criteria is the responsibility of the TOC, per ICD-30. Waste feed is transferred from the TOC to the LAW Facility through the underground transfer line that runs between the interface point at the site boundary and the tie-in with the existing transfer line from the PT Facility inside of the LAW Facility. This underground transfer line also includes a tie-in point, located in the LAW effluent drain tank building, to blend concentrated DEP system effluent into the feed. The sequenced transfer system is designed to first convey concentrated DEP system effluent, followed by a transfer of feed from the TOC, with the combined feed pushed into the LCP system with flush water from the TOC.

Liquid effluents collected in the LAW and Lab RLD vessels are transferred to the EMF for concentration within the DEP system evaporator. Waste transfer lines between the LAW Facility, Lab and EMF are flushed to ensure residual effluents are removed from the transfer line. Flush water is collected in the low point drain vessel of the DEP system and is also batch transferred to the evaporator for concentration. Once concentrated, the effluent is normally sampled and recycled to the LCP system for vitrification. During off-normal operating scenarios, the concentrate is sampled, chemically adjusted, and cooled for compliance with the concentrate effluent acceptance criteria (EAC) before returning to Tank Farms' double-shell tanks (DST), per ICD-31. An additional option of offloading to a tanker truck is available (following an ALARA, viability, and safety study).

Overhead vapor from the evaporator is condensed and collected. Spent caustic scrubber solution from the LVP system is transferred to the DEP system and combined with the condensed overhead vapor. The dilute effluent is sampled as required for compliance with dilute EAC, per ICD-06, before being sent to the LERF/ETF. Effluent not in compliance is reprocessed through the DEP system.

Within this document, the ventilation system that serves the process and utility areas of the EMF is referred to as the ACV system. This system operates on a once-through ventilation strategy, whereby air is cascaded from areas of lower contamination potential to areas of higher contamination potential. The exhaust is HEPA-filtered and discharged from the facility through a stack. Other C1 areas that are not supplied by the ACV system have no credible potential for exposure to contamination and receive conditioned air and ventilation from the C1V system, which operates independently of the ACV system.

The following tables identify the boundaries and interfaces associated with the EMF and the DEP, DVP, ACV, and C1V systems in the DFLAW operating configuration. This information is based on issued design where possible, in order to provide a greater level of detail. See Section 1.5.2 for a list of relevant system designators.

Table 2-5 Effluent Management Facility Interfaces

System	Interface	Boundaries
ACV	Conditioned air and ventilation is provided to the process and utility areas of the EMF by the ACV system.	1. ACV system ductwork routed throughout the EMF 2. ACV system equipment (air handling units, unit heaters, HEPA filters, exhaust fans) located both outdoors and indoors. **Reference**: 24590-BOF-P1-25-00003 24590-BOF-P1-25-00004 24590-BOF-P1-26-00003 24590-BOF-P2-P63T-00002 24590-BOF-P2-P63T-00003 24590-BOF-P2-P63T-00004

System	Interface	Boundaries
BSA	Breathing service air piping is provided for maintenance or recovery operations in designated C3 and C5 areas of the EMF.	The BSA piping and manifolds routed throughout the EMF. **Reference:** 24590-BOF-M6-BSA-00003001
C1V	The C1V system provides heating, cooling, and ventilation for the C1 areas of the EMF not supplied by the ACV system.	The C1V system unit heaters located in the fire riser rooms, the fan coil units (FCU) serving the AFR skid room (E-0103A), the C&I room (E-0103B), the drain tank building chase (EDCH01), and the equipment serving the LAW effluent electrical building. **Reference**: 24590-BOF-M8-C1V-00002 24590-BOF-ER-25-00004 (E-0103A, E-0103B and EDCH01) 24590-BOF-ER-25A-00001 (EDCH01) 24590-CM-POA-EKL1-00001-04-00032 (EE-0101)
Chemical Additions (AFR, SHR, and SNR)	The EMF houses the chemicals required by the DEP system to process secondary liquid effluents from the LAW Facility and Lab.	The SHR and SNR system tanks, heaters, and pumps located in the chemical storage area (E-0107) and the AFR system skid located in the AFR skid room (E-0103A). **Reference**: 24590-BOF-P1-25-00003 24590-BOF-P1-25-00004
CME/FNJ	The communications electrical system (CME) provides communications, alarms and public address and building evacuation services to ensure worker safety in the EMF. The Facility Network Infrastructure (FNJ) implements a fiber optic backbone providing connectivity within the WTP facilities as well as provides external links to off-site WTP facilities and offices.	The CME/FNJ cabinets located on concrete pads outside the west and south walls of the LAW effluent process building, in the C&I room (E-0103B), in the utility room (EU-0101), and in the LAW effluent electrical building C&I equipment room (EE-0102). **Reference**: 24590-BOF-EF-25-00001 24590-BOF-EF-26-00001 24590-BOF-EF-27-00001
DEP	The EMF houses the DEP system process equipment used to receive, store, concentrate, and transfer secondary liquid effluents.	The DEP system equipment located throughout the LAW effluent process and drain tank buildings. **Reference**: 24590-BOF-P1-25-00003 24590-BOF-P1-25-00004
DIW	Demineralized water is provided to allow for flushing, rinsing, and washdown of equipment and building surfaces to lower dose rates to workers and support contact maintenance in the facility.	The DIW system utility stations located throughout the EMF and the booster pump located outdoors on a concrete pad between the LAW effluent drain tank and process buildings. **Reference**: 24590-BOF-P1-25-00003 24590-BOF-M6-DIW-00002001
DOW	Domestic water is provided for the tepid water supply that supports the EMF safety showers.	The DOW system tepid water skid located in the utility room (EU-0101) and the combination safety shower eye wash units located throughout the process areas of the EMF. **Reference**: 24590-BOF-P1-25-00003 24590-BOF-P1-25-00004 24590-BOF-P1-26-00003

System	Interface	Boundaries
DVP	The EMF houses the DVP system equipment used to purge hydrogen from the DEP system vessels.	The DVP piping, preheaters, HEPA filters, and exhausters located in the LAW effluent process, drain tank, and utility buildings. **Reference**: 24590-BOF-P1-25-00003 24590-BOF-P1-25-00004 24590-BOF-P1-26-00003
EMJ	The environmental monitoring system (EMJ) provides monitoring and surveying capabilities to inform workers in EMF areas of the presence of radiation and/or contamination.	The four continuous air monitors: two located on the west wall of the west evaporator process area (E-0103), one located on the west wall of the east evaporator process area (E-0102), and one located in the drain tank cell (ED-B001). **Reference**: 24590-BOF-J0-EMJ-00001
FPW/FDE	The EMF interfaces with the FPW and FDE systems for detection and suppression of fires within facility buildings.	The FDE system detectors and panels and the FPW system piping located throughout the EMF. **Reference**: 24590-BOF-M6-FPW-00017 TBD for FDE system components
GRE	EMF is grounded and protected from lightning strikes by the installation of the GRE system.	The lightning protection air terminals and grounding grid installed throughout the EMF. **Reference**: 24590-BOF-EG-E41T-00003
HPS	The EMF houses the high pressure system (HPS) secondary steam generator used to support the DEP system process.	The HPS system secondary steam generator located in the east evaporator process area (E-0102) on platform EP0102A. **Reference**: 24590-BOF-P1-25-00004
HTE	The EMF structure supports the HTE system equipment used for heat tracing on process piping.	The HTE system panels, transformers, and switches on concrete pads outside of the LAW effluent process and utility buildings. **Reference**: 24590-BOF-P1-25-00003 24590-BOF-P1-25-00004 24590-BOF-P1-26-00003
Lab	The EMF interfaces with the Lab by receiving liquid effluents that supports the glass-making operations within the LAW Facility. The EMF also provides manual samples of dilute and concentrated effluent to the Lab for sample analysis and verification.	This boundary is defined at the DEP system level.
LAW Facility	The EMF interfaces with the LAW Facility for the exchange of effluents that support the glass-making operations. LAW RLD and LVP system effluents are sent to the EMF for processing, while concentrated effluent is returned to the LAW Facility for blending with the waste feed from the TOC.	This boundary is defined at the DEP system level.
LERF/ETF	The EMF interfaces with LERF/ETF for the disposal of dilute effluent for further processing at LERF/ETF.	This boundary is defined at the DEP system level.

System	Interface	Boundaries
LTE	The lighting electrical system (LTE) provides artificial illumination for the various buildings that comprise the EMF.	The LTE system panels, transformers, and lights located throughout the EMF. **Reference**: 24590-BOF-EL-25-00001 24590-BOF-EL-25-00002 24590-BOF-EL-25-00003 24590-BOF-EL-25-00004 24590-BOF-EL-25-00005 24590-BOF-EL-25-00006 24590-BOF-EL-25A-00001 24590-BOF-EL-26-00001 24590-BOF-EL-26-00002 TBD for the electrical building
MVE/LVE	Medium voltage power is provided to the EMF, where it is stepped down to low voltage power and supplied to end users throughout the various buildings that comprise the EMF.	1. The medium voltage electrical system (MVE) electrical equipment located in the LAW effluent electrical building (EE-0101). 2. The LVE system electrical equipment located in the LAW effluent electrical building and the distribution panels located in the utility room (EU-0101), C&I room (E-0103B), and the east evaporator process area (E-0102). **Reference**: 24590-BOF-P1-25-00004 24590-BOF-P1-26-00003 24590-CM-POA-EKL1-00001-04-00032 (EE-0101) 24590-BOF-ER-25-00004 (E-0103B and E-0102) 24590-BOF-ER-26-00003 (EU-0101)
PCJ	The PCJ system provides non-safety monitoring and control of EMF SSCs.	The PCJ system enclosures located in the C&I room (E-0103B), utility room (EU-0101), and the LAW effluent electrical building C&I equipment room (EE-0102). **Reference**: 24590-BOF-P1-25-00003 24590-BOF-P1-25-00004 24590-BOF-P1-26-00003 24590-CM-POA-EKL1-00001-04-00032(EE-0102) 24590-BOF-ER-25-00004 (E-0103B) 24590-BOF-ER-26-00004 (EU-0101)
PCW	The EMF houses the plant cooling water system (PCW) equipment that supports the DEP system process.	The PCW system strainer, vessel, heat exchanger, and pumps located in the utility room (EU-0101). **Reference**: 24590-BOF-P1-26-00003
PSA	Plant service air is provided to end users in the EMF at stations with hose connections.	The PSA system vessel and filter located in the utility room (EU-0101) and the plant service air utility stations located throughout the EMF. **Reference**: 24590-BOF-P1-26-00003 24590-BOF-M6-PSA-00007001

System	Interface	Boundaries
PSW	Process service water is provided in various rooms and areas to allow for flushing, rinsing, and washdown of equipment and building surfaces to lower dose rates to workers and support contact maintenance in the facility.	The PSW system utility stations located throughout the EMF. **Reference**: 24590-BOF-M6-PSW-00004001
RPJ	Radiological personnel monitoring (RPJ) system equipment is located throughout the EMF.	The friskers and the personnel contamination monitors (PCM) located in the LAW effluent process and LAW effluent drain tank buildings. **Reference:** 24590-BOF-J0-EMJ-00001
SDJ	The stack discharge monitoring system (SDJ) interfaces with the EMF stack for monitoring of the building exhaust in accordance with air permit requirements.	The SDJ system panels and equipment located in the filter room (EU-0102). **Reference**: 24590-BOF-P1-26-00003
Tanker Trucks	The EMF provides an option for the disposal of concentrated effluent to tanker trucks for offsite disposal. (This is following an ALARA, viability, and safety study)	This boundary is defined at the DEP system level.
Tank Farms DST	Concentrated effluent or untreated evaporator feed from the EMF is returned to Tank Farms for storage.	This boundary is defined at the DEP system level.
TOC	The EMF interfaces with the Tank Operations Contractor to provide treated low-activity waste feed to the LAW Facility.	This boundary is defined at the DEP system level.
UPE	The UPE battery system provides power for the monitoring and limited control of applicable EMF SSCs in the event of a loss of site power.	The UPE system equipment located in the LAW effluent electrical building (EE-0101), the battery room (EE-0103), and the distribution panels located in the utility room (EU-0101) and the C&I room (E-0103B). **Reference**: 24590-BOF-P1-25-00003 24590-BOF-P1-26-00003 24590-CM-POA-EKL1-00001-04-00032(EE-0101 and EE-0103) 24590-BOF-ER-25-00004(E-0103B) 24590-BOF-ER-26-00003(EU-0101) 24590-BOF-ER-26-00004(EU-0101)

Table 2-6 DEP System Interfaces

System	Interface	Boundaries
ACV	The ACV system provides direct exhaust of the operating space of the DEP system sampling station.	The 12" duct at the top of DEP-HOOD-00001 that mates with the ACV system exhaust ductwork. **Reference**: 24590-BOF-M0-DEP-00001001 24590-BOF-M8-ACV-00001004
AFR	Antifoam reagent is provided for use in the DEP evaporator separator vessel to minimize entrainment of aerosols within the overhead vapor.	The piping from the AFR skid to DEP-EVAP-00001, at the inlet to plug valve DEP-V-00145. **Reference**: 24590-BOF-M6-DEP-00003001
DIW	Demineralized water is provided to allow for flushing, rinsing, and washdown of DEP equipment to lower dose rates to workers and support contact maintenance in the facility.	1. The flush connection points located throughout the DEP system process piping. 2. The DIW system piping branch to the DEP-SUMP-00001 transfer piping, DEP-NOZ-00001/00011, and the DEP-VSL-00001 overflow line loop seal at the inlet to ball valve DEP-V-00477. 3. The DIW system piping branch to DEP-HOOD-00001 at the inlet to ball valve DEP-V-44462. 4. The DIW system piping branches to the spray nozzles of DEP-VSL-00002 and DEP-VSL-00003A/B/C, at the inlet to ball valves DEP-V-00515, DEP-V-00864, DEP-V-44112, and DEP-V-00885, respectively. 5. The DIW system piping branches to the discharge lines from DEP-FILT-00003 at the inlet to ball valves DEP-V-44292 and DEP-V-44828. 6. The DIW system piping branch to the DEP system piping upstream of DEP-MTEE-00001 at the inlet to ball valve DEP-V-44257. 7. The DIW system piping branch to DEP-VSL-00008 at the inlet to restriction orifice DEP-RO-00019. 8. The DIW system piping branch to the discharge line from DEP-PMP-00003A/B at the inlet to ball valve DEP-V-44126. **Reference**: 24590-BOF-M6-DEP-00001001 24590-BOF-M6-DEP-00001002 24590-BOF-M6-DEP-00002001 24590-BOF-M6-DEP-00002004 24590-BOF-M6-DEP-00002005 24590-BOF-M6-DEP-00002006 24590-BOF-M6-DEP-00003001 24590-BOF-M6-DEP-00003003 24590-BOF-M6-DEP-00003004 24590-BOF-M6-DEP-00003006 24590-BOF-M6-DEP-00004003 24590-BOF-M6-DEP-00005001 24590-BOF-M6-DEP-00005002 24590-BOF-M6-DEP-00005003 24590-BOF-M6-DEP-00005004 24590-BOF-M6-DEP-00006001 24590-BOF-M6-DEP-00010001

System	Interface	Boundaries
DVP	The DEP system interfaces with the DVP system for ventilation of process vessels to prevent the build-up of hydrogen and non-condensable gases in the headspace of DEP process vessels.	1. The inlet and outlet connections between the DVP system piping and DEP-VSL-00001 (N01 and N02), DEP-VSL-00002 (N12 and N04), DEP-VSL-00003A/B/C (N10 and N04), DEP-VSL-00004A/B (N06 and N12), and DEP-VSL-00005A/B (N28 and N05). 2. The outlet from DEP-COND-00003 (N03) to the DVP system vessel header. **Reference**: 24590-BOF-M6-DEP-00001001 24590-BOF-M6-DEP-00002001 24590-BOF-M6-DEP-00003004 24590-BOF-M6-DEP-00004001 24590-BOF-M6-DEP-00004002 24590-BOF-M6-DEP-00005001 24590-BOF-M6-DEP-00005002 24590-BOF-M6-DEP-00005003 24590-BOF-M6-DEP-00006001 24590-BOF-M6-DEP-00006002
GRE	DEP system equipment is grounded to the GRE system grid.	The grounding connections between DEP system equipment and the GRE system grid at the EMF. **Reference**: 24590-BOF-EG-25-00001 24590-BOF-EG-25-00002 24590-BOF-EG-25-00003 24590-BOF-EG-25-00004 24590-BOF-EG-25A-00001
HPS	High pressure steam is provided to the DEP system via a secondary loop to provide the heating capacity necessary for evaporator operation.	1. The steam supply piping connection point to DEP-RBLR-00001 (N03). 2. The steam supply piping to the DEP system steam ejectors (DEP-EJCTR-00001A/B, DEP-EJCTR-00002A/B) at the inlet to gate valve DEP-V-00349. **Reference**: 24590-BOF-M6-DEP-00003002 24590-BOF-M6-DEP-00003004

System	Interface	Boundaries
HTE	The heat trace electrical system provides freeze protection for DEP pipes, instrument air lines, liquid filled lines, and instrument sensing lines that are exposed to outdoor ambient conditions.	The heat trace cables installed on DEP system process piping located outdoors. **Reference**: 24590-BOF-M6-DEP-00001001 24590-BOF-M6-DEP-00001002 24590-BOF-M6-DEP-00002001 24590-BOF-M6-DEP-00004001 24590-BOF-M6-DEP-00004002 24590-BOF-M6-DEP-00005001 24590-BOF-M6-DEP-00005002 24590-BOF-M6-DEP-00005003 24590-BOF-M6-DEP-00005004 24590-BOF-M6-DEP-00006001 24590-BOF-M6-DEP-00006002 24590-BOF-M6-DEP-00009002 24590-BOF-M6-DEP-00009003 24590-BOF-M6-DEP-00009004 24590-BOF-M6-DEP-00009005 24590-BOF-M6-DEP-00012001 24590-BOF-M6-NLD-00008001 24590-PTF-M6-PWD-00058002
ISA	Dry, clean, pressurized air from the ISA system is used to operate pneumatic valves and instruments.	1. The instrument service air piping connection points to pneumatically actuated DEP system valves. 2. The instrument service air piping connection points to the seal boxes of DEP-PMP-00001A/B, DEP-PMP-00003A/B, DEP-PMP-00007A/B, and DEP-PMP-00017. **Reference**: 24590-BOF-M6-DEP-00001002 24590-BOF-M6-DEP-00003001 24590-BOF-M6-DEP-00003003 24590-BOF-M6-DEP-00005004 24590-BOF-M6-ISA-00001001
LAW-LCP	The DEP system conveys waste feed from the TOC to the LCP system via an underground waste transfer line in the DFLAW configuration. The DEP system also recycles concentrated effluent to the LAW-LCP system via the same underground waste transfer line used to provide the TOC waste feed.	The underground coaxial piping to LCP-VSL-00001/00002 at the battery limit of the LAW Facility. **Reference**: 24590-BOF-M6-RLD-00012001
LAW-LVP	The DEP system receives scrubber effluent from the LVP system. The scrubber effluent is combined with dilute effluent from the DEP process and stored for transfer for LERF/ETF.	The LVP system piping from the LAW Facility to the EMF where the pipe transitions from coaxial to single-walled in the drain tank cell. **Reference**: 24590-BOF-M6-RLD-00012001
Lab-RLD	The DEP system receives secondary liquid effluents from the Lab-RLD system for processing through the DEP evaporator.	The RLD system piping from the Lab to the EMF where the pipe transitions from coaxial to single-walled in the drain tank cell. **Reference**: 24590-BOF-M6-RLD-00012002

System	Interface	Boundaries
LAW-RLD	The DEP system receives secondary liquid effluents from the LAW-RLD system for processing through the DEP evaporator.	The RLD system piping from the LAW Facility to the EMF where the pipe transitions from coaxial to single-walled in the drain tank cell. **Reference**: 24590-BOF-M6-RLD-00012001
LERF/ETF	The DEP system transfers dilute effluent to LERF/ETF for further processing.	The underground coaxial piping at Nodes 8A/B of the WTP site boundary. **Reference**: 24590-BOF-M6-RLD-00012002 24590-WTP-B2-C12T-00001
LVE	Low voltage power is provided for the operation of DEP equipment and components.	The inlet power connections to all DEP system equipment requiring power. **Reference**: 24590-BOF-E8-LVE-00002
NLD	Non-radioactive liquids collected in the chemical storage area are recycled to the DEP system.	The NLD system piping from NLD-SUMP-00032 to DEP-VSL-00004A/B at the inlet to ball valves DEP-V-44348 and DEP-V-44350, respectively. **Reference**: 24590-BOF-M6-NLD-00008001
PCJ	The PCJ system provides non-safety monitoring and control of DEP SSCs.	The inlet connections to DEP system monitoring and control instruments. **Reference**: 24590-BOF-J3-DEP-0000X (multiple)
PCW	Plant cooling water is provided to the DEP system via a secondary loop to condense evaporator overhead vapors and maintain vacuum in the condensers. PCW is also used in the transfer cooler to cool concentrated effluent for return to Tank Farms.	1. The PCW system supply piping to DEP-HX-00001 at the outlet of ball valve PCW-V-69882 and the return line to the PCW system at the inlet to PCW-V-69883. 2. The PCW system supply piping to DEP-COND-00001/2/3 at the inlet to butterfly valve DEP-V-00759 and the return line to the PCW system at the outlet of butterfly valve DEP-V-00411. **Reference**: 24590-BOF-M6-DEP-00002006 24590-BOF-M6-DEP-00003004 24590-BOF-M6-PCW-00005002
PSA	Dry, pressurized air from the PSA system is used for the evaporator feed filter, the low-point drain area sump pump, and the sample fume hood.	1. The PSA system piping branch to DEP-FILT-00003 at the inlet to ball valve DEP-V-00763. 2. The PSA system piping branch to DEP-HOOD-00001 at the inlet to ball valve DEP-V-44647. 3. The PSA system piping branch to DEP-PMP-00031 at the inlet to ball valve DEP-V-44167. **Reference**: 24590-BOF-M6-DEP-00001002 24590-BOF-M6-DEP-00002004
PSW	Process service water is provided to allow for flushing, rinsing, and washdown of DEP equipment to lower dose rates to workers and support contact maintenance in the facility.	1. The flush connection points located at the suction header of DEP-PMP-00004A/B/C and on the coaxial piping from DEP-PMP-00003A/B in the drain tank building chase. 2. The PSW system pipe connection to the pump seal boxes of DEP-PMP-00001A/B, DEP-PMP-00003A/B, DEP-PMP-00007A/B, and DEP-PMP-00017. 3. The PSW system pipe branches to the spray nozzles of DEP-VSL-00004A/B at the inlet of ball valves DEP-V-00533 and DEP-V-00517, respectively.

System	Interface	Boundaries
		4. The PSW system pipe branches to the wash rings of DEP-VSL-00005A/B at the inlet of ball valves DEP-V-00649 and DEP-V-00577, respectively. 5. The PSW system pipe branch to the pump seals of DEP-PMP-00001A/B at the inlet to gate valve DEP-V-44939. **Reference**: 24590-BOF-M6-DEP-00001002 24590-BOF-M6-DEP-00003001 24590-BOF-M6-DEP-00003003 24590-BOF-M6-DEP-00004001 24590-BOF-M6-DEP-00004002 24590-BOF-M6-DEP-00004003 24590-BOF-M6-DEP-00005004 24590-BOF-M6-DEP-00006001 24590-BOF-M6-DEP-00006002 24590-BOF-M6-DEP-00010001 24590-BOF-M6-PSW-00004001
SCW	The SCW system receives steam condensate from the reboiler and transfers secondary steam generator blowdown to the DEP system.	1. The DEP system piping from DEP-VSL-00008 to HPS-HX-00011 at the outlet of ball valve DEP-V-00529. 2. The SCW system piping from SCW-PMP-00093 to DEP-VSL-00005A/B at the inlet to ball valves DEP-V-44229 and DEP-V-44233. **Reference**: 24590-BOF-M6-DEP-00003006 24590-BOF-M6-DEP-00006001 24590-BOF-M6-DEP-00006002
SHR	Sodium hydroxide is used to chemically adjust the feed and concentrated effluent to allow for transfer to Tank Farms or the LAW Facility.	1. The SHR system piping from SHR-TK-00013 to DEP-VSL-00002 at the inlet to ball valve DEP-V-40499. 2. The SHR system piping from SHR-TK-00013 to DEP-VSL-00003A/B/C at the inlet to ball valves DEP-V-00287, DEP-V-00234, and DEP-V-00694, respectively. 3. The SHR system piping from SHR-TK-00013 to the DEP system pipe from DEP-PMP-00003A/B to the LAW Facility at the inlet of plug valve DEP-V-44269. **Reference**: 24590-BOF-M6-DEP-00002001 24590-BOF-M6-DEP-00005001 24590-BOF-M6-DEP-00005002 24590-BOF-M6-DEP-00005003 24590-BOF-M6-DEP-00005004
SNR	Sodium nitrite is used for chemical adjustment of the feed and concentrated effluent to allow for transfer to Tank Farms or the LAW Facility.	The SNR system piping from SNR-TK-00002 to DEP-MTEE-00001 at the inlet to ball valve DEP-V-44262. **Reference**: 24590-BOF-M6-DEP-00002005
Tanker Trucks	The EMF provides an option for the disposal of concentrated effluent to tanker trucks for offsite disposal. (This is following an ALARA, viability, and safety study)	The load-out point downstream of DEP-PMP-00003A/B in the EMF truck bay. **Reference**: 24590-BOF-M6-DEP-00005004

System	Interface	Boundaries
Tank Farms DST	Tank Farms receives concentrated effluent or untreated evaporator feed from the DEP system.	The underground coaxial piping at Node 14 of the WTP site boundary. **Reference**: 24590-BOF-M6-RLD-00012002 24590-WTP-B2-C12T-00001
TOC	The DEP system conveys TOC treated low-activity waste to the LCP system.	The underground coaxial piping at Node 13 of the WTP site boundary. **Reference**: 24590-BOF-M6-RLD-00012002 24590-WTP-B2-C12T-00001
UPE	The UPE battery system provides power for the monitoring and limited control of applicable DEP SSCs in the event of a loss of site power.	The inlet power connection to DEP-PNL-00001, DEP-RT-8476, and DEP-RT-8676. **Reference**: 24590-BOF-E8-UPE-25001

Table 2-7 DVP System Interfaces

System	Interface	Boundaries
ACV	Filtered off-gas from the DVP system is discharged into the building exhaust stack downstream of the ACV HEPA filters and exhaust fans prior to release to the atmosphere.	The penetration of the DVP system B31.3 piping into the ACV system exhaust ductwork downstream of ACV-FAN-00001A/B. **Reference**: 24590-BOF-M8-SDJ-00001
DEP	The DVP system interfaces with DEP process vessels for the removal of hydrogen gases that accumulate in vessel headspace.	1. The inlet and outlet connections between the DVP system piping and DEP-VSL-00001 (N01 and N02), DEP-VSL-00002 (N12 and N04), DEP-VSL-00003A/B/C (N10 and N04), DEP-VSL-00004A/B (N06 and N12), and DEP-VSL-00005A/B (N28 and N05). 2. The outlet from DEP-COND-00003 (N03) to the DVP system vessel header. **Reference**: 24590-BOF-M6-DEP-00001001 24590-BOF-M6-DEP-00002001 24590-BOF-M6-DEP-00003004 24590-BOF-M6-DEP-00004001 24590-BOF-M6-DEP-00004002 24590-BOF-M6-DEP-00005001 24590-BOF-M6-DEP-00005002 24590-BOF-M6-DEP-00005003 24590-BOF-M6-DEP-00006001 24590-BOF-M6-DEP-00006002
DIW	Demineralized water is provided to allow for flushing, rinsing, and washdown of DVP equipment to lower dose rates to workers and support contact maintenance in the facility.	The flush connection point in the combined vessel vent header upstream of DVP-HTR-00001A/B. **Reference**: 24590-BOF-M6-DVP-00001001
GRE	DVP system electrical equipment is grounded and protected from lightning strikes by the GRE system.	The grounding connections between DVP system equipment and the GRE system grid in the LAW effluent process building. **Reference**: 24590-BOF-EG-25-00004

System	Interface	Boundaries
HTE	The heat trace electrical system provides freeze protection for DVP pipes that are exposed to outdoor ambient conditions.	The heat trace cables installed on DVP system process piping located outdoors. **Reference**: 24590-BOF-M6-DVP-00001001
ISA	Dry, clean, pressurized air from the ISA system is used to operate the exhauster outlet isolation valves.	The outlet of the ISA system valves (ISA-V-84634/84635) supplying instrument service air for the actuation of DVP-YV-8122/8120. **Reference**: 24590-BOF-M6-DVP-00001001
LVE	Low voltage power is provided for the operation of DVP system equipment and components.	The inlet power connections to all DVP system equipment requiring power. **Reference**: 24590-BOF-E8-LVE-00002
PCJ	The PCJ system provides non-safety monitoring and control of DVP system SSCs.	The inlet connections to DVP system monitoring and control instruments. **Reference**: 24590-BOF-J3-DVP-70001 24590-BOF-J3-DVP-70002 24590-BOF-J3-DVP-70003 24590-BOF-J3-DVP-71001 24590-BOF-J3-DVP-71002 24590-BOF-J3-DVP-71003 24590-BOF-J3-DVP-71004

Table 2-8 C1V System Interfaces

System	Interface	Boundaries
DOW	Domestic water is provided for humidification of supply air provided to the LAW effluent electrical building.	The DOW system pipe connection to the C1V system humidifier (C1V-HU-00030) servicing the LAW effluent electrical building C&I equipment room (EE-0102). **Reference**: 24590-BOF-M6-DOW-00005001
FDE	Smoke detection capabilities are provided in the LAW effluent electrical building ventilation system to support the shutdown of HVAC fans in the event of a fire.	The hardwired interlock between the smoke detector contact and the C1V system equipment servicing the LAW effluent electrical building. **Reference**: TBD
GRE	C1V system electrical equipment is grounded and protected from lightning strikes by the GRE system.	The grounding connections between C1V system equipment and the GRE system grid at the EMF. **Reference**: 24590-BOF-EG-25-00003 24590-BOF-EG-25-00004 24590-BOF-EG-25A-00001 24590-BOF-EG-26-00001 24590-BOF-EG-27-00001
LVE	Low voltage power is provided for the operation of C1V system equipment and components.	The inlet power connections to all C1V system equipment requiring power. **Reference**: 24590-BOF-E8-LVE-00002

System	Interface	Boundaries
UPE	The UPE system provides power for the monitoring and control of C1V-FAN-27001.	The inlet power connection to the hydrogen mitigation control panel (C1V-PNL-27001). **Reference**: 24590-BOF-E1-UPE-00001

Table 2-9 ACV System Interfaces

System	Interface	Boundaries
DEP	The ACV system provides direct exhaust of the operating space of the DEP system sampling fume hood.	The 12” duct at the top of DEP-HOOD-00001 that mates with the ACV system exhaust ductwork. **Reference**: 24590-BOF-M0-DEP-00001001 24590-BOF-M8-ACV-00001004
DOW	Domestic water is provided to the ACV system air handling units (ACV-AHU-00001A/B).	The DOW system piping inlet connections to the vendor packaged ACV-AHU-00001A/B. **Reference**: 24590-BOF-M8-ACV-00001001 24590-BOF-M8-ACV-00001008
DVP	Filtered off-gas from the DVP system is discharged into the building exhaust stack downstream of the ACV HEPA filters and exhaust fans prior to release to the atmosphere.	The penetration of the DVP system B31.3 piping into the ACV system exhaust ductwork downstream of ACV-FAN-00001A/B. **Reference**: 24590-BOF-M8-SDJ-00001
FDE	Smoke detection capabilities are provided in the ACV system to support the shutdown of the AHUs in the event of a fire.	The hardwired interlock between the FDE system smoke detector contact and the associated fan motor adjustable speed drive (ASD) controller starter circuit. **Reference**: 24590-BOF-M8-ACV-00001001 24590-BOF-M8-ACV-00001008
GRE	ACV system electrical equipment is grounded and protected from lightning strikes by the GRE system.	The grounding connections between ACV system equipment and the GRE system grid at the EMF. **Reference:** 24590-BOF-EG-25-00003 24590-BOF-EG-25-00004 24590-BOF-EG-25A-00001 24590-BOF-EG-26-00001 24590-BOF-EG-26-00002
ISA	Dry, clean, pressurized air from the ISA system is used to operate pneumatic dampers.	The outlet of the ISA system isolation valves supplying instrument service air to the ACV system pneumatically operated dampers. **Reference**: 24590-BOF-M8-ACV-00001001 24590-BOF-M8-ACV-00001004 24590-BOF-M8-ACV-00001007 24590-BOF-M8-ACV-00001008
LPS	Low pressure steam is provided to air handling units to warm air such that minimum temperatures are maintained in process and utility areas of the EMF.	The low pressure steam system (LPS) supply piping connection to the preheat and reheat coils of ACV-AHU-00001A/B. **Reference**: 24590-BOF-M8-ACV-00001001 24590-BOF-M8-ACV-00001008

System	Interface	Boundaries
LVE	Low voltage power is provided for the operation of ACV system equipment and components.	The inlet power connections to all ACV system equipment requiring power. **Reference**: 24590-BOF-E8-LVE-00002
PCJ	The PCJ system provides non-safety monitoring and control of ACV system SSCs.	The inlet connections to ACV system monitoring and control instruments. **Reference**: TBD
SCW	The SCW system collects steam condensate from use of low pressure steam in air handlers for heating purposes.	The ACV-AHU-00001A/B preheat and reheat coil condensate piping connection to the SCW system condensate return piping. **Reference**: 24590-BOF-M8-ACV-00001001 24590-BOF-M8-ACV-00001008
SDJ	The ACV system interfaces with the SDJ system for monitoring of the building exhaust (including filtered vessel vent off-gas from the DVP system) in accordance with air permit requirements.	The SDJ system sample probe penetrations in the ACV system exhaust ductwork. **Reference**: 24590-BOF-M8-SDJ-00001

3 Design Requirements

3.1 Requirements

Requirements are documented in Sections 3.4 through 3.16. Each requirement statement is accompanied by a basis discussion (as needed) and the expected means of verification. Requirements shall be met in design. If a requirement stated in this document cannot be met in design, then a revision to the requirement needs to be pursued, if possible, or the design must be changed to meet the requirement.

Requirements preceded by "**[HOLD]**" may only be used in support of preliminary or committed design, which shall also be issued with appropriate holds per procedure 24590-WTP-3DP-G04B-00046, *Engineering Drawings*. Requirements preceded by "**[HOLD]**" may not be used in support of procurement, fabrication, or construction. Per Section 5.7 of 24590-WTP-3DP-G04B-00046, procurement of equipment with requirements on HOLD in the FDD/SDD may proceed in certain cases with the authorization of the Manager of Production Engineering.

The following abbreviations are used to designate the selected method for verification (see 24590-WTP-3DP-G04B-00092, *System Verification*, for additional guidance concerning methods of verification):

(A) Analysis
(R) Review
(I) Inspection
(T) Test

The following abbreviations are used to designate the organization or individual responsible for performing the verification:

(COM) Commissioning
(CON) Construction

(ENG)	Engineering (including Independent, Qualified, Registered Professional Engineer (IQRPE) reviews, where noted)
(ES&H)	Environmental, Safety, and Health
(OPS)	Operations
(SU)	Startup

3.2 Bases

Basis discussions are provided as needed to explain the decomposition or interpretation from the originating source requirement(s). Where a **[HOLD]** has been applied to a requirement, this section will include the basis for the **[HOLD]**.

3.3 References

The requirements include a source document reference. Each unique source document reference is bracketed separately. Requirements may include a reference to Section 2.1, *System Functions/Safety Functions*, listed in parentheses following the source document. A complete listing of all source references is provided in Section 5.1.

3.4 Effluent Management Facility-Level Requirements

3.4.1 General Requirements

3.4.1.1 Mission and Functional/Performance Requirements

3.4.1.1.1 Effluent Management Facility Production

Requirement: The EMF shall be capable of supporting the collection, processing, and disposing of mixed radioactive liquid effluents from the LAW Facility and Lab to support the LAW Facility design capacity of 30 metric tons of glass (MTG) per day and a treatment capacity of 21 MTG per day. The availability of the EMF shall support a minimum integrated facility availability equal to or greater than 70 percent. [Sections C.7(b)(1), C.7(b)(2), C.7(d)(4)(ii), WTP Contract] [Sections 6, 6.3, BOD] (Table 2-1, A.1)

Basis Discussion: The LAW Facility is designed to produce 30 MTG per day. While operating in the DFLAW configuration, the EMF must be designed to support all internal systems to meet that production rate.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to verify the overall facility throughput capacity supports a LAW Facility design capacity of 30 MTG per day and a treatment capacity of 21 MTG per day.	
R	**ENG**	Review the design to verify conformance to the results of the analysis.	
T	**SU/ COM**	Perform a test to verify the capability to support the LAW Facility cold commissioning capacity testing criteria.	Expected to be met along with the LAW production requirement in the *LAW Facility Design Description*, 24590-LAW-3ZD-20-00002.

3.4.1.1.2 Effluent Management Facility Operation

Requirement: The EMF shall be designed to operate independently of the PT and HLW Facilities in the DFLAW configuration. [Section 6.1.4, BOD]

Basis Discussion: The ability to operate the EMF independent of the PT and HLW Facilities from the DFLAW configuration supports the project mission of LAW Facility glass production on an accelerated schedule.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the EMF is designed to operate independently of the PT and HLW Facilities in the DFLAW configuration.	

3.4.2 Requirements Related to Off-Normal/Emergency (Design Basis) Conditions and Configurations

General and emergency conditions and site parameters to be used as the basis for design are included in the BOD, Chapter 4. Safety analyses used to develop specific requirements for design are performed in accordance with Section C.4 of the WTP Contract.

3.4.2.1 General

The following statement is general and descriptive in nature and not subject to direct implementation and verification. Specific requirements developed to support achievement of these general statements are established in the subsequent sections.

- The EMF and associated SSCs are designed to perform their functional requirements within the established design basis environmental conditions and in accordance with governing codes and standards established for the WTP Project.

3.4.2.1.1 EMF Structure Categorization

Requirement: The EMF structure shall be designed as Hazard Category 3 (HC-3), Seismic Category IV (SC-IV)/Performance Category-1 (PC-1) facility. [Section H.53(c)(1), WTP Contract] (Table 2-1, D.1)

Basis Discussion: The designation of the EMF as SC-IV is a critical design input in the WTP Contract that supports completing the DFLAW configuration within cost and schedule targets.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the EMF structure is designed as a HC-3, SC-IV/PC-1 facility.	

3.4.2.2 External Events

3.4.2.2.1 Ashfall/Snowfall/Precipitation Events

Requirement: The EMF structure and roof shall be designed to withstand ash, precipitation, wind missile and snow loading in accordance with the BOD. [Sections 4.6, 4.10, 10.2.7, BOD] (Table 2-1, D.1)

Basis Discussion: Design of the EMF structures and roofing system is considered a passive design feature. The structure and roof system are designed for both static and live loads in accordance with ASCE 7-98, *Minimum Design Loads for Buildings and Other Structures*. Structure and roof system components provide structural integrity to prevent collapse.

Note: Per 24590-WTSC99-1036-42-17, *Final Report – Geotechnical Investigation*, flooding of the site due to inundation by the Columbia River is not credible and groundwater will not adversely impact the WTP. Additionally, DOE-STD-1020-94 identifies tornados as not applicable. Therefore, there are no requirements for the EMF associated with these events.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis of the facility structure and roof system verifying the ability to withstand the BOD design loads for snow, precipitation, and (or) ash loading.	
R	**ENG**	Review the structural and roof design to verify conformance to the analysis.	

3.4.2.2.2 DELETED.

3.4.2.2.3 DELETED.

3.4.2.2.4 Straight Wind

Requirement: The EMF exterior structure, doors, and louver assemblies shall be designed to withstand wind speeds in accordance with Table 4-5 of the BOD. [Sections 4.9, 10.2.7, 10.3.4.10, BOD] (Table 2-1, D.1)

Basis Discussion: Design of the EMF exterior structure is considered a passive design feature. The structure is designed for both static and live loads in accordance with ASCE 7-98, *Minimum Design Loads for Buildings and Other Structures*. Structural components provide structural integrity to prevent collapse.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the EMF exterior structural design to verify conformance with the BOD design standards for wind loads.	

3.4.2.2.5 Seismic Event

Requirement: The EMF exterior structure and anchorages shall be designed to withstand a seismic event in accordance with the BOD. [Section 10.2.7, BOD] (Table 2-1, D.1)

Basis Discussion: Design of the EMF structures, anchorages, and roofing system is considered a passive design feature. The structure, anchorages, and roof system are designed for both static and live loads in accordance with ASCE 7-98, *Minimum Design Loads for Buildings and Other Structures*. Structure, anchorage, and roof system components provide structural integrity to prevent collapse.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the structural design to verify conformance with the BOD design standards for seismic events.	

3.4.2.2.6 Loss of Site Electrical Power Event

The event is not applicable to the design of the EMF (structure). Requirements applicable to WTP electrical systems and systems within the EMF are specified at the system level.

3.4.2.3 Internal Events

3.4.2.3.1 Fire Extinguishers

Requirement: For C3 areas, portable fire extinguishers shall be located near, but outside of, the C5 and (or) R5 areas. [Section 13.3.2, BOD] (Table 2-1, D.2)

Basis Discussion: Locating fire extinguishers outside of C5 and/or R5 areas ensures that equipment is not inadvertently installed in a non-accessible area. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the location of fire extinguishers in C3 areas to verify they are located near, but outside of, the C5 and (or) R5 areas.	

3.4.2.3.2 DELETED.

3.4.2.3.3 Facility Fire Event – Fire Barriers and Other Materials

Requirement: The EMF shall meet the Highly Protected Risk criteria as defined in DOE Order 420.1B. The facility structural and architectural design shall comply with the fire protection requirements identified in the list below and shall use non-combustible materials to the extent practical in accordance with selected building and fire protection codes and standards. Openings and penetrations shall be designed to maintain the integrity of the fire barrier.

- The EMF shall be designed in accordance with fire separation requirements of the applicable building code. Compartmentalization of buildings by fire barriers to limit the spread of fire and restrict the movement of smoke shall be as required by applicable fire protection standards and specific occupancy chapters, and as required by the fire hazard analysis for EMF.
- Mechanical and electrical penetrations of fire barriers shall be fire stopped by materials listed in accordance with applicable codes and standards or approved engineering evaluation and be of a fire rating

not less than the barrier or enclosure. Fire barrier dampers and doors shall be rated as required per applicable building and fire protection codes and standards.

- Interior finish materials shall be Class A in accordance with applicable fire protection standards.
- Interior floor coverings shall be Class I in accordance with applicable fire protection standards.
- Membrane roof assemblies shall be Class I as listed by Factory Mutual. Buildings shall be constructed of noncombustible or fire-resistive material.

[Section 10.3.4.7, BOD] (Table 2-1, D.2)

Basis Discussion: The use of non-combustible materials is a passive design feature that mitigates the risk of fire and reduces fire loading in the event of a fire. 2-hr fire barriers are constructed as part of the implementation of DOE O 420.1B. Additional rated barriers are mandated by IBC, IFC and NFPA. To maintain the rating of the fire barriers, the openings (e.g., doors, dampers, etc.) are designed in accordance with their associated NFPA and IBC codes/standards, nationally recognized testing laboratory listing, and manufacturer's requirements.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify conformance with the applicable building and fire protection codes and standards.	Prepare a report to document review. Fire Hazard Analysis Engineering to participate in the review.
R	ENG	Review material test reports or independent lab certifications provided by suppliers or subcontractors for structural/architectural components indicating conformance with applicable codes and standards.	

3.4.2.3.4 Beyond Design Basis Conditions

When conditions are encountered that are beyond the design basis for the facility or its associated SSCs, affected SSCs are to be considered incapable of performing their design functions until they have been subjected to performance verification.

By definition, there are no design requirements for beyond design basis conditions.

3.4.3 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

Note: Refer to the definitions of *containment* and *confinement* in Section 1.4.

3.4.3.1 Nuclear Safety Requirements

None.

3.4.3.2 ALARA Requirements

3.4.3.2.1 Space for Radiological Monitoring Equipment at Zone Boundaries

Requirement: The facility design shall provide sufficient space to accommodate radiological monitoring equipment at C5/C3 and C3/C2 control area boundaries. Adequate space shall be provided to allow positioning and accessing of monitors and associated equipment without obstructing passageways, doorways, and work areas. Space shall be provided at each personnel survey station for step-off pads, survey instrument storage, and four laundry bags. [Sections 9.4.13.1, 9.4.13.2, BOD] [Sections 12.6.1.2, 12.7, 12.7.1, ORD] (Table 2-1, D.3) (Table 2-1, G.2)

Basis Discussion: The EMF layout supports the inclusion of components tagged ‘RPJ’ that serve a radiological protection function but are not integrated into a formal WTP system per 24590-WTP-RPT-ENG-02-009, *System and Area Locators List and System Division of Responsibility*. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify space provisions and the availability of utility connections (electrical power) for radiological monitoring equipment at zone boundary control points.	Plant Operations and Nuclear Safety Engineering to participate in review.

3.4.3.2.2 Decontamination Capability

Requirement: The EMF design shall include the following provisions for decontamination of designated C3 and C5 areas to reduce contamination levels and personnel exposure:

- Washdown capabilities shall be provided to aid decontamination of the stainless-steel lined areas and surfaces with special protective coatings.
- Floors shall be sealed or painted to facilitate decontamination.
- Special protective coatings/sealants compatible with intended decontamination fluids (to allow wet decontamination of surfaces with water, dilute nitric, and/or dilute caustic solutions without damaging the coated surface) shall be applied in C3 and C3/C5 areas to the selected horizontal and vertical surfaces identified in Section 13.4 of the ORD and to surfaces where required by environmental permits or regulations.
- Interior finishes in areas of potential contamination shall be non-porous for ease of decontamination.

[Sections 10.5, 13.4, 14.9, ORD] [Section 10.3.4.11, BOD] (Table 2-1, D.4) (Table 2-1, G.1)

Basis Discussion: This design requirement is based on ALARA design principles. Decontamination capabilities are appropriate for areas anticipated to have significant contamination (e.g., C3/C5 areas, especially areas requiring worker access). Decontamination of inaccessible areas may be appropriate to lower radioactive contamination levels and to support decommissioning. Stainless steel liners are sufficient to meet the intent of the requirement above regarding floor design to facilitate decontamination. If stainless steel liners do not provide adequate coverage up to the minimum height required for decontamination, special coatings are needed to allow for decontamination above the liner height. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify C3 and C5 areas have installed washdown capabilities.	
R	**ENG**	Review the design to verify floors are sealed or painted to facilitate decontamination and that the coating is compatible with the intended decontamination fluids.	
R	**ENG**	Review the design to verify interior finishes in areas of potential contamination are non-porous.	

3.4.3.2.3 Minimize Potential for Contamination Accumulation

Requirement: The design shall minimize “dead spaces” in the plant layout where contamination could build up and be difficult to remove (i.e., spaces that could become contaminated, but that have no flush or wash-down capability). [Section 20.0, ORD] (Table 2-1, D.4)

Basis Discussion: Design features that simplify and facilitate decontamination and decommissioning (D&D), minimize contaminated equipment, and minimize the generation of radioactive waste during deactivation and D&D are identified during the planning and design phase based on anticipated decommissioning methods. Pockets and cavities without a functional purpose should be filled with suitable material to minimize the collection of contamination and to provide a means to detect releases within 24 hours per WAC requirements. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the facility conforms to the requirement to minimize areas in which radiological contamination could accumulate, including verification that any specific ADR requirements have been met.	

3.4.3.2.4 Provide for Rapid Evacuation Under Emergency Conditions

Requirement: No physical control(s) shall be installed at any security, radiological, or other area exit that would prevent rapid evacuation of personnel under emergency conditions. [Section 8.1.3, ORD] [Appendix A, Requirement #61, RPP] (Table 2-1, D.4)

Basis Discussion: Immediate threats to life or health due to an emergency outweigh concerns of potential inadvertent spread of contamination from evacuating personnel. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify rapid evacuation routes are provided and that the design does not impede evacuation.	

3.4.3.2.5 Access Control to High Radiation Areas

Requirement: One or more of the following physical controls shall be used for each entrance or access point to a high radiation area (area classified R5) where radiation levels exist such that an individual could exceed an equivalent dose to the whole body of 1 rem (0.01 Sv) in any one hour at 30 centimeters from the source or from any surface that the radiation penetrates:

- A control device that prevents entry to the area when high radiation levels exist or that, upon entry, causes the radiation level to be reduced below the level that defines a high radiation area.
- A device that functions automatically to prevent use or operation of the radiation source or field while individuals are in the area.
- A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry.
- Locked entryways. During periods when access to the area is required, positive control over each entry is maintained.
- Continuous direct or electronic surveillance capable of preventing unauthorized entry.
- Control devices that automatically generate audible and visual alarm signals to alert personnel in the area before use or operation of the radiation source, and in sufficient time to permit evacuation of the area or activation of a secondary control device that prevent use or operation of the source.

[Appendix A, Requirement #63, RPP] (Table 2-1, D.3) (Table 2-1, D.4) (Table 2-1, G.3)

Basis Discussion: For radiological safety purposes, access to high radiation areas must be strictly controlled. Per Appendix A of 24590-WTP-RPP-ESH-01-001, a high radiation area is defined as any area, accessible to individuals, in which radiation levels could result in an individual receiving an equivalent dose to the whole body in excess of 0.1 rem (0.001 Sv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates. Per Table 5-1 of the BOD, only R5 areas have the potential to exceed this equivalent dose. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify conformance to the specified requirements for access controls, including any additional requirements or restrictions imposed by an associated ADR.	

3.4.3.2.6 Design to Limit Personnel Radiation/Contamination Exposure

Requirement: The design shall identify areas based on radiation and contamination levels and shall separate, shield, and control access to these areas to ensure personnel exposure to internal and external radiation during routine and non-routine operations are ALARA. [Appendix A, Requirement #108, RPP] (Table 2-1, D.4)

Basis Discussion: Measures are taken to maintain radiation exposure in controlled areas ALARA through engineered and administrative controls. The primary methods used to control radiation exposure are engineered controls (e.g., confinement, ventilation, remote handling, and shielding). Administrative controls are employed only as supplemental methods to control radiation exposure. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to verify the acceptable radiation and contamination levels, and the necessary shielding requirements for process and vessel areas.	
R	**ENG**	Review the results of the analysis to verify the proper shielding, separation, and access control is used in the appropriate areas.	

3.4.3.2.7 Shield Doors

Requirement: Where necessary or applicable, the design of shield door assemblies or adjacent walls shall permit simultaneous control of contamination and routing of breathing air hoses. Shield doors shall also be constructed for ease of decontamination and designed with airtight seals or an engineered gap to maintain sufficient air velocities to control contamination. [Section 7.1, ORD] (Table 2-1, D.4)

Basis Discussion: The design of shield doors to accommodate simultaneous control of contamination and routing of breathing hoses ensures that that facility worker exposure remains ALARA. The design of shield doors for ease of decontamination is consistent with ALARA principles, and the use of airtight seals/engineered air gaps ensures cascade airflow in EMF process and utility areas can be maintained from areas of lesser contamination potential to areas of greater contamination potential. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to determine the air gap value(s) necessary to maintain sufficient air velocities to control contamination.	This analysis is completed only if an engineered gap is chosen as the design feature, per the requirement statement.
R	**ENG**	Review the design to verify the shield door assemblies or adjacent walls permit simultaneous control of contamination and the routing of breathing air hoses.	
R	**ENG**	Review the design to verify shield doors are constructed for ease of decontamination.	
R	**ENG**	Review the design to verify an airtight seal or an engineered gap is used for contamination control.	
I	**ENG**	Inspect the installed design to verify conformance to the engineered air gap established in the analysis.	This inspection is completed only if an engineered gap is chosen as the design feature, per the requirement statement.

3.4.3.2.8 Off-Site Dose

Requirement: The EMF design shall support the overall WTP design and operating requirement to ensure that exposure to the maximally exposed off-site individual (non-acute) is ALARA, but not more than 1.5 mRem per year. [Section C.7 (a)(13), WTP Contract] [Section 14.3.1, BOD]

Basis Discussion: The limits are for WTP as a whole, taken in conjunction with the other facilities. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to determine the estimated dose rate of the EMF while operating the WTP in the DFLAW configuration.	
R	**ENG**	Review dose estimates from EMF and WTP, based on the process model and facility design, to verify the design is ALARA but not more than 1.5 mRem per year to off-site dose receptor.	

3.4.3.3 Environmental Protection Requirements

3.4.3.3.1 Environmental Temperature Design Parameters

Requirement: The EMF structure shall be designed to operate in the external environmental temperature conditions established in Section 4.12 of the BOD and shall consider the internal conditions to be maintained by the EMF HVAC systems as part of the facility design. [Section 4.12, BOD] [Section 15.1, ORD] (Table 2-1, B.1) (Table 2-1, D.1) (Table 2-1, D.2)

Basis Discussion: The EMF design should integrate with the ventilation system design. The requirements imposed on EMF HVAC systems for establishing internal design conditions are stated in Table 12-1 of the BOD and are included in Sections 3.9.1.4.3, 3.9.1.4.4, 3.10.1.4.1, and 3.10.1.4.2 of this document. The facility structure needs to operate within these temperature ranges.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Verify facility construction materials used are designed to withstand the internal and external environments of the EMF.	Review construction details and architectural materials for compliance.

3.4.3.3.2 Dangerous Waste Permit Tank System Design Requirements

Requirement: The design of DWP tank systems shall comply with the following DWP requirements from the BOD:

- The tank foundations shall maintain the load imparted by the filled tank (WAC 173-303-640[3][a][v][A]).
- The tank system shall withstand the effects of frost heave, if applicable (WAC 173-303-640[3][a][v][C]).
- The tank system components shall be designed to support testing for tightness prior to being covered, enclosed, or placed in use (WAC 173-303-640[3][e]).
- Ancillary equipment shall be designed in such a way that it is supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction. **Note:** Procedures described in American Petroleum Institute (API) Recommended Practice 1615, *Installation of Underground Petroleum Storage Systems*, or ASME B31.3-1996, *Process Piping*, may be used as guidance where applicable (WAC 173-303-640[3][f]).
- Backfill material for tank systems or components placed underground shall be noncorrosive, porous, and homogeneous. Backfill material shall be placed completely around the tank system components and

compacted so that the components are uniformly supported (WAC 173-303-640[3][d]), in accordance with WAC 173-303-680(2) and (3)].

- The tank system shall prevent the escape of vapors, fumes, or other emissions into the air if the tank holds materials acutely or chronically toxic by inhalation (WAC 173-303-640[5][e]).
- Underground tank system components likely to be affected by vehicular traffic shall be designed for protection against potential damage (WAC 173-303-640[3][a][iv]).
- The tank system shall be designed with the type and degree of corrosion protection recommended by an independent corrosion expert. **Note:** The practices described in the National Association of Corrosion Engineers Standard RP-02-85, *Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems*, and the API Recommended Practice 1632, *Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems*, may be used as guidelines for underground tank systems (WAC 173-303-640[3][a][iii]).

[Sections 14.10.1, BOD] [Condition III.10.E.3, section III.10.E.3.b, DWP] (Table 2-1, C.1)

Basis Discussion: A tank system, as defined in WAC 173-303-040, means a dangerous waste storage or treatment tank and its associated ancillary equipment and secondary containment system. Requirements for tank system design and integrity assessments are identified in WAC 173-303-640.

NOTE: Installation of EMF DWP SSCs is dependent upon incorporation of the revised design into the DWP. Additional design requirements of DWP tank systems are provided in Section 3.6.1. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	An independent, qualified, registered professional engineer (IQRPE) shall review the design to verify the tank system design per established codes and standards in the BOD to prevent damage.	The IQRPE prepares a written assessment attesting that the tank system has sufficient structural integrity and is acceptable for the storing and treating of dangerous waste. The assessment demonstrates that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

3.4.3.3.3 Dangerous Waste Permit Spill Prevention Controls Design

Requirement: The following requirements shall be implemented for tank systems as part of the spill prevention control design:

- Spill prevention controls shall be provided (e.g., check valves, dry-disconnect couplings) (WAC 173-303-640[5][b][i]).
- Overfill prevention controls shall be provided (e.g., level sensing devices, high-level alarms, automatic feed cutoff, pressure-sensing devices, or bypass to a standby tank) (WAC 173-303-640[5][b][ii]).
- The tank systems shall be marked with signs or labels visible at a distance for 50 ft where routine personnel access is required (WAC 173-303-640[5][d]).

- Signs or labels with a legend identifying the material within the tank system shall be provided to warn employees, emergency response personnel, and the public of major risks associated with the material (WAC 173-303-640[5][d]).

[Section 14.10.1.1, BOD] (Table 2-1, C.1) (Table 2-1, D.4)

Basis Discussion: Spill prevention controls are necessary to ensure that tanks/vessels containing dangerous liquid waste are clearly marked and the contents of the tank are identified for the safety of facility workers. Provisions for spill prevention are included in the design to prevent the release of dangerous liquid waste during waste transfers.

NOTE: Installation of EMF DWP SSCs is dependent upon incorporation of the revised design into the DWP. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	An IQRPE shall review the design to verify the tank system spill prevention control is designed per the established codes and standards in the BOD.	The IQRPE prepares a written assessment attesting that the tank system has sufficient structural integrity and is acceptable for the storing and treating of dangerous waste. The assessment demonstrates that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

3.4.3.3.4 Tank System Secondary Containment

Requirement: Tank systems shall be designed with liners, vaults, double-walled tanks, or an equivalent device as approved by Ecology for secondary containment. Portions of the tank systems (including sumps), that serve as part of the secondary containment system shall be exempted from the requirements for secondary containment. Concrete in stainless steel lined permitted secondary containment areas, where control of splashes, washdown sprays, or airborne contamination is necessary, shall be coated during construction with a durable chemical-resistant impermeable protective coating. Top edges of the liner plates in these secondary containment areas shall be sealed to the concrete surface. Secondary containment areas with intact protective coatings shall be decontaminated with water washing if necessary.
(WAC 173-303-640[1][c], [4][d][i-iv]). [Section 14.10.1.2, BOD] [Sections 13.4, 14.9, 20.0, ORD] [Section III.10.C.16.a, DWP] (Table 2-1, C.1) (Table 2-1, D.4).[Ch.11, Section 11.3.3.1, DWP].

Basis Discussion: Secondary containment systems for EMF process areas ensure that any releases of dangerous liquid waste from primary containment SSCs are captured and are not released to the environment. Secondary containment system design is in accordance with DWP requirements.

NOTE: Installation of EMF DWP SSCs, including secondary containment structural concrete, is dependent upon incorporation of the revised design into the DWP. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	An IQRPE shall review the design to verify all tank systems are provided with a suitable provision for secondary containment.	The IQRPE prepares a written assessment attesting that the tank system has sufficient structural integrity and is acceptable for the storing and treating of dangerous waste. The assessment demonstrates that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

3.4.3.3.5 External Liner Design

Requirement: External liners used as secondary containment shall comply with the following:

- Contain 100% of the capacity of the largest tank (WAC 173-303-640[4][e][i][A]). One-hundred percent capacity means the total volume of the tank It is not the expected process volume of the tank or the volume at the level where overflow prevention measures are implemented.
- As applicable, the liner shall be designed to handle volume of fire protection water from the fire protection water system (FPW) over the minimum design area for a period of 20 minutes in addition to the 100% capacity of the largest tank (UBC, Section 307.2.4).
- Prevent run-on or infiltration into the containment system unless the containment system has the capacity to contain precipitation from a 25-year, 24-hour rainfall event (WAC 173-303-640[4][e][i][B]).
- Be free of cracks or gaps (WAC 173-303-640[4][e][i][C]).
- Surround the tank completely and cover all surrounding earth likely to come into contact with the waste if it were released from the tank (i.e., be capable of preventing lateral and vertical migration of the waste) (WAC 173-303-640[4][e][i][D]).
- Collect releases and accumulated liquids until the collected material is removed (WAC 173-303-640[4][b][ii]).
- Be constructed of material that is compatible with the waste to be placed in the tank system (WAC 173-303-640[4][c][i]).
- Provide sufficient strength and thickness to prevent failure owing to (WAC 173-303-640[4][c][i]):
  - Pressure gradients, including static head and external hydrological forces
  - Physical contact with the waste
  - Climatic conditions
  - The stress of daily operation, including stresses from nearby vehicle traffic
- Be placed on a foundation or base capable of (WAC 173-303-640[4][c][ii]):
  - Supporting the secondary containment system
  - Resisting the pressure gradients above and below the system
  - Preventing failure due to settlement, compression, or uplift
- Provide a leak-detection system that detects the failure of primary tank system or the secondary containment system, the presence of any release of mixed or dangerous waste, or accumulated liquid in the secondary containment system within 24 hours of a leak (WAC 173-303-640[4][c][iii]). **Note:**

Ecology has interpreted this requirement to mean the detection of a leak of at least 0.1 gal/hr within 24 hours is defined as being able to detect a leak within 24 hours (DWP, Condition III.10.E.9.e.ii).

- Be sloped or operated to drain and remove liquids resulting from leaks, spills, or precipitation within 24 hours of a leak detection (WAC 173-303-640[4][c][iv]). (Provide a minimum of 1% floor slope, as specified in the secondary containment design document located in Appendix 7.5 of the DWP.)
- Allow for removal of spills, leaks, or accumulated liquid from the secondary containment system within 24 hours or in as timely a manner as possible. (WAC 173-303-640[4][c][iv]).
- Provide means to inspect the visible portion of the secondary containment system on a daily basis (WAC 173-303-640[6][b][iii]). **Note:** Typical civil structural details can be found in Appendix 7.5 of the DWP.
- Where stainless steel liners are used, they shall be extended up the walls to the regulatory required height. The walls above the steel may be sealed with suitable finishes depending on the conditions and as established by the ADR for the special protective coatings.

[Sections 14.10.1.2, 14.10.1.2.1, BOD] [Section 20, ORD] [Section III.10.M.5.g, DWP (Table 2-1, C.1) (Table 2-1, D.4)

Basis Discussion: Liners ensure that any releases of dangerous liquid waste from primary containment SSCs are captured and are not released to the environment. Liners are designed in accordance with DWP requirements. **NOTE:** Installation of EMF DWP SSCs is dependent upon incorporation of the revised design into the DWP. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	ENG	Perform an analysis to determine the required liner height for the EMF.	
R	ENG	Review the design to verify the acceptable DWP liner height for the EMF.	
R	ENG	An IQRPE shall review the design to verify all requirements for the external liners within the EMF have been met.	The IQRPE prepares a written assessment attesting that the external liner has sufficient structural integrity and is acceptable for the storing and treating of dangerous waste. The assessment demonstrates that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the external liner has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

3.4.3.3.6 Secondary Containment Design for Vault

Requirement: Vaults used as secondary containment shall comply with the following:

- Contain 100% of the capacity of the largest tank (WAC 173-303-640[4][e][ii][A]). One hundred percent capacity means the total volume of the tank. It is not the expected process volume of the tank or the volume at the level where overflow prevention measures are implemented.

- Prevent run-on or infiltration into the containment system, unless the containment system has the capacity to contain precipitation from a 25-year, 24-hour rainfall event (WAC 173-303-640[4][e][ii][B]).
- Constructed with chemical-resistant water stops in place at all joints (if any) (WAC 173-303-640[4][e][ii][C]).
- Provide with an impermeable interior coating or lining compatible with the stored waste to prevent migration of waste into the concrete (WAC 173-303-640[4][e][ii][D]). All coatings will meet the following performance standards:

  - III.10.M.5.h.i The coating must seal the containment surface such that no cracks, seams, or other avenues through which liquid could migrate are present;

  - III.10.M.5.h.ii The coating must be of adequate thickness and strength to withstand the normal operation of equipment and personnel within the given area such that degradation or physical damage to the coating or lining can be identified and remedied before dangerous and mixed waste could migrate from the system; and

  - III.10.M.5.h.iii The coating must be compatible with the dangerous and mixed waste, treatment reagents, or other materials managed in the containment system [WAC 173-303-640(4)(e)(ii)(D), in accordance with WAC 173-303-680(2) and (3) and WAC 173-303-806(4)(i)(i)(A)].
- Provide a means to protection against the formation of ignition of vapors within the vault if the waste is being stored or treated (WAC 173-303-640[4][e][ii][E]):
  - Meets the definition of ignitable waste under WAC 173-303-090(5)
  - Meets the definition of reactive waste under WAC 173-303-090(7) and may form an ignitable or explosive vapor
- Provided with an exterior moisture barrier or be otherwise designed or operated to prevent migration of moisture into the vault if the vault is subject to hydraulic pressure (WAC 173-303-640[4][e][ii][F]).

[Section 14.10.1.2.2, BOD] (Table 2-1, C.1) (Table 2-1, D.4), [Section III.10.M.5.h, DWP

Basis Discussion: Vaults are synonymous with process cells or tank and vessel cells. Vault design requirements are applicable for all rooms that do not contain stainless steel liners for secondary containment.

NOTE: Installation of EMF DWP SSCs, including secondary containment structural concrete, is dependent upon incorporation of the revised design into the DWP. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	An IQRPE shall review the design to verify all requirements for vaults within the EMF have been met.	The IQRPE prepares a written assessment attesting that the vault has sufficient structural integrity and is acceptable for the storing and treating of dangerous waste. The assessment demonstrates that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the vault has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

3.4.3.3.7 Ancillary Equipment Secondary Containment

Requirement: Tank system ancillary equipment that manages dangerous waste shall have secondary containment (e.g., trench jacketing, double-walled piping). [Section 14.10.1.3, BOD] (Table 2-1, C.1) (Table 2-1, D.4)

Basis Discussion: Ancillary equipment means any device (e.g., piping, fittings, flanges, valves, and pumps) used to distribute, meter, or control the flow of dangerous waste from its point of generation to a tank system, between dangerous waste storage tanks, or to a point of disposal or shipment offsite. For the purposes of the WTP project, in addition to the definition identified above, ancillary equipment may also include other in-line components containing dangerous waste such as breakpots, pulse pots, dampers, drains, overflows, jumpers, joggles, ejectors, strainers, reducers, misters, mixing tees, and certain heat exchangers associated with the piping. If unable to comply with the applicable design requirements, evaluate alternatives in accordance with WAC 173-303-640[4][f].

NOTE: Installation of EMF DWP SSCs is dependent upon incorporation of the revised design into the DWP. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	An IQRPE shall review the design to verify all requirements for ancillary equipment within the EMF have been met.	The IQRPE prepares a written assessment attesting that the ancillary equipment has sufficient structural integrity and is acceptable for the storing and treating of dangerous waste. The assessment demonstrates that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the ancillary equipment has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

3.4.3.3.8 Secondary Containment Design for Ancillary Equipment

Requirement: The secondary containment for ancillary equipment shall be designed for the following:

- Prevent any migration of wastes or accumulated liquid out of the system to the soil, groundwater, or surface water at any time during the use of the tank system (WAC 173-303-640[4][b][i]).
- Detect and collect releases and accumulated liquids until the collected material is removed (WAC 173-303-640[4][b][ii]).
- Be constructed or lined with materials compatible with the waste to be placed in the tank system (WAC 173-303-640[4][c][i]).
- Provide sufficient strength and thickness to prevent failure caused by the following (WAC 173-303-640[4][c][i]):
  - Pressure gradients, including static head and external hydrological forces
  - Physical contact with the waste
  - Climatic conditions
  - Stress of daily operation, including stresses from nearby vehicle traffic
- Be placed on a foundation or base capable of the following (WAC 173-303-640[4][c][ii]):
  - Support the secondary containment system
  - Resist the pressure gradients above and below the system
  - Prevent failure due to settlement, compression, or uplift
- Provide a leak detection system that detects, within 24 hours, the failure of the primary tank system or the secondary containment system, the presence of any release of mixed or dangerous waste, or accumulated liquid in the secondary containment system (WAC 173-303-640[4][c][iii]). **Note:** Ecology has interpreted this requirement to mean the detection of 0.1 gal/hr based on the DWP, Condition III.10.E.9.e.ii.
- Slope or be operated to drain and remove within 24 hours liquids resulting from leaks, spills, or precipitation (WAC 173-303-640[4][c][iv]).
- Remove within 24 hours, or in as timely a manner as possible, spills, leaks, or accumulated liquid from the secondary containment system. (WAC 173-303-640[4][c][iv])
- Provide a means to inspect the visible portion of the secondary containment system on daily basis (WAC 173-303-640[6][b][iii]).

[Section 14.10.1.3, BOD] (Table 2-1, C.1) (Table 2-1, D.4)

Basis Discussion: WTP secondary containment systems, including sumps, are exempt from WAC 173-303-640 subsection (4), including the WAC 173-303-640[4][c][iii] requirement to have secondary containment per WAC-173-303-640(1)(c) and EPA/530-SW-88-004 (EPA Office of Solid Waste and Emergency Response in the OSWER guidance document Rules for Hazardous Waste Tank Systems). Per EPA/530-SW-88-004, “Tank systems and sumps that are an integral part of a secondary containment system to collect or contain hazardous waste releases are exempt from the secondary containment requirements of the regulations.” All WTP facilities have been constructed without the ability to detect leaks from secondary containment sumps per the exemptions provided in the WAC and EPA source documents.

NOTE: Installation of EMF DWP SSCs is dependent upon incorporation of the revised design into the DWP. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	An IQRPE shall review the design to verify all requirements for ancillary equipment secondary containment within the EMF have been met.	The IQRPE prepares a written assessment attesting that the ancillary equipment secondary containment has sufficient structural integrity and is acceptable for the storing and treating of dangerous waste. The assessment demonstrates that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the ancillary equipment secondary containment has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.
T	SU/COM	Perform a test to verify the leak detection capability of secondary containment equipment for tank systems.	

3.4.3.3.9 Tank Inspection

Requirement: The tank system design shall provide means to perform the following:

- Inspect aboveground portions of the tank systems for corrosion or releases of waste (WAC 173-303-640[6][b][i]).
- Provide the capability to review data gathered from leak detection equipment (e.g., leak detection, level detection, pressure or temperature gauges, monitoring wells) to ensure that the tank system is being operated according to its design (WAC 173-303-640[6][b][ii]).
- Inspect the construction materials and the area immediately surrounding the externally accessible portion of the tank system (e.g. dikes), including the secondary containment to detect erosion or signs of releases of waste (e.g. wet spots, dead vegetation) (WAC 173-303-640[6][b][iii]).
- Inspect the tank systems for areas without secondary containment (WAC 173-303-640[4][f]).
- Inspect the cathodic protection system, if present (WAC 173-303-640[6][c])

[Section 14.10.1.5, BOD] (Table 2-1, C.1) (Table 2-1, D.4)

Basis Discussion: Tank systems are designed to be inspected on a regular basis to identify leaks and faulty equipment. Each of the tank inspection requirements above is to be completed once per operating day per the DWP.

NOTE: Installation of EMF DWP SSCs is dependent upon incorporation of the revised design into the DWP.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	An IQRPE shall review the design to verify the means for inspecting tank systems, including leak detection equipment, is in accordance with the requirement.	The IQRPE prepares a written assessment attesting that the tank system has sufficient structural integrity and is acceptable for the storing and treating of dangerous waste. The assessment demonstrates that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

3.4.3.3.10 Miscellaneous Unit Design

Requirement: Miscellaneous units, as defined in the BOD, Section 14, shall be designed to the same requirements as tank systems and ancillary equipment. [Section 14.13, BOD] (Table 2-1, C.1) (Table 2-1, D.4)

Basis Discussion: Miscellaneous units (e.g., condensers, heat exchangers, HEPA filters, etc.) are designed to the same requirements as tank systems and ancillary equipment due to the non-distinctive nature of their definition in the Washington Administrative Code. Design requirements in WAC 173-303-630 through 173-303-670, WAC 173-303-800 through 173-303-806, and 40 CFR 146 are appropriate for the miscellaneous units being permitted.

NOTE: Installation of EMF DWP SSCs is dependent upon incorporation of the revised design into the DWP.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	An IQRPE shall review the design to verify all requirements for miscellaneous units within the EMF have been met.	The IQRPE prepares a written assessment attesting that the miscellaneous unit has sufficient structural integrity and is acceptable for the storing and treating of dangerous waste. The assessment demonstrates that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the miscellaneous unit has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

3.4.3.3.11 Loading and Unloading Areas Managing Liquid Dangerous Waste

Requirement: Treatment, storage, and disposal facilities that receive or ship manifested shipments of liquid dangerous waste for treatment, storage, or disposal shall provide and use an area for loading and unloading waste shipments. The loading and unloading areas(s) shall be designed to do the following (WAC 173-303-395[4]):

- Contain spills and leaks that might occur during loading and unloading (WAC 173-303-395[4][a])
- Prevent the release of dangerous waste or dangerous waste constituents to ground or surface waters (WAC 173-303-395[4][b])
- Contain wash waters (if any) resulting from the cleaning of contaminated transport vehicles and load/unload equipment (WAC 173-303-395[4][I])
- Allow for removal, as soon as possible, of collected wastes resulting from spills, leaks and equipment cleaning (if any) in a manner that assures compliance with the previous bullets in this list (WAC 173-303-395[4][d])

[Section 14.14, BOD] [Section 13.1, ORD] (Table 2-1, C.1) (Table 2-1, D.4)

Basis Discussion: Examples of liquid dangerous wastes which may be manifested and shipped for off-site treatment and disposal are waste solvents, paints, adhesives, caustics, and acids. Since the EMF utilizes chemical reagents for corrosion mitigation and pH adjustment in the process, the unloading area must be designed to WAC 173-303-395[4].

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	An IQRPE shall review the design to verify all requirements for loading and unloading areas within the EMF have been met.	The IQRPE prepares a written assessment attesting that the waste shipment loading and unloading areas are designed to contain spills/leaks, prevent release of dangerous waste, contain washes, and provide capability for the removal of collected wastes. The assessment demonstrates that the waste shipment loading and unloading areas are sufficient to provide containment for collected wastes/washes and allow for removal of collected wastes in accordance with WAC requirements.

3.4.3.3.12 DELETED.

3.4.3.3.13 DELETED.

3.4.3.3.14 Building Confinement

Requirement: The building envelope enclosing potentially radioactive areas of the process facilities shall be designed, in conjunction with the HVAC systems, to provide confinement for normal operations and anticipated operational occurrences. [Section 10.3.4.10, BOD] (Table 2-1, B.1) (Table 2-1, D.4)

Basis Discussion: None. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the building design to verify the facility provides confinement, with the HVAC systems, for normal operations and anticipated operational occurrences.	

3.4.3.3.15 Atmospheric Monitoring for Hazardous Gases

Requirement: Atmospheric monitoring for gaseous hazards shall be provided for rooms or areas where there is a potential for the gas concentration to exceed the Permissible Exposure Limit due to a single failure or mis-operation. [Sections 8.1.1, 8.1.4.3, ORD] (Table 2-1, D.4) (Table 2-1, G.2)

Basis Discussion: Potential gaseous hazards may exist within the EMF. The lower value of the Permissible Exposure Limit, Threshold Limit Value, or Occupational Exposure Limit may be required for code compliance.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to identify the rooms or areas with the potential for gas concentrations to exceed the Permissible Exposure Limit.	
R	**ENG**	Review the design to verify the inclusion of appropriate monitoring equipment in areas identified in the analysis.	

3.4.3.3.16 Facility Design for Control of Hazardous Gases

Requirement: The following hierarchy of requirements shall be applied to the design of the EMF as applicable:

- The facility design shall maintain the room breathing zone below the Immediately Dangerous to Life and Health (IDLH) concentration during expected component failures and abnormal maintenance and operation activities, such as instrument tubing break or mis-operation of vent valves.
- If the facility design cannot prevent reaching IDLH concentrations, the time from the event to reaching IDLH concentration in the room shall be greater than 30 minutes.
- Where the system design cannot provide 30 minutes for identification and evacuation, the affected room shall be considered inaccessible to personnel while the hazard is present in the system piping.
    - Maintenance requirements and plant availability shall be evaluated to ensure contract requirements are met by the design with this limitation on access.
    - Rooms containing these systems shall include design access controls (e.g., locks).

[Section 8.1.4.4, ORD]

Basis Discussion: Potential gaseous hazards may exist within the EMF. If hazardous gases are generated by or contained within the process systems located in the EMF, the facility design is such that features are provided to mitigate the impacts of any release and provide for the safety of the workers.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to compare the duration for breeching dangerous threshold limits against personnel evacuation times.	
R	**ENG**	Review the design to verify the inclusion of design access control (e.g., locks) for the rooms identified in the analysis that cannot provide 30 minutes for identification and evacuation.	

3.4.4 Interface Requirements

3.4.4.1 Interface with the LAW Facility and Lab

Requirement: The EMF shall be designed to accept, store, and treat effluent from the LAW Facility and Lab. [Sections 6, 6.1.4, BOD] (Table 2-1, A.1)

Basis Discussion: The LAW RLD, LAW LVP, and Lab RLD systems transfer effluent to the EMF in the DFLAW configuration. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the EMF is designed to accept, store, and treat effluent from the LAW Facility and Lab.	

3.4.4.2 Interface with LERF/ETF

Requirement: The EMF shall be capable of transferring dilute effluent to LERF/ETF for further processing and treatment. [Section 6.1.4, BOD] [Section 18, ORD] [Section C.7(a)(6), WTP Contract] (Table 2-1, A.1)

Basis Discussion: Dilute effluent produced by the DEP system is collected and sampled prior to being sent to LERF/ETF for further processing in accordance with ICD-06. Discharge of the radioactive, dangerous liquid effluents is within the limits specified in HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the EMF's capability to transfer dilute effluent to LERF/ETF in accordance with the waste acceptance criteria identified in ICD-06.	

3.4.4.3 Deleted.

3.4.4.4 Interface with Tank Farms

Requirement: The EMF shall be capable of transferring untreated evaporator feed and concentrated effluent to Tank Farms, as well as transfer line drains/flushes, for storage. [Sections 6, 6.1.2, 6.1.4, BOD] (Table 2-1, A.1)

Basis Discussion: The primary flow path for concentrated effluent is return to the LCP system for blending with TOC waste feed; however, the option to return concentrated effluent to Tank Farms is provided in the event that the LAW Facility cannot receive concentrated effluent from EMF. Untreated evaporator feed can also be returned to Tank Farms, along with any associated transfer line drain/flushes.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the EMF's capability to transfer untreated evaporator feed, concentrated effluent, and transfer line drains/flushes to Tank Farms.	

3.4.4.5 DELETED.

3.4.4.6 DELETED.

3.4.4.7 Interface with Chemical Reagents

Requirement: The EMF design shall support the receipt and storage of anti-foam, sodium hydroxide, and sodium nitrite reagent. [Section 6.4, BOD] (Table 2-1, F.1)

Basis Discussion: Sodium hydroxide and sodium nitrite are used to adjust the feed and concentrated effluent chemistry to allow for transfer to Tank Farms or the LAW Facility. Anti-foam reagent is supplied to the DEP system to control foam generation in the waste within the evaporator.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the EMF design to verify the ability to support the receipt and storage of the chemical reagents.	

3.4.4.8 Interface with Electrical Distribution System (MVE)

Requirement: The EMF electrical power distribution system shall be supplied normal power from the BOF MVE system by 13.8 kV feeders. [Section 8.3.1, BOD] (Table 2-1, F.1)

Basis Discussion: The EMF design provides the space to accommodate the electrical equipment required to receive 13.8 kV power from the BOF MVE system. However, the electrical power distribution requirements associated with EMF are contained in 24590-WTP-3ZD-MVE-00001, *LAW, BOF, and LAB Medium Voltage Electrical (MVE) Low Voltage Electrical (LVE) and DC Electrical (DCE) System Design Description*.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the EMF's electrical power is supplied by the BOF MVE system.	

3.4.4.9 Interface with Grounding Electrical System (GRE)

Requirement: The EMF shall interface with the WTP GRE system to provide electrical ground and lightning protection to the facility. Electrical equipment, building steel, metal components, and metallic enclosures containing electrical apparatus that are likely to become energized under abnormal conditions shall be effectively grounded by direct or indirect connection to the building steel, embedded rebar, or the building grounding system. [Sections 8.8.1.1, 8.8.1.3, 8.8.2, BOD] (Table 2-1, D.1) (Table 2-1, D.2) (Table 2-2, G.1) (Table 2-3, F.1) (Table 2-4, H.1)

Basis Discussion: A lightning strike at the WTP site is considered a credible event. Providing a grounding and lightning protection system for the EMF ensures that the effects of a lightning strike or a power surge on the facility and facility workers are mitigated. System-level requirements associated with the design and testing of the

GRE system are contained in 24590-WTP-3ZD-GRE-00001, *System Design Description for the Grounding and Lightning Protection Electrical System*.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the inclusion of the GRE system in the EMF.	
R	ENG	Review the design to verify that electrical equipment, building steel, metal components, and metallic enclosures containing electrical apparatus likely to become energized under abnormal conditions are grounded by direct or indirect connection to the building steel, embedded rebar, or the building grounding system.	

3.4.4.10 DELETED.

3.4.4.11 DELETED.

3.4.5 Other Technical, Specialty, Operations and Maintenance Requirements

3.4.5.1 Required Service Life

3.4.5.1.1 Facility 40-Year Design Life

Requirement: The EMF shall have a 40-year operating design life. [Section C.7(a)(1), WTP Contract] [Section 10.3.4.3, BOD]

Basis Discussion: This requirement covers the facility structure. Design life requirements for internal systems are contained in other sections of this document. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify construction materials for the facility structure and internal structure associated with confinement area boundaries are specified or demonstrated for a 40-year service life.	

3.4.5.2 Specialty Requirements

3.4.5.2.1 Floor Drain System

Requirement: Floor drains or sumps shall be provided in areas requiring eyewash and safety shower stations to collect water drainage from eyewash and shower usage and testing. A floor drain system shall also be provided in process areas to dispose of leakage, fire water, and wash-down liquids. [Sections 10.2, 13.1, ORD] (Table 2-1, C.1)

Basis Discussion: A means to remove waste water from eyewashes and shower stations, as well as the capability to dispose of leakage, fire water, and wash-down liquids, must be provided within the EMF. Employing a system of sumps ensures that the waste water is routed to the appropriate location for further treatment/processing.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the EMF design to verify all areas with eyewashes and safety showers are equipped with a floor drain or sump.	
R	**ENG**	Review the EMF design to verify all process areas are equipped with a floor drain system to dispose of leakage, fire water, and wash-down liquids.	

3.4.5.3 Monitoring, Controls, and Communication

3.4.5.3.1 Interface for Monitoring and Controls

Requirement: The EMF shall interface with the LAW Facility control room (FCR) for monitoring and control of applicable facility and system SSCs during operations in the DFLAW configuration. [Sections 7.2.1, 7.2.1.2.1, BOD] (Table 2-1, G.3)

Basis Discussion: The EMF does not contain its own control room, as control of the EMF is provided through the LAW FCR. Refer to 24590-LAW-3ZD-20-00002, *LAW Facility Design Description*, for requirements associated with control and monitoring of the EMF from the LAW FCR during operations in the DFLAW configuration. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that an interface is provided with the LAW FCR for the monitoring and control of facility and system SSCs during operations in the DFLAW configuration.	

3.4.5.3.2 Interface for Standby Monitoring and Controls

Requirement: The EMF shall have the capability to interface with a standby control room (SCR) in the Lab for monitoring and control of applicable facility and system SSCs during operations in the DFLAW configuration. [Section 11.1, ORD] (Table 2-1, G.3)

Basis Discussion: During DFLAW operations, control and monitoring of the EMF is from the LAW FCR. The capability to interface with the SCR at the Lab ensures that monitoring and control of operating facilities, including EMF, is maintained in the event of adverse conditions in the LAW FCR. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that the EMF has the capability to interface with a standby control room in the Lab for the monitoring and control of facility and system SSCs during operations in the DFLAW configuration.	

3.4.5.3.3 Deleted

3.4.5.4 Safeguards and Security

3.4.5.4.1 Deleted

3.4.5.4.2 Perimeter Fence

Requirement: A perimeter fence line shall define the “Operating Island,” road, parking, and pedestrian accessways, and other boundaries that are required to separate the construction activities from the DFLAW early operation activities. The fence shall also act as a means to control access through gates or other entrances to the active portion of the facility at all times (WAC 173-303-310[2][c]). [Section C.7(d)(4)(iii), WTP Contract] [Section 14.15, BOD] [Section 6.1.3, DWP]

Basis Discussion: Although the perimeter fence is installed in the BOF yard which is subject to the requirements of 24590-BOF-3YD-50-00002, *Facility Description for the Balance of Facilities*, this requirement is directly applicable to the DFLAW operating configuration and therefore is verified in this document. These separate zones are necessary as they create access control between the DFLAW operations team and the Construction organization for personnel safety and security.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the perimeter fence separates the construction activities from the DFLAW early operation activities.	

3.4.5.4.3 Deleted

3.4.5.4.4 Boundary Signs

Requirement: Signs shall be posted at each entrance to the active portion, and at other locations, in sufficient numbers to be seen from any approach to the active portion. Additionally, signs shall be posted on entrances and exits to enclosed buildings where dangerous or mixed waste is actively managed. Signs shall bear the legend, “Danger - Unauthorized Personnel Keep Out,” or an equivalent legend, written in English and shall be legible from a distance of at least 25 feet or more (WAC 173-303-310(2)(a)). [Section 14.15, BOD] [Section 6.1.2, DWP]

Basis Discussion: During operations in the DFLAW configuration, the active portion of the WTP site (referred to as the “Operating Island”) is enclosed by a perimeter fence. Signage on the perimeter fence that surrounds the “Operating Island” identifies the active portion of the WTP site to site personnel who may be supporting construction activities in other areas of the WTP site.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the fence boundary design to verify inclusion of signage at each entrance for the identification of the active portion of the facility to site personnel, as well as on entrances and exits to enclosed buildings where dangerous or mixed waste is actively managed.	

3.4.5.5 Operations Requirements

The EMF is exempted from providing access for the physically handicapped. Therefore, no verification is required. [Section 10.3.4.9, BOD]

3.4.5.5.1 General Facility Requirements

Requirement: The EMF shall comply with the following general requirements if not specifically covered elsewhere in this document:

- Storage pads shall be provided for secondary waste drums awaiting pickup.
- General storage areas shall be provided for supplies and equipment needed to operate the plant.

[Sections 10.3.5, 10.5, 13.1, ORD] (Table 2-1, C.2) (Table 2-1, E.1) (Table 2-1, E.2) (Table 2-1, E.3) (Table 2-1, E.4)

Basis Discussion: The EMF includes storage facilities for miscellaneous operations support equipment and supplies depending on the level of support required. Secondary solid waste produced at the EMF includes equipment that is normally replaced during operations such as filters.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that general storage space is provided for supplies and equipment needed to operate the plant.	Operations to participate in the design review.
R	**ENG**	Review the design to verify that storage pads are provided for secondary waste drums.	

3.4.5.5.2 DELETED.

3.4.5.5.3 Breathing Service Air Considerations

Requirement: The EMF design shall provide breathing service air capabilities in C2 or C2/C3 subchange rooms for maintenance or recovery operations in C3 and C5 areas. The facility shall provide the following:

- Wall/door penetrations available to alleviate doors needing to be propped open and hoses potentially being pinched and damaged.
- Protective access door remains open and a second non-shielded door with access ports to allow hoses to be routed into area without being pinched.

- Access points to C3 and C5 areas to support manned entries for equipment recovery and maintenance evolutions, both normal (preventive) and corrective. Additional stations may be added to account for changing or unknown conditions during operation of facilities.

[Section 14.6, ORD] (Table 2-1, F.1)

Basis Discussion: The design is expected to incorporate, to the extent practical, accessibility for maintenance or recovery operations in designated C3 and C5 areas. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify facility layout and design for placement of breathing air access points, as required.	

3.4.5.5.4 DELETED.

3.4.5.5.5 Mobile Mechanical Lifting Equipment

Requirement: The facility shall provide for installed equipment or space for mobile equipment to provide mechanical lifting capability for any routine or anticipated lifts of equipment or supplies that exceed 40 lb. [Section 8.1.1, ORD] (Table 2-1, E.4)

Basis Discussion: Routine manual lifting of more than 40 lb of equipment or materials is to be avoided where possible per NIOSH Lifting Guide, 1991. The number of lifts, location, and how far the load is to be carried may be considered in determining the type and location of lifting equipment needed.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that anticipated or routine lifts of equipment and materials of more than 40 lb are provided with the capability to use installed or mobile mechanical lifting equipment.	Document in an evaluation or assessment report. Operations or Plant Engineering to participate in the evaluation or assessment.

3.4.5.5.6 Hoists

Requirement: The EMF shall include hoists that are located to remove equipment designed to be replaced during the operating life of the facility. [Section 20.0, ORD]

Basis Discussion: Hoists should be located throughout the facility in support of the anticipated maintenance and removal of EMF equipment.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify hoists have been included in the design to facilitate removal and replacement of failed components.	

3.4.5.5.7 Engineered Anchor Points

Requirement: Engineered anchor points shall be provided to accommodate the use of rigging, if required. Fall protection or tie-off points shall be provided in appropriate locations. [Section 14.16, ORD]

Basis Discussion: Provisions are included in the design to ensure all equipment is maintainable in the event that platforms and hoists do not provide adequate coverage.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that engineered anchor points are provided, if required, and fall protection or tie-off points are included.	

3.4.5.5.8 Hoist Operator Controls

Requirement: Standardized operator controls shall be provided between EMF hoists as much as possible to avoid errors that might occur when moving from one hoist to another. Hoists shall be designed with automation only as it adds value to the operation. Otherwise, they shall be operated directly. [Sections 14.1, 14.16, ORD]

Basis Discussion: Providing standardized controls that are remotely operable minimizes training required for operators and promotes worker safety by allowing operators to be removed from the proximity of loads being lifted. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify similar control units are provided for similar equipment.	
R	**ENG**	Review the design to verify automation is included in the design of hoists only where value is added to the operation.	

3.4.5.5.9 Standardization of Hoists

Requirement: Components shall be standardized and interchangeable between hoists to the maximum extent possible. [Section 14.16, ORD]

Basis Discussion: Providing standardized hoist components minimizes the spare part inventory and supports the maintainability of common mechanical handling equipment used at WTP. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify similar components are provided for similar hoists.	Operations to participate in a facility-wide review of hoist design approaches.

3.4.5.5.10 Hoist Brakes

Requirement: Brakes on hoists shall be designed to set when power is off. [Section 14.16, ORD]

Basis Discussion: To prevent the cranes from travelling along the rails when not in operation, the brakes on all drive functions are set when the power is off. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify brakes are set when crane and hoist power is off.	Operations to participate in a facility-wide review of hoist design approaches.
T	**SU/COM**	Perform testing to verify hoist brakes engage with a loss of power.	

3.4.5.5.11 Decontamination of Cranes/Hoists

Requirement: Where decontamination is applicable, a means for decontamination of hoists shall be provided. Electrical and mechanical parts and controls of the hoists shall not be degraded as a result of decontamination. [Section 14.16, ORD] (Table 2-1, G.1)

Basis Discussion: The EMF contains hoists to support the lifting and transport of system equipment inside the facility. The ability to decontaminate hoists supports the maintenance strategy for the facility and ensures worker exposure is ALARA. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify a means of decontamination, including disposal of waste liquid, is available for hoists located in the EMF.	
R	**ENG**	Review the design of the EMF hoists to verify that electrical and mechanical parts are compatible with the expected decontamination methods.	

3.4.5.5.12 Survey Stations

Requirement: Portable (hand-held) self-survey instruments and step-off pads shall be required (at a minimum) at designated exits from areas of contamination potential. [Section 12.7.1, ORD]

Basis Discussion: Inclusion of portable survey stations at designated egress points from potentially contaminated areas within the EMF mitigates the risk of contaminated materials being transported to non-contaminated areas. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify portable self-survey instruments and step-off pads are provided at exits from areas of contamination potential.	

3.4.5.5.13 Changing/Sub-change Areas

Requirement: Sub-change rooms and (or) airlocks shall be provided for personnel movement from a non-contaminated area to a contaminated area. These rooms shall provide space for changing between personal clothing and contractor-provided clothing and into radiological protective clothing, directly adjacent to controlled radiological areas. [Sections 10.3.1, 13.1, ORD] [Section 12.3.4, BOD] (Table 2-1, E.1)

Basis Discussion: Facility workers require access to C3 and C5 areas within the EMF to perform periodic maintenance and repairs. Providing an area within the EMF that supports change-out of radiological protective clothing prevents the spread of contamination to uncontaminated areas. This requirement only applies to normal access doors (not emergency exits). [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify an area is available within the EMF to change into radiological protective clothing to support personnel movement from a non-contaminated area to a contaminated area.	

3.4.5.5.14 Packaged Control Systems

Requirement: Packaged control systems shall have the capability to be placed in manual mode so that individual devices can be selected and operated at the local control points. [Section 11.12.3.5, ORD]

Basis Discussion: Packaged control systems constitute standalone, vendor supplied control systems. The ability to place packaged control systems in manual mode allows for ease and convenience of operation from the local control point.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify packaged control systems can be placed in manual mode and individual devices selected and operated at the local control points.	

3.4.5.5.15 Manual/Local Mode

Requirement: Maintenance control (also called direct control) shall be available as a means of operating devices independent of the control systems from a local panel, pendant, or motor control center, where appropriate. Systems used to control and monitor plant processes and equipment shall include direct actuation for drives via a maintenance control switch. [Sections 11.10, 11.12.3.6, ORD]

Basis Discussion: Control systems used for direct actuation of drives include systems controlling drive motors for fans, pumps, etc. Maintenance control is used in the event of control system failure or to perform operational tests as a result of equipment repair or maintenance.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify maintenance control is available as a means of operation independent of a local panel, pendant, or motor control center, where appropriate.	
R	**ENG**	Review the design to verify systems used to control and monitor plant process/equipment include maintenance control switches for direct actuation of drives.	

3.4.5.5.16 Emergency Stops (E-Stops)

Requirement: Where operators will be co-located with operating equipment and physical injury is credible, dedicated emergency-stop (E-Stop) buttons shall be provided near the machinery. Each individual E-Stop provided in the EMF, however configured, shall report its individual status back to its control system. Equipment with MHJ connection shall report E-stop status both to the MHJ and to the local control system. Equipment with no MHJ connection shall only provide E-stop status to the local control system. When the E-stops are activated, the E-stop circuit shall remain in a shutdown state until the circuit is physically reset to prevent equipment restart while the dangerous condition exists. [Section 7.3.9.1, BOD] [Section 11.12.5.3, ORD]

Basis Discussion: Guidance for the application of E-stops for equipment at the WTP is provided in 24590-WTP-ES-J-11-001. An evaluation of individual SSCs (e.g., hoists) within the EMF is to be performed to determine where E-Stops are required in the design.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Evaluate any potential credible events that may lead to operator injury for every piece of equipment located in normally accessible areas to determine which equipment requires E-stops.	Operations and ES&H to participate in review of equipment requiring E-stops.
R	**ENG**	Review the design to verify incorporation of emergency stops on equipment deemed to have a credible injury hazard.	
R	**ENG**	Review the design to verify individual E-stops report individual status to the appropriate control system and the equipment remains in a shutdown state until the circuit is physically reset.	
T	**SU/COM**	Perform a test to verify the emergency stop capability to (a) report status to the appropriate control system, (b) stop equipment, and (c) remain in a shutdown state until the circuit is physically reset to prevent equipment restart while the dangerous condition exists.	

3.4.5.5.17 DELETED.

3.4.5.5.18 Cable Routing

Requirement: Instrument cables shall be routed so that they:

- Do not interfere with the maintenance or removal of unrelated equipment
- Avoid hot environments and fire risk areas
- Are not subject to mechanical abuse

[Section 16.1, ORD]

Basis Discussion: Routing cables such that they are protected from hazards supports maintaining the cables and prevents the need for periodic replacements due to wear and abuse that can occur within the facility environment.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the cable routing design to verify cables (a) do not interfere with maintenance or removal of unrelated equipment, (b) avoid hot environments and fire risk areas, and (c) are not subject to mechanical abuse.	Plant Engineering or Operations to participate in review.

3.4.5.5.19 Exhaust Filtration Equipment Location

Requirement: Exhaust filtration equipment shall be located at or near individual enclosures to minimize long runs of ventilation ducting. [Section 20, ORD]

Basis Discussion: Placing filtration equipment in close proximity to the final common point for exhaust streams, gloveboxes, fume hoods, etc. minimizes long runs of ducting where contamination could accumulate. Minimizing long runs of ductwork supports the efficient deactivation, closure, decontamination and decommissioning of the facility and system components upon mission completion.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the ventilation ductwork design to verify exhaust filtration equipment is located at or near individual enclosures.	

3.4.5.5.20 Provisions for Material and Equipment Import/Export

Requirement: The facility design shall accommodate the use of equipment such as fork lifts, mechanical augers and air/vacuum transfer equipment for the import and handling of raw materials and equipment into the facility in order to prevent ergonomic related injuries. [Section 7.1, ORD] (Table 2-1, E.4)

Basis Discussion: Designing the facility to support the use of lifting and transfer devices ensures that raw materials and equipment can be safely imported and exported from the facility without the risk of injury to the facility worker.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the layout design of the facility to verify that lifting and transfer devices can be accommodated for the import and export of raw materials and equipment as necessary.	

3.4.5.5.21 Noise

Requirement: The EMF areas housing equipment shall be designed to be below the American Conference of Governmental Industrial Hygienists limits for continuous occupancy without personal protective equipment. Where this is impractical, the design shall minimize noise exposure levels to allow continuous occupancy with personal protective equipment up to the use of double hearing protection (109 dBA) when the equipment is in operation. Equipment within rooms shall be designed to be below 109 dBA when equipment is in operation. [Sections 8.1.5, 10.5, ORD]

Basis Discussion: Rooms with equipment that require personal protective equipment for entry are considered "high-noise areas use double hearing protection". Exemptions to this requirement may be granted in accordance with Section 2.1 of the ORD for equipment within rooms in excess of 109 dBA based on an Operations evaluation of the activities to be performed in that room to ensure facility operations are not impacted (maintenance activities for technical safety requirement equipment, operator and maintenance staffing, production rates, etc.).

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that equipment within EMF occupied plant spaces is designed to be below 109 dBA when placed in operation.	
T	**SU/ COM**	Perform noise level measurements to verify normal operating noise levels are in accordance with the applicable codes and standards within EMF occupied plant spaces.	

3.4.5.6 Maintenance Requirements

3.4.5.6.1 Equipment Accessibility

Requirement: The EMF design shall include the following:

- Adequate clearances and headroom around equipment to accommodate maintenance and operation personnel and any encumbrances such as protective garments, respirators, portable lifting devices, and alignment equipment for pumps, etc.
- Equipment and plant structural elements such as columns and beams shall be arranged to allow access to equipment by maintenance personnel.
- Equipment, instrumentation, and electrical components located more than 5 ft from ground level shall have adequate space to allow for access with a ladder, portable man-lift, or scaffolding for operations and maintenance.
- Equipment, instrumentation, and electrical components that are 6 ft and over from floor level shall be provided with a permanent work platform with fixed ladder and stair access to perform operation and maintenance.
- In-plant controls shall be easily accessible.
- Adequate space and support provided for installing permanent and temporary shielding in areas where it may be needed. Dual trains of radioactive systems, for example, shall have adequate space to be separated by shielding and still permit access by maintenance and operation personnel.
- Space for movement of large pieces of equipment, temporary containment enclosures for change areas, and changeout of large equipment.

- Plant and equipment that contain dangerous (hazardous) wastes shall have inspection provisions. The capability to perform these inspections shall be designed and included in the layout.

[Sections 9.1, 10.5, 11.16, 14.13, ORD] [Sections 10.2.14, 11.3.1, BOD] (Table 2-1, E.1) (Table 2-1, E.2)

Basis Discussion: The maintenance strategy for the equipment in the EMF is hands-on only. Therefore, adequate provisions for operator interaction with equipment must be included in the design. Deviations from the above requirements may be granted by the Facility Operations Lead or Plant Operations Manager. The design is expected to incorporate, to the extent practical, human factors practices, including tool use, ergonomics, and equipment and material handling. [ALARA]

Refer to the following documents for approved EMF exemptions to this requirement:

- 24590-WTP-ORDX-OP-15-0031
- 24590-WTP-ORDX-OP-15-0050
- 24590-WTP-ORDX-OP-15-0051
- 24590-WTP-ORDX-OP-16-0056
- 24590-WTP-ORDX-OP-16-0003
- 24590-WTP-ORDX-OP-16-0009
- 24590-WTP-ORDX-OP-16-0021
- 24590-WTP-ORDX-OP-16-0022
- 24590-WTP-ORDX-OP-16-0023
- 24590-WTP-ORDX-OP-16-0025
- 24590-WTP-ORDX-OP-16-0051
- 24590-WTP-ORDX-OP-17-0010
- 24590-WTP-ORDX-OP-17-0011
- 24590-WTP-ORDX-OP-17-0013
- 24590-WTP-ORDX-OP-17-0016
- 24590-WTP-ORDX-OP-17-0017
- 24590-WTP-ORDX-OP-17-0020
- 24590-WTP-ORDX-OP-17-0022
- 24590-WTP-ORDX-OP-17-0024

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the conceptual and detailed facility layout design to verify adequate equipment accessibility.	Operations to participate in review.

3.4.5.6.2 DELETED.

3.4.5.6.3 Equipment Location Supporting Maintenance

Requirement: Maintainable equipment components, such as drive motors, shall be located out of high radiation cave, cell, and bulge areas to the extent practical. [Section 7.1, ORD]

Basis Discussion: During normal operations, the EMF does not contain any high radiation areas (i.e., R5 areas). During off-normal operations, however, the lower level of the LAW effluent low point drain tank building has the potential to reach R5 area radiation levels. Locating maintainable equipment out of high radiation areas to the extent practical supports maintaining facility worker exposure levels ALARA. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify maintainable equipment is located outside of high radiation areas to the extent practical.	Operations to participate in review.

3.4.5.6.4 Removal and Replacement Capabilities in High Radiation Areas

Requirement: Where there is potential for equipment failure within a high radiation area (not black cells), means shall be provided for recovery of that equipment. [Sections 8.1.3, 9.1, 14.1, ORD]

Basis Discussion: During normal operations, the EMF does not contain any high radiation areas (i.e., R5 areas). During off-normal operations, however, the lower level of the LAW effluent low point drain tank building has the potential to reach R5 area radiation levels. For this reason, capability is provided within the facility design for the removal and replacement of equipment contained in this area. Recovery is accomplished by using either routine remote maintenance or, where permissible, manned intervention. Manned intervention is not an acceptable means for routine maintenance, but the capability is designed into the facility for off-normal recovery operations. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify components in high radiation areas can be maintained or replaced.	
T	**SU/ COM**	Perform a test to verify that the removal and replacement capabilities support replacement of necessary equipment in high radiation areas of the EMF.	This test is anticipated to be performed in conjunction with tests of the mechanical handling equipment.

3.4.5.6.5 Welding Receptacles

Requirement: Three-phase 480 VAC welding type receptacles shall be located in maintenance areas and where in-place repair of process equipment might be required, as determined by Operations. [Section 8.6.3, BOD] [Section 16.1, ORD]

Basis Discussion: The location of the LVE system receptacles should factor in the EMF facility layout and the location of equipment where in-place repair might be required.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that welding type receptacles are located in maintenance areas and where in-place repair of process equipment might be required.	Operations to participate in the review.

3.4.6 Other Facility-Level Requirements

3.4.6.1 Waste Management

3.4.6.1.1 Secondary Waste Disposal

Requirement: All waste streams, including mixed waste (hazardous and radioactive), shall be identified, minimized, and have designated disposal routes. [Section 20.0, ORD] (Table 2-1, C.1)

Basis Discussion: The ability to implement and verify this requirement depends on the development of an analysis of all secondary waste streams anticipated to be generated and an associated management plan. Reports satisfy permit conditions but do not satisfy design requirements. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify all requirements are met relative to supporting the management and disposal of all secondary wastes anticipated to be generated.	

3.4.6.1.2 Waste Management Design

Requirement: The waste management design strategy shall incorporate the following requirements:

- Comply with HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*.
- Most radioactive waste shall be considered as mixed waste, and the methods, equipment, and facilities for packaging and shipment of that type of waste shall be provided in the design.
- The use and storage of hazardous materials shall be minimized by limiting their quantities through design restrictions. These materials shall be controlled and located so that an accident or release of the materials does not jeopardize the safe conditions at WTP. Chemicals that have the potential to react shall be physically separated during storage.
- The generation of secondary wastes shall be minimized, including radioactive solid wastes, dangerous wastes, and nonradioactive and nondangerous liquid effluents.
- The design shall include appropriate disposal provisions for hydraulics fluids, oils, and refrigerants.
- Dangerous waste storage areas shall be provided in the waste accumulation areas of all facilities for both satellite accumulation areas and less-than-90-day storage areas. The location and space for waste segregation, packaging, and storage shall be clearly specified on plant layout drawings.
- Waste shall be segregated as near the source of the waste as practical.
- All radioactive solid waste packages sent to the DOE shall be designed to comply with either the Department of Transportation or approved Hanford Site Safety Analysis Reports for Packaging and the HNF-EP-0063 requirements.

[Section 18, ORD] (Table 2-1, C.2) (Table 2-1, E.3)

Basis Discussion: The ability to implement and verify this requirement depends on the development of an analysis of all secondary waste streams anticipated to be generated and an associated management plan. Reports satisfy permit conditions but do not satisfy design requirements. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify all requirements are met relative to supporting the management of all secondary wastes anticipated to be generated.	

3.4.6.1.3 Permit and License Compliance

Requirement: The EMF shall interface with the information management systems to meet all documentation requirements during operation. [Section 8.2, ORD] (Table 2-1, F.1)

Basis Discussion: The design requirements originating in the WTP permits and licenses that are applicable to the EMF have been allocated to this SDD. However, the EMF must also interface with the information management systems to meet all documentation requirements for permit compliance.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design of the EMF to verify information management systems are provided to meet all documentation requirements during operation.	

3.4.6.2 Decommissioning

3.4.6.2.1 Design for Future Volume Reduction

Requirement: The EMF structures shall be designed, where possible, using construction materials amenable to volume reduction and eventual disposal. [Section 20, ORD]

Basis Discussion: Where possible, the EMF is to be constructed of materials that can be readily demolished and crushed or compacted for disposal, or that can be salvaged and reprocessed pending free release. This is a design objective lower in precedence than the need for the facility to be designed to survive design basis conditions and still maintain safe containment and confinement of hazardous materials. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the facility materials used are amenable to volume reduction and eventual disposal.	Operations to participate in verification.

3.4.6.2.2 Decontamination and Decommissioning Requirements

Requirement: The EMF design shall include process and facility design features to safely and efficiently facilitate deactivation, decontamination, decommissioning, and the *Resource Conservation and Recovery Act of 1976* closure of facilities. Specific design features to be considered to support decommissioning shall include facilities to changeout and decontaminate equipment during deactivation for those components designed to be changed out during their operating life. Add to that, architectural material and product selection shall minimize the quantity of radioactive waste generated during decontamination, deactivation, and decommissioning activities. Interior finishes in areas of potential contamination shall be non-porous for ease of decontamination. [Section C.7(a)(12), WTP Contract] [Sections 10.3.4.11, 11.10, BOD] [Section 20.0, ORD]

Basis Discussion: Design features that simplify and facilitate D&D, minimize contaminated equipment, and minimize the generation of radioactive waste during deactivation and D&D are identified during the planning and design phase based upon anticipated decommissioning methods. Consideration of design features in support of this requirement is documented through the ADR process. This is a design objective lower in precedence than the need for the facility to be designed to survive design basis conditions and still maintain safe containment and confinement of hazardous materials. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Engineering/Operations review and acceptance of the conceptual and detailed designs of general facility requirements and any aspects of facility design supporting D&D.	

3.4.6.3 Equipment Standardization

Requirement: Whenever possible, standardized equipment shall be used between WTP facilities and within EMF for similar equipment performing similar duties to help improve operator familiarity, reduce maintenance training, minimize spare parts inventory, reduce maintenance procedures, and reduce design effort. [Sections 11.4.5, 12.6.2, BOD]

Basis Discussion: Equipment standardization is employed throughout the facility design where safety requirements and cost requirements can be satisfied. The WTP Project uses these standardized equipment designs whenever possible. Where identified as cost-efficient, the WTP Project develops new standardized equipment designs. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify facility equipment conforms to the requirement for standardized equipment.	Plant Operations may participate in review.

3.4.6.4 Civil, Structural, and Architectural Design Requirements

3.4.6.4.1 Earthwork

Requirement: Temporary and permanent earthwork slopes, excavations, structural fill, soil, and foundations shall be designed in accordance with the requirements of the *RPP-WTP Geotechnical Investigation* report. [Sections 10.1.5.1, 10.1.5.3, 10.2.6, BOD]

Basis Discussion: The *RPP-WTP Geotechnical Investigation*, WTSC99-1036-42-17, was performed by Shannon & Wilson Inc. The report characterizes the subsurface soil conditions at the site to provide the basis for foundation and structural design.

Verification: Verification is expected to be achieved through the following

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of temporary and permanent earthwork slopes, excavations, structural fill, soil, and foundations to verify adherence to the requirements of the *RPP-WTP Geotechnical Investigation* report.	

3.4.6.4.2 Structural Design Methods

Requirement: Reinforced concrete shall be designed by the strength design method. Structural steel shall be designed by the allowable stress design method. [Section 10.2.5, BOD]

Basis Discussion: The strength design method is the primary method for reinforced concrete design in the United States. The use of the allowable stress design ensures that the stresses developed in the structure due to service loads do not exceed the elastic limit.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of reinforced concrete to verify the use of the strength design method.	
R	**ENG**	Review the design of structural steel to verify the use of the allowable stress design method.	

3.4.6.4.3 Additional Energy Conservation Measures

Requirement: Additional energy conservation measures incorporated into the design of the EMF structure shall include the following:

- Exterior openings shall be weather stripped to minimize air leakage
- Personnel, equipment, and vehicular exterior access doors in conditioned buildings shall be insulated
- Vestibules shall be provided at all building entrances, where possible, to maintain positive or negative air pressure

[Section 10.3.4.8, BOD]

Basis Discussion: The above provisions supplement the energy conservation requirements of ASHRAE 90.1, *Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.*

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of EMF buildings to verify the additional energy conservation measures are included.	

3.4.6.4.4 Structural Stability

Requirement: The EMF structures shall be evaluated for stability against sliding and overturning. [Section 10.2.9, BOD]

Basis Discussion: The design of EMF structures should meet acceptable factors of safety against sliding and overturning defined in 24590-WTP-DC-ST-01-001, *Structural Design Criteria*.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the EMF structure design calculations to verify acceptable factors of safety against sliding and overturning are included.	

3.4.6.4.5 Deflection Limits

Requirement: Limitations for deflection of concrete and structural steel elements in EMF structures shall meet the requirements of the applicable design code referenced in the *Safety Requirements Document* (SRD). [Section 10.2.10, BOD]

Basis Discussion: None.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of the EMF structures to verify inclusion of the required deflection limits.	

3.4.6.4.6 Building Separation

Requirement: Building separation in the EMF shall meet the requirements in the *Seismic Analysis and Design Criteria*. [Section 10.2.12, BOD]

Basis Discussion: Section 8.6 of 24590-WTP-DC-ST-04-001, *Seismic Analysis and Design Criteria*, describes the minimum separation distances of structures at the WTP based on the recommendation of the NRC-approved document *Seismic Analysis of Structures and Equipment for Nuclear Power Plants*.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of EMF buildings to verify the required separation per the Seismic Analysis and Design Criteria.	

3.4.6.4.7 Seismic Proportioning and Detailing

Requirement: Seismic proportioning and detailing of concrete elements and structural steel members shall be in accordance with the *Seismic Analysis and Design Criteria*. [Section 10.2.13, BOD]

Basis Discussion: Section 8.7 of 24590-WTP-DC-ST-04-001, *Seismic Analysis and Design Criteria*, describes the governing codes and standards for seismic proportioning and detailing.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of the EMF structures to verify adherence to the appropriate method for seismic proportioning and detailing, per the *Seismic Analysis and Design Criteria*.	

3.4.6.4.8 Dead Loads

Requirement: The dead loads used in the design of the EMF structure shall include the weight of the structure, built-in partitions, permanent equipment, piping, raceways, HVAC ductwork, and other permanent static loads. [Section 10.2.7, BOD]

Basis Discussion: Dead loads include static forces that are relatively constant for an extended period of time, such as the weight of all permanent components of the structure.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of EMF structures for inclusion of the dead load considerations.	

3.4.6.4.9 Live Loads

Requirement: The live loads used in the design of the EMF structure shall include floor and roof area loads, dynamic loads from equipment, movable loads, laydown loads, cranes, monorails, forklifts, elevators, and moving vehicles. Minimum live loads shall comply with the applicable codes identified in the SRD. Drop loads shall be treated as live loads with impact. [Section 10.2.7, BOD]

Basis Discussion: Live loads include all the forces produced by the use and occupancy of a building and do not include construction and NPH loads such as wind load, snow load, earthquake load, ashfall load, or flood load.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of EMF structures for inclusion of the live load considerations.	

3.4.6.4.10 Other Loads

Requirement: The following loads shall be included in the design of EMF structures:

- Static lateral earth pressures for all structures shall be calculated using the lateral earth pressure coefficients recommended in the *RPP-WTP Geotechnical Investigation* report
- Active lateral earth pressures shall be used in the stability evaluation of structures.
- Earthquake loads shall be evaluated in accordance with the *Seismic Analysis and Design Criteria*

- Thermal loads during normal operating and accident conditions shall be calculated using temperature gradients
- Fluid loads shall include loads due to the weight of fluids with defined densities and maximum heights
- Piping reaction loads due to normal operation shall be considered

[Sections 10.2.6, 10.2.7, BOD]

Basis Discussion: None.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of EMF structures for inclusion of the required load considerations.	

3.4.6.4.11 Load Combinations

Requirement: The load combinations used in the design of EMF structures shall adhere to the following:

- The load combinations for the design of SC-IV reinforced concrete shall be based on the applicable codes identified in the SRD for SC-III reinforced concrete
- The load combinations for the design of SC-IV structural steel shall be based on the applicable codes identified in the SRD for SC-III structural steel
- The load combinations prescribed in the SRD shall be used to verify the allowable soil bearing capacity

[Sections 10.2.8.1, 10.2.8.2, 10.2.8.4, BOD]

Basis Discussion: None.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of EMF structures for inclusion of the load combination considerations.	

3.4.6.4.12 Exterior Building Materials

Requirement: Selection and placement of exterior EMF building material types, treatments, colors, and roof slopes shall reflect a coordinated WTP site aesthetic to create a visually unified project campus. [Section 10.3.4, BOD]

Basis Discussion: None.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of EMF buildings to verify coordination with the WTP site aesthetic.	

3.4.6.4.13 Building Colors

Requirement: EMF buildings shall be a neutral color that minimizes the visual/aesthetic impact on the surrounding environment. [Section 10.3.4, BOD] [Section 3.1.5, ICD-09]

Basis Discussion: None.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design of EMF buildings to verify the use of neutral colors in accordance with ICD 09.	

3.4.6.4.14 Interior Building Materials

Requirement: The interior building material products, salient features, sizes, and manufacturers (when necessary) shall be consistent throughout the EMF. [Section 10.3.4, BOD]

Basis Discussion: Standardizing building materials allows for ease of procurement and maintenance, and to reduces storage and handling requirements. Materials of particular importance are building envelope materials, roofing systems, interior finish materials, doors and door hardware/keying, signage, conveying systems, and plumbing fixtures.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design of EMF buildings to verify the standardization of building material products, salient features, sizes, and manufacturers.	

3.4.6.4.15 Material Durability

Requirement: Durable materials shall be selected for those interior and exterior EMF areas subject to equipment movement and operations of potential impact. [Section 10.3.4, BOD] [Section 10.1, ORD]

Basis Discussion: None.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design of the EMF buildings to verify the use of materials that are durable.	

3.4.6.4.16 Room and Door Numbering

Requirement: The EMF shall use the room and door numbering system that is consistent across all facilities throughout the WTP site. [Section 10.3.4, BOD] [Section 10.1, ORD]

Basis Discussion: None.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of EMF buildings to verify the use of a consistent room and door numbering system.	

3.4.6.4.17 Loading Bay Weather Protection

Requirement: The EMF loading bay/dock shall be weather protected. [Section 13.1, ORD] (Table 2-1, D.1)

Basis Discussion: Weather protection provides for the safe receipt and shipment of supplies, waste, and equipment at the EMF. Exceptions to this requirement may be approved by the respective Facility Operations Lead or Commissioning Operations manager.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of the EMF loading bay/dock to verify that it is weather protected.	

3.4.6.4.18 Exterior Door Awnings

Requirement: Awning-type structures shall be provided at personnel exterior doors located below eaves. [Section 13.1, ORD]

Basis Discussion: Awnings protect facility personnel from falling icicles. Exceptions to this requirement may be approved by the respective Facility Operations Lead or Commissioning Operations manager.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of personnel exterior doors to verify that an awning is provided.	

3.4.6.4.19 Door Design for Life Safety

Requirement: Doors shall be designed to meet Life Safety codes for the force required to open them during normal and adverse ventilation conditions. [Section 13.1, ORD]

Basis Discussion: This requirement ensures that large, heavy doors or doors with differential pressure between zones are able to be opened and do not injure personnel.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to evaluate whether doors at the EMF comply with the opening force required by the Life Safety Code.	

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify that doors at the EMF comply with the results of the analysis.	

3.4.6.4.20 Floor Design to Support Operations

Requirement: The EMF process facility floors shall be designed to accommodate the movement of loads to support operations and maintenance activities. [Section 13.1, ORD]

Basis Discussion: The LAW effluent process building floors should be designed to minimize severe slopes or obstructions that would prevent the movement of equipment (e.g. pallets with drums) throughout the building.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design of EMF process facility floors to verify the ability to accommodate the movement of loads to support operations and maintenance activities.	

3.5 General DEP System Requirements

3.5.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.5.1.1 Throughput (Design and Treatment Capacity)

3.5.1.1.1 DEP System Production

Requirement: The DEP system shall be capable of supporting the LAW Facility design capacity of 30 metric tons of glass (MTG) per day and a treatment capacity of 21 MTG per day. [Section C.7(b)(2), WTP Contract]

Basis Discussion: The LAW Facility is designed to produce 30 MTG per day. While operating in the DFLAW configuration, the DEP system must be designed to collect, process, and dispose of secondary liquid effluents to meet the LAW Facility throughput production requirements.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	ENG	Perform an analysis to verify the DEP system throughput capacity supports LAW Facility design capacity of 30 MTG per day and a treatment capacity of 21 MTG per day.	
R	ENG	Review the design to verify conformance to the results of the analysis.	
T	SU/ COM	Perform a test to verify the capability to support the LAW Facility cold commissioning capacity testing criteria.	Expected to be met along with the LAW production requirement in the *LAW Facility Design Description*, 24590-LAW-3ZD-20-00002.

3.5.1.1.2 DEP System Receipt of Waste

Requirement: The DEP system shall be capable of collecting and treating liquid waste from the LAW RLD system, the LAW LVP system, the Lab RLD system, and from transfer line flushes and drains (including flushes/drains associated with Tank Farms and inter-facility transfers). [Sections 6.1.2, 6.1.4, BOD] (Table 2-2, A.3) (Table 2-2, C.1)

Basis Discussion: The DEP system collection of LAW Facility and Lab effluents is in support of the LAW Facility's capability of producing 30 MTG per day in the DFLAW configuration. The DEP system is designed to support the LAW Facility at full design capacity (30 MTG per day) and at a minimum of 70% availability (21 MTG per day).

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the DEP system can collect and treat effluent from the sources stated in the requirement.	DEP system batch volume calculations and process throughput model to be used for verification of compliance with requirement.

3.5.1.1.3 DELETED.

3.5.1.1.4 DEP System Transfer of Concentrated Waste

Requirement: The DEP system shall be capable of transferring concentrated effluent to the LAW Facility, transferring concentrated effluent to Tank Farms, recycling concentrated effluent within the EMF, or transporting concentrate to tanker trucks. A viability, ALARA, and Safety study shall be performed prior to the use of tanker trucks. [Sections 6, 6.1.2, 6.1.4, 6.3.6, BOD] (Table 2-2, A.8.1)

Basis Discussion: Multiple disposal methods are provided for concentrated evaporator effluent in the event that one method becomes unavailable. The primary destination of the DEP system concentrated effluent is a return to the LAW Facility for waste processing. Requirements for this transfer line are contained in Section 3.14.1.2. Requirements for the transfer line to Tank Farms are contained in Section 3.14.1.3.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the DEP system is capable of returning concentrated effluent to the LAW Facility, transferring concentrated effluent to Tank Farms, recycling concentrated effluent within the EMF, or transporting concentrate to tanker trucks.	

3.5.1.1.5 Concentration of Liquid Effluent

Requirement: The DEP system shall be capable of concentrating the liquid effluent from LAW Facility (RLD system) and Lab (RLD system), as well as flushes/drains associated with Tank Farms and inter-facility transfers. [Sections 6.1.2, 6.1.4, BOD] (Table 2-2, A.4)

Basis Discussion: The ability to concentrate liquid effluents from the LAW Facility and Lab supports meeting the LAW Facility design capacity identified in Section 3.4.1.1.1 above for operations in the DFLAW configuration.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	ENG	Perform an analysis to verify the ability of the DEP system to concentrate the liquid effluent from the LAW Facility (RLD system) and Lab (RLD system), as well as flushes/drains associated with Tank Farms and inter-facility transfers.	
R	ENG	Review the design to verify conformance with the results of the analysis.	

3.5.1.1.6 LAW Facility Feed Line Flushing

Requirement: The DEP system shall be capable of flushing the feed line from the EMF to the LAW Facility with a combination of 5M sodium hydroxide and process condensate. [Section 6, BOD]

Basis Discussion: In the event that the TOC could become unavailable for timely transfers, the DEP system should have provisions to mitigate the high chlorine concentration of the evaporator concentrate on the Type 316L stainless steel piping. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify that the DEP system is capable of flushing the feed line to the LAW Facility with a combination of 5M sodium hydroxide and process condensate.	

3.5.1.2 Design Life

3.5.1.2.1 Minimum Design Life

Requirement: Non-replaceable, non-maintainable, permanent DEP system plant equipment shall be designed for a minimum design life of 40 years, inclusive of maintenance. Design life of equipment shall consider the effects of chemical, radiological and thermal exposure. [Sections 11.1.1, 11.7.4, BOD]

Basis Discussion: Equipment and material selection is based on proven performance, value engineering principles, and fit-for-function principles. The selection of equipment and materials is further addressed in detail as the design progresses. Equipment design needs to address the routine environmental exposures under normal operations for non-safety equipment; this minimizes the need for equipment maintenance, exposure, and radiological waste generation in radiological areas. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the design life of non-safety non-replaceable, non-maintainable SSCs is documented in procurement documents and supported by supplier certificates of conformance.	

3.5.1.2.2 Materials of Construction and Erosion/Corrosion Design Parameters

Requirement: The DEP system SSCs shall be designed to include adequate allowance for erosion and corrosion. [Section 11.9, BOD]

Basis Discussion: The allowance for erosion/corrosion and applicable materials of construction are limited to those components that come into contact with the process fluids and that are required to maintain confinement/containment of those process fluids. Materials of construction that can withstand the erosive/corrosive low-activity waste effluents and chemicals are selected. The materials for the DEP system equipment and components should be selected based on the stream data presented in the process corrosion data sheet report. Refer to 24590-BOF-RPT-PR-15-001, *Direct Feed LAW Process Corrosion Data*, for the fluid characteristics of the process streams.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	ENG	Perform an analysis of materials used in DEP system SSCs that are in contact with the process fluids to verify they are acceptable for use in the operating environment and have adequate erosion and corrosion allowances.	Per corrosion evaluation(s) and pipe class sheet(s) for the DEP system SSCs in contact with the process fluids. (N1D and 3PB document types)
R	ENG	Review the design of the selected components used in the DEP system that are in contact with the process fluids to verify conformance with the analysis.	

3.5.1.3 Seismic Design

Requirement: The DEP system equipment and components shall be designed as non-safety, Seismic Category IV (SC-IV)/Performance Category 1 (PC-1). [Section H.53(c)(1), WTP Contract]

Basis Discussion: The designation of the EMF as SC-IV is a critical design input in the WTP Contract that supports completing the DFLAW configuration within cost and schedule targets. .

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify all DEP system equipment and components meet the non-safety, SC-IV/PC-1 requirements.	

3.5.1.4 Availability in the DEP and Supporting Systems

Requirement: The DEP system, along with its supporting systems, shall be designed with sufficient process redundancy and equipment reliability to support a minimum integrated facility availability equal to or greater than 70 percent. [Section C.7(b)(1), WTP Contract] [Section 11.4.2, BOD]

Basis Discussion: The LAW Facility treatment capacity is 21 metric tons per day at an overall DFLAW availability of 70%. Prior to startup and availability of the PT Facility, there is no process redundancy for delivery of feed to the LAW Facility. The DFLAW configuration, however, does provide process flexibility including bypass of the evaporator, and equipment redundancy for increased reliability in managing RLD and LVP system effluent disposal. Redundancy allows the failed equipment to be repaired and the facility to continue to operate. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform model runs to verify the availability and operating efficiency of the DEP system using the DFLAW configuration.	Evaluation to be completed for integration between systems and facilities.

3.5.1.5 Environmental Conditions for DEP Non-Safety SSCs

Requirement: The DEP system equipment and components tagged non-safety shall be designed to operate within the conditions identified in Table 12-1 of the BOD if they are located indoors and within the conditions identified in Table 4-7 of the BOD if they are located outdoors. [Section 4.12, Table 4-7, Table 12-1, BOD] [Section 16.1, ORD]

Basis Discussion: None.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of indoor DEP system non-safety SSCs to verify compliance with BOD Table 12-1 conditions.	
R	**ENG**	Review the design of outdoor DEP system non-safety SSCs to verify compliance with BOD Table 4-7 conditions.	

3.5.1.6 Recycle Capability

Requirement: Strategic locations shall be identified within the DEP system process train to provide the capability to re-work/recycle effluent and the capability to transfer the contents of the downstream vessels back to other vessels. [Section 7.1, ORD] [Section 6.7.4, BOD]

Basis Discussion: In general, cross-connecting vessels at strategic locations in the DEP system provides process redundancy that improves reliability, operability, accessibility, and maintainability of the system. Recycling liquids within the process also minimizes the effluent volume discharged from the WTP.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	ENG	Perform an analysis to determine the vessels in the DEP system where the capability to transfer the contents of downstream vessels back to other vessels provides benefit to the re-work/recycle philosophy of the WTP.	
R	ENG	Review the design to verify cross-connections are provided at strategic vessel locations in the process system.	

3.5.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

None.

3.5.3 System Interface Requirements

None.

3.5.4 Other Technical, Specialty, Operations and Maintenance Requirements

3.5.4.1 DELETED.

3.5.4.2 Tank Farms Transfer Corrosion Mitigation

Requirement: The DEP system design shall include one of the following methods to meet ICD-31 corrosion mitigation control requirements for transfers to Tank Farms:

1. Design the capability to control via hydroxide concentration by:
   a. Provide the capability to control the effluent temperature ≤ 35 °C (or 95 °F) prior to transfer
   b. Provide the capability to control $[NO_3^-] \leq 1.5$ M
   c. Provide the capability to control $[SO_4^{2-}] \leq 0.2$ M
   d. Provide the capability to control total halide (F^- and Cl^-) concentration ≤ 0.25 M
   e. Provide the capability to adjust $[OH^-] > 1.0$ M
   f. Provide the capability to adjust $[NO_2^-] > 0.5$ M

OR

2. Design the capability to control via nitrite concentration by:
   a. Provide the capability to control the effluent temperature ≤ 35 °C (or 95 °F) prior to transfer
   b. Provide the capability to control $[OH^-] < 1.0$ M
   c. Provide the capability to control pH ≥ 12
   d. Provide the capability to control total halide (F^- and Cl^-) concentration / $[NO_3^-] > 0.03$
   e. Provide the capability to control $[NO_3^-] \leq 1.5$ M
   f. Provide the capability to control $[SO_4^{2-}] \leq 0.2$ M
   g. Provide the capability to control total halide (F^- and Cl^-) concentration ≤ 0.25 M
   h. Provide the capability to adjust $[NO_2^-]$ to the maximum value of $[NO_2^-] > 0.3$ M or $[NO_2^-] > 10$ x total halide (F^- and Cl^-) concentration

[Section 2.3, ICD-31] (Table 2-2, B.1)

Basis Discussion: In order to return evaporator concentrate to Tank Farms, the DEP system must chemically adjust unconditioned effluent to meet the requirements of ICD-31.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify that the one of the two capabilities that are included in the requirement are met.	

3.5.4.3 Sampling and Adjustment of Effluent for Transfer to Tank Farms

Requirement: The DEP system shall have the capability to sample unconditioned effluent to determine the chemical additions required for a transfer to Tank Farms. The DEP system shall have the capability to make chemical additions to the unconditioned effluent as necessary to meet the corrosion control criteria identified in Table 4 of ICD-31. The DEP system shall provide the capability to sample the conditioned effluent on a DFLAW feed campaign basis in an EMF vessel or in the transfer pipeline to Tank Farms downstream of the chemical addition. [Sections 1.2, 2.3, 2.5.2, ICD-31] [Section 6.1.2, BOD] (Table 2-2, B.1)

Basis Discussion: The sample checks the concentrations of hydroxide, nitrite, nitrate, sulfate, chloride, and fluoride in the unconditioned effluent for comparison with the corrosion control criteria identified in Table 4 of ICD-31. After the necessary chemical additions are made, the conditioned effluent is sampled and analyzed for comparison with the waste compatibility criteria contained in Table-6 of ICD-31 to confirm the bounding waste profile is adequate.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the capability to sample the unconditioned effluent to determine the chemical additions required for a transfer to Tank Farms.	
R	ENG	Review the design to verify the capability to make chemical additions for compliance with Table 4 of ICD-31.	
R	ENG	Review the design to verify that the effluent being transferred to Tank Farms can be sampled on a DFLAW feed campaign basis within an EMF vessel or the transfer pipeline downstream of the chemical addition.	

3.5.4.4 DELETED.

3.5.4.5 System Flushing to Support Maintenance

Requirement: The DEP system equipment shall be designed to be flushed and drained to support contact maintainability and shall be located outside of high radiation areas to the extent practical. [Sections 14.1, 20, ORD] (Table 2-2, D.1)

Basis Discussion: The DEP system equipment is washed down and able to be worked on by maintenance workers without the help of robotics, cranes, or other mechanical equipment to the extent practical. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that DEP system equipment can be flushed and drained.	
R	**ENG**	Review the design to verify maintainable equipment is located outside of high radiation areas to the extent practical.	

3.5.4.6 Provisions for Extra Nozzles, Branches, or Spools

Requirement: The DEP system design shall accommodate provisions as necessary to support testing as identified in Appendix A. [Section 11.4.7, BOD] [Sections 19.6, 19.12, ORD]

Basis Discussion: Additional nozzles, branch lines, removable spools or other provisions that may be needed to support identified testing are to be accommodated in the design as jointly determined by the design agency, startup and commissioning during the design development and review process, with consideration given to the tests and demonstration activities required for requirement verification specified in Appendix A. This may include (but is not limited to) provisions to support the introduction or removal of fluids, gases, reagents, or simulants; or the availability of special test ports, sampling ports, or temporary instruments or instrument lines.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG/ SU/ COM**	Review the design to verify the requirement is met based on established tests and demonstrations to be performed during startup and commissioning.	

3.5.4.7 Isolation and Test Points

Requirement: Isolation and test points with drain and bleed valves shall be included in the DEP system design to allow for testing of plant items during normal operations and removal or replacement, as applicable. For work on high-energy systems (fluid systems with operating parameters greater than 200 °F and/or 500 psig.), a double block and bleed method of isolation shall be provided for all paths where the fluid could cross the work boundary involving hands-on maintenance. If isolation of the high-energy system impacts unit operations, the double block and bleed arrangements shall be applied to individual components. Isolating devices shall be capable of being locked out and shall provide visible indication of the device position required. [Section 11.5.1, BOD] [Sections 9.1, 19.14, ORD]

Basis Discussion: Isolation and test points that are needed to support testing are identified by the design agency, startup, and commissioning during the design development and review process, with consideration given to the tests and demonstration activities required for requirement verifications specified in Appendix A. Isolations and test points are provided within the design as necessary to support the testing plan. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify isolation and test points with drain and bleed valves are installed to allow for testing of equipment during normal operations.	
R	ENG	Review the design to verify double block and bleed isolations are provided on all high energy systems where the fluid could cross the work boundary involving hands-on maintenance.	
R	ENG	Review the design to verify double block and bleed protections are provided on individual components where isolation of the high energy system impacts operations.	
R	ENG	Review the design to verify isolating devices are capable of being locked out and provide visible indication of the device position required.	

3.5.4.8 Manual Sample Points

Requirement: WTP shall provide sample points to allow for sampling of radioactive, dangerous liquid effluent to confirm compliance with the LERF/ETF treatability envelope and the LAW facility during normal operations. Sampling systems shall be designed to preclude secondary hazards (e.g., loss of containment), and shall provide a disposal route for excess sample and secondary waste. The design of the sampling equipment shall not introduce a bottleneck in the processing of material. [Sections 6.1.4, 11.6.7, BOD] [Section 14.14, ORD] [Section 1.2, ICD-31] [Section 3.1.1.8, ICD-06] (Table 2-2, A.6.1) (Table 2-2, A.6.2)

Basis Discussion: The EMF uses manual sampling for all samples that need to be collected and analyzed. An exception to the ORD requirement for automatic sampling has been approved in 24590-WTP-ORDX-OP-15-0049.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify sample points are included to allow for manual sampling of waste during normal operations.	
R	ENG	Review the design to verify that the sampling equipment maintains containment of sampled process fluids and provides a disposal route for excess effluent and secondary waste.	
R	ENG	Review the design to verify the sampling equipment does not introduce a bottleneck in material processing.	

3.5.4.9 Remote Valve Operation

Requirement: Remote valve operation from the LAW FCR shall be provided for DEP system valves located where accessibility is difficult, such as R5/C5 areas, and for valves used in routine operations. Manual valve reach rods, if necessary, shall be designed to be removed easily and, when reinstalled, only engage the valve in the correct alignment, using no more than two universals. Valves in remotely maintained areas that are repositioned to support processing (this includes support systems) shall have position indication from directly coupled positioning mechanisms unless other indications are available such as flow, level, pressure, etc. [Section 14.4, ORD] (Table 2-2, E.2) (Table 2-2, F.3)

Basis Discussion: Remote operation is used to ensure the WTP facilities' design achieves occupational doses that are ALARA. The need for "remote" operation does not apply to a black cell or pit only, but instead applies to an automatic valve or other feature needed to operate a valve at a distance. Valve position indication signals can be visual, mechanical, electric, or electronic based on the valve location and type of valve. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify remote operation is provided for valves located in areas where accessibility is difficult (e.g., R5/C5 areas) and for valves used in routine operations.	
R	**ENG**	Review the design to verify manual reach rods are easily removed and engage in the correct alignment using no more than two universals.	
R	**ENG**	Review the design to verify valves in remotely maintained areas have position indication from directly coupled positioning mechanisms unless other indications are available.	

3.5.4.10 Automatic Valve Actuation

Requirement: Automatic valve operator closure devices shall be sufficiently slow to prevent damage from fluid-induced water hammer. The WTP control system shall ensure that the permissive is removed before any WTP actuated valve is closed. [Section 11.7.4, BOD] [Section 14.4, ORD] [Section 3.1.1.11, ICD-30][Section 3.1.1.15, ICD-31[ID: WTP-ICD-MG-01-031 ID#381]]

Basis Discussion: Damaging fluid pressure transients, often referred to as water hammer, are potentially generated upon the rapid closure of automatic valves due to the sudden change in liquid flow rates. Ensuring WTP valve closures are delayed until after the permissive is removed will allow TOC to stop the transfer feed pump to mitigate water hammer potential.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the valve stroke time conforms to the results of fluid transient studies conducted for the WTP.	
R	**ENG**	Review the control system design to verify that the permissive is removed before any WTP actuated valve is closed.	

3.5.4.11 Valve Lockout

Requirement: DEP system valves shall be designed and procured where possible to support lockout using commercially manufactured devices other than chains. [Section 7.1, ORD]

Basis Discussion: The design of DEP system valves for compatibility with commercial off-the-shelf locking devices supports maintainability, operability, and testing of the valves throughout the life of the valve.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify all valves are designed and procured where possible to support lockout using commercially manufactured devices other than chains.	

3.5.4.12 Decontamination Provisions

Requirement: The DEP system equipment subject to decontamination shall be designed to withstand this process without any reduction of functionality through degradation of the electrical, mechanical, or any other components involved. [Section 9.1, ORD]

Basis Discussion: Equipment operating in a contaminated environment is monitored and, if necessary, decontaminated before maintenance. The specifications must convey that the equipment design accounts for these processes. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the DEP system design to verify equipment can withstand decontamination processes without reduction or degradation of equipment functionality.	

3.5.4.13 Radiation Detection

Requirement: Where there are radiation monitors to detect radiation breakthrough in non-contaminated systems that interface with the DEP system (e.g. steam and cooling water), there shall be the means to divert streams from the normally non-contaminated systems to alternate locations or to isolate the normally non-contaminated stream discharge. [Section 7.1, ORD]

Basis Discussion: Instrumentation systems are provided to detect breakthrough in cooling water, steam condensate, and liquid effluents. Conductivity measurements are provided in locations where it can be verified that a means of detection is appropriate and effective. Standard liquid effluent radiation monitors and cooling water monitors are designed and installed where radiation monitors are included in the design. These instrumentation systems, in conjunction with isolation valves, diversion valves, holdup tankage, and alarms (where required), serve to prevent significant radioactive discharges into streams that are expected to be non-active. In the event of a non-contaminated system becoming contaminated, this provides the ability to isolate and direct the streams from normally non-contaminated systems to other areas in the process. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify all places where radiation monitoring of non-contaminated systems that interface with the DEP system (e.g. steam and cooling water) is provided, there is an alternate path for the normally non-contaminated stream or isolations for the normally non-contaminated stream discharge.	

3.5.4.14 Freeze Protection

Requirement: Electrical freeze protection shall be provided for DEP system liquid filled piping and instrument sensing lines subject to freezing and process lines which must be maintained at a specific operating temperature. [Section 8.7, BOD] [Section 16.5, ORD] (Table 2-2, G.2)

Basis Discussion: To prevent liquid filled piping and instrument sensing lines from freezing when exposed to low temperatures, a means of freeze protection is included in the design of the piping or controls systems.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of the DEP system to verify that heat tracing is provided for liquid filled piping and instrument sensing lines subject to freezing.	This is done prior to installation.

3.5.4.15 Sectionalized Thermal Insulation

Requirement: When thermal insulation is required around DEP system valves and in-line instruments, it shall be sectionalized to allow easy removal and replacement. [Section 11.16, ORD]

Basis Discussion: Thermal insulation is used in piping system design for heat conservation, freeze protection, and personnel protection. For personnel protection purposes, insulation reduces the temperature of valve and in-line component surfaces in accessible areas so that personnel are not harmed by physical contact. Equipment accessibility is a consideration of the general plant lay-out and valve and in-line instrument design.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify insulation provided around valves and in-line instruments is sectionalized.	

3.5.4.16 Deleted

3.5.4.17 Prevention of Steam Induced Water Hammer

Requirement: The DEP process system design shall include adequate provisions to preclude steam-induced water hammer. The ability to isolate part of the steam header shall be provided. Isolation of steam headers shall include the provision to double block and bleed the system. There shall be an adequate number of condensate drains at the low points to assure complete condensate drainage before reintroduction of steam. For steam systems 3 inches and larger, where pipe length and configuration create the potential for steam induced water hammer, there shall be bypass warm-up lines. There shall be high point vents to avoid vacuum formation and incomplete draining during steam system shutdown. [Section 7.1, ORD]

Basis Discussion: The DEP system design should include protection from fluid-induced water hammer, covered in requirement 3.5.4.10 of this document, as well as steam-induced water hammer.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify provisions are included in the design for the prevention of steam-induced “water hammer”.	
R	**ENG**	Review the design to verify double block and bleed isolations, condensate drains, bypass/warm-up lines, and high point vents are provided as needed to prevent steam induced “water hammer”.	

3.5.4.18 Temperature Element Installation

Requirement: DEP system temperature elements shall be installed in thermowells to allow for removal without interrupting the process. [Section 11.16, ORD]

Basis Discussion: Installing temperature elements in thermowells reduces maintenance time and worker exposure to process fluids. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the DEP system design to verify temperature elements are installed in thermowells.	

3.5.4.19 Flush Mounted Instrumentation

Requirement: DEP system instrumentation installed in piping with solids shall be flush-mounted. [Section 11.16, ORD]

Basis Discussion: Flush mounting prevents solids from plugging and the instrumentation from providing erroneous indications as it does not create an obstruction of flow where solids could accumulate. For example, transducers installed in a short pipe stub would fill with solids. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify instrumentation installed in DEP system process piping is flush mounted.	

3.5.4.20 Steam Valve Racks

Requirement: Steam valve racks shall be provided at the interface where steam is introduced into the DEP system. Appropriate additional protection shall be provided to prevent contamination created by vacuum when the steam is turned off. [Section 14.4, ORD] [Section 11.6.6, BOD]

Basis Discussion: Inclusion of steam valve racks at the interface point allows for isolation of the utility system steam piping from the process system steam piping. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify steam valve racks are provided at the interface with the utility steam system and that protections are in place to prevent contamination created by vacuum when the steam supply is turned off.	

3.5.4.21 Steam Line Lagging

Requirement: Steam line lagging shall not cover DEP system valves and other equipment such as to prevent its use and identification, and not introduce hazards when removing or replacing the lagging, (sharp edges, etc.). Lagging blankets shall be installed if access is required regularly. [Section 7.1, ORD]

Basis Discussion: The ability to access and identify valves and other equipment contained in steam system piping is a consideration for the design of lagging and incorporation of lagging blankets in the design. Design for accessibility and maintainability supports continued operation of the steam and process systems.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of the steam system piping to verify any provided lagging does not impact the continued use and identification of in-line components and instruments.	
R	**ENG**	Review the design of the steam system piping to verify blankets are provided in locations where regular access to steam system piping is required.	

3.5.4.22 Permanently Lubricated Components

Requirement: Permanently lubricated, sealed for life components shall be used wherever possible in the DEP system in order to reduce maintenance requirements. [Section 9.1, ORD]

Basis Discussion: The use of permanently lubricated, sealed for life components wherever possible ensures that the need for maintenance is minimized, which supports maintaining facility worker exposure levels ALARA. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify permanently lubricated, sealed for life components are used in the DEP system design wherever practical.	

3.5.4.23 Power and Instrumentation Connections

Requirement: Plugs and electrical connectors shall be used for DEP system power and instrumentation connections instead of hard wiring, where practical. [Section 9.1, ORD]

Basis Discussion: The use of plugs and electrical connectors minimizes the time and type of crafts required to perform maintenance work.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify plugs and electrical connectors are used for power and instrumentation connections, where practical.	

3.5.4.24 Pressure Relief Valve Configuration

Requirement: Where portions of the DEP system cannot be easily isolated or when system draining and isolation would have a negative impact on safety or productivity, pressure relief valves shall be configured using a three-way valve, dual PSVs, and drain valves on each leg. The three-way valve shall be designed such that there is no position where the internal plug, disc, or ball would isolate or block both PSVs simultaneously. The three-way valve shall also be capable of being locked in a position that only allows one port to be fully open and the other port fully closed. [Section 14.4, ORD]

Basis Discussion: The use of a three-way valve and dual PSVs precludes a system service outage when servicing any relief valve. This configuration requirement is not also extended to the DVP system because a redundant exhauster train is provided.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review portions of the DEP system where pressure relief valves are used and the system cannot easily be isolated or where the isolation would have a negative impact on safety or productivity to verify the required valve configuration is utilized.	
R	ENG	Review the design of the three-way valves to verify there is no position where the internal plug, disc, or ball would isolate or block both PSVs simultaneously and that the valve can be locked.	

3.6 DEP System Equipment Requirements

3.6.1 Vessel Requirements

3.6.1.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.6.1.1.1 DEP System Storage Capacity

Requirement: The DEP system vessels shall be sized to allow for a minimum of 48 hours of effluent storage capacity and for a maximum capacity in accordance with Table III.10.E.R in the DWP. [Section 6.3.6, BOD] [Section 3.1.1.1, ICD-06] [Sections 1.2, 2.3, ICD-31] [Section III.10.E.1.b, Table III.10.E.R, DWP] (Table 2-2, A.7.1) (Table 2-2, A.7.2)

Basis Discussion: The DEP system should provide adequate storage capacity for the receipt of effluents and the evaporator condensate and concentrate prior to their transfer out of the system.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	ENG	Perform an analysis to verify DEP system is sized to accommodate the required 48 hours of storage capacity.	
R	ENG	Review the design to verify the DEP system vessels are sized in accordance with the preceding analysis and Table III.10.E.R of the DWP.	

3.6.1.1.2 Storing Concentrated and Dilute Effluent

Requirement: The DEP system shall store the dilute and concentrated effluent from the evaporator separately. [Sections 6.1.4, 6.3.6, BOD] (Table 2-2, A.5.1) (Table 2-2, A.5.2)

Basis Discussion: The dilute and concentrated effluent are stored separately to allow for transfer to different facilities/systems with different waste criteria.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the dilute and concentrated effluent are accumulated and stored separately.	

3.6.1.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

3.6.1.2.1 Vessel Overflow

Requirement: The DEP system process vessels that operate at or below atmospheric pressure shall have overflow feature(s) that are instantaneously and continuously available to accommodate abnormal operating conditions (e.g., loss of negative pressure or vessel contents exceeding the high level limit of the vessel) to prevent liquid flow through the DVP vessel vent system. Overflow features in DEP system process vessels shall be designed to handle the maximum inflow to the vessel without the liquid level in the overflowing tank reaching an unacceptably high level. No valves or other restrictions shall be included in the DEP system process vessel overflow lines. Overflow lines shall also be designed to prevent the buildup of material that could cause blockages. Overflowed process stream shall be returned to the waste treatment process, and the compatibility of the overflowing liquid and recipient vessel shall be confirmed. Overflowing direct to the cell floor shall only be considered as the last overflow in a cascaded system. [Section 6.7.5, BOD] [Section 4.2.8, DWP] (Table 2-2, C.1) (Table 2-2, C.2)

Basis Discussion: Normal process operating controls and trips are used for prevention of vessel overfill. In the event these controls fail to stop overfilling (i.e., abnormal operation conditions), the engineered overflows prevent liquid from entering the vessel ventilation system. Overflow systems meet the requirements of WAC 173-303, *Dangerous Wastes Regulations*. The overflow features on the DEP vessels minimizes the potential of effluents from the DEP vessels backflow to low contamination or radiation areas, which limits dose exposure of personnel. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to determine the required overflow size to handle the maximum inflow to the vessel without the liquid level in the overflowing tank reaching an unacceptably high level	
R	**ENG**	Review the design to verify each DEP system process vessel operating at or below atmospheric pressure is provided with an overflow feature that is instantaneously and continuously available for use to accommodate abnormal operating conditions.	
R	**ENG**	Review the design to verify overflow features in DEP system process vessels are designed to (1) handle the maximum inflow to the vessel without the liquid level in the overflowing tank reaching an unacceptably high level in accordance with the analysis, (2) contain no valves or other restrictions, and (3) prevent the buildup of material that could cause blockages.	

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify return of overflowed process stream to the waste treatment process (DEP system) and compatibility of overflowing liquid with the recipient vessel.	
R	ENG	Review the design to verify that any overflow directly to a cell floor is the last overflow in a cascaded system.	

3.6.1.2.2 Overflow to Cell Design

Requirement: Where an overflow is from a DEP system vessel to the cell, the overflow system shall maintain segregation of the cell and vessel ventilation systems. Overflow lines shall be provided with a mechanism to prevent venting to personnel areas. The design shall include features necessary for monitoring and maintaining the vent seal, where a vent seal is used. Cells that receive process vessel overflows shall be designed as secondary containment areas. [Section 7.1, ORD] [Section 6.7.5, BOD] [Section 4.2.8, DWP]

Basis Discussion: DEP system vessels are connected to the vessel ventilation systems for the removal of hazardous gases from the vessel headspace. Under abnormal operating conditions, the potential exists for the low point drain vessel to overflow through a loop seal and discharge process effluents to the cell floor. In this unlikely event, process effluents would be exposed to the room environment and vented by the building ventilation system. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the overflow features of vessels that overflow to cells are in conformance with the requirement.	
R	ENG	Review the design to verify that cells that receive process vessel overflows are designed as secondary containment areas.	

3.6.1.3 System Interface Requirements

None.

3.6.1.4 Other Technical, Specialty, Operations, and Maintenance Requirements

3.6.1.4.1 Internal Spray Wash Mechanism

Requirement: The DEP system process vessels shall be equipped with an internal spray mechanism to facilitate adequate internal vessel washing for contamination removal. [Section 11.7.4, BOD] [Sections 14.2, 20, ORD] (Table 2-2, D.1)

Basis Discussion: The internal spray mechanisms used to wash the vessels help to facilitate the removal of contamination and prevent the buildup of solids on the inner walls of the vessels. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the DEP system process vessel designs to verify internal spray mechanisms are included.	

3.6.1.4.2 Vessel Entry

Requirement: The DEP system process vessels shall provide means of gaining personnel access to each vessel to facilitate vessel inspection, cleaning, and draining of contents. A man-way shall be a temporary cover that shall be fitted with a mechanism to securely lock the cover in place and shall provide a positive seal so as not to hinder the vessel ventilation commissioning program. Upon completion of commissioning and to comply with vessel and cell ventilation requirements, a permanent cover (and appropriate shielding) shall be fitted in place. If personnel access is not feasible, provisions shall be made to ensure that vessel cleanliness is certified at construction and maintained by controls until turnover to commissioning. [Section 19.10, ORD]

Basis Discussion: Inclusion of provisions to accommodate vessel entry in the design supports inspection and cleaning of the vessel. Most DEP process vessels include suction-off lines that support removal of the vessel contents for cleaning, inspection, and other operational purposes. Vessels without the bottom drain use alternative methods for liquid removal, including heel dilution and use of specialty pumps.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify a means of gaining access to each process vessel is incorporated and that each DEP system process vessel can be drained.	

3.6.1.4.3 Corrosion Protection of Vessels

Requirement: The DEP system process vessels shall be protected from internal and external corrosion. [Section 11.1.1.1, BOD]

Basis Discussion: None.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify DEP system process vessels are protected from internal and external corrosion.	

3.6.2 Evaporator Requirements

3.6.2.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.6.2.1.1 Evaporator Accessibility for Maintenance

Requirement: The location and design of the DEP system evaporator shall support the ability to replace maintainable components to support the overall design life of the evaporator. [Section 11.3.2.4, BOD]

Basis Discussion: Equipment accessibility is a consideration of the general plant lay-out and evaporator system design. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design and location of the evaporator to verify the ability to replace components to support the overall design life of the evaporator.	

3.6.2.1.2 Evaporator Antifoam Addition

Requirement: The DEP system evaporator shall have provisions to add antifoam reagent as necessary. [Section 6.1.4, BOD] (Table 2-2, B.2)

Basis Discussion: Antifoam reagent is used to minimize generation of foam in the waste. Antifoam addition prevents carryover, which can cause overhead condensate to not meet decontamination factor requirements.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify antifoam reagent addition provisions.	

3.6.2.1.3 Evaporator Bypass

Requirement: The DEP system shall be designed to allow the bypass of the evaporator system. [Section 6.1.2, BOD] (Table 2-2, B.3)

Basis Discussion: In the event that the DEP system evaporator is unavailable, the DEP system bypasses the evaporator and transfers the feed to Tank Farms.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the capability to bypass the DEP system evaporator.	

3.6.2.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

None.

3.6.2.3 System Interface Requirements

None.

3.6.2.4 Other Technical, Specialty, Operations and Maintenance Requirements

None.

3.6.3 Heat Exchanger Requirements

3.6.3.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.6.3.1.1 Heat Exchanger Accessibility for Maintenance

Requirement: The DEP system heat exchangers and condensers shall be designed to permit access for in-situ maintenance, repair, or inspection, as necessary. [Sections 11.3.2.5, 11.7.4, BOD] [Section 14.1, ORD]

Basis Discussion: Equipment accessibility is a consideration of the general plant lay-out and heat exchanger/condenser system design, and provisions for accessibility ensure these components can be serviced as needed while installed. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify heat exchangers and condensers are designed to permit access for in-situ maintenance, repair, or inspection.	

3.6.3.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

None.

3.6.3.3 System Interface Requirements

None.

3.6.3.4 Other Technical, Specialty, Operations and Maintenance Requirements

3.6.3.4.1 Secondary Cooling Water Loop

Requirement: The DEP system shall use a secondary cooling water loop to protect the BOF cooling water system from contamination. The closed loop system shall be monitored for radioactive contamination and be designed for decontamination. [Sections 7.1, 14.7, ORD] [Section 9.4.10, BOD]

Basis Discussion: Use of a secondary cooling water loop protects the uncontaminated cooling water system from becoming contaminated in the event of a leak or radiation breakthrough. Monitoring of the secondary loop for conductivity supports early identification of a leak or radiation breakthrough so that mitigating actions can be taken. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the DEP system design to verify a secondary cooling water loop is used to protect the BOF cooling water system from contamination.	

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the secondary cooling water loop is monitored for radioactive contamination and is designed for decontamination.	

3.6.3.4.2 Secondary Steam Loop

Requirement: The DEP system shall use a secondary steam loop to protect the BOF steam system from contamination. The closed loop system shall be monitored for radioactive contamination and be designed for decontamination. [Section 7.1, ORD] [Sections 9.4.10, 11.6.6, BOD]

Basis Discussion: Use of a secondary steam loop protects the uncontaminated steam system from becoming contaminated in the event of a leak or radiation breakthrough. Monitoring of the secondary loop for conductivity supports early identification of a leak or radiation breakthrough so that mitigating actions can be taken. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the DEP system design to verify a secondary steam loop is used to protect the BOF steam system from contamination.	
R	**ENG**	Review the design to verify the secondary steam loop is monitored for radioactive contamination and is designed for decontamination.	

3.6.4 Pump/Ejector Requirements

3.6.4.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.6.4.1.1 Sump Pump Transfer Rate

Requirement: The minimum transfer rate for the DEP system sump pumps in DWP areas shall be based on the removal of spills, leaks, or accumulated liquid from the secondary containment system within 24 hours or in as timely a manner as possible, as required by the DWP. [Section 14.10.1.2, BOD] (Table 2-2, C.3.2)

Basis Discussion: The removal of spills or leaks occurs within 24 hours, or as timely as possible. Note: Ecology must be notified if the releases or accumulated liquid cannot be removed within 24 hours. (WAC 173-303-640[4][c][iv])

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to verify sumps can be emptied per the DWP requirement.	
R	**ENG**	Review the design to verify conformance to the requirement.	
T	**SU/ COM**	Perform a test to verify DEP system sump pumps in DWP areas meet the minimum flow rates.	

3.6.4.1.2 Evaporator Concentrate/Feed Transfer to Tank Farms

Requirement: The DEP system shall provide the motive force for transferring evaporator concentrate/feed to the Tank Farm. If the effluent contains solids or the specific gravity is greater than 1.35 kg/L, the transfer system shall be capable of achieving a velocity greater than 4 ft/sec. [Sections 1.2, 2.7, ICD-31] (Table 2-2, A.8.1)

Basis Discussion: The transfer distance, volume of effluent, and velocities necessitate the use of mechanical motive force for delivery of effluent to Tank Farms. The transfer velocity is based on the critical velocity to prevent deposition of solids from the submerged bed scrubber effluent. If the effluent does not contain solids and the specific gravity is less than 1.35 kg/L, the transfer does not have a minimum velocity to satisfy requirements for waste transfers.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to determine the volumetric flow necessary to achieve a transfer velocity greater than 4ft/sec.	This analysis is only required if it is determined that the effluent will contain solids or the specific gravity will be greater than 1.35 kg/L.
R	**ENG**	Review the design to verify that the DEP system provides the motive force for the transfer of evaporator concentrate/feed from EMF to the Tank Farm.	
T	**SU/COM**	Perform a test to verify the ability to achieve the minimum volumetric flow determined by the analysis.	This test is only required if it is determined that the effluent will contain solids or the specific gravity will be greater than 1.35 kg/L.

3.6.4.1.3 Dilute Effluent Transfer to LERF/ETF

Requirement: The DEP system shall provide the motive force (transfer pumps) and the waste transfer pipelines that connect to the existing LERF/ETF transfer pipelines at the designated TOC/WTP interface points near the WTP site boundary (nodes 8A and 8B). The WTP transfer system shall ensure that the design pressure of the Tank Operating Contractor’s (TOC) waste transfer pipelines between the LERF/ETF and the TOC/WTP interface points (nodes 8A and 8B) is not exceeded. The design pressure for both TOC waste transfer pipelines (primary and backup) is 100 psig at 49 °C (120 °F). [Sections3.1.1.2, 3.1.1.3, ICD-06 (Table 2-2, A.8.2)

Basis Discussion: The transfer distance, volume of dilute effluent, and velocities necessitate the use of mechanical motive force for delivery of dilute effluent to LERF/ETF.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to determine the maximum instantaneous discharge rate of the transfer that does not exceed the design pressure of the downstream pipeline.	
R	**ENG**	Review the design to verify conformance with the results of the analysis.	
R	**ENG**	Review the design to verify that the DEP system provides the motive force for the transfer of dilute effluent from EMF to LERF/ETF.	

3.6.4.1.4 Vacuum Ejector Maintenance and Replacement

Requirement: Provisions shall be made for the maintenance or replacement of DEP system vacuum ejectors if they are unable to sustain a 40-year life or spare units are not available. [Section 14.1, ORD]

Basis Discussion: Vacuum ejectors are subject to continuous duty and therefore can suffer from erosion and loss of efficiency. Spare units should be installed in the design to allow for continuous system availability.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that provisions for maintenance or replacement of vacuum ejectors are provided if the units are unable to sustain a 40-year life or spare units are not provided in the design.	

3.6.4.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

Refer to Section 3.6.4.1.1 for the DWP-related requirement for DEP system pumps.

3.6.4.3 System Interface Requirements

None.

3.6.4.4 Other Technical, Specialty, Operations and Maintenance Requirements

3.6.4.4.1 Pump Seals

Requirement: The DEP system pump seals or other pump design features, upon failure, shall not provide a pathway for liquids or gases to personnel or to the environment. [Section 14.1, ORD]

Basis Discussion: The spread of contaminants (liquids or gases) to personnel or to the environment is minimized by using pump seals or other design features. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the DEP system pumps are designed to preclude leakage of liquids/gases that could lead to exposure to the workers or the environment.	

3.6.4.4.2 Backflow Prevention in Steam Motivated Jet Systems

Requirement: There shall be provisions to prevent backflow of contamination for DEP system steam motivated jet systems. [Sections 14.1, 14.3, ORD]

Basis Discussion: The DEP system should ensure that the steam source for the steam ejector does not become contaminated with fluid from the DEP evaporator system. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the provisions for backflow prevention are included in DEP steam motivated jet systems.	

3.6.4.4.3 Motors

Requirement: The following requirements apply to DEP system pump motors:

- Motors shall be squirrel-caged induction type
- Motors in hazardous locations shall have enclosures constructed for the area in which they are installed
- Motors powered from adjustable speed drives shall be definite-purpose inverter fed polyphase type
- Motors 20-hp or larger located outdoors, unless specific operating conditions dictate otherwise, shall be equipped with space heaters. The power source for the space heaters shall be 120-V AC individually protected
- Premium efficiency motors shall be used, where practical

[Section 8.4.7, BOD] [Section 16.1, ORD]

Basis Discussion: Motors should be qualified to function in the environment in which they are installed. The selection of enclosures considers the specific conditions of the installation location.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design of DEP system motors to verify adherence to the criteria listed in the requirement.	

3.6.5 General Piping Requirements

This section contains general requirements for the design of DEP piping systems. Requirements for the design of underground waste transfer lines are contained in Section 3.14.

3.6.5.1 Mission and Functional/Performance Requirements (Including States/Modes)

None.

3.6.5.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

3.6.5.2.1 Mechanical Isolation of Utility Supply Lines

Requirement: The utility supply lines (e.g. steam and water) within the scope of the DEP system shall include suitable isolation provisions to prevent reverse flow at tie-in points that can potentially result in contaminating the utility supply lines as well as include provisions to preclude unplanned syphoning of piping. [Section 7.1, ORD]

Basis Discussion: This mechanical isolation design feature (e.g., valves, blind flanges, check valves, siphon breaks, spectacle blinds, or capped lines) ensures there is no connection between utility supply lines susceptible to backflow of contamination. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the piping design to verify back-flow and siphoning prevention features are included.	

3.6.5.3 System Interface Requirements

None.

3.6.5.4 Other Technical, Specialty, Operations and Maintenance Requirements

3.6.5.4.1 Pipe Draining and Slopes

Requirement: The aboveground DEP system process piping shall have provisions to drain the piping and shall have no traps or pockets that can accumulate liquids or solids that cannot be drained either by operator action or through free draining design. [Sections 7.1, 14.3, 20.0, ORD] [Section 11.3.1, BOD]

Basis Discussion: For additional details on pipe sloping, refer to 24590-WTP-GPG-M-027, *Recommended Slopes for Piping System*. Level piping for a short distance through wall penetrations, at connections to equipment, and at jumpers is acceptable (Section 14.3, ORD). This is an ALARA feature because it ensures the pipes are drained of radioactive material if maintenance needs to be performed, and during decommissioning, which reduces dose and the potential to spread contamination. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the DEP system aboveground piping design to verify that the piping is designed to drain.	

3.6.5.4.2 Flush Piping

Requirement: The aboveground DEP system process piping shall have the capability to be flushed. [Section 6.2.1, BOD] [Sections 14.1, 14.3, 20.0, ORD] (Table 2-2, D.1)

Basis Discussion: Flushing capability is provided for piping systems to limit accumulation of solids and reduce contamination in process piping. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the DEP system aboveground piping design to verify that the flushing capability is incorporated in the design.	

3.6.5.4.3 Piping Design for Gravity Liquid Draining

Requirement: The aboveground DEP system process piping shall include the capability to break a vacuum in a transfer line as required to allow gravity liquid draining. [Section 7.1, ORD]

Basis Discussion: The addition of a vacuum breaker, high point vent, or other design feature that provides the capability to break a vacuum within a transfer line ensures that air can be admitted and swept in the pipe, thereby restoring normal flow. This is an ALARA feature because it allows lines to completely drain. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the aboveground DEP system piping design to verify a means of breaking vacuum is provided.	

3.6.5.4.4 Piping Exiting Cells

Requirement: A coaxial pipeline system or the provision of a stainless steel liner shall be used as secondary containment where DEP system process pipes exit cells. The secondary containment shall be provided with drains and a leak detection system. [Sections 11.3.5.2, 14.10.1.3, BOD] (Table 2-2, C.3.1)

Basis Discussion: Although requirements for underground waste transfer lines are covered in section 3.14 of this document, the design should also account for process pipelines that exit cells but are located aboveground, such as the process piping in the chase between the LAW effluent process building and the LAW effluent drain tank building. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that secondary containment is provided for DEP system aboveground pipelines that exit cells.	
R	**ENG**	Review the design to verify that the secondary containment feature is provided with drains and a leak detection system.	

3.6.5.4.5 Filtering Effluent to LERF/ETF

Requirement: A 5 micron filter, maintainable at the EMF and installed in the effluent line to the LERF/ETF upstream of the split into primary and backup transfer lines, shall be provided for transfers from the DEP system to LERF/ETF. [Section 3.1.1.5, ICD-06]

Basis Discussion: A single 5-micron filter is installed in the DEP system effluent line to the LERF/ETF upstream of the split into primary and backup transfer lines consistent with CCN 275986, *Liquid Waste Processing Facilities Waste Acceptance Criteria, HNF-3172* (CHPRC 2012).

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the inclusion of a 5 micron filter upstream of the split into primary and backup transfer lines.	

3.6.5.4.6 Provisions for Decontamination Chemical Addition

Requirement: The DEP system shall be furnished with the capability to add decontamination chemicals to the appropriate process vessels. [Section 14.1, ORD]

Basis Discussion: Incorporation of design features that support decontamination and decommissioning of the system is a consideration for DEP system design. Designing the piping and valving systems to allow for decontamination chemical additions support decontamination and decommissioning objectives. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the DEP system design to verify the provisions to add decontamination chemicals to the appropriate process vessels.	

3.6.6 Mixer/Agitator Requirements

3.6.6.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.6.6.1.1 General Agitation/Mixing

Requirement: The DEP system process vessels handling radioactive waste shall be capable of mixing vessel contents. [Sections 6.1, 6.7.3, BOD] [Section 14.14, ORD] (Table 2-2, A.6.1) (Table 2-2, A.6.2)

Basis Discussion: Agitation or mixing of the wastes helps prevent buildup of settled solids. Agitation or mixing of the DEP vessels is also required to collect a representative sample of vessel contents and to blend cold chemicals with active process liquids.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to verify that mixer/agitator sizing supports resuspension of settled solids.	
R	**ENG**	Review the design to the DEP system process vessels handling radioactive waste to verify the mixing/agitation capability is incorporated.	

3.6.6.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

None.

3.6.6.3 System Interface Requirements

None.

3.6.6.4 Other Technical, Specialty, Operations and Maintenance Requirements

None.

3.7 DEP System Monitoring and Control Requirements

This section contains general requirements for the monitoring and control of DEP system SSCs. Requirements associated with the monitoring and control of waste transfers (i.e., the transfer of waste feed from the TOC and EMF to the LAW Facility, the return of DEP system concentrated effluent to Tank Farms, and the transfer of dilute effluent to LERF/ETF) through underground waste transfer lines within the DEP system scope are contained in Section 3.15.

3.7.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.7.1.1 Sump Liquid Level Monitoring

Requirement: All sumps used for secondary containment of DEP system process effluents shall include a continuous liquid level sensing capability for detection of leaks and shall be remotely monitored for liquid in the sumps. [Section 14.10.1.2, BOD] (Table 2-2, C.3.1) (Table 2-2, E.2)

Basis Discussion: Additional details on the various types of level sensing equipment used for leak detection within WTP sumps is found in 24590-BOF-PER-J-16-001, *System Logic Description for the Direct Feed LAW Effluent Management Facility Process System (DEP)*.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to (a) verify the inclusion of a liquid level sensing capability for leak detection and (b) verify the capability to remotely monitor the sumps for liquid accumulation from the PCJ.	

3.7.1.2 DEP Vessel Monitoring and Controls

3.7.1.2.1 Process Vessel Monitoring

Requirement: The DEP system process vessels shall include temperature and continuous level sensing capabilities and shall be remotely monitored for temperature and effluent level within the vessels. [Section 14.10.1.1, BOD] (Table 2-2, E.2)

Basis Discussion: Temperature monitoring provides the capability to ensure the effluents within the vessels are maintained within the system specified operating range. Effluent level is monitored to prevent overflows and to provide data on the effluent level in the vessels before the effluents are transferred.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to (a) verify the inclusion of temperature and level sensing capabilities and (b) verify the capability to remotely monitor the vessels for temperature and level from the PCJ.	

3.7.1.3 DEP Evaporator Monitoring and Controls

3.7.1.3.1 Process Evaporator Monitoring

Requirement: The DEP system evaporator shall include pressure and level sensing capabilities and shall be remotely monitored for pressure and concentrate level within the evaporator. [Section 14.10.1.1, BOD] (Table 2-2, E.2)

Basis Discussion: Pressure monitoring provides the capability to ensure the effluent within the evaporator is maintained within the system specified operating range. Concentrate level is monitored to prevent liquid reaching the bubble-cap trays and demister pads and to provide data on the effluent level in the vessels before the effluents are transferred.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to (a) verify the inclusion of pressure and level sensing capabilities and (b) verify the capability to remotely monitor the pressure and level within the DEP evaporator from the PCJ.	

3.7.1.3.2 Passivation of Stainless-Steel Vessel and Piping Materials

Requirement: The DEP design shall allow for addition of chemicals to promote re-passivation after or during liquid transfer. The design of process systems containing waste shall have the capability to be chemically cleaned, descaled, and re-passivated. [Section 18.6.5, BOD]]

Basis Discussion: See also 24590-WTP-ORDCN-OP-19-001 for programmatic implementation requirements (surveillance, testing, inspection and chemistry control).

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that the DEP system includes provisions for the addition of chemicals to promote re-passivation after or during liquid transfers and that the system is designed to be chemically cleaned, descaled, and re-passivated.	

3.7.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

None.

3.7.3 System Interface Requirements

None.

3.7.3.1 Process Control System - Instruments

Requirement: DEP system instruments connected to the PCJ system shall not perform any credited active safety function. Instruments connected to the PCJ may include and perform safety boundary or retention functions. The DEP system shall use standard, commercially available instrumentation and communication protocols to interconnect to the PCJ system. Fieldbus or Profibus communication shall be used to the extent practicable. [Sections 9.4.1, 9.5.3.1, 9.5.3.4, 9.6.5, BOD]

Basis Discussion: The PCJ is used as the normal process control system. The PCJ allows remote operator control and monitoring of the DEP process (e.g., provision for process level, temperature, pressure, along with the ability to control and monitor pumps, motors, and valves to operate the DEP system). Alarms and warnings are provided to bring operator attention to and allow rectification of abnormal process situations.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify required specifications (related to PCJ interface) are included in material requisitions (MR), used to procure instruments.	
R	**ENG**	Review the design and vendor documents to verify the DEP system uses standard, commercially available process control instrumentation and communication protocols.	
R	**ENG**	Review the design and vendor documents to verify Foundation Fieldbus or Profibus DP Fieldbus communications are used to the extent practicable.	

3.7.4 Other Technical, Specialty, Operations, and Maintenance Requirements

3.7.4.1 Accessibility for Calibration, Testing, and Inspection

Requirement: The DEP system shall provide the capability to access and perform replacement, removal, calibration, maintenance, troubleshooting, repairs, periodic functional testing, and inspections of monitoring components during normal operation. [Sections 6.7, 8.1.2, 9.12, BOD] [Sections 9.1, 11.16, ORD]

Basis Discussion: Clearances are provided in the design for easy access to monitoring and controls equipment requiring calibration, maintenance, testing, inspection, or replacement. Adequate clearances around equipment accommodate maintenance and operation personnel and any encumbrances such as protective garments, respirators, portable lifting devices, and alignment equipment for pumps, etc. This requirement provides Operations with a verification of actual field configuration to ensure no other accessibility issues remain.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the ability to perform the replacement, removal, calibration, maintenance, troubleshooting, repairs, periodic functional testing, and inspection of monitoring components during normal operation.	

3.7.4.2 Instrument Location

Requirement: The DEP system instrumentation shall be located outside of R5/C5 areas when possible. Whenever possible, instruments and detectors for the C3 process areas that require maintenance shall be located outside the C3 contaminated areas. However, transducer panels housing liquid level systems and associated input/output, and pressure transducers, shall be located in the C3 classified area as a precaution against back-contamination. In-plant controls shall be easily accessible (radiological zone) and shall not require double staffing (for example, locate control equipment close to readouts that monitor change of state). [Sections 9.1, 11.16, ORD]

Basis Discussion: Locating instruments and instrumentation panels outside of C5/R5 areas reduces the plant personnel exposure. Whenever possible, instruments and detectors that require maintenance are located outside the C3 contamination areas. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify instruments for the DEP system are located outside of R5/C5 areas when possible.	

3.7.4.3 Flow Meter Bypass

Requirement: Where flow interruption is not acceptable, DEP system flowmeters shall be provided with bypass piping. [Section 11.16, ORD]

Basis Discussion: This requirement enables the flow element to be isolated and repaired/replaced online with the system in service while providing flow to users requiring uninterrupted flow.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the DEP system design to verify flow meters are provided with by piping for those lines requiring uninterrupted flow.	

3.7.4.4 Warning and Alarm Systems

Requirement: DEP system warnings and alarms shall be designed to ensure that they can be heard at the local noise levels of the area they are intended to cover. Indicators shall be positioned to give a clear line-of-sight and safe accessibility. Flashing lights shall be used in high noise areas. [Section 11.16, ORD]

Basis Discussion: Alarms and warnings are provided to bring operator attention to—and allow rectification of—abnormal process situations. Rooms with equipment that require PPE for entry are considered "high noise areas" for compliance with ORD Section 12.5, Communications.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify warnings and alarms are audible at local noise levels and flashing lights are provided in high noise areas.	
R	ENG	Review the design to verify indicators are positioned to give clear line-of-sight and safe accessibility.	

3.7.4.5 Pump Monitoring

Requirement: If required, the run time of selected higher horsepower DEP system motors shall be monitored. [Section 7.1, ORD]

Basis Discussion: The PCJ must be programmed to monitor the run time of any high horsepower motors contained in the DEP system. This supports efficient scheduling of run-hour based preventative maintenance.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify that applicable high horsepower motors are identified in the DEP system design and run hours of specified high horsepower motors can be monitored.	

3.8 General HVAC Requirements

Note: If system designators are not explicitly stated in the requirement text, these general HVAC requirements are applicable to the ACV, C1V, and DVP systems.

3.8.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.8.1.1 Confine Hazardous Materials

3.8.1.1.1 Cascade Principle

Requirement: The ACV system design shall be based on the cascade principle (airflow from areas of lower potential for contamination to areas of higher potential for contamination). [Sections 5.3.2.2, 12.3.1.3, 12.15.1.1, BOD] [Section 15.1, ORD] (Table 2-4, C.1)

Basis Discussion: Confinement provided by EMF physical barriers (i.e., walls, doors, roofs, etc.) is enhanced by the EMF ventilation system that uses the cascading ventilation philosophy (i.e., the ACV system), which creates pressure gradients in process and utility areas and causes air to flow through the penetrations in physical barriers from an area of lower contamination potential to an area of higher contamination potential. This is achieved by maintaining areas with greater contamination potential at the greatest negative pressure with respect to all other areas. The resultant effect is that ventilation air cascades from areas of lesser contamination potential to areas of greater contamination potential. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify that the direction of ventilation air is designed to flow from areas of low or no potential for contamination to areas of higher potential for contamination.	
T	SU/ COM	Perform differential pressure measurements to verify the airflow direction at contamination zone boundaries.	Testing to be performed as part of overall EMF HVAC system test

3.8.1.1.2 Balancing Dampers/Valves

Requirement: The ACV and DVP systems shall have balancing dampers/valves in the ventilation ductwork/piping that are manually operable with local indication of position and shall have provisions to be locked and (or) secured in position following balancing. The damper/valve position shall be permanently marked on the balancing damper/valve. [Section 12.7.3.4, BOD] [Section 15.1, ORD]

Basis Discussion: Balancing dampers/valves are provided in the ventilation ductwork/piping to facilitate system balancing during commissioning. The dampers/valves are manually operated with local indication of status only and are locked and (or) secured in the commissioned position. The damper/valve position is permanently marked on the balancing damper/valve upon completion of overall system balancing. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that dampers/valves are specified with local indication of position and have provisions to be locked and/or secured in position following balancing.	
I	**SU/ COM**	Inspect the ACV and DVP system balancing dampers/valves to verify the damper/valve position has been permanently marked to indicate position.	

3.8.1.1.3 Seismic Design

Requirement: The EMF ventilation system equipment and components shall be designed as non-safety, Seismic Category IV (SC-IV)/Performance Category 1 (PC-1). [Section H.53(c)(1), WTP Contract]

Basis Discussion: The designation of the EMF as SC-IV is a critical design input in the WTP Contract that supports completing the DFLAW configuration within cost and schedule targets.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify all EMF ventilation system equipment and components meet the non-safety, SC-IV/PC-1 requirements.	

3.8.1.2 Remove Particulates

3.8.1.2.1 HEPA Filter Challenge Testing Configuration

Requirement: The ACV and DVP system ductwork/piping, dampers/valves, filters, aerosol sample equipment and injection ports shall be designed and arranged to support HEPA filter aerosol challenge testing. [Section 12.9, BOD]

Basis Discussion: HEPA filters are tested in-place after installation and at least annually thereafter. The test is performed in accordance with Section TA of ASME AG-1-1997 and demonstrates that the removal efficiency is no less than 99.95% for each stage of filtration. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify ACV and DVP system components, aerosol sampling equipment and injection ports are designed and arranged to support HEPA filter air-aerosol mix concentration testing.	

3.8.1.3 Exhaust Air

3.8.1.3.1 Exhaust Fan Inlet Isolation Dampers/Valves

Requirement: The ACV and DVP systems shall have exhaust fan inlet isolation dampers/valves that are manually operated, normally open, and include remote indication of closed status in the LAW FCR. [Section 15.1, ORD] [Section 12.7.3.1, BOD]

Basis Discussion: Exhaust fan inlet isolation dampers/valves ensure exhaust air flow is routed to the operating exhaust fan and not the standby unit. Exhaust fans are interlocked with their respective inlet isolation dampers/valves so that the fan cannot start unless the damper/valve has been opened and the fan trips when the damper/valve has been closed. The exhaust fan inlet isolation dampers/valves are normally open.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the exhaust fans inlet dampers/valves are manually operated, normally open, and include remote indication at the PCJ of closed status.	

3.8.1.3.2 Supply and/or Exhaust Fan Outlet Isolation Dampers/Valves

Requirement: The ACV and DVP systems shall have supply and/or exhaust fan outlet isolation dampers/valves with remote status indication in the LAW FCR that are automatically operated via pneumatic actuators by the control system. [Section 15.1, ORD] [Section 12.7.3.1, BOD]

Basis Discussion: Exhaust fans are interlocked with their respective outlet isolation dampers/valves so that when the fan starts, the damper/valve automatically opens. The outlet isolation dampers/valves fail open but automatically close when the exhaust fan stops. For building ventilation systems, in the event that smoke is detected in the air handling unit (AHU) supply fan duct, the AHU supply fan is shut down. Once the AHU supply fan is shut down, the building exhaust fan is shut down and the AHU supply fan outlet isolation damper is closed to mitigate the spread of smoke to the facility.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify supply and exhaust fan discharge dampers/valves are automatically operated and include remote indication of status at the PCJ.	

3.8.1.3.3 Environmental Conditions for EMF HVAC Non-Safety SSCs

Requirement: The EMF ventilation system equipment and components tagged non-safety shall be designed to operate within the conditions identified in Table 12-1 of the BOD if they are located indoors and within the conditions identified in Table 4-7 of the BOD if they are located outdoors. [Section 4.12, Table 4-7, Table 12-1, BOD] [Section 16.1, ORD]

Basis Discussion: Non-safety SSCs are designed to function as intended in the environmental conditions associated with their location.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of indoor EMF HVAC non-safety SSCs to verify compliance with BOD Table 12-1 conditions.	
R	**ENG**	Review the design of outdoor EMF HVAC non-safety SSCs to verify compliance with BOD Table 4-7 conditions.	

3.8.2 Nuclear Safety, ALARA, Environmental and Other Regulatory Requirements

3.8.2.1 DELETED.

3.8.2.2 Environmental

3.8.2.2.1 Hanford Site Ambient Conditions

Requirement: The following Hanford Site ambient conditions shall be used to ensure EMF ventilation systems are operable during normal operations and design basis events:

- Summer: 101 °F dry bulb, 67 °F wet bulb, and 30 °F mean daily range
- Winter: 5 °F dry bulb

[Section 12.4.1.1, BOD]

Basis Discussion: The summer external dry-bulb temperature indicated above has been equaled or exceeded by 1% of the total hours during June through September. The coincident wet-bulb temperature indicated above is the mean of all wet-bulb temperatures occurring at the specific dry-bulb temperature. The winter external temperature has been equaled or exceeded by 99.6% of the total hours in a year.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify HVAC calculations performed in support of EMF ventilation systems design use the required climate data parameters.	

3.8.3 System Interface Requirements

3.8.3.1 DELETED.

3.8.4 Other Technical, Specialty, Operations and Maintenance Requirements

3.8.4.1 Remote Damper Operation

Requirement: Remote operation of ACV and C1V system dampers shall be provided where accessibility is difficult and for dampers used in routine operations. [Section 9.1, ORD]

Basis Discussion: The intent of this requirement is to minimize the amount of time required to perform routine maintenance and (or) operations activities by providing remotely operated dampers where possible. In

CCN 033014, *Operations Level of Automation Criteria*, "routine operations" is defined as operations anticipated to occur at least once per month. The use of remote actuation would allow significant reduction in operator or maintenance workload justifying additional installation and operating costs of remote action. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of ACV and C1V system dampers to verify compliance with requirement to provide remote operability.	

3.8.4.2 Decontamination

Requirement: The ACV and DVP system equipment subject to decontamination shall be designed to withstand this process without any reduction of functionality through degradation of the electrical, mechanical, or any other components involved. [Section 9.1, ORD] (Table 2-4, G.4)

Basis Discussion: Equipment operating in a contaminated environment is monitored and, if necessary, decontaminated before maintenance. HEPA filters are not subject to decontamination and can be disposed of directly; therefore, the above requirement is not applicable for HEPA filters. The specifications must convey that the equipment design accounts for these processes. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the ACV and DVP system equipment design to verify equipment/components can withstand decontamination without degradation or reduction in equipment functionality.	

3.8.4.3 Insulation for Protection from High Temperature Surfaces

Requirement: Where EMF ventilation systems operate at high temperatures and maintenance is required, insulation or protection shall be provided per OSHA requirements. [Section 15.1, ORD]

Basis Discussion: Insulation of protection from high temperature surfaces minimizes the risk of burning the skin when contact with the surface occurs.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the EMF ventilation system equipment that operates at high surface temperatures and where maintenance is required is insulated or protected.	

3.8.4.4 Thermal Insulation

Requirement: When thermal insulation is required around EMF ventilation system valves and in-line instruments, it shall be sectionalized to allow easy removal and replacement. [Section 11.16, ORD]

Basis Discussion: Personnel protection insulation reduces the temperature of exposed surfaces in accessible areas so that personnel are not harmed by physical contact. Equipment accessibility is a consideration of the general plant lay-out and valve and in-line instrument design.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify insulation provided around valves and in-line instruments is sectionalized to allow for easy removal and replacement.	

3.8.4.5 Ventilation System Accessibility

Requirement: EMF ventilation systems shall provide the capability to access and perform calibration, maintenance, periodic functional testing, and inspections of AHUs, non-manual dampers, fire dampers, and instrumentation without interruption of operations. EMF ventilation systems equipment requiring maintenance or replacement shall be accessible. [Sections 6.7, 8.1.2, 9.12, 12.6.3, BOD] [Sections 9.1, 14.1, 15.1, ORD]

Basis Discussion: Clearances are provided in the design for easy access to ventilation system equipment requiring calibration, maintenance, testing, inspection, or replacement. Adequate clearances around equipment accommodate maintenance and operations personnel and any encumbrances such as protective garments, respirators, portable lifting devices, and alignment equipment for pumps, etc. This requirement provides Operations with a verification of actual field configuration to ensure no other accessibility issues remain. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify equipment requiring maintenance or replacement is accessible or designed to support these activities.	
R	**ENG**	Review the design to verify the capability to perform calibration, maintenance, periodic functional testing, and inspections of equipment and components without interruption of operations from accessible areas (low dose, low contamination).	

3.8.4.6 Instrumentation Location

Requirement: The EMF ventilation systems instrumentation shall be located outside of R5/C5 areas when possible. Whenever possible, instruments and detectors for the C3 process areas that require maintenance shall be located outside the C3 contaminated areas. However, transducer panels housing liquid level systems and associated input/output, and pressure transducers, shall be located in the C3 classified area as a precaution against back-contamination. [Sections 9.1, 11.16, ORD]

Basis Discussion: Locating instruments and instrumentation panels outside of C5/R5 areas reduces the plant personnel exposure. Whenever possible, instrumentation and control equipment is located in C3 or lower areas. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the instruments for the EMF ventilation systems are located outside of R5/C5 areas when possible.	

3.8.4.7 Minimum Design Life

Requirement: Non-replaceable, non-maintainable, permanent EMF ventilation system plant equipment shall be designed for a minimum design life of 40 years, inclusive of maintenance. Design life of equipment shall consider the effects of chemical, radiological and thermal exposure. [Sections 11.1.1, 11.7.4, 12.6.1, BOD]

Basis Discussion: Equipment and material selection is based on proven performance, value engineering principles, and fit-for-function principles. The selection of equipment and materials is further addressed in detail as the design progresses. Equipment design needs to consider the routine environmental exposures under normal operations for non-safety equipment; this minimizes the need for equipment maintenance, exposure, and radiological waste generation in radiological areas. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the design life of non-safety non-replaceable, non-maintainable SSCs is documented in procurement documents and supported by supplier certificates of conformance.	

3.8.4.8 Contamination Protection

Requirement: The ACV and DVP systems shall be provided with suitable isolation provisions to prevent diffusion, backflow, or other methods of leakage of the contents to areas where the material is not intended. [Section 15.1, ORD]

Basis Discussion: Backflow provisions prevent contamination from areas of greater contamination potential from entering areas of lower contamination potential in the event of a loss of differential pressure between the two areas. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify suitable isolation provisions to prevent diffusion, backflow, or other methods of leakage of the contents to areas where the material is not intended are included.	

3.8.4.9 Steam Line Lagging

Requirement: Steam line lagging shall not cover ACV system valves and other equipment such as to prevent its use and identification, and not introduce hazards when removing or replacing the lagging, (sharp edges, etc.). Lagging blankets shall be installed if access is required regularly. [Section 7.1, ORD]

Basis Discussion: The ability to access and identify valves and other equipment contained in steam system piping is a consideration for the design of lagging and incorporation of lagging blankets in the design. Design for accessibility and maintainability supports continued operation of the steam and HVAC systems.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of the steam system piping to verify any provided lagging does not impact the continued use and identification of in-line components and instruments.	
R	**ENG**	Review the design of the steam system piping to verify blankets are provided in locations where regular access to steam system piping is required.	

3.8.4.10 Permanently Lubricated Components

Requirement: Permanently lubricated, sealed for life components shall be used wherever possible in the EMF ventilation systems in order to reduce maintenance requirements. [Section 9.1, ORD]

Basis Discussion: Use of permanently lubricated, sealed for life components wherever possible ensures that the need for maintenance is minimized, which supports maintaining facility worker exposure levels ALARA. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify permanently lubricated, sealed for life components are used in the ACV and DVP system designs wherever practical.	

3.8.4.11 Ventilation System Motors

Requirement: The motors used in the EMF ventilation systems shall comply with the following requirements:

- Motors shall be squirrel-caged induction type
- Motors in hazardous locations shall have enclosures constructed for the area in which they are installed
- Motors powered from adjustable speed drives shall be definite-purpose inverter fed polyphase type
- Motors 20-hp or larger located outdoors, unless specific operating conditions dictate otherwise, shall be equipped with space heaters. The power source for the space heaters shall be 120-V AC individually protected.
- Premium efficiency motors shall be used, where practical

[Section 8.4.8, BOD] [Section 16.1, ORD]

Basis Discussion: Motors should be qualified to function in the environment in which they are installed. The selection of enclosures considers the specific conditions of the installation location.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of HVAC motors to verify adherence to the criteria listed in the requirement.	

3.8.4.12 Power and Instrumentation Connections

Requirement: Plugs and electrical connectors shall be used in the EMF ventilation systems for power and instrumentation connections instead of hard wiring, where practical. [Section 9.1, ORD]

Basis Discussion: The use of plugs and electrical connectors minimizes the time and type of crafts required to perform maintenance work.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify plugs and electrical connectors are used for HVAC power and instrumentation connections, where practical.	

3.9 C1V System Requirements

3.9.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.9.1.1 Confine Hazardous Materials

None.

3.9.1.2 Draw and Supply Air

3.9.1.2.1 Supply Air to the Electrical Building

Requirement: The LAW effluent electrical building shall receive conditioned air independently of the ACV system via the C1V system. [Section 12.15, BOD] (Table 2-3, C.1) (Table 2-3, C.2)

Basis Discussion: To mitigate the potential for release of radioactive contamination to uncontaminated areas, the LAW effluent electrical building is provided with a separate, standalone ventilation system that is independent of the ventilation systems serving the LAW effluent process and utility buildings. The electrical building has no direct interface with process or utility areas, and therefore does not have any credible potential for exposure contamination.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the LAW effluent electrical building receives conditioned air independently of the ACV system via the C1V system.	

3.9.1.2.2 C1V System Outdoor Air Ventilation Intakes

Requirement: The C1V system outdoor air ventilation intake design shall include 3/4-inch square bird screens in order to preclude frost buildup. The C1V system outdoor air ventilation intakes shall be located so that they are protected from inclement weather (e.g., prevailing wind direction for minimizing wind pressure effects), as well as located so that emergency power equipment exhaust fumes cannot enter. [Section 12.14, BOD] [Section 15.1, ORD] (Table 2-3, A.1)

Basis Discussion: In order to prevent plugging of building air intake filters due to frost buildup, frost prevention means are required on building air intakes. Additionally, high winds have the potential to impact indoor pressure gradients and exhaust fumes from equipment and trucks have to potential to impact indoor air quality, so the effects of each are considered when choosing the location for outdoor air ventilation intakes.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify ¾-inch square bird screens are provided on outdoor air ventilation intakes for frost prevention purposes.	
R	**ENG**	Review the design to verify outdoor air ventilation intakes are located such that the intakes are protected from inclement weather and such that emergency power equipment exhaust fumes cannot enter.	

3.9.1.3 Remove Particulates

None.

3.9.1.4 Condition Air

3.9.1.4.1 Electrical Area Conditioned Air Supply

Requirement: Conditioned air shall be provided to the electrical area of the LAW effluent electrical building by direct EC-type AHUs or by DX heat pump air conditioning units (ACUs). [Section 12.15.1.2, BOD] (Table 2-3, C.1)

Basis Discussion: The option to use either EC-type AHUs or DX heat pump ACUs provides design flexibility and allows the best option to be selected based on cost considerations and building requirements.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that either EC-type AHUs or DX heat pump ACUs supply the electrical area of the LAW effluent electrical building.	

3.9.1.4.2 Control and Battery Areas Conditioned Air Supply

Requirement: Conditioned air shall be provided to the control and battery areas of the LAW effluent electrical building by direct EC-type AHUs or DX heat pump air conditioning units (ACUs). [Section 12.15.1.2, BOD] [Section 16.3, ORD] (Table 2-3, C.2)

Basis Discussion: Direct EC-type AHUs or DX heat pump air conditioning units provide adequate heating/cooling capability for the integrated control network (ICN) equipment and battery rooms of the LAW effluent electrical building. Battery rooms are environmentally controlled to optimize cell service life.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify either direct EC-type AHUs or DX heat pump ACUs supply the control and battery rooms of the LAW effluent electrical building.	

3.9.1.4.3 C1 Area Internal Temperatures

Requirement: The C1V system shall provide cooling and heating in order to maintain internal unoccupied design conditions listed in the BOD, Table 12-1. [Section 15.1, ORD] [Section 12.15.1.3, Table 12-1, BOD] (Table 2-3, B.1) (Table 2-3, B.3)

Basis Discussion: The C1V system should be designed to provide a suitable environment for the proper operation of equipment located in C1 areas of the EMF.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to verify that the internal temperatures are held within the ranges tabulated under established site conditions.	
R	**ENG**	Review the design to verify conformance with the results of the analysis.	

3.9.1.4.4 C1 Area Internal Humidity

Requirement: The C1V system shall supply humidification in order to maintain internal unoccupied design conditions listed in the BOD, Table 12-1. [Section 12.15.1.3, Table 12-1, BOD] (Table 2-3, B.2)

Basis Discussion: Sufficient humidification is required to prevent problems for electronics associated with static electricity discharges.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to verify that the internal relative humidity is held within the ranges tabulated under established internal design conditions.	
R	**ENG**	Review the design to verify conformance with the results of the analysis.	

3.9.1.5 Exhaust Air

3.9.1.5.1 Battery Room Ventilation and Status Indication

Requirement: The C1V system shall provide the ventilation capability for battery rooms of the LAW effluent electrical building to prevent hydrogen accumulation. The ventilation of battery rooms within the LAW effluent electrical building shall not be combined with other areas to prevent personnel exposure to hazardous fumes. Local indication shall be provided at each entrance door to provide exhaust fan status. [Section 12.15.1.2, BOD] [Section 15.1, ORD] (Table 2-3, D.1)

Basis Discussion: The ventilation capability for the LAW effluent electrical building battery room prevents hydrogen gas produced by the battery banks from concentrating to dangerous levels. Indication of exhaust fan status at each entrance door ensures that workers do not enter the battery room unless the exhaust fan is operational.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the C1V system provides ventilation of battery rooms.	
R	**ENG**	Review the design to verify local indication of exhaust fan status is provided at each entrance door.	
R	**ENG**	Review the design to verify the battery room ventilation is not combined with any other areas.	

3.9.2 Nuclear Safety, ALARA, Environmental and Other Regulatory Requirements

None.

3.9.3 System Interface Requirements

None.

3.9.4 Other Technical, Specialty, Operations and Maintenance Requirements

None.

3.10 ACV Supply System Requirements

3.10.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.10.1.1 Confine Hazardous Materials

None.

3.10.1.2 Draw and Supply Air

3.10.1.2.1 ACV Supply System Air

Requirement: The ACV supply system shall be designed to operate on 100 % filtered outside air and shall supply air to the process and utility areas of the EMF. [Sections 12.15, 12.15.1.1, BOD] [Section 6.3, NOC 1043] (Table 2-4, A.1) (Table 2-4, C.1)

Basis Discussion: Since the ACV supply system supplies air to EMF areas that could potentially be contaminated, no supply air is recirculated to the ACV supply system AHUs; rather, all supply air is exhausted from the building after passing through HEPA filtration. The process and utility areas of the EMF have the potential for radiological release and therefore should be maintained by an active confinement ventilation system that mitigates the risks associated with these potential releases.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify ACV supply system AHUs only operate on 100% filtered outside air.	
R	ENG	Review the design to verify that the ACV system supplies air to the process and utility areas of the EMF.	

3.10.1.2.2 ACV System Outdoor Air Ventilation Intakes

Requirement: The ACV supply system outdoor air ventilation intake design shall include 3/4-inch square bird screens in order to preclude frost buildup. The ACV supply system outdoor air ventilation intakes shall be located so that they are protected from inclement weather (e.g., prevailing wind direction for minimizing wind pressure effects), as well as located so that emergency power equipment exhaust fumes cannot enter. [Section 12.14, BOD] [Section 15.1, ORD]

Basis Discussion: In order to prevent plugging of building air intake filters due to frost buildup, frost prevention means are required on building air intakes. Additionally, high winds have the potential to impact indoor pressure gradients and exhaust fumes from equipment and trucks have to potential to impact indoor air quality, so the effects of each are considered when choosing the location for outdoor air ventilation intakes.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify ¾-inch square bird screens are provided on outdoor air ventilation intakes for frost prevention purposes.	
R	**ENG**	Review the design to verify outdoor air ventilation intakes are located such that the intakes are protected from inclement weather and such that emergency power equipment exhaust fumes cannot enter.	

3.10.1.3 Remove Particulates

None.

3.10.1.4 Condition Air

3.10.1.4.1 EMF Internal Temperatures

Requirement: The ACV supply system shall provide cooling and heating to the process and utility areas of the EMF in order to maintain unoccupied internal design conditions listed in Table 12-1 of the BOD. [Section 12.15.1.3, Table 12-1, BOD] [Section 15.1, ORD] (Table 2-4, B.1) (Table 2-4, B.3)[Section 12.15.2, BOD]

Basis Discussion: The ACV supply system provides a conditioned working environment within the process and utility areas of the LAW effluent process building, LAW effluent drain tank building, and LAW effluent utility building that is consistent with the facilities being unoccupied.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to verify that the internal temperatures are held within the ranges tabulated under established internal design conditions.	
R	**ENG**	Review the design to verify conformance with the results of the analysis.	

3.10.1.4.2 EMF Internal Humidity

Requirement: The ACV supply system shall provide humidification to the process and utility areas of the EMF in order to maintain internal design conditions for unoccupied areas listed in the BOD, Table 12-1. [Section 12.15.1.3, Table 12-1, BOD] (Table 2-4, B.2)

Basis Discussion: Sufficient humidification is required to prevent problems for electronics associated with static electricity discharges.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to verify that the internal relative humidity is held within the ranges tabulated under established internal design conditions.	
R	**ENG**	Review the design to verify conformance with the results of the analysis.	

3.10.2 Nuclear Safety, ALARA, Environmental and Other Regulatory Requirements

None.

3.10.3 System Interface Requirements

None.

3.10.4 Other Technical, Specialty, Operations and Maintenance Requirements

3.10.4.1 Smoke Control

Requirement: The ACV system isolation dampers used for smoke control shall be actuated by smoke detectors located in the immediate damper vicinity and can be remotely reset from a manned control area. [Section 12.10.2, BOD]

Basis Discussion: Isolation dampers used for smoke control are selected and installed to provide safe operation during all operating conditions consistent with all fire protection codes and standards.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that isolation dampers used for smoke control are shut upon actuation of smoke detectors in the immediate damper vicinity and can be remotely reset from a manned control area.	

3.10.4.2 Humidifier Control

Requirement: The ACV system humidification components shall be automatically controlled during normal operation. [Section 12.7.4.3, BOD]

Basis Discussion: The humidification function of the ACV system is automatically controlled so that constant operator intervention is not required during normal operations.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that the ACV system humidification components are automatically controlled.	

3.11 ACV Exhaust System Requirements

3.11.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.11.1.1 Confine Hazardous Materials

3.11.1.1.1 Ventilation for Sampling Enclosures

Requirement: The ACV system shall have the capability to provide ventilation for sampling enclosures if provided within the EMF. (Table 2-2, D.3) (Table 2-4, E.1)

Basis Discussion: The capability of the ACV system to provide confinement ventilation in sampling enclosures is a functional requirement of the ventilation system. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify ventilation capability is provided in sampling enclosures.	

3.11.1.2 Draw Air

None.

3.11.1.3 Remove Particulates

3.11.1.3.1 HEPA Filtration

Requirement: Conditioned air shall pass through a single stage of HEPA filters located in the LAW Effluent Utility Building before being exhausted by the ACV exhaust system. [Section 12.15.1.1, BOD] [Sections 6.1, 6.3, NOC 1043] (Table 2-4, D.1)

Basis Discussion: New radioactive air emission units are required to comply with the best available radionuclide control technology (BARCT). The number of stages of HEPA filtration and filter efficiency are determined in accordance with applicable codes and standards for the demonstration of regulatory compliance.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify that conditioned air provided to the process and utility areas of the EMF passes through a single stage of HEPA filtration located in the LAW Effluent Utility Building.	

3.11.1.3.2 Standby Filter Banks

Requirement: The ACV exhaust system shall have a standby filter bank. [Section 15.1, ORD]

Basis Discussion: Standby filter banks facilitate filter change-out without interrupting the normal operation of the ventilation system. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify a standby filter bank is included in the ACV exhaust system.	

3.11.1.3.3 DELETED.

3.11.1.3.4 DELETED.

3.11.1.3.5 HEPA Filter Loading

Requirement: The ACV exhaust system design shall provide for constant flow or constant pressure such that gradual filter loading does not affect established limits. Consideration shall be given to providing automatic systems to control the established parameter. [Section 15.1, ORD]

Basis Discussion: The exhaust fan flow varies based on the pressure at the inlet to the HEPA filters. Exhaust flow is directly based on this inlet pressure, and the speed of the exhaust fan is adjusted to maintain the pressure at the HEPA filter inlet as the filter is loaded with particulate. The filter high differential pressure alarm sounds when the pressure on the exhaust side of the HEPA filter becomes too high, thereby indicating that the filter is full and a filter change is required.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	ENG	Perform an analysis to verify that the ACV system design includes an allowance for filter loading such that the fan system may maintain constant flow or constant pressure such that gradual filter loading does not affect established limits.	
R	ENG	Review the design to verify conformance with the results of the analysis.	

3.11.1.4 Condition Air

None.

3.11.1.5 Exhaust Air

3.11.1.5.1 Discharge Stack Design

Requirement: The ACV exhaust system design shall provide for an appropriate stack height and location to ensure adequate dispersal and to prevent re-entry of exhaust air to the building air intake. [Section 15.1, ORD] (Table 2-4, E.1)

Basis Discussion: Sufficient stack height and exhaust discharge velocity is required to ensure exhaust air is not re-introduced through the building air supply systems. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	ENG	Perform an analysis to verify the design meets the requirement to prevent exhaust re-entrainment for the designed stack height and velocities.	
R	ENG	Review the duct layout drawings to verify the stack location and height are consistent with the analysis.	

3.11.1.5.2 Discharge Stack Velocity

Requirement: The ACV system stack discharge velocity shall be sufficient to prevent rainwater intrusion during operation. [Section 15.1, ORD] (Table 2-4, E.1)

Basis Discussion: If an alternate solution is available, the designer may pursue a change notice or exception to the ORD to allow the alternate solution to be used.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	ENG	Perform an analysis to verify that the ACV system stack discharge velocities meet the requirement to prevent rainwater intrusion.	
R	ENG	Review the stack design to verify the stack discharge velocity is adequate to prevent rainwater intrusion.	
T	SU/COM	Perform a test to verify the required discharge velocity is achieved.	Notify results to the WDOH in accordance with air permit requirements.

3.11.1.5.3 Filter Isolation Dampers

Requirement: The ACV exhaust system shall have manually operated isolation dampers installed upstream and downstream of the filter banks to facilitate filter changing. [Section 15.1, ORD] [Section 12.7.3.3, BOD]

Basis Discussion: The manually operated dampers provide isolation of the HEPA filter housing so that the filter can be changed out without affecting the air flow through the HEPA filter bank. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify manual isolation dampers are included upstream and downstream of filters.	

3.11.1.5.4 Exhaust Configuration

Requirement: The ACV exhaust shall be combined with HEPA-filtered air from the DVP system downstream of the ACV exhaust fans and discharged to the atmosphere via the EMF stack. [Section 6.3, NOC 1043] (Table 2-4, E.1)

Basis Discussion: The ACV exhaust is ducted through a dedicated flue to support monitoring of the exhaust stream as required by environmental permits.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the ACV system exhaust is combined with HEPA-filtered air from the DVP system downstream of the ACV exhaust fans and is ducted through a flue and into the EMF stack.	

3.11.1.6 Sample Air

3.11.1.6.1 ACV Exhaust System Emission Monitoring

Requirement: Air emissions from EMF process and utility areas shall be environmentally sampled and/or monitored to ensure compliance with regulatory requirements. The ACV exhaust system shall have provisions for instrumentation and (or) sampling in support of radiological monitoring. [Sections 9.4.12, 9.4.12.2, 12.15, 12.5.1.1, BOD] [Sections 8.2, 15.1, ORD] [Section 9.1, NOC 1043] (Table 2-4, F.2)

Basis Discussion: The EMF stack design interfaces with SDJ for continuous radiological monitoring, as well as periodic sampling. The actual monitoring of the exhaust stream is within the scope of the SDJ system. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the EMF stack design interfaces with SDJ for continuous radiological monitoring, as well as periodic sampling.	

3.11.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

None.

3.11.3 System Interface Requirements

None.

3.11.4 Other Technical, Specialty, Operations and Maintenance Requirements

None.

3.12 DVP System Requirements

3.12.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.12.1.1 DVP System Configuration

Requirement: The DEP system vessel vent and after-condenser exhaust streams shall be passed through a pre-heater and a dedicated two-stage HEPA filtration system prior to their discharge into the building stack downstream of the ACV HEPA filters and fans. [Section 12.15.2, BOD] [Sections 6.1, 6.2, NOC 1043] (Table 2-4, D.2) (Table 2-4, E.1)

Basis Discussion: New radioactive air emission units are required to comply with the best available radionuclide control technology (BARCT). The pre-heater mitigates the parameters that could affect the function or integrity of the BARCT under normal operating conditions. DVP off-gas streams are HEPA filtered prior to discharge to remove any free radioactive particulate contamination that may be present in the vessel vent off-gas. Discharge into the building stack must occur upstream of any required stack monitoring systems. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify vessel vent and after-condenser off-gas is passed through a pre-heater and a dedicated two-stage HEPA filtration system prior to discharge downstream of the ACV HEPA filters and fans and into the building stack.	

3.12.1.2 Hydrogen Purging

Requirement: The DEP system process vessels shall interface with the DVP system for the capability of purging hydrogen. [Section 6.1, BOD] (Table 2-2, D.2) (Table 2-4, C.2)

Basis Discussion: Process vessels are ventilated to prevent hydrogen accumulation at concentrations above those specified in the authorization basis for the EMF.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review of design to verify the DEP system process vessels interface with the DVP system for the capability of purging hydrogen.	

3.12.1.3 DELETED.

3.12.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

None.

3.12.3 System Interface Requirements

None.

3.12.4 Other Technical, Specialty, Operations and Maintenance Requirements

3.12.4.1 Operability and Maintenance Filter Changing

Requirement: The DVP system shall be designed with isolation valves installed upstream and downstream of HEPA filter units to facilitate filter changing. The need for valve indication status at the PCJ, and the need for automatic vs. direct action, shall be based on the individual system design requirements, including reliability and operator response during normal and off-standard conditions, and design basis events. [Section 15.1, ORD]

Basis Discussion: The valves provide isolation of the HEPA filter housing so that the filter can be changed out without effecting the air flow through the HEPA filter bank. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify isolation valves are installed such that filters can be changed.	

3.12.4.2 DVP System Valve Lockout

Requirement: DVP system valves shall be designed and procured where possible to support lockout using commercially manufactured devices other than chains. [Section 7.1, ORD]

Basis Discussion: Design of DVP system valves for compatibility with commercial off-the-shelf locking devices supports maintainability, operability, and testing of the valves throughout the life of the valve.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify all DVP system valves are designed and procured where possible to support lockout using commercially manufactured devices other than chains.	

3.12.4.3 DVP System Remote Valve Operation

Requirement: Remote valve operation from the LAW FCR shall be provided for DVP system valves located where accessibility is difficult, such as R5/C5 areas, and for valves used in routine operations. Manual valve reach rods, if necessary, shall be designed to be removed easily and, when reinstalled, only engage the valve in the correct alignment, using no more than two universals. Valves in remotely maintained areas that are repositioned to support processing (this includes support systems) shall have position indication from directly coupled positioning mechanisms unless other indications are available such as flow, level, pressure, etc.. [Section 14.4, ORD]

Basis Discussion: Remote operation is used to ensure the WTP facilities' design achieves occupational doses that are ALARA. The need for "remote" operation does not apply to a black cell or pit only, but instead applies to an automatic valve or other feature to operate a valve at a distance. Valve position indication signals can be visual, mechanical, electric, or electronic based on the valve location and type of valve. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify remote operation is provided for DVP system valves located in areas where accessibility is difficult (e.g., R5/C5 areas) and for valves used in routine operations.	
R	ENG	Review the design to verify manual reach rods are easily removed and engage in the correct alignment using no more than two universals.	
R	ENG	Review the design to verify valves in remotely maintained areas have position indication from directly coupled positioning mechanisms unless other indications are available.	

3.12.4.4 DVP System Pipe Material

Requirement: The DVP system piping shall be constructed of stainless steel. [Section 12.15.2, BOD]

Basis Discussion: The strength, resistance to corrosion, and low maintenance properties of stainless steel make it an ideal material for use in the vessel vent process system. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design of the DVP system to verify that all piping is constructed of stainless steel.	

3.12.4.5 DVP System Temperature Element Installation

Requirement: DVP system temperature elements shall be installed in thermowells to allow removal without interrupting the process. [Section 11.16, ORD]

Basis Discussion: Installing temperature elements in thermowells reduces maintenance time and worker exposure to process gases. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the DVP system design to verify temperature elements are installed in thermowells.	

3.13 HVAC Monitoring and Control Requirements

3.13.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.13.1.1 EMF ACV and DVP System Control

Requirement: The startup, operation, and shutdown of the ACV and DVP systems shall be controlled and monitored from the LAW FCR through the PCJ system. [Sections 11.1, 15.1, ORD] [Section 12.7, BOD] (Table 2-4, F.1)

Basis Discussion: Interfacing with the PCJ system provides monitoring and control capability for HVAC systems serving EMF process and utility areas. EMF areas not served by the ACV or DVP systems (i.e., AFR room, pipe chase, and fire riser rooms), as well as all areas within the LAW effluent electrical building, are provided with standalone C1V system units to provide conditioned air and are controlled by local thermostats.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify monitoring and control of the ACV and DVP systems can be accomplished via the PCJ system from the LAW FCR.	

3.13.1.2 Flow Metering and Indication

Requirement: The ACV system shall include provisions for air flow metering and indication. [Section 9.4.12.1, BOD] (Table 2-4, F.1)

Basis Discussion: These flow measurements are used in conjunction with monitoring or sampling data to account for total emissions from monitored/sampled point sources. Total emissions data (including volume and flow rate) are reported for the facility in accordance with the requirements of WAC 246-247.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the ACV system discharge point includes provisions for air flow metering and indication.	

3.13.1.3 Support for Startup and Commissioning Testing

Requirement: The ACV and DVP systems shall have provisions for the connection or insertion of temporary flow measurement equipment, pressure/leak testing equipment, or other test equipment needed for startup and commissioning purposes. [Section 9.4.12.1, BOD] [Sections 15.1, 19.12, ORD]

Basis Discussion: Test ports may be installed in various locations of the ACV and DVP systems to enable portable measurements of pressure, flow sampling, and other infrequent measurements during commissioning and flow balancing.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that test ports are incorporated into the ACV and DVP systems.	SU/COM to participate in this review.

3.13.1.4 Fan Start and Shutdown Sequence

Requirement: The ACV and DVP systems' control logic shall ensure the fan systems start and shut down in the correct order to maintain cascade ventilation during the fan start-up and shutdown sequences. [Sections 12.7, 12.7.2, BOD] (Table 2-4, F.1)

Basis Discussion: The intent of the requirement is to ensure cascade ventilation is maintained in all process and utility areas of the EMF. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
A	**ENG**	Perform an analysis to determine the correct fan start-up and shutdown sequence to verify that cascade ventilation is maintained during fan start-up and shutdown sequences.	
R	**ENG**	Review the design to verify conformance with the results of the analysis.	
T	**SU/COM**	Perform a test to verify that the sequence activates and both starts and shuts down the fan systems in the correct order.	

3.13.1.5 Supply and Exhaust Fan Monitoring

Requirement: If required, the run time of selected higher horsepower ACV and DVP system motors shall be monitored. [Section 7.1, ORD]

Basis Discussion: The PCJ system must be programmed to monitor the run time of any high horsepower motors contained in the HVAC system. This supports efficient scheduling of run-hour based preventative maintenance.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that applicable high horsepower motors are identified in the ACV and DVP system design and run hours of specified high horsepower motors can be monitored.	

3.13.1.6 DELETED.

3.13.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

3.13.2.1 HEPA Filter Differential Pressure Monitoring

Requirement: The differential pressure across each ACV and DVP system exhaust HEPA filter stage shall be measured by strain gauge pressure sensors. [Section 6.1, NOC 1043] (Table 2-4, F.1)

Basis Discussion: A minimum differential pressure measurement combined with a calculated total airflow is used to check for HEPA filter bypass. A loss of differential pressure without a coincident reduction in airflow is indicative of filter bypass. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the ACV and DVP system designs to verify the differential pressure across each exhaust HEPA filter stage is measured by strain gauge pressure sensors.	

3.13.2.2 HEPA Filter Flow Monitoring

Requirement: The flow through the ACV and DVP system exhaust HEPA filter bank shall be measured by an averaging pitot tube with a magnehelic differential gauge or transmitter. [Section 6.1, NOC 1043] (Table 2-4, F.1)

Basis Discussion: A minimum differential pressure measurement combined with a calculated total airflow is used to check for HEPA filter bypass. A loss of differential pressure without a coincident reduction in airflow is indicative of filter bypass. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the ACV and DVP system designs to verify the flow through each exhaust HEPA filter stage is measured by an averaging pitot tube with a magnehelic differential gauge or transmitter.	

3.13.2.3 Preheater Temperature Monitoring

Requirement: The inlet and outlet temperature of the DVP system HEPA preheater shall be measured by resistive temperature detectors. [Section 6.1, NOC 1043] (Table 2-4, F.1)

Basis Discussion: Measuring the temperature output of the preheater verifies that the unit is performing its function of mitigating parameters that could affect the function or integrity of the BARCT under normal operating conditions. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the DVP system design to verify the inlet and outlet temperature of the HEPA preheater is measured by resistive temperature detectors.	

3.13.3 System Interface Requirements

None.

3.13.4 Other Technical, Specialty, Operations, and Maintenance Requirements

3.13.4.1 DELETED.

3.13.4.2 Fan Auto-Changeover

Requirement: The ACV and DVP system control logic shall ensure the fan auto-changeover systems detect the failure of an operational fan and automatically start the standby unit. [Section 15.1, ORD] [Section 12.7, BOD] (Table 2-4, F.1)

Basis Discussion: Control logics are used in lieu of fan auto-changeover systems to ensure the appropriate interlocks exist between operating and standby fans. This requirement only applies if a stand-by unit is specified in the design.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the control logic incorporates fan auto-changeover upon failure detection.	
T	**SU/ COM**	Perform a test to verify that upon simulated failure of an operational fan, ventilation system control logic automatically starts the standby unit.	

3.14 Underground Transfer Piping Requirements

Requirements included in this section are specific to the design of underground waste transfer lines that are within the scope of the DEP system and accommodate the DFLAW operating configuration. These lines consist of the combined treated feed and evaporator concentrate feed from the EMF to the LAW Facility (ICD-30), the evaporator feed/concentrate return from EMF to Tank Farms (ICD-31), and the dilute evaporator effluent from EMF to LERF/ETF (ICD-06). Refer to Section 3.6.5 for requirements associated with the design of all DEP piping systems that are not underground waste transfer lines.

3.14.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.14.1.1 General Underground Transfer Piping Requirements

3.14.1.1.1 Double-Walled (Coaxial) Piping Testing

Requirement: Co-axial lines used as underground transfer lines shall have provisions to pneumatically test both the primary and secondary lines for leakage. [Sections 11.2.3, 14.10.1.3, BOD] [Section 14.3, ORD]

Basis Discussion: The use of coaxial piping ensures that secondary containment is provided for the primary (inner) transfer line for compliance with WAC requirements. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the underground piping design to verify the capability to pneumatically test both the primary and secondary lines for leakage is included.	

3.14.1.1.2 Pipe Draining

Requirement: Underground transfer piping shall have provisions to drain and shall have no traps or pockets that can accumulate liquids or solids that cannot be drained either by operator action or through free draining design. [Sections 7.1, 14.3, 20.0, ORD] [Sections 11.3.1, 11.2.3, BOD] (Table 2-2, C.1)

Basis Discussion: For additional details on pipe sloping, refer to 24590-WTP-GPG-M-027, *Recommended Slopes for Piping System*. Level piping for a short distance through wall penetrations, at connections to equipment, and at jumpers is acceptable (Section 14.3, ORD). This is an ALARA feature because it ensures the pipes are drained of radioactive material if maintenance needs to be performed, and during decommissioning, which reduces dose and the potential to spread contamination. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the underground transfer piping design to verify piping is designed to drain.	

3.14.1.1.3 Pipe Flushing

Requirement: The WTP Contractor shall provide the capability and the motive force to flush the transfer pipeline with either deionized/demineralized water, raw water, or inhibited water following conditioned effluent transfers from the EMF to the Tank Farm Double-Shell Tank system. The minimum required flush volume is 1.5 times the transfer line volume. [Section 6.2.1, BOD] [Sections 14.1, 14.3, 20.0, ORD] [Section 3.1.1.9, ICD-31] (Table 2-2, D.1)

Basis Discussion: A flushing capability is provided for underground transfer piping systems to limit the accumulation of solids and reduce contamination in transfer piping. This is an ALARA feature because it facilitates removal of potentially contaminated material from process piping systems in support of decontamination. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the ICD-31 governed underground transfer piping design to verify a flushing capability is incorporated.	

3.14.1.1.4 DELETED. (Moved to 3.14.1.4.6)

3.14.1.1.5 Transfer Piping Depth

Requirement: The WTP Contractor shall ensure all conditioned effluent underground transfer piping between the Effluent Management Facility and the Node 14 interface point is buried a minimum of 3 feet deep to the top of the core (inner) pipe, or other appropriate freeze protection measures are provided. [Section 10.1.5.7, BOD] [Section 2.1, ICD-06] [Section 3.1.1.4, ICD-31][Section 3.1.1.5, ICD-30] (Table 2-2, G.2)

Basis Discussion: To avoid temperature monitoring requirements for buried piping, the TOC has a requirement for a minimum of 3 ft of cover soil over the waste feed lines (HNF-IP-1266, *Tank Farms Operations Administrative Controls*). This requirement also applies to the buried piping in the transfer system installed by the WTP Contractor. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the transfer piping is buried a minimum of 3 ft deep.	

3.14.1.1.6 Corrosion Protection of Underground Metallic Piping Systems

Requirement: Underground metallic piping systems and fittings shall be protected from external and stray current corrosion. [Section 11.1.1.1, BOD]

Basis Discussion: None.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify that DEP underground metallic piping systems and fittings are protected from external and stray current corrosion.	

3.14.1.1.7 Radiation Shielding

Requirement: All underground radiological waste transfer lines shall be provided with adequate shielding to comply with ALARA goals. [Section 10.1.5.8, BOD]

Basis Discussion: Underground radiological waste transfer lines are shielded in support of meeting the target dose equivalent rate at the WTP site. Examples of adequate shielding include soil, concrete, or steel. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of underground radiological waste transfer lines to verify that adequate shielding is provided.	

3.14.1.2 ICD-30 Requirements

Physical and administrative interactions that allow for the direct transfer of treated low-activity waste feed from the TOC to the LAW Facility in the DFLAW configuration are governed by the requirements of ICD-30. The underground waste transfer line between the WTP site boundary and the battery limit of the LAW Facility are within the scope of the DEP system, and is therefore included in this document. Section 3.14.1.2 addresses requirements associated with the physical design of the underground waste transfer line, while Section 3.15.1.2 addresses requirements associated with monitoring and control of transfers between the TOC and the LAW Facility.

3.14.1.2.1 Feed Transfer to the LAW Facility

Requirement: Underground Treated LAW Feed transfer piping from the Node 13 interface point to the LAW facility shall be a double-contained feed transfer pipeline. The core (inner) pipe shall be 3-inch nominal diameter, schedule 40S, ASTM A 312 grade TP 316L, seamless construction. The encasement (outer) pipe shall be 6-inch nominal diameter, standard wall thickness, ASTM A 106 grade B, seamless construction. [Section 6, BOD] [Section 3.1.1.1, ICD-30] (Table 2-2, A.1)

Basis Discussion: The underground waste transfer line supplying waste feed from the TOC to the LAW Facility is within the scope of the DEP system. The waste feed from the TOC is not processed by the DEP system, but the transfer piping has been included as part of DEP system scope as it accommodates the DFLAW operating configuration.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the DEP system interfaces with the TOC at the node specified on 24590-WTP-B2-C12T-00001 to enable waste feed transfers to the LAW Facility.	

3.14.1.2.2 Feed Transfer Piping Physical Characteristics

Requirement: The WTP Contractor shall provide corrosion protection measures on the WTP underground portion of the Treated LAW Feed outer containment pipe consisting of an epoxy coating followed by a rigid foam insulation protected by a waterproof nonmetallic jacket. [Sections 3.1.1.4, ICD-30] (Table 2-2, A.1)

Table 3-1 Not Used

Basis Discussion: Both WTP and Tank Farms sections of the transfer pipeline are constructed according to approved procedures, approved permits, and Washington Administrative Code (WAC) 173-303, including code equivalency evaluations as required, to minimize interference during installation of pipelines and supporting system.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that the transfer pipeline consists of a exterior pipe that is insulated with rigid-polyurethane foam insulation and is protected from corrosion by an epoxy coating with a waterproof nonmetallic insulation jacket.	

3.14.1.2.3 Feed Transfer Piping Design Pressure and Temperature

Requirement: The WTP Contractor shall ensure:

- All core (inner) pipe components installed in the LAW feed transfer system on the downstream (LAW) side of the ASME B31.3 code break valve shall meet or exceed a design pressure/temperature of 150 psig at 150 °F.
- All core (inner) pipe components installed in the LAW feed transfer system between the ASME B31.3 code break valve and the Node 13 interface point shall meet or exceed a design pressure/temperature of 400 psig at 150 °F.
- All encasement (outer) pipe components installed in the LAW feed transfer system shall meet or exceed a design pressure/temperature of 50 psig at 150 °F.

[Sections 3.1.1.3, ICD-30] (Table 2-2, A.1)

Table 3-2 Not Used

Basis Discussion: ICD-30 identifies the design pressure and temperature of the existing LAW LCP piping, but if the LAWPS feed delivery system design pressure is higher, protection of the installed LAW LCP system piping will need to be evaluated.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the DEP system feed transfer piping used for transfers from the TOC to the LAW Facility is designed to meet the required environmental conditions.	

3.14.1.2.4 Deleted

3.14.1.2.5 DELETED. (Combined with 3.5.4.10)

3.14.1.3 ICD-31 Requirements

Physical and administrative interactions that allow for the transfer of evaporator concentrate/feed from the EMF to the Tank Farms DSTs in the DFLAW configuration are governed by the requirements in ICD-31. The underground waste transfer line between the EMF and the WTP site boundary is within the scope of the DEP system, and is therefore included in this document. Section 3.14.1.3 addresses requirements associated with the physical design of the underground waste transfer line, while Section 3.15.1.3 addresses requirements associated with monitoring and control of transfers between the EMF and the Tank Farms DSTs.

3.14.1.3.1 Evaporator Concentrate/Feed Transfer to Tank Farms

Requirement: Conditioned effluent transfer piping between the EMF and the Node 14 interface point shall be a double-contained transfer pipeline. The core (inner) pipe shall be 3-inch nominal diameter, schedule 40S, ASTM A 312 grade TP 316L, seamless construction. The encasement (outer) pipe shall be 6-inch nominal diameter, standard wall thickness, ASTM A 106 grade B, seamless construction. [Section 3.1.1.2, ICD-31] (Table 2-2, A.8.1)

Basis Discussion: Pipelines are provided from the EMF to the interface point with Tank Farms. The underground waste transfer line for return of concentrated effluent up to the interface point is within the scope of the DEP system.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the DEP system interfaces with the Tank Farms at node 14 specified on 24590-WTP-B2-C12T-00001 to enable the return of evaporator concentrate/feed.	
R	ENG	Review the design to verify the piping is a double-contained transfer pipeline with the core (inner) pipe a 3-inch nominal diameter, schedule 40S, ASTM A 312 grade TP 316L, seamless construction. The encasement (outer) pipe shall be 6-inch nominal diameter, standard wall thickness, ASTM A 106 grade B, seamless construction.	

3.14.1.3.2 Evaporator Concentrate/Feed Transfer Piping Protection

Requirement: The WTP Contractor shall provide corrosion protection measures on the underground portion of the conditioned DFLAW effluent outer containment pipe consisting of an epoxy coating followed by a rigid foam insulation protected by a waterproof nonmetallic jacket. The pipeline design shall be designed in accordance with the physical characteristics identified in Table 3-3, below. [Sections 3.1.1.3, ICD-31] (Table 2-2, A.8.1)

Table 3-3 Not Used

Basis Discussion: Both WTP and Tank Farms sections of the transfer pipeline are constructed according to approved procedures, approved permits, and Washington Administrative Code (WAC) 173-303, including code equivalency evaluations as required, to minimize interference during installation of pipelines and supporting system. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify that the transfer pipeline is insulated with rigid-polyurethane foam insulation and is protected from corrosion by an epoxy coating and protected with a waterproof nonmetallic insulation jacket.	

3.14.1.3.3 Evaporator Concentrate/Feed Transfer Piping Design Pressure and Temperature

Requirement: The WTP Contractor shall ensure all conditioned effluent transfer piping between the Effluent Management Facility and the Node 14 interface point is buried a minimum of 3 feet deep to the top of the core (inner) pipe, or other appropriate freeze protection measures are provided. [Sections 3.1.1.4, ICD-31] (Table 2-2, A.8.1)

Table 3-4 Not Used

Basis Discussion: Both WTP and Tank Farms sections of the transfer pipeline are constructed according to approved procedures, approved permits, and Washington Administrative Code (WAC) 173-303, including code equivalency evaluations as required, to minimize interference during installation of pipelines and supporting system.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify all conditioned effluent transfer piping between the EMF and the Node 14 interface point is buried a minimum of 3 feet deep to the top of the core (inner) pipe, or other appropriate freeze protection measures are provided.	

3.14.1.3.4 Deleted

3.14.1.3.5 DELETED. (Combined with 3.6.4.1.2)

3.14.1.3.6 DELETED. (Combined with 3.5.4.10)

3.14.1.3.7 DELETED.

3.14.1.4 ICD-06 Requirements

Physical and administrative interactions that allow for the transfer of dilute effluent from the EMF to LERF/ETF in the DFLAW configuration are governed by the requirements in ICD-06. The underground waste transfer line between the EMF and the WTP site boundary is within the scope of the DEP system, and is therefore included in this document. Section 3.14.1.4 addresses requirements associated with the physical design of the underground waste transfer line, while Section 3.15.1.4 addresses requirements associated with monitoring and control of transfers between the EMF and LERF/ETF.

3.14.1.4.1 Dilute Effluent Transfer

Requirement: Underground waste transfer lines shall be provided for the transfer of dilute effluents and LAW caustic scrubber effluent from the DEP system to LERF/ETF. The physical interface at the WTP site boundary shall be Nodes 8A and 8B, as shown on the *Interface Control Drawing*, 24590-WTP-B2-C12T-00001. [Section 6, BOD] [Sections 1.2 Table 1, 2.1, 2.1.1, ICD-06] (Table 2-2, A.8.2)

Basis Discussion: The DEP system design should include a method to dispose of dilute effluents, including LAW caustic scrubber effluent, since they constitute the larger portion of effluent generated at the EMF.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that the physical interface of the dilute effluent transfer line to LERF/ETF is at Nodes 8A and 8B at the site boundary.	

3.14.1.4.2 Dilute Effluent Transfer Piping Configuration

Requirement: Two transfer lines (a primary and a backup) shall be provided to transfer dilute effluent from EMF to LERF/ETF. The primary transfer pipeline shall be a coaxial line constructed of 4 inch 316L stainless steel carrier pipe with an 8 inch carbon steel secondary containment pipe. The backup transfer pipeline shall be a coaxial line constructed of 3 inch 316L stainless steel carrier pipe with a 6 inch carbon steel secondary containment pipe. [Sections 1.2, 2.1, 2.1.1, ICD-06] (Table 2-2, A.8.2)

Basis Discussion: Piping is in accordance with applicable project piping codes and standards.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that two transfer lines (a primary and a backup) are provided to transfer dilute effluent from the EMF to LERF/ETF.	
R	**ENG**	Review the design to verify the correct size and material of construction is used for the primary and backup transfer pipelines.	

3.14.1.4.3 Dilute Effluent Transfer Piping Design Pressure

Requirement: DEP system underground dilute effluent transfer piping used for transfers from EMF to LERF/ETF shall be designed to a design pressure of 100 psig at a design temperature of 120°F. [Section 2.1, 3.1.1.3, ICD-06] (Table 2-2, A.8.2)

Basis Discussion: Dilute effluent is transferred from EMF to LERF/ETF to support the throughput and design capacity requirements for the LAW Facility while operating in the DFLAW configuration.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the design pressure and temperature of the DEP system dilute effluent transfer piping is 100 psig and 120°F, respectively.	

3.14.1.4.4 DELETED. (Combined with 3.6.4.1.3)

3.14.1.4.5 DELETED. (Combined with 3.5.4.10)

3.14.1.4.6 Piping Design for Gravity Liquid Draining

Requirement: The underground transfer piping from the EMF to LERF/ETF shall include the capability to break a vacuum to allow gravity liquid draining. [Section 7.1, ORD]

Basis Discussion: The addition of a vacuum breaker, high point vent, or other design feature that provides the capability to break a vacuum within a transfer line ensures that air can be admitted and swept in the pipe, thereby restoring normal flow. This requirement applies only when the high point between the sending facility/system and receiving facility/system occurs within the DEP piping system. This is an ALARA feature because it allows lines to completely drain. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design of the DEP system underground transfer piping between the EMF and the LERF/ETF to verify a means of breaking a vacuum is provided.	

3.14.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

None.

3.14.3 System Interface Requirements

None.

3.14.4 Other Technical, Specialty, Operations, and Maintenance Requirements

None.

3.15 Underground Transfer Piping Monitoring and Control Requirements

Requirements included in this section are specific for the monitoring and control of underground waste transfer lines that are within the scope of the DEP system and accommodate the DFLAW operating configuration.

3.15.1 Mission and Functional/Performance Requirements (Including States/Modes)

3.15.1.1 General Underground Transfer Piping Monitoring and Controls Requirements

3.15.1.1.1 Coaxial Pipe Leak Detection

Requirement: All underground coaxial lines shall have on-line primary containment leak detection capability. [Sections 11.3.5.2, 14.10.1.3, BOD] [Section 14.3, ORD] (Table 2-2, C.3.1) (Table 2-2, E.1)

Basis Discussion: The leak detection system must be able to detect a leak within 24 hours of failure. Ecology has interpreted this requirement to mean the detection of 0.1 gallons per hour based on the DWP. It is acceptable for multiple coaxial lines to share a common leak detection box. However, operational impacts associated with identifying the source of any potential leak must be determined when considering use of a common leak detection box. The design of leak detection systems should consider the impacts on the DEP system operation if multiple coaxial lines must be isolated in order to identify the source of the leak. The verification of a leak detection capability is performed through testing detailed in Section 3.4.3.3.8 and is not repeated in the verification methods listed below. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify there are provisions for leakage detection for the underground coaxial lines.	

3.15.1.2 ICD-30 Monitoring and Controls Requirements

3.15.1.2.1 Feed Transfer Leak Detection Interlock and Fail-Safe State Shutdown

Requirement: WTP shall provide permissive and shutdown signals (e.g., interlock) to the Tank Farm Monitoring and Control System to shutdown transfer of Treated LAW Feed and establish a fail-safe state if an upset condition is detected (e.g., leak detection, high radiation, high flow rate, high tank levels, valve alignment). [Section 3.1.1.8, ICD-30] [Section 7.1, ORD] (Table 2-2, E.1)

Basis Discussion: The DEP system provides monitoring information of its transfer lines and vessel systems to incorporate into the Tank Farm Monitoring and Control System. Typical inputs to the interlock signal are leak detection, vessel levels, valve alignment, transfer times, and ventilation signals. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify permissive and shutdown signals to the Tank Farm Monitoring and Control System exist that shutdown transfer of Treated LAW Feed and establishes a fail-safe state.if an upset condition is detected (e.g., leak detection, high radiation, high flow rate, high tank levels, valve alignment). .	
T	SU/ COM	Perform a test to verify that a permissive/shutdown signal is sent to the Tank Farms Monitoring and Control System to shutdown the transfer, and establish a fail-safe state, in the event of an upset condition (such as a transfer line leak, high radiation, high flow rate, high tank level, or valve alignment) is detected.	

3.15.1.2.2 Deleted

3.15.1.2.3 Feed Transfer Monitoring Information

Requirement: The WTP Contractor shall provide/transmit Treated LAW Feed transfer data (e.g., flow rates, density, temperature, pressure, radiation level, valve alignment, etc.) to incorporate into the Tank Farms Monitoring and Control System. [Section 3.1.1.6, ICD-30] (Table 2-2, E.1)

Basis Discussion: The TOC and the WTP DEP system provide monitoring information for their respective transfer lines and feed tank/feed receipt systems to incorporate into the Tank Farms Monitoring and Control System and the WTP control network. This is a data link allowing Tank Farms to see WTP process data while operating and during transfer.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify that Treated LAW Feed transfer data (e.g., flow rates, density, temperature, pressure, radiation level, valve alignment, etc.) is transmitted to the LAW Facility and feed tank/feed receipt systems and provided for incorporation in Tank Farms Monitoring and Control System.	
T	SU/ COM	Perform a test to verify Treated LAW feed transfer data is provided to the Tank Farms Monitoring and Control System.	

3.15.1.2.4 Feed Transfer Volume Balances

Requirement:
The WTP Contractor shall provide capability/instrumentation to measure the total volume of Treated LAW Feed received during transfers to the LAW Facility.[Section 3.1.1.9, ICD-30] [Section 7.1, ORD] (Table 2-2, E.1)

Basis Discussion: Instrumentation is used to determine volume balances during transfers to WTP process vessels. Per ICD-30, the volume of treated feed and flush water received is to be documented and differences reconciled with the transfer volumes recorded by Tank Farms.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENG	Review the design to verify the DEP system has the capability to measure the total volume of treated feed and flush water during feed transfers to the LAW Facility.	

3.15.1.2.5 Deleted

3.15.1.2.6 Feed Piping Radiation Monitoring

Requirement: The design of the DEP system feed transfer piping to the LAW Facility shall include a radiation monitor. The batch transfer of Treated LAW Feed shall be stopped upon detection of radiation levels that exceed the limits for the LAW Facility. [Section 3.1.1.10, ICD-30] (Table 2-2, E.1)

Basis Discussion: Use of a radiation monitor within the transfer line allows the transfer of waste feed to be stopped if the measured exposure exceeds limits for the LAW Facility. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the feed transfer piping design to verify that radiation monitors are included in the design.	
T	**SU/ COM**	Perform a test to verify that batch transfers of the Treated LAW feed are stopped upon detection of radiation levels that exceed the limits for the LAW Facility.	

3.15.1.2.7 Feed Transfer Control System Sequencing

Requirement: The control system for feed to the LAW Facility shall be sequenced to first transfer available concentrated effluent from the DEP system, followed by a transfer of feed from the TOC, with the feed pushed into the receipt vessels by flush water from the TOC. [Sections 6, 6.1.2, BOD] (Table 2-2, A.2)

Basis Discussion: The transfer line piping could contain solutions with high concentration of chlorine ions that are not aligned with the design limits for the piping material. In order to mitigate the potential for corrosion caused by the transfer of the concentrate process stream, the design needs to include provisions for the dilution and flushing of the transfer system.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design of the transfer system of feed to the LAW Facility to verify it is designed to first transfer available concentrated effluent from the DEP system, followed by a transfer of feed from the TOC, with the feed pushed into the receipt vessels by flush water from the TOC.	

3.15.1.3 ICD-31 Monitoring and Controls Requirements

3.15.1.3.1 Deleted

3.15.1.3.2 Evaporator Concentrate/Feed Transfer Leak Detection Interlock and Fail Safe Shutdown

Requirement:. The WTP monitoring and control system shall have capability to stop a transfer and establish a fail-safe condition upon:

- detection of a leak by either the WTP or the TOC transfer line leak detection system, or
- removal of permissive signal, or interlock, or on loss of watchdog signals.

[Section 3.1.1.14, ICD-31] [Section 7.1, ORD] (Table 2-2, E.1)

Basis Discussion: During the transfer process, a means of stopping transfer flow and establishing a fail-safe condition is necessary if an upset condition is detected in either the WTP transfer line, the TOC transfer line, or the associated monitoring and control system(s). [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that a transfer is stopped upon detection of a leak, and if the permissive/shutdown signal from the WTP Contractor or from the TOC is lost during the transfer of evaporator concentrate/feed to Tank Farms, the transfer shutdown process is initiated to a fail-safe state.	
T	**SU/ COM**	Perform a test to verify that the transfer process is stopped upon detection of a leak and is shutdown to a fail-safe state when the permissive/shutdown signal is lost from WTP or from Tank Farms during the transfer of evaporator concentrate/feed to Tank Farms.	

3.15.1.3.3 Evaporator Concentrate/Feed Transfer Monitoring Information

Requirement: The WTP Contractor shall provide capability to transmit process monitoring data to the TOC for incorporation into the Tank Farms Monitoring and Control System. The DEP system shall provide monitoring information for the evaporator concentrate/feed transfer line and effluent tank system to incorporate into the Tank Farms Monitoring and Control System. [Section 3.1.1.13, ICD-31] (Table 2-2, E.1)

Basis Discussion: This is a data link allowing Tank Farms to see WTP process data while operating and during transfers and flushes. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that monitoring information of the evaporator concentrate/feed transfer line and effluent tank systems is provided for incorporation in Tank Farms Monitoring and Control System.	
T	**SU/ COM**	Perform a test to verify that monitoring information for the evaporator concentrate/feed return line to Tank Farms is provided to the Tank Farms Monitoring and Control System.	

3.15.1.3.4 Evaporator Concentrate/Feed Transfer Volume Balances

Requirement: The DEP system shall have the capability to measure the total volume of DFLAW concentrated effluent, chemical additions, and flush water transferred during transfers of evaporator concentrate/feed to Tank Farms. All individual volumes of effluent and additions used in the transfer shall be measured with an accuracy of +/- 10%. The WTP Contractor shall provide capability to measure the total volume of conditioned DFLAW effluent and the total volume of flush water transferred to TOC. [Section 3.1.1.10, ICD-31] [Section 7.1, ORD] (Table 2-2, E.1)

Basis Discussion: The volume of effluent and flush water transferred to TOC is needed for tracking Double-Shell Tank (DST) inventory and waste chemistry limits..

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify the DEP system has the capability to measure the total volume of concentrated effluent, chemical additions, and flush water during evaporator concentrate/feed transfers to Tank Farms.	

3.15.1.4 ICD-06 Monitoring and Controls Requirements

3.15.1.4.1 Dilute Effluent Transfer Stop Control

Requirement: The DEP system underground dilute effluent transfer system shall have interlocks or other provisions to stop the transfer of dilute effluent to LERF/ETF upon an alarm of either the leak detection system on the WTP portion of the LERF/ETF transfer line or an alarm on the LERF/ETF leak detection or control system. [Section 3.1.1.4, ICD-06] [Sections 7.1, 18, ORD] (Table 2-2, E.1)

Basis Discussion: LERF/ETF also has the ability to terminate transfers from the WTP. [ALARA]

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that appropriate interlocks or other provisions are in place to terminate dilute effluent transfers in the event of leak detection in either the WTP or LERF/ETF portions of the transfer line.	
R	**ENG**	Review the design to verify that LERF/ETF has the ability to terminate dilute effluent transfers from the LERF/ETF facility.	
T	**SU/ COM**	Perform a test to verify the stop control function as intended upon an alarm of either the leak detection system on the WTP portion of the LERF/ETF transfer line or an alarm on the LERF/ETF leak detection or control system.	

3.15.1.4.2 Dilute Effluent Transfer Monitoring Information

Requirement: Under DFLAW operations, the DEP system shall provide real-time monitoring of the dilute effluent flow rate, effluent radiation, pH, and conductivity during transfers to LERF/ETF. For DFLAW process operations, the data, controls and monitoring interface requirements shall be identical to those determined for full WTP operation. [Sections 3.1.1.6, 3.1.1.7, ICD-06][ID : WTP-ICD-MG-01-006 ID#207]] [Section 7.1, ORD] (Table 2-2, E.1)

Basis Discussion: This is a data link allowing LERF/ETF to see WTP process data during transfer.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that flow rate, radiation, pH, and conductivity monitoring is provided on the dilute effluent transfer line to LERF/ETF.	
R	**ENG**	Review the design to verify that monitoring information can be transmitted to LERF Instrument Building (242AL-71) over a dedicated line at the required minimum frequency and that interface requirements for DFLAW operations are consistent with those for full WTP operation.	
T	**SU/COM**	Perform a test to verify that relevant, real-time effluent monitoring information (including dilute effluent flow rate, radiation, pH, and conductivity) is provided at the required frequency over a dedicated line to the LERF Instrument Building (242AL-71).	

3.15.1.4.3 Infrastructure to Support Dilute Effluent Transfer Monitoring

Requirement: Fiber optic cable and telecommunication equipment using PROFIBUS communication technology shall be provided for the transmittal of data signals to the interface point with LERF/ETF, as shown as Node 18 on the *Interface Control Drawing*, 24590-WTP-B2-C12T-00001. [Section 3.1.1.7, ICD-06]

Basis Discussion: WTP and Tank Farms install their choice of hardware to provide the necessary communications capability. The necessary connections are made at the interface point.

Verification: Verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENG**	Review the design to verify that fiber optic cable and equipment are provided to the interface point for the transmittal of data signals.	
R	**ENG**	Review the design to verify secure telecommunication lines are provided between the EMF and interface point.	
T	**SU/COM**	Perform a test to verify that secure data signals from the EMF are received at the interface point for LERF/ETF-related transfers.	

3.15.2 Nuclear Safety, ALARA, Environmental, and Other Regulatory Requirements

None.

3.15.3 System Interface Requirements

None.

3.15.4 Other Technical, Specialty, Operations, and Maintenance Requirements

None.

3.16 Technical Safety Requirements and Key Elements

None.

3.16.1 Deleted

3.16.2 Features Facilitating Chemical Safety Management Program

Hydrogen Mitigation in Process Vessels. Per CSMPD, App. A, Table A-1, Item 65, DEP vessels with the potential for appreciable hydrogen accumulation have provisions to ensure concentrations are maintained below applicable design codes and standards, including any required surveillances.

3.17 Relevant Codes and Standards

Table 3-5 identifies relevant external codes and standards applicable to the EMF and DEP, DVP, C1V, and ACV system designs. Use of the *Engineering, Procurement, and Construction (EPC) Code of Record*, 24590-WTP-COR-MGT-15-00001 is typically invoked in the design process through the documents identified in Section 3.17.1. Beyond inclusion here, no attempt is made in this document to extract individual design requirements from the Code of Record for allocation to SSCs.

In some cases, the expected means of verification may be established on the basis of tests or other criteria required by the codes and standards. This does not necessarily include verification or testing more appropriately defined in the procurement of individual sub-systems or components, or verification or testing that is a routine activity defined by specifications and/or procedures used by construction and startup.

Table 3-5 EMF Applicable Codes & Standards

Implementing Codes and Standards: [24590-WTP-COR-MGT-15-00001, Rev. 1, Engineering, Procurement, and Construction (EPC) Code of Record]
• 10 CFR 835, *Occupational Radiation Protection*
• 10 CFR 851, *Worker Safety and Health Program*
• 40 CFR 52, *Approval and Promulgation of Implementation Plans*
• 40 CFR 60, *Standards of Performance for New Stationary Sources*
• ANSI/AMCA 210, *Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating*
• ANSI/API STD 2000-1998, *Venting Atmospheric and Low-Pressure Storage Tanks, Non-Refrigerated and Refrigerated*
• ANSI/ASHRAE Standard 15-1994, *Safety Code for Mechanical Refrigeration*
• ANSI/UL 142, *Steel Aboveground Tanks for Flammable and Combustible Liquids*
• API STD 520, *Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries*
• API STD 521, *Pressure-relieving and Depressuring Systems*
• API STD 620, *Design and Construction of Large, Welded, Low-Pressure Storage Tanks*
• API STD 650, *Welded Steel Tanks for Oil Storage*
• ASCE 7-98, *Minimum Design Loads for Buildings and Other Structures*
• ASME B30.11, *Monorails and Underhung Cranes*
• ASME B30.16, *Overhead Hoists (Underhung)*

Implementing Codes and Standards: [24590-WTP-COR-MGT-15-00001, Rev. 1, Engineering, Procurement, and Construction (EPC) Code of Record]
• ASME B30.2, *Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)*
• ASME B31.1, *Power Piping*
• ASME B31.3-1996, *Process Piping Guide* (as tailored in Appendix C of the SRD)
• ASME B31.9, *Building Services Piping*
• ASME B36.19M, *Stainless Steel Pipe*
• ASME B73.1-2001, *Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process*
• ASME Section II, *Boiler and Pressure Vessel Code, Materials*
• ASME Section V, *Boiler and Pressure Vessel Code, Nondestructive Examination*
• ASME Section VIII Divisions 1 and 2, *Boiler and Pressure Vessel Code, Rules for Construction of Pressure Vessels*
• ASME Section IX, *Boiler and Pressure Vessel Code, Welding and Brazing Qualifications*
• ASME NOG-1-2002, *Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)*
• ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*
• ASTM E648, *Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source*
• ASTM E814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops*
• AWS D1.1/D1.1M, *Structural Welding Code – Steel*
• AWS D1.6, *Structural Welding Code – Stainless Steel*
• AWWA D100, *Welded Carbon Steel Tanks for Water Storage*
• CMAA 70, *Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes*
• DOE-STD-1020-94 (Change 1 1996), *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities*
• DOE-STD-1066-97, *Fire Protection Design Criteria* (as tailored in Appendix C of the SRD)
• IBC-2000, *International Building Code* (IBC)
• IEEE 485-1997, *Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications*
• IEEE 1023-1988, *IEEE Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations and Other Nuclear Facilities*
• IEEE 1050-1996, *Guide for Instrumentation and Control Equipment Grounding in Generating Stations*
• IEEE 1187-2002, *Recommended Practice for Installation Design and Installation of Valve-Regulated Lead-Acid Storage Batteries for Stationary Applications*
• IESNA/ANSI RP-1, *Recommended Practice for Office Lighting*
• IESNA/ANSI RP-7, *Recommended Practice for Lighting Industrial Facilities*
• IESNA/ANSI RP-8, *Roadway Lighting*
• IESNA RP-16, *Nomenclature and Definitions for Illuminating Engineering*
• NFPA 10-1998, *Standard for Portable Fire Extinguishers*
• NFPA 13-1999, *Standard for the Installation of Sprinkler Systems*

Implementing Codes and Standards: [24590-WTP-COR-MGT-15-00001, Rev. 1, Engineering, Procurement, and Construction (EPC) Code of Record]
• NFPA 69-2002, *Standard on Explosion Prevention Systems*
• NFPA 70-1999, *National Electrical Code (NEC)*
• NFPA 72-2002 and -2013, *National Fire Alarm and Signaling Code*
• NFPA 80-1999, *Standard for Fire Doors and Fire Windows*
• NFPA 80A-2001, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*
• NFPA 90A-1999, *Standard for the Installation of Air-Conditioning and Ventilating Systems*
• NFPA 101-2000, *Life Safety Code*
• NFPA 780-1997, *Standard for the Installation of Lighting Protection Systems*
• NFPA 801-2003, *Standard for Fire Protection for Facilities Handling Radioactive Materials*
• UBC-1997, *Uniform Building Code* (UBC)
• UL 1581, *Standard for Electrical Wires, Cables, and Flexible Cords*
• UMC, *Uniform Mechanical Code* (UMC)
• WAC 173-303, *Washington Administrative Code - Dangerous Waste Regulations*
• WAC 246-247, *Radiation Protection—Air Emissions*
• WAC 246-290, *Washington Administrative Code - Group A Public Water Supplies*

3.17.1 WTP Standards, Design Criteria, and (General) Specifications

Table 3-6 identifies relevant discipline design criteria, guides, and general specifications applicable to the EMF and associated systems. Use of these documents to develop the detailed design of SSCs is governed by engineering procedures. They majority or requirements within these documents are derived from external codes and standards or are specified methods and approaches to achieve standardization and consistency of design. Beyond inclusion here, no attempt is made in this document to extract individual design requirements from these documents for tracing and verification, or to define how direction provided by these documents is applicable and allocated (or not) to individual SSCs.

Table 3-6 WTP Design Criteria, Guides, and General Specifications Applicable to EMF

Document Number	Title
Design Criteria Documents	
24590-WTP-DC-AR-01-001	*Architectural Design Criteria*
24590-WTP-DC-C-01-001	*Civil Design Criteria*
24590-WTP-DC-E-01-001	*Electrical Design Criteria*
24590-WTP-DC-E-09-001	*Design Criteria for Electrical Equipment Installations*
24590-WTP-DC-M-06-001	*Mechanical Systems Design Criteria*
24590-WTP-DC-ST-01-001	*Structural Design Criteria*
24590-WTP-DC-ST-04-001	*Seismic Analysis and Design Criteria*
Design Guides	
24590-WTP-GPG-CSA-001	*Interior Room, Corridor, Door, and Window Numbering*
24590-WTP-GPG-CSA-0007	*Coordination of WTP Steel Design with Steel Suppliers*
24590-WTP-GPG-E-0006	*Electrical Equipment Installations Working and Dedicated Space Evaluation*

Document Number	Title
24590-WTP-GPG-ENG-004	*Pipe Stress, Pipe Layout and Support Spacing*
24590-WTP-GPG-ENG-005	*Engineering Design Guide for Pipe Support*
24590-WTP-GPG-ENG-009	*Reliability, Availability, Maintainability, and Inspectability (RAMI)*
24590-WTP-GPG-ENG-029	*Seismic Category III/IV Cable Tray and Conduit Support Design*
24590-WTP-GPG-ENG-034	*Automation Work Process for Pipe Stress Analysis and Support Design*
24590-WTP-GPG-ENG-039	*Quality Designation & Grading*
24590-WTP-GPG-ENG-078	*System and Facility Descriptions*
24590-WTP-GPG-ENG-0099	*Design Verification of Plant Design Deliverables*
24590-WTP-GPG-ENG-0105	*Design Guide for Stack Discharge Monitoring (SDJ) System (Rad and Non-Rad)*
24590-WTP-GPG-ENG-0144	*Piping Interface with Flexible Equipment-Stress Analysis Design Guide*
24590-WTP-GPG-ENG-0146	*Piping Coating System Selection Guide*
24590-WTP-GPG-ENG-0150	*Plant Design/Mechanical Systems Equipment Interfaces: Terminal End Equipment*
24590-WTP-GPG-ENG-0169	*Engineering Flooding Calculations*
24590-WTP-GPG-J-005	*Control Systems Interfaces*
24590-WTP-GPG-J-014	*Design Guide: Control Systems Design Process Guide*
24590-WTP-GPG-J-016	*Control Valve Sizing*
24590-WTP-GPG-J-017	*WTP Seismic Category Application to C&I Systems*
24590-WTP-GPG-M-009	*Jet Pumps (Ejectors) For Vacuum Generation*
24590-WTP-GPG-M-012	*Pump Net Positive Suction Head*
24590-WTP-GPG-M-013	*Plant Wash System Design*
24590-WTP-GPG-M-019	*Vessel Sizing*
24590-WTP-GPG-M-021	*Thermal Insulation*
24590-WTP-GPG-M-022	*Liquid And Vapor Line Sizing By Formula*
24590-WTP-GPG-M-027	*Recommended Slopes For Piping Systems*
24590-WTP-GPG-M-028	*Vent, Drain, And Root Valve Sizing And Selection For Piping Systems*
24590-WTP-GPG-M-030	*P&ID Development*
24590-WTP-GPG-M-032	*Vessel Overflow And Gravity Line Sizing*
24590-WTP-GPG-M-033	*Fire Water Floor Drain System*
24590-WTP-GPG-M-034	*Sizing Safety Relief Devices And Relief System Design*
24590-WTP-GPG-M-042	*Material Requisition Process*
24590-WTP-GPG-M-047	*Preparation Of Corrosion Evaluations*
24590-WTP-GPG-M-048	*Maintenance of WTP Heating, Ventilation, Air Conditioning Code Compliance Matrices*
24590-WTP-GPG-M-050	*Pressure Vessel And Heat Exchanger Design*
24590-WTP-GPG-M-052	*Specifying Design Cycles for Equipment and Piping*
24590-WTP-GPG-M-0059	*Avoiding Chemical Line Plugging - Plant Design Considerations*
24590-WTP-GPG-M-0067	*Mechanical Systems Engineering Documentation of ASME B31.3 Unlisted Components*
24590-WTP-GPG-MGT-0026	*Design & Operating Margin Terms*
24590-WTP-GPG-PE-0001	*Assigning Process Stream Numbers*

Document Number	Title
24590-WTP-GPG-PL-002	*Plant Design Material Control Guide*
24590-WTP-GPG-PR-004	*Preparation of Process Corrosion Data Sheets*
24590-WTP-GPG-SRAD-001	*Design Guide for ALARA*
Specifications	
24590-BOF-3PS-AELH-T0001	*Engineering Specification for DFLAW Effluent Management Facility Liquid Sampling Station*
24590-BOF-3PS-AKBS-T0001	*Engineering Specification for Pre-Engineered Metal Buildings Section (13122)*
24590-BOF-3PS-C000-T0001	*Engineering Specification for Material Testing Services*
24590-BOF-3PS-C000-T0002	*Engineering Specification for Excavation and Backfill of Underground Radioactive Waste Transfer Lines*
24590-BOF-3PS-CE00-T0001	*Technical Specification for Site Work*
24590-BOF-3PS-CE01-T0001	*Engineering Specification for Excavation and Backfill*
24590-BOF-3PS-CE01-T0002	*Engineering Specification for Installation of Drilled Shafts and Cast-in-Place Caissons*
24590-BOF-3PS-CM01-T0001	*Engineering Specification for Monitoring of Buildings and Shored Excavations*
24590-BOF-3PS-CP00-T0001	*Specification for Shoring of Deep Excavations*
24590-BOF-3PS-CY11-T0001	*Engineering Specification for Fence and Gates*
24590-BOF-3PS-EKL1-T0001	*Engineering Specification for EMF Pre-Fabricated Electrical Powerhouse*
24590-BOF-3PS-JF04-T0001	*Restriction Orifices*
24590-BOF-3PS-JV09-T0001	*Engineering Specification for EMF Non-Safety Actuated On/Off Ball Valves*
24590-BOF-3PS-JV14-T0001	*Engineering Specification for Effluent Management Facility (EMF) Pressure Relief Valves*
24590-BOF-3PS-MACS-T0001	*Engineering Specification for DVP Vessel Vent Centrifugal Exhauster*
24590-BOF-3PS-MACS-T0002	*Engineering Specification for DFLAW Effluent Management Facility ACV System Single Stage High Integrity Centrifugal Fans and Blowers (AG-1)*
24590-BOF-3PS-MAH0-T0001	*Engineering Specification for Air Handling Units*
24590-BOF-3PS-MEE0-T0002	*Engineering Specification for DVP HEPA Filter Preheater*
24590-BOF-3PS-MEP0-T0001	*Engineering Specification for DFLAW Effluent Management Facility Plate and Frame Heat Exchangers*
24590-BOF-3PS-MEW-T0001	*Engineering Specification for DFLAW Effluent Management Facility Process System (DEP) Evaporator System*
24590-BOF-3PS-MEVV-T0001	*Engineering Specification for DEP Evaporator Separator Vessel, DEP Evaporator Reboiler, and DEP Evaporator Primary Condenser*
24590-BOF-3PS-MJKH-T0001	*Engineering Specification for DFLAW Effluent Management Facility Maintenance Monorail Hoists*
24590-BOF-3PS-MKH0-T0001	*Engineering Specification for Effluent Management Facility High Efficiency Particulate Air (HEPA) Filter Housings*
24590-BOF-3PS-MKH0-T0002	*Engineering Specification for Effluent Management Facility High Efficiency Particulate Air (HEPA) Filter*
24590-BOF-3PS-MLF0-T0001	*Engineering Specification for DFLAW Effluent Management Facility (EMF) Cartridge Filters*
24590-BOF-3PS-MLF0-T0002	*Engineering Specification for DFLAW EMF Evaporator Feed Pre-Filter*
24590-BOF-3PS-MPC0-T0001	*Engineering Specification for EMF Centrifugal Pumps*

Document Number	Title
24590-BOF-3PS-MPPD-T0001	*Engineering Specification for Air-Operated Diaphragm Sump Pump*
24590-BOF-3PS-MPPM-T0001	*Engineering Specification for DFLAW Effluent Management Facility (EMF) Positive Displacement Pumps, Skid, and Sample Pumps*
24590-BOF-3PS-MPV0-T0001	*Engineering Specification for EMF DFLAW Low Point Drain Vessel Discharge Pumps*
24590-BOF-3PS-MPVS-T0001	*Engineering Specification for Submersible Centrifugal Sump Pumps*
24590-BOF-3PS-MS00-T0002	*Engineering Specification for Steam Condensate Collection Skid*
24590-BOF-3PS-MVSC-T0002	*Engineering Specification for DFLAW Effluent Management Facility Atmospheric Process Vessels*
24590-BOF-3PS-MVSC-T0003	*Engineering Specification for DFLAW EMF Lag Storage and Overhead Sampling Vessels*
24590-BOF-3PS-PY00-T0001	*Engineering Specification for DFLAW Effluent Management Facility Leak Detection Boxes*
24590-BOF-3PS-PY02-T0001	*Engineering Specification for Duplex Strainer*
24590-BOF-3PS-PZ41-T0006	*Engineering Specification for Effluent Management Facility (EMF) Suppression Systems*
24590-WTP-3PS-ADDS-T0001	*Engineering Specification for Steel Doors and Frames 08110*
24590-WTP-3PS-ADDZ-T0001	*Engineering Specification for Access Doors and Frames 08311*
24590-WTP-3PS-ADHD-T0001	*Engineering Specification for Door Hardware 08711*
24590-WTP-3PS-ADRC-T0001	*Engineering Specification for Vertical and Horizontal Coiling Doors 08331*
24590-WTP-3PS-AEDL-T0001	*Engineering Specification for Loading Dock Equipment 11160*
24590-WTP-3PS-AFBR-T0001	*Engineering Specification for Resilient Wall Base and Accessories 09653*
24590-WTP-3PS-AFGB-T0001	*Engineering Specification for Gypsum Board Assemblies 09260*
24590-WTP-3PS-AFGB-T0005	*Engineering Specification for Quality requirements for Procurement of Fire and Pressure Rated Safety Equipment, Assemblies and Components*
24590-WTP-3PS-AFGW-T0001	*Engineering Specification for Gypsum Board Shaft-Wall Assemblies 09265*
24590-WTP-3PS-AFPP-T0001	*Engineering Specification for Painting (Professional Line Products) 09912*
24590-WTP-3PS-AFPS-T0001	*Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*
24590-WTP-3PS-AFPS-T0002	*Engineering Specification for Special Protective Coating Limited-Combustible Testing Protocol*
24590-WTP-3PS-AFPS-T0003	*Engineering Specification for Field Applied Special Protective Coatings for Steel Items and Equipment*
24590-WTP-3PS-AFPS-T0004	*Engineering Specification for Field Applied Special Protective Coatings for Concrete Surfaces and Gypsum Board Walls*
24590-WTP-3PS-AFPS-T0006	*Engineering Specification for Field Applied Special Protective Coatings for Secondary Containment Areas*
24590-WTP-3PS-AFPS-T0007	*Engineering Specification for Cold Galvanizing Field Tough-Up/Repair of Steel or Galvanized Steel Items and Equipment*
24590-BOF-3PS-AKBS-T0001	*Engineering Specification for Pre-Engineering Metal Buildings Section 13122*
24590-WTP-3PS-ANEJ-T0001	*Engineering Specification for Architectural Joint Systems 05811*
24590-WTP-3PS-ANFC-T0001	*Engineering Specification for Cold-Formed Metal Framing 05400*
24590-WTP-3PS-ATFR-T0001	*Engineering Specification for Thin Film Intumescent Fireproofing 07811*

Document Number	Title
24590-WTP-3PS-ATFR-T0002	*Engineering Specification for Cementitious Fireproofing 07831*
24590-WTP-3PS-ATFS-T0001	*Engineering Specification for Through-Penetration Firestop System 07841*
24590-WTP-3PS-ATFS-T0002	*Engineering Specification for Fire Resistive Joint Systems 07842*
24590-WTP-3PS-ATIB-T0001	*Engineering Specification for Building Insulation 07210*
24590-WTP-3PS-ATJS-T0001	*Engineering Specification for Joint Sealants 07901*
24590-WTP-3PS-ATPR-T0001	*Engineering Specification for Metal Roof Panels 07411*
24590-WTP-3PS-ATPW-T0002	*Engineering Specification for Factory Foam Insulated Metal Wall Panel System 07413*
24590-WTP-3PS-ATRC-T0001	*Engineering Specification for Thermoplastic Membrane Roofing 07540*
24590-WTP-3PS-ATRY-T0001	*Engineering Specification for Protective Canopies 10530*
24590-WTP-3PS-ATRZ-T0001	*Engineering Specification for Roof Accessories 07720*
24590-WTP-3PS-ATTF-T0001	*Engineering Specification for Sheet Metal Flashing and Trim 07620*
24590-WTP-3PS-ATWF-T0001	*Specification for Bituminous Dampproofing 07115*
24590-WTP-3PS-AWCR-T0001	*Specification for Rough Carpentry 06100*
24590-WTP-3PS-AYFP-T0001	*Engineering Specification for Fire Protection Specialties 10520*
24590-WTP-3PS-AYSS-T0001	*Engineering Specification for Architectural Signage 10431*
24590-WTP-3PS-AYVL-T0001	*Engineering Specification for Louvers and Vents 10200*
24590-WTP-3PS-AYWP-T0001	*Engineering Specification for Impact Resistant Wall Protection 10265*
24590-WTP-3PS-D000-T0001	*Engineering Specification for Concrete Work*
24590-WTP-3PS-DB01-T0001	*Engineering Specification for Furnishing and Delivering Ready-Mix Concrete*
24590-WTP-3PS-DB01-T0002	*Engineering Specification for Furnishing and Delivering Ready Mix Lightweight Concrete*
24590-WTP-3PS-DD00-T0001	*Engineering Specification for Purchase of Standard and Non-Standard Embedded Steel Items*
24590-WTP-3PS-DG00-T0001	*Engineering Specification for Furnishing of Reinforcing Steel*
24590-WTP-3PS-E000-T0001	*Engineering Specification for Electrical Bulk Materials*
24590-WTP-3PS-E00X-T0001	*Engineering Specifications for Electrical Equipment Installation*
24590-WTP-3PS-E00X-T0003	*Engineering Specification for Cable Terminations*
24590-WTP-3PS-E00X-T0004	*Engineering Specification for Installation of Cables*
24590-WTP-3PS-E00X-T0005	*Engineering Specification for Electrical Raceway and Cable Identification*
24590-WTP-3PS-E00X-T0007	*Engineering Specification for Electrical Raceway System Installation*
24590-WTP-3PS-EF00-T0001	*Engineering Specification for Plant Communications Equipment*
24590-WTP-3PS-EH00-T0002	*Engineering Specification for Heat Trace*
24590-WTP-3PS-EKP0-T0001	*Engineering Specification for Electrical Requirements for Packaged Equipment*
24590-WTP-3PS-F000-T0002	*Engineering Specification for Fastener Torque and Tensioning*
24590-WTP-3PS-FA01-T0001	*Engineering Specification for Furnishing of Anchor Bolts (RODS)*
24590-WTP-3PS-FA02-T0001	*Engineering Specification for Purchase of Post Installed Concrete Anchors for Non-Important to Safety (Non-ITS) Applications*
24590-WTP-3PS-FA02-T0003	*Engineering Specification for Design of Posted Installed Concrete Anchors for CM Applications*

Document Number	Title
24590-WTP-3PS-FA02-T0004	*Engineering Specification for Installation and Testing of Post Installed Concrete Anchors and Drilling/Coring of Concrete*
24590-WTP-3PS-FB01-T0001	*Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks*
24590-WTP-3PS-G000-T0002	*Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication*
24590-WTP-3PS-G000-T0003	*Engineering Specification for Packaging, Handling, and Storage requirements*
24590-WTP-3PS-G000-T0014	*Engineering Specification for Supplier Design Analysis*
24590-WTP-3PS-G000-T0045	*Engineering Specification for Supplier Design Analysis with Developed Software*
24590-WTP-3PS-JA03-T0002	*Engineering Specification for Radiological Stack Emissions Monitoring System*
24590-WTP-3PS-JA04-T0002	*Engineering Specification for Continuous In-Line Density, Mass Flow Instruments with Temperature Measurement*
24590-WTP-3PS-JD01-T0001	*Engineering Specification for Plant Wide Control Systems (Integrated Control Network)*
24590-WTP-3PS-JP01-T0001	*Engineering Specification for Process Gauges, Thermometers*
24590-WTP-3PS-JP02-T0001	*Engineering Specification for Radiation Tolerant Pressure Transmitter Gauge, Absolute, or Differential Pressure Measurements*
24590-WTP-3PS-JP02-T0002	*Engineering Specification for Radiation Tolerant Pressure Transmitter Gauge, Absolute, or Differential Pressure Measurements*
24590-WTP-3PS-JP02-T0003	*Engineering Specification for Transmitters for Gauge, Absolute, Differential Pressure, Level and Flow Measurement*
24590-WTP-3PS-JP02-T0004	*Engineering Specification for Transmitters for Gauge, Absolute, Differential Pressure, Level, and Flow Measurements*
24590-WTP-3PS-JQ00-T0004	*Engineering Specification for Management of Supplier Software*
24590-WTP-3PS-JQ05-T0001	*Engineering Specification for Fire Detection and Alarm Systems*
24590-WTP-3PS-JQ07-T0001	*Engineering Specification for Instrumentation for Packaged Systems*
24590-WTP-3PS-JQ08-T0001	*Engineering Specification for Construction and Installation of Controls and Instrumentation*
24590-WTP-3PS-JR00-T0008	*Engineering Specification for Radiation Monitors (Continuous Air Monitors)*
24590-WTP-3PS-JR00-T0010	*Engineering Specification for Process At-Line Gamma Monitor - ITS*
24590-WTP-3PS-JR00-T0011	*Engineering Specification for Radiation Monitors - ITS*
24590-WTP-3PS-JV01-T0001	*Engineering Specification for Control Valves*
24590-WTP-3PS-JV01-T0003	*Engineering Specification for Control Valves (QL)*
24590-WTP-3PS-JV09-T0001	*Engineering Specification for On/Off Instrument Valves - ITS*
24590-WTP-3PS-JV09-T0003	*Engineering Specification for Non-Safety Actuated On/Off Ball Valves*
24590-WTP-3PS-JXXE-T0002	*Engineering Specification for C&I Enclosures, Panels, Cabinets, and Racks*
24590-WTP-3PS-LVE-T0001	*Engineering Specification For Electrical and Instrumentation Jumper Cables*
24590-WTP-3PS-LVE-T0002	*Engineering Specification For Insulating Plates and Contacts*
24590-WTP-3PS-LVE-T0003	*Engineering Specification for Electrical and Instrumentation Jumper Connectors*
24590-WTP-3PS-LVE-T0006	*Engineering Specification for Electrical and Instrumentation Jumper Connectors*
24590-WTP-3PS-MACG-T0001	*Engineering Specification for HVAC Centrifugal Fans*
24590-WTP-3PS-MACS-T0003	*Engineering Specification For Mechanical Agitators*

Document Number	Title
24590-WTP-3PS-MAH0-T0001	*Engineering Specification for HVAC Air Handling Units*
24590-WTP-3PS-MAHC-T0001	*Engineering Specification for Fan Coil Units*
24590-WTP-3PS-MD00-T0001	*Engineering Specification for Heating Ventilation and Air Conditioning Systems Installation*
24590-WTP-3PS-MDD0-T0001	*Engineering Specification for HVAC Dampers*
24590-WTP-3PS-MDH0-T0001	*Engineering Specification for Heating, Ventilating and Air Conditioning System Seismic Category III and IV Ductwork (Q)*
24590-WTP-3PS-MDH0-T0002	*Engineering Specification for Heating, Ventilating and Air Conditioning System Seismic Category III and IV Ductwork (CM)*
24590-WTP-3PS-MDP0-T0001	*Engineering Specification for Remote Operated Dampers*
24590-WTP-3PS-MEE0-T0001	*Engineering Specification for Electric Heating Coil Units*
24590-WTP-3PS-MEHU-T0001	*Technical Specification for Unit Heaters*
24590-WTP-3PS-MEHX-T0001	*Engineering Specification for Package and Split System Air Conditioning Units*
24590-WTP-3PS-MEHX-T0002	*Engineering Specification for Package Air Conditioning Units and Split Systems*
24590-WTP-3PS-MEP0-T0001	*Engineering Specification for Plate and Frame Heat Exchangers*
24590-WTP-3PS-MES0-T0001	*Engineering Specification for Shell and Tube Heat Exchangers*
24590-WTP-3PS-MEVH-T0001	*Engineering Specification for HVAC Humidifiers*
24590-WTP-3PS-MKH0-T0001	*Engineering Specification for Safe Change HEPA Filter Housing*
24590-WTP-3PS-MKH0-T0002	*Engineering Specification for Nuclear Grade High Efficiency Particulate Air (HEPA) Filters (ASME AG-1 Section FK Filters)*
24590-WTP-3PS-MKH0-T0005	*Engineering Specification for Medium Efficiency Filters*
24590-WTP-3PS-MKH0-T0007	*Engineering Specification for Axial Flow High Efficiency Particulate Air (HEPA) Filter Housings*
24590-WTP-3PS-MKH0-T0009	*Engineering Specification for Standard Nuclear Grade High Efficiency Particulate Air (HEPA) Filters (for ASME AG-1 Compliant Filters)*
24590-WTP-3PS-MKH0-T0012	*Engineering Specification for Specification for Fire Screen Housings*
24590-WTP-3PS-MKH0-T0014	*High Efficiency Particulate Air (HEPA) Filter Test Specification*
24590-WTP-3PS-MPC0-T0002	*Engineering Specification For General Centrifugal Pumps To Meet Requirements Of ASME B73.1m-2001 And ASME B73.2m-2003 for Commercial (CM) Components*
24590-WTP-3PS-MPC0-T0007	*Non-ASME B73.1 Horizontal Centrifugal Pumps for Non-Quality Related Components*
24590-WTP-3PS-MPPM-T0001	*Engineering Specification for Positive Displacement Metering Pumps*
24590-WTP-3PS-MTF5-T0001	*Engineering Specification For Field-Erected Tanks Design and Fabrication*
24590-WTP-3PS-MTSS-T0001	*Engineering Specification for Tank Welding*
24590-WTP-3PS-MUMI-T0002	*Engineering Specification for Low Voltage Induction Motors*
24590-WTP-3PS-MV00-T0001	*Engineering Specification for Pressure Vessel Design And Fabrication*
24590-WTP-3PS-MVB2-T0001	*Engineering Specification for Welding of Pressure Vessels, Heat Exchangers And Boilers*
24590-WTP-3PS-NLLR-T0002	*Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates*
24590-WTP-3PS-NN00-T0001	*Engineering Specification for Thermal Insulation For Mechanical Systems*
24590-WTP-3PS-NWP0-T0001	*Engineering Specification for General Welding and NDE Requirements for Supplier Fabricated Piping*

Document Number	Title
24590-WTP-3PS-P000-T0001	*Engineering Specification for Technical Supply Conditions for Pipe, Fittings, and Flanges*
24590-WTP-3PS-PH01-T0002	*Engineering Specification for Installation of Pipe supports*
24590-WTP-3PS-PS02-T0003	*Engineering Specification for Shop Fabrication of Piping*
24590-WTP-3PS-PY00-T0001	*Engineering Specification for Wall/Floor-Boxes*
24590-WTP-3PS-SS00-T0001	*Engineering Specification for Welding of Structural Carbon Steel*
24590-WTP-3PS-SS00-T0002	*Engineering Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*
24590-WTP-3PS-SS00-T0005	*Engineering Specification for Thermite Welding of Rails*
24590-WTP-3PS-SS01-T0001	*Engineering Specification for Purchase of Miscellaneous Steel*
24590-WTP-3PS-SS01-T0002	*Engineering Specification for Purchase of Structural Steel*
24590-WTP-3PS-SS01-T0003	*Engineering Specification for Purchase of Commercial Structural Steel, Miscellaneous Steel, Steel Decking, and Fasteners*
24590-WTP-3PS-SS02-T0001	*Engineering Specification for Erection of Structural Steel*
24590-WTP-3PS-SS25-T0001	*Engineering Specification for Purchase of Steel Deck*
24590-WTP-3PS-SS25-T0002	*Engineering Specification for Purchase of Steel Roof Deck*
24590-WTP-3PS-SY00-T0001	*Engineering Specification for Purchase of Standard Struts, Fittings and Accessories*

3.18 Dangerous Waste Permit (DWP) and Washington Administrative Code (WAC) for the DFLAW Effluent Management Facility (EMF)

The requirements delineated in this section are construction and installation certification requirements and do not include design or operational requirements. These requirements, once verified, document that the WTP Dangerous Waste Management Units have been constructed in accordance with the WTP – Operating Unit Group 10 DWP requirements, Permit Number WA7890008967, Condition III.10.C.2.a and Washington Administrative Code (WAC) 173-303-810(14)(a).

3.18.1 EMF Dangerous Waste Miscellaneous Units

3.18.1.1 Construction of EMF Dangerous Waste Miscellaneous Units

Requirement: The Permittees shall construct the EMF Dangerous Waste Miscellaneous units identified in Permit Table III.10.M.A (Table 3-7), as specified in Operating Unit Group 10, Appendices 13.1 through 13.14 of this Permit, as approved pursuant to Permit Conditions III.10.M.9.b., III.10.M.9.c., and III.10.M.9.d.

Table 3-7 EMF Plant Miscellaneous Unit System Description

Sub-system Description and Location	Sub-system	Material
DEP-COND-00001 (DEP Evaporator Primary Condenser) E-0102	DEP	Stainless Steel
DEP-COND-00002 (DEP Evaporator Inter-Condenser) E-0102	DEP	Stainless Steel

Sub-system Description and Location	Sub-system	Material
DEP-COND-00003 (DEP Evaporator After-Condenser) E-0102	DEP	Stainless Steel
DEP-EVAP-00001 (DEP Evaporator Separator Vessel) E-0103	DEP	Hastelloy
DVP-HTR-00001A and 00001B (DVP Process Ventilation Preheaters) E-0102	DVP	Stainless steel
DVP-HEPA-00003Aand 00003B (DVP Process Ventilation Primary HEPA Filters) E-0102A	DVP	Stainless steel
DVP-HEPA-00004A and 00004B (Process Ventilation Secondary HEPA Filters) E-0102A	DVP	Stainless steel
DEP-HX-00001 (Evaporator Concentrate/Feed Vessels LAW Effluent Cooler) E-0103	DEP	Stainless Steel
DEP-RBLR-00001 (Evaporator Reboiler) E-0103	DEP	Hastelloy
DVP-EXHR-00001A and 00001B (Process Ventilation Exhausters) E-0102	DVP	Stainless steel
DEP-FILT-00003 (Evaporator feed pre-filter) E-0103	DEP	6% Mo
DEP-FILT-00002 (Process condensate filter)	DEP	Reserved

[Sections III.10.M.2.a,Table III.10.M.a, Chp.4G.6, Table 4G-2, DWP]

Basis Discussion: None.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R/I	**ENV**	Perform a review of the design and documentation to verify the EMF Dangerous Waste Miscellaneous Units are constructed per the DWP appendices. Perform a walk-down (as needed) to complete the verification.	

3.18.1.2 Concrete Coating System for EMF Dangerous Waste Miscellaneous units

Requirement: An impermeable coating, as specified in Operating Unit Group 10, Appendices 13.4, 13.5,13.7, 13.9, 13.11, and 13.12 of this Permit, as approved/modified pursuant to Permit Condition III.10.M.9.b.v. of this Permit, shall be maintained for all concrete containment systems and concrete portions of containment systems for each EMF miscellaneous unit system listed in Permit Table III.10.M.A. [concrete containment systems that do not have a liner pursuant to WAC-173-303-640(4)(e)(i), in accordance with WAC 173-303-680(2), and have construction joints, shall meet the requirements of WAC 173-303-640(4)(e)(ii)(C), in accordance with WAC 173-

303-680(2)]. The coating shall prevent migration of any dangerous and mixed waste into the concrete. All coatings shall meet the following performance standards:

- The coating must seal the containment surface such that no cracks, seams, or other avenues through which liquid could migrate are present;
- The coating must be of adequate thickness and strength to withstand the normal operation of equipment and personnel within the given area such that degradation or physical damage to the coating or lining can be identified and remedied before dangerous and/or mixed waste could migrate from the system; and
- The coating must be compatible with the dangerous and/or mixed waste, treatment reagents, or other materials managed in the containment system. [Section III.10.M.5.h, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements are incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967. [WAC 173-303-640(4)(e)(ii)(D), in accordance with WAC 173-303-680(2) and (3) and WAC 173-303-806(4)(i)(i)(A)].

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R/I	**ENV**	Review the construction documentation to verify the impermeable coating have been installed in accordance to DWP appendices. Perform walkdown as necessary to complete verification.	

3.18.1.3 Handling and Installation Procedures for EMF Dangerous Waste Miscellaneous units

Requirement: The Permittees shall ensure that proper handling procedures are adhered to in order to prevent damage to the EMF Dangerous Waste Miscellaneous units (Table 3-7) during installation. Prior to covering, enclosing, or placing a new EMF Miscellaneous Unit System(s) or component (s) in use, an independent, qualified, installation inspector or an independent, qualified, registered professional engineer, either of whom is trained and experienced in the proper installation of similar systems or components, must inspect the system for the presence of any of the following items:

- Weld breaks.
- Punctures.
- Scrapes of protective coatings.
- Cracks.
- Corrosion.
- Other structural damage or inadequate construction/installation.

- All discrepancies must be remedied before the EMF Miscellaneous Unit Systems are covered, enclosed, or placed in use.

[Section III.10.M.3.a, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967. [WAC 173-303-640(3)(c) in accordance with WAC 173-303-680(2) and (3)].

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed independent installation inspector documentation. Perform walkdown as necessary to complete verification.	

3.18.1.4 Test for Tightness for EMF Dangerous Waste Miscellaneous units

Requirement: The Permittees shall test for tightness the EMF Dangerous Waste Miscellaneous units (Table 3-7), prior to being covered, enclosed, or placed into use. If an EMF Dangerous Waste Miscellaneous unit is found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to being covered, enclosed, or placed in use. [Section III.10.M.3.c, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967. [WAC 173-303-640(3)(e), in accordance with WAC 173-303-680(2) and (3)].

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Metho d	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed independent installation inspector packages documentation to ensure the tightness testing was completed.	

3.18.1.5 Support and Protection for EMF Dangerous Waste Miscellaneous units

Requirement: The Permittees shall ensure the EMF Dangerous Waste Miscellaneous units (Table 3-7) are supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction. [Section III.10.M.3.d, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967. [WAC 173-303-640(3)(f), in accordance with WAC 173-303-680(2) and (3)].

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed installation packages, nonconformance reports and construction deficiency reports to confirm the EMF Dangerous Waste Miscellaneous units were constructed and installed in accordance with the approved designs, plans specifications and the associated WAC codes.	

3.18.1.6 Corrosion Protection for EMF Dangerous Waste Miscellaneous units

Requirement: The Permittees shall provide the type and degree of corrosion protection recommended by an independent corrosion expert, based on the information provided in Operating Unit Group 10, Appendices 13.9 and 13.11 as approved pursuant to Permit Conditions III.10.M.9.b.i., III.10.M.9.b.iv., III.10.M.9.b.v., III.10.M.9.c.i., III.10.M.9.c.iv., III.10.M.9.c.v., and III.10.M.9.d.i., III.10.M.9.d.iv. III.10.M.9.d.v, or other corrosion protection if Ecology believes other corrosion protection is necessary to ensure the integrity of the EMF Miscellaneous Unit systems during use of the EMF Miscellaneous Unit Systems. The installation of a corrosion protection system that is field fabricated shall be supervised by an independent corrosion expert to ensure proper installation. [Section III.10.M.3.e, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303. [WAC 173-303-640(3)(g), in accordance with WAC 173-303-680(2) and (3)]. This requirement is not applicable to tank systems with components that are not in contact with soil or water.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENV	Review completed installation packages to verify the requirements corrosion protection are met.	

3.18.1.7 Installation Inspection for EMF Dangerous Waste Miscellaneous units

Requirement: The independent EMF Dangerous Waste Miscellaneous units (Table 3-7) inspection and subsequent written statements shall be certified in accordance with WAC 173-303-810(13)(a) as modified pursuant to Permit Condition III.10.M.1.d., comply with all requirements of WAC 173-303-640(3)(h), in accordance with WAC 173-303-680, and shall consider, but not be limited to, the following miscellaneous unit system installation documentation:

- Field installation report with date of installation;
- Approved welding procedures;
- Welder qualifications and certification;
- Hydro-test reports, as applicable, in accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section VIII, Division 1, American Petroleum Institute (API) Standard 620, or Standard 650 as applicable;
- Tester credentials;
- Field inspector credentials;
- Field inspector reports;
- Field waiver reports; and
- Non-compliance reports and corrective action (including field waiver reports) and repair reports.

[Section III.10.M.3.g, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed independent installation inspector documentation to verify installation documentation is properly prepared.	

3.18.1.8 Vapor Collection System for EMF Dangerous Waste Miscellaneous units

Requirement: Each miscellaneous unit that is holding dangerous waste, which are acutely or chronically toxic by inhalation, shall be constructed to prevent escape of vapors, fumes or other emissions into the air. [Section III.10.m.5.m, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303.These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967. [WAC 173-303-806(4)(i)(i)(B) and WAC 173-303-640(5)(e), in accordance with WAC 173-303-680].

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review EMF Dangerous Waste Miscellaneous units as-built P&IDs/V&IDs, inspection and installation documentation to verify construction is per design to treat process vapors appropriately prior to release to the environment. Perform walkdown as necessary to complete verification.	

3.18.1.9 Underground EMF Miscellaneous Units and Components

Requirement: EMF Miscellaneous Unit Systems or components that are placed underground and that are back filled, the Permittees shall provide a backfill material that is a non-corrosive porous, homogeneous substance. The backfill shall be installed so that it is placed completely around the miscellaneous unit and compacted to ensure that the miscellaneous unit and piping are fully and uniformly supported. [Section III.10.M.3.b, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967 in accordance with WAC 173-303-680(2) and (3).

Verification: Verification is expected to be achieved through:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Verify that backfill materials for underground EMF Miscellaneous Units and Components are specified non-corrosive, porous, and homogeneous and that backfill placement is completely around the Underground EMF	Document in IQRPE report prepared in accordance with WAC requirements

Verif. Method	Verif. By	Plan	Notes/Comments
		Miscellaneous Units and Components and properly compacted.	

3.18.2 EMF Plant Tank Systems Description

3.18.2.1 Construction for EMF Plant Tank Systems

Requirement: The Permittees shall construct the EMF Plant Tank Systems, shown in Table 3-8, as specified in Operating Unit Group 10, Appendices 13.1 through 13.14 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.b, III.10.E.9.c, and III.10.E.9.d.

Table 3-8 EMF Plant Tank Systems Descriptions

System	Vessel Number/Location	Description	Material	Approx. Total Volume (US Gallons)	Approximate Dimensions (Inside Diameter x Height or Length in feet) (tangent line/tangent line)
DEP	DEP-VSL-00001 ED-B001	Low-Point Drain Vessel	Stainless Steel	18,000	14 ft. x 12.75 ft.
DEP	DEP-VSL-00002 E-0105	Evaporator Feed Vessel	6% Mo	42,300	14 ft. x 32 ft.
DEP	DEP-VSL-00003A E-0105	Evaporator Concentrate Vessel	6% Mo	14, 900	12 ft. x 13.5 ft.
DEP	DEP-VSL-00003B E-0105	Evaporator Concentrate Vessel	6% Mo	14, 900	12 ft. x 13.5 ft.
DEP	DEP-VSL-00003C E-0105	Evaporator Concentrate Vessel	6% Mo	14, 900	12 ft. x 13.5 ft.
DEP	DEP-VSL-00004A E-0106	Overhead Sampling Vessel	Reserved	40,800	14 ft. x 30.75 ft.
DEP	DEP-VSL-00004B E-0106	Overhead Sampling Vessel	Stainless steel	40,800	14 ft. x 30.75 ft.
DEP	DEP-VSL-00005A E-0106	Process Condensate Lag Storage Vessel	Stainless steel	127,260	25 ft. x 29.5 ft.
DEP	DEP-VSL-00005B E-0106	Process Condensate Lag Storage Vessel	Reserved	127,260	25 ft. x 29.5 ft.

[Sections III.10.E.2.a, Table III.10.E.R, Chp. 4G.6,Table 4G-1, DWP]

Basis Discussion: None.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R/I	**ENV**	Perform a review of the design and documentation to verify the EMF Dangerous Waste Tank System Units are constructed per the	

Verif. Method	Verif. By	Plan	Notes/Comments
		DWP appendices. Perform a walk-down (as needed) to complete the verification.	

3.18.2.2 Concrete Coating System for EMF Plant Tank Systems

Requirement: An impermeable coating, as specified in Operating Unit Group 10, Appendices 13.4, 13.5, 13.7, 13.9, 13.11 and 13.12 of this Permit, as approved pursuant to Permit Condition III.10.E.9.b.v, shall be maintained for all concrete containment systems and concrete portions of containment systems for each EMF Plant Tank System listed in Permit Table III.10.E.R as approved/modified pursuant to Permit Condition III.10.E.9. Concrete containment systems that do not have a liner and have construction joints, shall meet the requirements of WAC 173-303-640(4)(e)(ii)(C) and -806(4)(c)(vii). The coating shall prevent migration of any dangerous and/or mixed waste into the concrete. All coatings shall meet the following performance standards:

- The coating must seal the containment surface such that no cracks, seams, or other avenues through which liquid could migrate are present;
- The coating must be of adequate thickness and strength to withstand the normal operation of equipment and personnel within the given area such that degradation or physical damage to the coating or lining can be identified and remedied before dangerous and/or mixed waste could migrate from the system; and
- The coating must be compatible with the dangerous and/or mixed waste, treatment reagents, or other materials managed in the containment system.

[Section III.10.E.5.h, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R/I	**ENV**	Review the construction documentation to verify the impermeable coating have been installed. Perform walkdown as necessary to complete verification.	

3.18.2.3 Handling and Installation Procedures for EMF Plant Tank Systems

Requirement: The Permittees shall ensure that proper handling procedures are adhered to in order to prevent damage to the EMF Plant Tank Systems (Table 3-8) during installation. Prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified, installation inspector or an independent, qualified, registered professional engineer, either of whom is trained and experienced in the proper installation of similar systems or components, must inspect the system for the presence of any of the following items:

- Weld breaks.
- Punctures.

- Scrapes of protective coatings.
- Cracks.
- Corrosion.
- Other structural damage or inadequate construction/installation.

All discrepancies must be remedied before the tank system is covered, enclosed, or placed in use. [Section III.10.E.3.a, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967, as permit condition III.10.E.3.a (WAC 173-303-640(3)(c), WAC 173-303-640(3)(h)).

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed independent installation inspector documentation. Perform walkdown as necessary to complete verification.	

3.18.2.4 Test for Tightness for EMF Plant Tank Systems

Requirement: The Permittees shall test for tightness the EMF Plant Tank Systems (Table 3-8), prior to being covered, enclosed, or placed into use. If an EMF tank system is found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to the tank system being covered, enclosed, or placed in use. [Section III.10.E.3.c, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed independent installation inspector packages documentation to ensure the tightness testing was completed.	

3.18.2.5 Support and Protection for EMF Plant Tank Systems

Requirement: The Permittees shall ensure the EMF Plant Tank Systems (Table 3-8) are supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.[Section III.10.E.3.d, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed installation packages, nonconformance reports, and construction deficiency reports to confirm the EMF Dangerous Waste Tank units were constructed and installed in accordance with the approved designs, plans specifications and the associated WAC codes.	

3.18.2.6 Corrosion Protection for EMF Plant Tank Systems

Requirement: The Permittees shall provide the type and degree of corrosion protection recommended by an independent corrosion expert, based on the information provided in Operating Unit Group 10, Appendix 13.11 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.b.i, III.10.E.9.b.iv, III.10.E.9.b.v, III.10.E.9.c.i, III.10.E.9.c.iv, III.10.E.9.c.v, III.10.E.9.d.i, III.10.E.9.d.iv, and III.10.E.9.d.v or other corrosion protection if the Ecology believes other corrosion protection is necessary to ensure the integrity of the tank system during use of the tank system. The installation of a corrosion protection system that is field fabricated must be supervised by an independent corrosion expert to ensure proper installation. [Section III.10.E.3.e, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed installation packages to verify the requirements for corrosion protection are met.	

3.18.2.7 Installation Inspection for EMF Plant Tank Systems

Requirement: The independent tank system installation inspection and subsequent written statements shall be certified pursuant to Permit Condition III.10.E.1.d, comply with all requirements of WAC 173-303-640(3)(h) and shall consider, but not be limited to, the following tank system installation documentation:

- Field installation report with date of installation;
- Approved welding procedures;
- Welder qualifications and certification;
- Hydro-test reports, as applicable, in accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section VIII, Division 1, American Petroleum Institute (API) Standard 620, or Standard 650 as applicable;
- Tester credentials;
- Field inspector credentials;
- Field inspector reports;
- Field waiver reports; and
- Non-compliance reports and corrective action (including field waiver reports) and repair reports.

[Section III.10.E.3.g, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed independent installation inspector documentation to verify installation documentation is properly prepared.	

3.18.2.8 Vapor Collection System for EMF Plant Tank Systems

Requirement: Each tank system that is holding dangerous waste, which is acutely or chronically toxic by inhalation, shall be constructed to prevent escape of vapors, fumes or other emissions into the air. [Section III.10.E.5.m, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967, as permit condition III.10.E.9.c.xii (WAC 173-303-640(5)(e)).

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review EMF tank system as-built P&IDs/V&IDs, inspection and installation documentation to verify construction is per design to treat process vapors appropriately prior to release to the environment. Perform walkdown as necessary to complete verification.	

3.18.2.9 Underground EMF Tank Units and Components

Requirement: Underground EMF tank systems or components that are placed underground and that are back filled, the Permittees shall provide a backfill material that is a non-corrosive, porous, homogeneous substance. The backfill shall be installed so that it is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported. [Section III.10.e.3.b, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967 in accordance with WAC 173-303-640(3)(d).

Verification: Verification is expected to be achieved through:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Verify that backfill materials for Underground EMF tank systems or components are specified non-corrosive, porous, and homogeneous and	Document in IQRPE report prepared in accordance with WAC requirements

Verif. Method	Verif. By	Plan	Notes/Comments
		that backfill placement is completely around the Underground EMF tank systems or components and properly compacted.	

3.18.3 EMF Plant Secondary Containment Rooms/Areas

Requirement: The dimensions and minimum secondary containment height for each of EMF Plant secondary containment area/room shall be as shown in Table 3-9.

Table 3-9 EMF Plant Secondary Containment Rooms/Areas

Room/Area	Approximate Room/Area Dimensions (LxW, in feet)	Minimum Secondary Containment Height (feet)
E-0102 east evaporator process area	62 ft. x 94 ft. 6 in.	4 ft. 6 in.
E-0103 west evaporator process area	62 ft. x 56 ft. 6 in.	3 ft. 5 in.
ED-B001 low-point drain vessel area	28 ft. x 33 ft.	4 ft. 2 in.
E-0105 evaporator feed vessel area	45 ft. 6 in. x 39 ft.	5ft. 2 in.
E-0106 process condensate lag storage vessel area	45 ft. 6 in. x 84 ft. 4 in.	6ft. 10 in.

[Table III.10.E.T, Chp. 4G.6, Table 4G-3, DWP]

Basis Discussion: The secondary containment for this tank system leak detection system is influenced by the geometry and slope of the cell floor. Additionally, the volume of containment is also influenced by the floor size.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review design documentation, inspection reports, and completed independent installation inspector packages/documentation to verify the cell dimensions and the secondary containments height. Perform walkdown as necessary to complete verification.	

3.18.4 EMF Secondary Containment Systems in Area E-0102

3.18.4.1 Construction of EMF Secondary Containment Systems: The East Evaporator Process Area (Rm. No. E-0102)

Requirement: The Permittees shall construct the secondary containment systems for the east evaporator process area (Rm. No. E-0102), Table 3-10, as specified in Operating Unit Group 10, Appendices 13.2, 13.4 through

13.14, and 13.18 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.b., III.10.E.9.c., III.10.E.9.d, III.10.M.9.b., III.10.M.9.c., and III.10.M.9.d.

Table 3-10 EMF Plant Systems Secondary Containment Systems, including Sumps

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room#	Maximum Sump/Leak Detection Box Capacity (gallons)	Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction
DEP-SUMP-00003A E-0102	~58	24 in. Dia. x 30 in. Length 304L SS
DEP-SUMP-00003B E-0102	~58	24 in. Dia. x 30 in. Length 304L SS

[Sections III.10.M.2.b, III.10.E.2.b, Table III.10.E.S, Chp. 4G.6, Table 4G-4, DWP]

Basis Discussion: None.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed installation, nonconformance reports, and construction deficiency reports to confirm the plant is constructed in accordance with the approved designs, plans and specifications. Perform walkdown as necessary to complete verification.	

3.18.4.2 Leakage Detection Systems: The East Evaporator Process Area (Rm. No. E-0102)

Requirement: The Permittees shall install all process and leak detection system monitoring/instrumentation, as specified in Table 3-11 as approved/modified pursuant to Permit Condition III.10.M.9, and III.10.E.9., in accordance with Operating Unit Group 10, Appendices 13.1, 13.2, and 13.14 of this Permit, as approved pursuant to Permit Conditions III.10.M.9.d.x, III.10.E.9.e.ix. and III.10.E.9.d.x.

Table 3-11 EMF Plant Systems Secondary Containment Systems Leak Detection Instrumentation

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room #	Sump/Leak Detection Box Level Detection Type
DEP-SUMP-00003A E-0102	RF Capacitance
DEP-SUMP-00003B E-0102	RF Capacitance

[Sections III.10. M.5.b, III.10.E.5.b, III.10.E.9.e.ii, Table III.10.E.S, Chp.4G.6,Table 4G-4, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System Regulations in WAC 173-303-640.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Perform a review of the EMF Plant Secondary Containment Systems construction documentation to verify the construction of the required leak detection systems is completed per the WAC requirements and DWP appendices. Perform a walk-down (as needed) to complete the verification.	

3.18.4.3 Secondary Containment System Integrity: The East Evaporator Process Area (Rm. No. E-0102)

Requirement: The secondary containment systems for EMF miscellaneous unit systems listed in Permit Table III.10.M.A (Table 3-7), and permitted vessels listed in Table III.10.E.R (Table 3-8) as approved/modified pursuant to Permit Conditions III.10.M.9 and III.10.E.9, shall be free of cracks or gaps to prevent any migration of dangerous and/or mixed waste or accumulated liquid out of the system to the soil, ground water, or surface water at any time waste is in the EMF Miscellaneous Units System. Any indication that a crack or gap may exist in the containment systems shall be investigated and repaired in accordance with Operating Unit Group 10, Appendix 13.18 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.e.v and III.10.M.9.e.v.[Section III.10.E.5.g, III.10.M.5.g, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967. [WAC 173-303-640(4)(b)(i), WAC 173-303-640(4)(e)(i)(C), and WAC 173-303-640(6) in accordance with WAC 173-303-680(2) and (3), WAC 173-303-806(4)(i)(i)(B), and WAC 173-303-320].

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
I	**ENV**	Perform a facility and system inspection of the tank and miscellaneous unit systems to verify construction and installation is free of cracks or gaps to prevent any migration of dangerous and/or mixed waste.	

3.18.5 EMF Secondary Containment Systems in Area E-0103

3.18.5.1 Construction of Secondary Containment

Requirement: The Permittees shall construct the secondary containment systems for the west evaporator process area (Rm. No. E-0103), Table 3-12, as specified in Operating Unit Group 10, Appendices 13.2, 13.4 through 13.14, and 13.18 of this Permit, as approved/modified pursuant to Permit Conditions III.10.E.9.b, III.10.E.9.c, III.10.E.9.d, III.10.M.9.b, III.10.M.9.c, and III.10.M.9.d.

Table 3-12 EMF Plant Systems Secondary Containment Systems, including Sumps

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room#	Maximum Sump/Leak Detection Box Capacity (gallons)	Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction
DEP-SUMP-00002A E-0103	~58	24 in. Dia. x 30 in. Length 304L SS
DEP-SUMP-00002B E-0103	~58	24 in. Dia. x 30 in. Length 304L SS

[Sections III.10.M.2.b, III.10.E.2.b, Table III.10.E.S, Chp.4G.6,Table 4G-4, DWP]

Basis Discussion: None.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENV	Review completed installation, nonconformance reports and construction deficiency reports to confirm the plant was constructed in accordance with the approved designs, plans and specifications. Perform walkdown as necessary to complete verification.	

3.18.5.2 Leakage Detection Systems

Requirement: The Permittees shall install all process and leak detection system monitoring/instrumentation, as specified in Table 3-13 as approved/modified pursuant to Permit Condition III.10.M.9, and III.10.E.9., in accordance with Operating Unit Group 10, Appendices 13.1, 13.2, and 13.14 of this Permit, as approved pursuant to Permit Conditions III.10.M.9.d.x, III.10.E.9.e.ix. and III.10.E.9.d.x.

Table 3-13 EMF Plant Systems Secondary Containment Systems Leak Detection

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room#	Sump/Leak Detection Box Level Detection Type
DEP-SUMP-00002A E-0103	RF Capacitance
DEP-SUMP-00002B E-0103	RF Capacitance

[Sections III.10. M.5.b, III.10. E.5.b, III.10.E.9.e.ii, Table III.10.E.S, Chp.4G.6,Table 4G-4, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System Regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP – Operating Unit Group 10, WA 78900089.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENV	Perform a review of the EMF Plant Secondary Containment Systems construction documentation to verify the construction of the leak detection systems are completed per the WAC requirements and DWP appendices. Perform a walk-down (as needed) to complete the verification.	

3.18.5.3 Secondary Containment System Integrity

Requirement: The secondary containment systems for EMF miscellaneous unit systems listed in Permit Table III.10.M.A (Table 3-7), and permitted vessels listed in Table III.10.E.R (Table 3-8) as approved/modified pursuant to Permit Conditions III.10.M.9 and III.10.E.9, shall be free of cracks or gaps to prevent any migration of dangerous and/or mixed waste or accumulated liquid out of the system to the soil, ground water, or surface water at any time waste is in the EMF Miscellaneous Units System. Any indication that a crack or gap may exist in the containment systems shall be investigated and repaired in accordance with Operating Unit Group 10, Appendix 13.18 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.e.v and III.10.M.9.e.v. [Section III.10.E.5.g, III.10.M.5.g, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967. [WAC 173-303-640(4)(b)(i), WAC 173-303-640(4)(e)(i)(C), and WAC 173-303-640(6) in accordance with WAC 173-303-680(2) and (3), WAC 173-303-806(4)(i)(i)(B), and WAC 173-303-320].

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
I	ENV	Perform a facility and system inspection of the tank and miscellaneous unit systems to verify construction and installation is free of cracks or gaps to prevent any migration of dangerous and/or mixed waste.	

3.18.6 EMF Secondary Containment Systems in Areas (ED-B001) and (ED-CH01)

3.18.6.1 Construction of Secondary Containment (ED-B001) and (ED-CH01)

Requirement: The Permittees shall construct the secondary containment systems for area (Rm. No. ED-B001) and area (Rm. No. ED-CH01), Table 3-14, as specified in Operating Unit Group 10, Appendices 13.2, 13.4 through 13.14, and 13.18 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.b., III.10.E.9.c, III.10.E.9.d, III.10.M.9.b, III.10.M.9.c, and III.10.M.9.d.

Table 3-14 EMF Plant Systems Secondary Containment Systems, including Sumps, Drain Lines, and Floor Drains

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room#	Maximum Sump/Leak Detection Box Capacity (gallons)	Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction	
Sumps			
DEP-SUMP-00001 ED-B001	~58	24 in. Dia. x 30 in. Length 304L SS	
Leak Detection Boxes			
DEP-LDB-00001 ED-B001	~7	8 in. Dia. x 41 in. Length 316L SS	
DEP-LDB-00002 ED-B001	~7	8 in. Dia. x 41 in. Length 316L SS	
DEP-LDB-00003 ED-B001	~7	8 in. Dia. x 41 in. Length 316L SS	
DEP-LDB-00004 ED-B001	~7	8 in. Dia. x 41 in. Length 316L SS	
DEP-LDB-00005 ED-B001	~7	8 in. Dia. x 41 in. Length 316L SS	
DEP-LDB-00006 ED-B001	~7	8 in. Dia. x 41 in. Length 316L SS	
Drain Lines			
BOF-DEP-ZS-20282-W11A-011/02-01 ED-CH01	NA	4 in. Dia. 316L SS	Containment pipe
		1 ½ in. Dia. AL6XN	Process pipe
BOF-DEP-ZS-20236-W31A-02-01 ED-CH01	NA	4 in. Dia. Carbon Steel	Containment pipe
		2 in. Dia. 316L SS	Process pipe
BOF-DEP-ZS-20245 -W11A-04-01ED-CH01	NA	6 in. Dia. 316 SS	Containment pipe
		4 in. Dia. AL6XN	Process pipe
BOF-DEP-ZS-20231-W31A-03-01 ED-CH01	NA	6 in. Dia. Carbon Steel	Containment pipe
		3 in. Dia. 316L SS	Process pipe
BOF-DEP-ZS-20242-W31A-10-01 ED-CH01	NA	14 in. Dia. Carbon Steel	Containment pipe
		10 in. Dia. 316L SS	Process pipe
BOF-DEP-ZS-20249-W31A-03-01 ED-CH01	NA	6 in. Dia. Carbon Steel	Containment pipe
		3 in. Dia. 316L SS	Process pipe

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room#	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	
BOF-DEP-ZS-20225-W31A-02-01 ED-CH01	NA	4 in. Dia. Carbon steel	Containment pipe
		2 in. Dia. 316L SS	Process pipe
BOF-DEP-ZS-20219-W31A-02-01 ED-CH01	NA	4 in. Dia. Carbon steel	Containment pipe
		2 in. Dia. 316L SS	Process pipe
BOF-DEP-ZS-20222-W31A-02-01 ED-CH01	NA	4 in. Dia. Carbon Steel	Containment pipe
		2 in. Dia. 316L SS.	Process pipe
BOF-DEP-ZS-20252-W11A-03-01 ED-CH01	NA	6 in. Dia. 316L SS	Containment pipe
		3 in. Dia. AL6XN	Process pipe
BOF-DEP-ZS-20265-W31A-03-01 ED-CH01	NA	6 in. Dia. Carbon Steel	Containment pipe
		3 in. Dia. 316L SS	Process pipe
BOF-DEP-ZY-00181-W31A-03-01 ED-CH01	NA	6 in. Dia. Carbon Steel	Containment pipe
		3 in. Dia. 316L SS	Process pipe
BOF-DEP-WU-00008-W31A-03-01 ED-CH01	NA	6 in. Dia. Carbon steel	Containment pipe
		3 in. Dia. 316L SS	Process pipe
BOF-DVP-GV-00026-W31A-03-01 ED-CH01	NA	6 in. Dia. Carbon steel	Containment pipe
		3 in. Dia. 316L SS	Process pipe

[Sections III.10.M.2.b, III.10.E.2.b, Table III.10.E.S, Chp.4G.6,Table 4G-4, DWP]

Basis Discussion: None.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	**Verif. By**	**Plan**	**Notes/Comments**
R	**ENV**	Review completed installation, nonconformance reports, and construction deficiency reports to verify the plant is constructed in accordance with approved designs, plans and specifications.	

Verif. Method	Verif. By	Plan	Notes/Comments
		Perform walkdown as necessary to complete verification.	

3.18.6.2 Leakage Detection Systems (ED-B001)

Requirement: The Permittees shall install all process and leak detection system monitoring/instrumentation, as specified in Table 3-15 as approved/modified pursuant to Permit Condition III.10.M.9, and III.10.E.9, in accordance with Operating Unit Group 10, Appendices 13.1, 13.2, and 13.14 of this Permit, as approved pursuant to Permit Conditions III.10.M.9.d.x, III.10.E.9.e.ix. and III.10.E.9.d.x.

Table 3-15 EMF Plant Systems Secondary Containment Systems Leak Detection and Leak Detection Boxes

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room#	Sump/Leak Detection Box Level Detection Type
DEP-SUMP-00001 ED-B001	Radio Frequency (RF) Capacitance
DEP-LDB-00001 ED-B001	Conductivity Switch
DEP-LDB-00002 ED-B001	Conductivity Switch
DEP-LDB-00003 ED-B001	Conductivity Switch
DEP-LDB-00004 ED-B001	Conductivity Switch
DEP-LDB-00005 ED-B001	Conductivity Switch
DEP-LDB-00006 ED-B001	Conductivity Switch

Sections III.10. M.5.b, III.10. E.5.b, III.10.E.9.e.ii, Table III.10.E.S, Chp.4G.6, Table 4G-4, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System Regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP – Operating Unit Group 10, WA 78900089 Table 3-367, as permit condition III.10.#.9.e.ii (WAC 173-303-640(4)(c)(iii))

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Perform a review of the EMF Plant Secondary Containment Systems construction documentation to verify the construction of the required leak detection systems are completed per the WAC requirements and DWP appendices. Perform a walk-down (as needed) to complete the verification.	

3.18.6.3 Secondary Containment System Integrity (ED-B001) and (ED-CH01)

Requirement: The secondary containment systems for EMF miscellaneous unit systems listed in Permit Table III.10.M.A (Table 3-7), and permitted vessels listed in Table III.10.E.R (Table 3-8) as approved/modified pursuant to Permit Conditions III.10.M.9 and III.10.E.9, shall be free of cracks or gaps to prevent any migration of dangerous and/or mixed waste or accumulated liquid out of the system to the soil, ground water, or surface water at any time waste is in the EMF Miscellaneous Units System. Any indication that a crack or gap may exist in the containment systems shall be investigated and repaired in accordance with Operating Unit Group 10, Appendix 13.18 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.e.v and III.10.M.9.e.v.[Section III.10.E.5.g, III.10.M.5.g, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967. [WAC 173-303-640(4)(b)(i), WAC 173-303-640(4)(e)(i)(C), and WAC 173-303-640(6) in accordance with WAC 173-303-680(2) and (3), WAC 173-303-806(4)(i)(i)(B), and WAC 173-303-320].

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
I	ENV	Perform a permitted facility and system inspection of the tank and miscellaneous unit systems to verify construction and installation is free of cracks or gaps to prevent any migration of dangerous and/or mixed waste.	

3.18.7 EMF Secondary Containment Systems in Area (E-0105)

3.18.7.1 Construction of Secondary Containment

Requirement: The Permittees shall construct the secondary containment systems for the evaporator feed vessel area (Rm. No. E-0105), Table 3-16, as specified in Operating Unit Group 10, Appendices 13.2, 13.4 through 13.14, and 13.18 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.b., III.10.E.9.c, III.10.E.9.d, III.10.M.9.b, III.10.M.9.c, and III.10.M.9.d.

Table 3-16 EMF Plant Systems Secondary Containment Systems, including Sumps

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room#	Maximum Sump/Leak Detection Box Capacity (gallons)	Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction
DEP-SUMP-00004A E-0105	~58	24 in. Dia. x 30 in. Length 304L SS
DEP-SUMP-00004B E-0105	~58	24 in. Dia. x 30 in. Length 304L SS

[Sections III.10.M.2.b, III.10.E.2.b, Table III.10.E.P, DWP]

Basis Discussion: None.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENV	Review completed installation, nonconformance reports and construction deficiency reports to confirm the plant is constructed in accordance with the approved designs, plans and specifications. Perform walkdown as necessary to complete verification.	

3.18.7.2 Leakage Detection Systems

Requirement: The Permittees shall install all process and leak detection system monitoring/instrumentation, as specified in Table 3-17 as approved/modified pursuant to Permit Condition III.10.E.9, in accordance with Operating Unit Group 10, Appendices 13.1, 13.2, and 13.14 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.e.ix. and III.10.E.9.d.x.

Table 3-17 EMF Plant Systems Secondary Containment Systems Leak Detection and Leak Detection Boxes

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room#	Sump/Leak Detection Box Level Detection Type
DEP-SUMP-00004A E-0105	RF Capacitance
DEP-SUMP-00004B E-0105	RF Capacitance

Sections III.10. M.5.b, III.10. E.5.b, III.10.E.9.e.ii, Table III.10.E.S, Chp. 4G.6, Table 4G-4, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System Regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP – Operating Unit Group 10, WA 78900089.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	ENV	Perform a review of the EMF Plant Secondary Containment Systems construction documentation to verify the construction of the required leak detection systems is completed per the WAC requirements and DWP appendices. Perform a walk-down (as needed) to complete the verification.	

3.18.7.3 Secondary Containment System Integrity

Requirement: The secondary containment systems for EMF miscellaneous unit systems listed in Permit Table III.10.M.A (Table 3-7), and permitted vessels listed in Table III.10.E.R (Table 3-8) as approved/modified pursuant to Permit Conditions III.10.M.9 and III.10.E.9, shall be free of cracks or gaps to prevent any migration of dangerous and/or mixed waste or accumulated liquid out of the system to the soil, ground water, or surface water at any time waste is in the EMF Miscellaneous Units System. Any indication that a crack or gap may exist in the containment systems shall be investigated and repaired in accordance with Operating Unit Group 10, Appendix 13.18 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.e.v and III.10.M.9.e.v. [Section III.10.E.5.g, III.10.M.5.g, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967. [WAC 173-303-640(4)(b)(i), WAC 173-303-640(4)(e)(i)(C), and WAC 173-303-640(6) in accordance with WAC 173-303-680(2) and (3), WAC 173-303-806(4)(i)(i)(B), and WAC 173-303-320].

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
I	**ENV**	Perform a permitted facility and system inspection of the tank and miscellaneous unit systems to verify construction and installation is free of cracks or gaps to prevent any migration of dangerous and/or mixed waste.	

3.18.8 EMF Secondary Containment Systems in Area (E-0106)

3.18.8.1 Construction of Secondary Containment

Requirement: The Permittees shall construct the secondary containment systems for the process condensate lag storage vessel area (Rm. No. E-0106), Table 3-18 as specified in Operating Unit Group 10, Appendices 13.2, 13.4 through 13.14, and 13.18 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.b., III.10.E.9.c, III.10.E.9.d, III.10.M.9.b, III.10.M.9.c, and III.10.M.9.d.

Table 3-18 EMF Plant Systems Secondary Containment Systems, including Sumps, Drain Lines, and Floor Drains

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room#	Maximum Sump/Leak Detection Box Capacity (gallons)	Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction
Sumps		
DEP-SUMP-00005A E-0106	~58	24 in. Dia. x 30 in. Length 304L SS
DEP-SUMP-00005B E-0106	~58	24 in. Dia. x 30 in. Length 304L SS

[Sections III.10.M.2.b, III.10.E.2.b, Table III.10.E.P, DWP]

Basis Discussion: None.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Review completed installation, nonconformance reports and construction deficiency reports to confirm the plant is constructed in accordance with the approved designs, plans and specifications. Perform walkdown as necessary to complete verification.	

3.18.8.2 Leakage Detection Systems (E-0106)

Requirement: The Permittees shall install all process and leak detection system monitoring/instrumentation, as specified in Table 3-19 as approved/modified pursuant to Permit Condition III.10.E.9., in accordance with Operating Unit Group 10, Appendices 13.1, 13.2, and 13.14 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.e.ix. and III.10.E.9.d.x.

Table 3-19 EMF Plant Systems Secondary Containment Systems Leak Detection

Sump/Leak Detection Box, or Floor Drain/Line I.D.# and Room#	Sump/Leak Detection Box Level Detection Type
DEP-SUMP-00005A E-0106	RF Capacitance
DEP-SUMP-00005B E-0106	Conductivity Switch

Sections III.10. M.5.b, III.10. E.5.b, III.10.E.9.e.ii, Table III.10.E.S, Chp.4G.6, Table 4G-4, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System Regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP – Operating Unit Group 10, WA 78900089.

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
R	**ENV**	Perform a review of the EMF Plant Secondary Containment Systems construction documentation to verify the construction of the required leak detection systems are completed per the WAC requirements and DWP appendices. Perform a walk-down (as needed) to complete the verification.	

3.18.8.3 Secondary Containment System Integrity

Requirement: The secondary containment systems for EMF miscellaneous unit systems listed in Permit Table III.10.M.A (Table 3-7), and permitted vessels listed in Table III.10.E.R (Table 3-8) as approved/modified pursuant to Permit Conditions III.10.M.9 and III.10.E.9, shall be free of cracks or gaps to prevent any migration of dangerous and/or mixed waste or accumulated liquid out of the system to the soil, ground water, or surface water at any time waste is in the EMF Miscellaneous Units System. Any indication that a crack or gap may exist in the containment systems shall be investigated and repaired in accordance with Operating Unit Group 10, Appendix 13.18 of this Permit, as approved pursuant to Permit Conditions III.10.E.9.e.v and III.10.M.9.e.v. [Sections III.10.E.5.g, and III.10.M.5.g, DWP]

Basis Discussion: This requirement is derived from the Washington Administrative Code (WAC) Dangerous Waste Regulations at WAC Chapter 173-303, specifically the Tank System regulations in WAC 173-303-640. These regulatory requirements have been incorporated into the Dangerous Waste Permit, WTP- Operating Unit Group 10, WA 7890008967. [WAC 173-303-640(4)(b)(i), WAC 173-303-640(4)(e)(i)(C), and WAC 173-303-640(6) in accordance with WAC 173-303-680(2) and (3), WAC 173-303-806(4)(i)(i)(B), and WAC 173-303-320].

Verification: Construction/installation verification is expected to be achieved through the following:

Verif. Method	Verif. By	Plan	Notes/Comments
I	**ENV**	Perform an inspection of facility and system the tank and miscellaneous units to verify construction and installation is free of cracks or gaps to prevent any migration of dangerous and/or mixed waste.	

4 System Description

This section summarizes design output information by describing the current design and the operational and maintenance aspects of the system. The information provided below does not contain design requirements and should not be used as design input. The description of the current design contained in this section may not fully align with design requirements. This is acceptable within the context of this section. Areas of misalignment are to be resolved through appropriate mechanisms and the FDD/SDD updated to reflect changes made to the design. Changes to the descriptive text will be made following the changes to the lower tiered engineering documents.

4.1 Configuration Information

Note: The process conditions that are described are normal operating parameters (unless otherwise noted) to provide the necessary context for description of the facility, systems, subsystems, and major components.

The primary function of the EMF is to house the DEP and DVP systems and their supporting utility systems, which allow for the treatment of radioactive, dangerous liquid effluent derived from secondary waste streams resulting from glass production in the LAW Facility. The sources of the secondary effluents that are sent to the EMF for treatment are the LAW and Lab RLD systems, the LAW LVP system, and the transfer line flushes and drains associated with the feed and secondary effluent transfers. The EMF will operate up to and during the commissioning of the PT and HLW Facilities. Once the HLW Facility and the PT Facility begin hot commissioning, the EMF will be placed into lay-up and maintained in the event that the PT Facility is unavailable.

The effluents from LAW Facility and Lab operations are collected in the EMF and blended together for evaporation, with the exception of the caustic scrubber effluent received from the LVP system. The EMF concentrates the blended effluent to reduce the total volume to be returned to the LAW LCP system. The caustic scrubber effluent is combined with the evaporator condensate and is sent to the LERF/ETF for disposal.

The DEP system includes the equipment necessary to concentrate the liquid effluent from the LAW Facility and Lab, as well as transfer line drains and flushes, via evaporation. Recycling some concentrated effluent causes build-up in the evaporator recycle loop until steady state conditions are achieved. This approach is consistent with the baseline design, in which LAW Facility effluent is recycled to the PT Facility treated LAW evaporator process system (TLP) evaporator.

Internal areas of the EMF are provided with conditioned air and ventilation capability by the EMF HVAC systems. The ACV system serves the process and utility areas of the EMF, while the C1V system serves the C1 areas that do not interface with the ACV system. The ACV system uses a cascading ventilation system that maintains airflow from areas of less potential for contamination to areas of greater potential for contamination to provide confinement of contamination at or near the source. Exhaust from the ACV system is monitored to ensure compliance with permit requirements.

4.1.1 Description of System, Subsystems, and Major Components

This section provides a summary level description of the EMF and DEP system major components.

4.1.1.1 EMF Facility Description

The EMF is comprised of four buildings. The LAW effluent process building (Building 25) houses the main DEP system equipment and is where the radiological liquid effluent is collected and processed. This single-story windowless structure consists of an enclosed high bay area on the west end of the building, an enclosed lower bay area on the east end of the building, outdoor holding vessel and chemical tank areas on the north side of the building, a covered truck unloading area on the east side of the building, and support areas on the south side of the building. The building foundation is cast-in-place reinforced concrete. The high bay area is surrounded by a 3 ft thick reinforced concrete wall up to a height of 40 ft, which then supports a system of metal panels over structural girts and framing that further extends to a height of 60 ft. The lower bay area is also surrounded by a 3 ft thick reinforced concrete wall, however this structure only extends up to a height of 8 ft 6 in. The remaining wall system extends to a height of 37 ft and consists of metal panels over structural girts and framing. The roofing system for these areas, as well as the cover for the truck bay, is a metal standing-seam roof installed over insulation and a thermal barrier that is fastened to a metal roof deck.

The LAW effluent drain tank building (Building 25A), located directly west of the LAW effluent process building, houses the low-point drain vessel that is used to support draining of the underground transfer lines and leak detection from the secondary side of the transfer lines. The lower basement of this structure is a concrete enclosure that extends down to a depth of −39 ft. The basemat and wall members are constructed of 5 ft thick reinforced concrete and the top slab consists of 2 ft 8 in. thick reinforced concrete. The upper level of this structure is a pre-engineered metal frame with exterior wall panels and an insulated metal roof that is supported by the top slab of the basement and an additional slab on grade. The metal frame of this level extends to a height of 35 ft 7 in. A concrete pipe chase is provided between the LAW effluent process building and the LAW effluent drain tank building to house process piping that runs between the two structures. The chase is used for radiation shielding only, since the piping is co-axial for secondary containment purposes. The chase sits on top of both the 2 ft 8 in. thick slab of the LAW effluent drain tank building and a separate 3 ft thick concrete slab located between the two process buildings. The portion of the chase that rests on top of the LAW effluent drain tank building slab, referred to as the pipe chase doghouse, has 8 ft high walls and a roof that are both 1 ft 8 in. thick. The other portion of the chase has 8 ft high walls and a roof that are both 1 ft 6 in. thick. These two sections are connected by an isolation joint.

The LAW effluent utility building (Building 26) houses the ACV system HEPA filters and fans, along with the various BOF utility system equipment. This single-story windowless structure is 28 ft tall and consists of insulated metal sandwich wall panels over structural girts and framing and an insulated metal roof. The building is supported by a 3 ft thick concrete foundation.

The LAW effluent electrical building (Building 27) houses most of the EMF electrical equipment, which includes the 480V secondary unit substation load center, 480V motor control centers, the uninterruptible power supply system, panelboards, transformers, and adjustable speed drives. This pre-fabricated building is raised 6 ft above grade and is supported by a 3 ft thick concrete foundation.

All buildings (inclusive of most SSCs) within the EMF are non-safety. The one exception is the pressure relief valve on the sodium hydroxide supply line from the truck unloading area to the chemical storage area (E-0107). This component, however, is covered in the scope of the SHR system and its relevant requirements can be found in 24590-WTP-3ZD-SHR-00001, *System Design Description for the WTP Process Reagent Systems*. The EMF exterior structural and architectural elements (walls, roof segments, doors) are constructed of noncombustible materials in accordance with applicable fire protection codes and standards contained in 24590-WTP-COR-MGT-15-00001, *Engineering, Procurement, and Construction (EPC) Code of Record*. The EMF is designed to ensure exposure to the maximally exposed offsite individual (non-acute) is ALARA.

4.1.1.1.1 Maintenance Platforms

EMF SSCs as defined in Sections 3.5.1.2.1 and 3.8.4.7 have a 40-year minimum design life, including the confinement function to minimize out-leakage into lower contamination areas for ventilation system components. All non-replaceable, non-maintainable permanent EMF plant equipment is designed for a 40-year service life, inclusive of maintenance. The EMF is also a hands-on only maintenance facility, meaning that maintenance personnel decontaminate and work on equipment by hand. The EMF facility and equipment designs include adequate space for maintenance activities. While the EMF provides adequate space for some decontamination activities, it is anticipated that the majority of decontamination work for EMF SSCs will be completed in the LAW Facility. Maintenance platforms are installed throughout the EMF to facilitate operator access to maintainable equipment.

4.1.1.1.1.1 LAW Effluent Drain Tank Building Platforms

Refer to:	24590-BOF-S1-25-00101	*LAW Effluent Drain Tank Building 25A Structural Steel Platform EDPB001C Plan Sections and Details*
	24590-BOF-S1-25-00102	*LAW Effluent Drain Tank Building 25A Structural Steel Platforms EDPB001A & EDPB001B Plans and Sections*

Three platforms are provided in the drain tank cell (ED-B001) of the LAW effluent drain tank building. Operators descend a stairwell from the drain tank maintenance room (ED-0102) to platforms EDPB001B and EDPB001A, located on the −22 ft 7¼ in. and −20 ft 9½ in. elevations, respectively. These platforms provide access to the top of DEP-VSL-00001 and allow for the remote operation of the overflow/drain plugs of the underground piping leak detection boxes. A ladder at the south side of platform EDPB001B provides access down to platform EDPB001C on the −32 ft 7½ in. elevation and to the drain tank cell floor. Platform EDPB001C provides structural support for DEP-PMP-00031 and adequate space to perform maintenance on the pump.

4.1.1.1.1.2 LAW Effluent Process Building Platforms

Refer to:	24590-BOF-S1-25-00003	*LAW Effluent Process Bldg. 25 Structural Steel Platform EP0103A Plan and Sections*
	24590-BOF-S1-25-00004	*LAW Effluent Process Bldg. 25 Structural Steel Platform EP0102A Plans*
	24590-BOF-S1-25-00005	*LAW Effluent Process Bldg. 25 Structural Steel Platform EP0106A Plans*
	24590-BOF-S1-25-00006	*LAW Effluent Process Bldg. 25 Structural Steel Platform EP0106C and EP0106B Plans*
	24590-BOF-S1-25-00010	*LAW Effluent Process Bldg. 25 Structural Steel Platform EP0103C Plans*
	24590-BOF-S1-25-00011	*LAW Effluent Process Bldg. 25 Structural Steel Platform EP0103B Plans*
	24590-BOF-S1-25-00012	*LAW Effluent Process Bldg. 25 Structural Steel Platform EP0102B Plans*
	24590-BOF-S1-25-00013	*LAW Effluent Process Bldg. 25 Structural Steel Platform EP0102B Plan and Sections*

Several platforms are provided in the east evaporator process area (E-0102), west evaporator process area (E-0103), and process condensate tank area (E-0106) of the LAW effluent process building. Platform EP0102B runs along the entire north wall of the east evaporator process area at the 14 ft 5 in. elevation and is accessible by both a staircase in the northeast corner of the room and a ladder in the northwest corner of the room. This structure supports the process condensate filter (DEP-FILT-00002), a combination safety shower eye wash unit (DOW-

SHR-00174), electrical equipment, and operator movement to platform EP0102A and to the west evaporator process area. Platform EP0102A, located in the southwest corner of E-0102 at the 20 ft elevation, is accessible via an ascending staircase from platform EP0102B or a ladder from the ground elevation. This structure supports the secondary steam generator (HPS-HX-00011) and provides the space necessary for operators to perform maintenance on the heat exchanger.

Platform EP0102B also provides a transition point through hollow metal doors to platform EP0103B, located along the entire north wall of the west evaporator process area and also at the 14 ft 5 in. elevation. This platform is also accessible from the ground elevation by a ladder situated in the northwest corner of the room. An additional ladder installed directly west of this ladder allows operators to access the 30 ft 7 in. elevation of platform EP0103B and platform EP0103A, located at the 40 ft 7 in. elevation. These two structures are limited to the northwest corner of the room. EP0103A structurally supports the evaporator feed pre-filter (DEP-FILT-00003) and provides the space necessary for operators to perform maintenance on the unit. The west evaporator process area also includes a separate maintenance platform, EP0103C, that is centrally located and not accessible from other maintenance platforms. Operators at the ground elevation ascend a ladder to the 19 ft 5 in. elevation of the structure, which supports the reboiler (DEP-RBLR-00001) and provides adequate space for maintenance activities on the unit. A separate ladder provides a route to the 29 ft 10 in. elevation of the structure, which supports the evaporator (DEP-EVAP-00001) and allows operators to access the evaporator manway. A final ladder provides access to the 43 ft 10 in. elevation of EP0103C, which includes the required space to perform maintenance on the mesh basket located at the top of DEP-EVAP-00001.

There are three structural steel platforms outdoors in the process condensate tank area (E-0106) that facilitate vessel access and support multiple commodities. Platform EP0106C, located on the west wall of the room at the 9 ft 5 in. elevation, is accessible from a staircase in the northwest corner of the room and provides support for the process condensate vessel area sump pump filter (DEP-FILT-00006). Operators can ascend a ladder to platform EP0106A on the 24 ft 4¾ in. elevation, installed directly above EP0106C. This structure supports the feed vessel area sump pump filter (DEP-FILT-00005) and allows operators to access the outer head of the overhead sampling vessels (DEP-VSL-00004A/B). Platform EP0106B, located in the center of the process condensate tank area at the 24 ft 1¾ in. elevation, provides a connection to the subcontractor maintenance platform of the process condensate lag storage vessels (DEP-VSL-00005A/B).

4.1.1.1.1.3 Access Stairs

The exterior access stairs leading to area E-0105 are to be operationally controlled to prevent access by non-radiological workers due to the radiation levels that may be present (refer to 24590-BOF-Z0C-W13T-00005, *Shielding Analysis for Labyrinth Wall for Door in E-0105 North Wall*).

4.1.1.1.2 Maintenance Monorail Hoists

4.1.1.1.2.1 Low Point Drain Tank Ancillaries Hoist (25-HST-00001)

Refer to:	24590-WTP-M0D-25-00001	*24590-WTP-MJ-25-HST-00001 – BOF/EMF Monorails Maintenance Monorail Hoist*

The low point drain tank ancillaries hoist (25-HST-00001) is located at the 30 ft elevation of the drain tank maintenance area (ED-0102) and provides support for the maintenance of components of the low point drain vessel (DEP-VSL-00001). The operator can affix the lifting hook to equipment in the R5/R3 drain tank cell (ED-B001), extract the equipment to the above R3 area through a shield hatch, and position the component on the tank agitator/pump assembly stand for repairs. The unit is powered by 3-phase/60 Hz/460 V motors, one for the hoist (25-MTR-00001) and one for the trolley (25-MTR-00006), and has a lifting capacity of 5 tons.

4.1.1.1.2.2 Evaporator Hoist (25-HST-00002)

Refer to:	24590-BOF-S1-25-00090	*LAW Effluent Process Bldg. 25 Structural Steel Monorails 2 and 3 Plans and Sections*
	24590-WTP-M0D-25-00002	*24590-WTP-MJ-25-HST-00002 – BOF/EMF Monorails Maintenance Monorail Hoist*

The evaporator hoist (25-HST-00002) is located at the 54 ft 3 in. elevation of the west evaporator process area (E-0103) and provides support for the maintenance of the mesh basket of the evaporator (DEP-EVAP-00001). The operator can affix the lifting hook to the lifting lug of the evaporator head and raise the head of the unit so that the mesh basket is exposed for maintenance. The unit is powered by 3-phase/60 Hz/460 V motors, one for the hoist (25-MTR-00002) and one for the trolley (25-MTR-00007), and has a lifting capacity of 2 tons.

4.1.1.1.2.3 Reboiler Hoist (25-HST-00003)

Refer to:	24590-BOF-S1-25-00090	*LAW Effluent Process Bldg. 25 Structural Steel Monorails 2 and 3 Plans and Sections*
	24590-WTP-M0D-25-00003	*24590-WTP-MJ-25-HST-00003 – BOF/EMF Monorails Maintenance Monorail Hoist*

The reboiler hoist (25-HST-00003) is located at the 42 ft 6 in. elevation of the west evaporator process area (E-0103) and provides support for the maintenance of the reboiler (DEP-RBLR-00001). The operator can affix the lifting hook to the lifting lugs of the reboiler head and raise the head of the unit to enable tube replacement or cleaning. The unit is powered by 3-phase/60 Hz/460 V motors, one for the hoist (25-MTR-00003) and one for the trolley (25-MTR-00008), and has a capacity of 5 tons.

4.1.1.1.2.4 Steam Generator Hoist (25-HST-00004)

Refer to:	24590-BOF-S1-25-00091	*LAW Effluent Process Bldg. 25 Structural Steel Monorails 4, 5, and 6 Plans and Sections*
	24590-WTP-M0D-25-00004	*24590-WTP-MJ-25-HST-00004 – BOF/EMF Monorails Maintenance Monorail Hoist*

The steam generator hoist (25-HST-00004) is located at the 30 ft 3 in. elevation of the east evaporator process area (E-0102) and provides support for the maintenance of the secondary steam generator (HPS-HX-00011). The operator can affix the lifting hook to the lifting lugs of the heat exchanger and raise the unit for maintenance and repair. The unit is powered by 3-phase/60 Hz/460 V motors, one for the hoist (25-MTR-00004) and one for the trolley (25-MTR-00009), and has a capacity of 5 tons.

4.1.1.1.2.5 Truck Bay Area Hoist (25-HST-00005)

Refer to:	24590-BOF-S1-25-00091	*LAW Effluent Process Bldg. 25 Structural Steel Monorails 4, 5, and 6 Plans and Sections*
	24590-WTP-M0D-25-00005	*24590-WTP-MJ-25-HST-00005 – BOF/EMF Monorails Maintenance Monorail Hoist*

The truck bay area hoist (25-HST-00005) is located at the 17 ft elevation of the LAW effluent process building. The monorail hoist provides the capability to lift and transport equipment from the truck unloading area (E-0108) to the sub-change (E-0101) through a bi-sliding import door separating the two rooms. The unit is powered by 3-phase/60 Hz/460 V motors, one for the hoist (25-MTR-00005) and one for the trolley (25-MTR-00010), and has a capacity of 5 tons.

4.1.1.1.2.6 Filter Hoist (25-HST-00006)

Refer to:	24590-BOF-S1-25-00091	*LAW Effluent Process Bldg. 25 Structural Steel Monorails 4, 5, and 6 Plans and Sections*
	24590-WTP-M0D-25-00006	*BOF/EMF Maintenance Monorail Hoist for Filter DEP-FILT-00003*

The filter hoist (25-HST-00006) is located at the 53 ft 3¾ in. elevation of the west evaporator process area (E-0103) and provides support for the maintenance of the evaporator feed pre-filter (DEP-FILT-00003). The operator can affix the lifting hook to the lifting lugs provided on the top head of the filter vessel and raise the head for access to the candle filter assembly. The filter assembly can also be removed and transferred horizontally to a location adjacent to the filter vessel for maintenance and cleaning. The unit is powered by 3-phase/60 Hz/460 V motors, one for the hoist (25-MTR-00011) and one for the trolley (25-MTR-00012), and has a capacity of 5 tons.

4.1.1.1.3 Fire Barriers

Refer to:	24590-BOF-FHA-RAFP-FP-0001	*Fire Hazards Analysis (FHA) for the Effluent Management Facility (EMF)*
	24590-BOF-U1-25-00001	*Balance of Facilities LAW effluent Process Bldg. & LAW Effluent Drain Tank Bldg. Fire Barrier Drawing Elevation 0'-0"*
	24590-BOF-U1-26-00001	*Balance of Facilities LAW Effluent Utility Bldg. & LAW Effluent Electrical Bldg. Fire Barrier Drawing Elevation 0'-0"*

The fire safety strategy for all fire areas of the EMF relies primarily on area protection and area separation. The facility interfaces with the fire protection water (FPW) system to control fires originating within the EMF through an automatic fire suppression system for area protection. The requirement for area separation is implemented exterior to the facility through the use of building separation, while fire barriers implement the requirement on the interior of the facility.

4.1.1.1.4 Facility Secondary Containment

Refer to:	24590-BOF-A5-25-05200001	*LAW Effluent Process Bldg. 25 Drain Tank Bldg. 25A Utility Bldg. 26 Architectural Room Finish Schedule*
	24590-BOF-M0C-DEP-00001	*Liner Height Calculation in the EMF*
	24590-BOF-PER-M-16-003	*Dangerous Waste Permit (DWP) Liner Heights in the Effluent Management Facility (EMF)*

The EMF structure provides secondary containment for the five dangerous waste permit affecting areas of the LAW effluent process and LAW effluent drain tank buildings containing DEP system process piping and equipment. The drain tank cell (ED-B001) is equipped with stainless steel liners on the floor and walls, up to the −34 ft elevation, and finished with epoxy novolac coating from the top of the liner to the −30 ft 10 in. elevation. The east evaporator process area (E-0102), west evaporator process area (E-0103), and sub-change (E-0101) floors, concrete walls, and gypsum wall boards are finished with an epoxy novolac coating up to the 7 ft 6 in. elevation. Although the sub-change does not contain a source of dangerous waste, the design assumes that the door between the sub-change and the east evaporator process area is open and that the gypsum wall board separating the two rooms fails. The outdoor process condensate tank area (E-0106) floors and walls are finished with a 100% polyurea coating system up to the 7 ft 9 in. elevation. The outdoor feed tank area (E-0105) is equipped with stainless steel liners on the floor and walls, up to the 7 ft 6 in. elevation.

Secondary containment is also provided for the hazardous material that has the potential to accumulate in the chemical storage area (E-0107) and the truck unloading area (E-0108). The floor and wall of the chemical storage area, up to the 5 ft 8 in. elevation, are coated with a 100% solids polyurea solution. The same finish is applied to the truck unloading area, although only to the floor and 2 ft high curb.

The drain tank pipe chase (EDCH01) is not provided with liners or finishes because the encasement portion of the coaxial DEP system process piping running through the structure serves the secondary containment function.

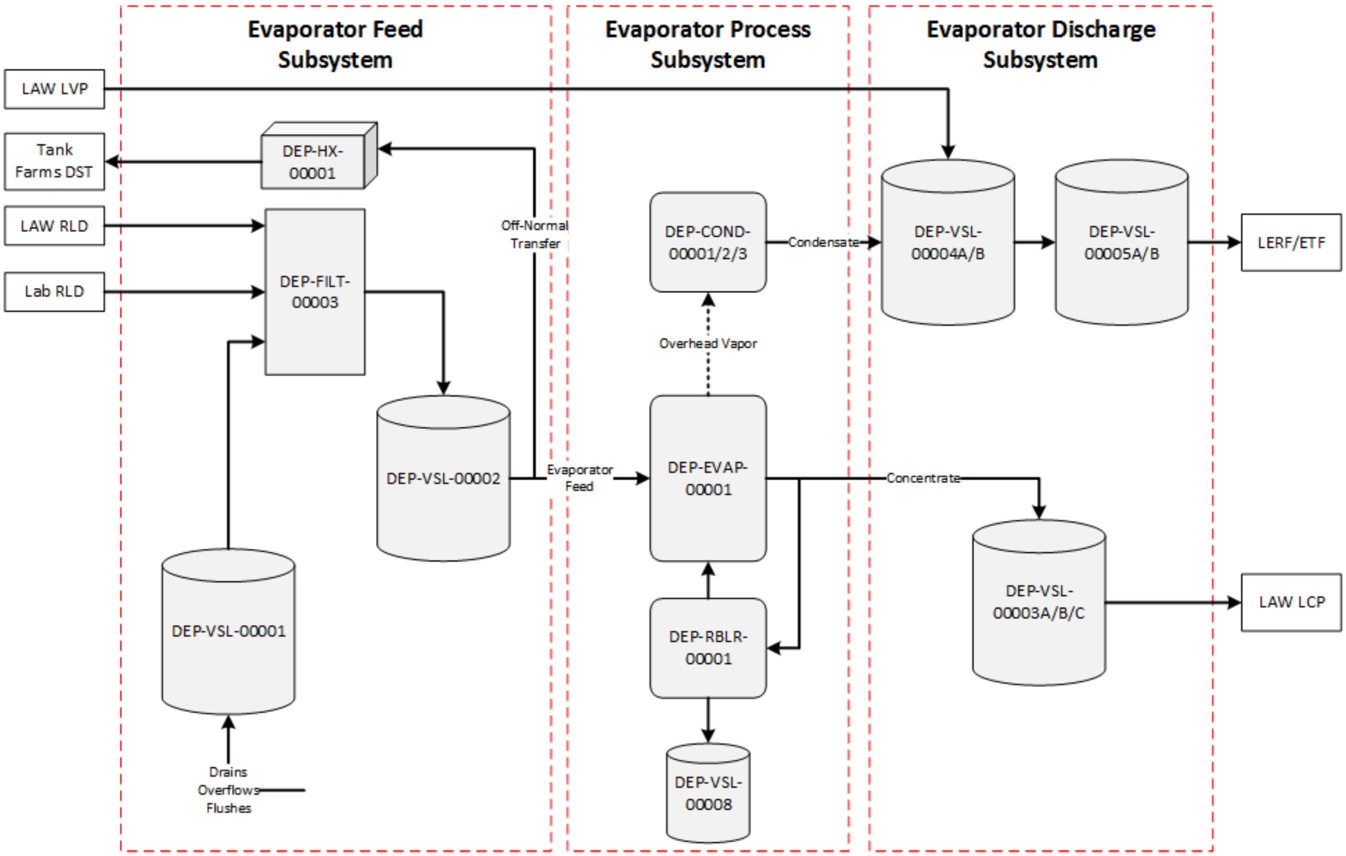
4.1.1.2 DEP System Description

The EMF houses the DEP system, which collects, processes, and disposes of the radioactive liquid effluents from the LAW Facility, Lab, and associated transfer line drains and flushes. The EMF and DEP system are designed to support the LAW Facility throughput design and treatment capacities of 30 MTG per day and 21 MTG per day, respectively. The DEP system contains an evaporator system and 9 major process vessels. For details related to the chemical reagent systems supporting the DEP system, refer to 24590-WTP-3ZD-SHR-00001, *System Design Description for the WTP Process Reagent Systems (AFR, MXR, NAR, SHR, SNR, SPR, STR).* All waste streams, including mixed waste (hazardous and radioactive), are identified, minimized, and have designated disposal routes. The facility design accommodates disposal routes, size reduction, encapsulation/packaging, accumulation, staging, surveying, and transfer and export of secondary waste streams as defined for the EMF in a secondary solid waste management plan.

Transfer of dilute effluent from EMF to LERF/ETF is accomplished through a dedicated line to LERF/ETF. The tie-in point is upstream of the interface point between WTP and LERF/ETF (shown as Nodes 8A and 8B on 24590-WTP-B2-C12T-00001). Dilute liquid effluents that are within the permit acceptance limits specified in ICD-06 are discharged to the LERF/ETF for subsequent treatment and disposal. The off-normal concentrated effluent return line from the EMF to the Tank Farms is shown as Node 14 on 24590-WTP-B2-C12T-00001. Concentrated liquid effluents that are within the permit acceptance limits specified in ICD-31 can be transferred to Tank Farms during off-normal operating conditions. Furthermore, the design includes a load-out point to transfer evaporator feed and concentrate to a tanker truck for removal during off-normal conditions (option following an as low as reasonably achievable [ALARA], viability, and safety study).

For clarity, the description of the DEP system is separated into four subcategories: the evaporator feed subsystem, the evaporator process subsystem, the evaporator discharge subsystem, and other system equipment. For an overview of the DEP system and the subsystems described in this section, refer to Figure 4-1.

Figure 4-1 Simplified DEP System Overview



4.1.1.2.1 Evaporator Feed Subsystem Description

The evaporator feed subsystem prepares radioactive mixed waste effluent from the LAW and Lab Facilities and any flushes/drains associated with these transfer lines or the DEP system for processing in the evaporator. In off-normal operating conditions, the evaporator feed is returned to Tank Farms or removed using a tanker truck.

4.1.1.2.1.1 Low Point Drain Vessel (DEP-VSL-00001)

Refer to:	24590-BOF-M6-DEP-00001001	*P&ID – BOF/EMF Direct Feed LAW - EMF Process System - Low Point Drain Vessel – DEP-VSL-00001*
	24590-BOF-M6-DEP-00001002	*P&ID – BOF/EMF Direct Feed LAW - EMF Process System – Low Point Drain Vessel Pumps - DEP-PMP-00001A/B*
	24590-BOF-MFD-DEP-00001	*Mechanical Agitator DEP-AGT-00001 for Low Point Drain Vessel DEP-VSL-00001*
	24590-BOF-MVC-DEP-00001	*DEP Low Point Drain Vessel (DEP-VSL-00001) – Vessel Sizing, Vessel Overflow Nozzle Sizing, and Plant Wash System Sizing*
	24590-BOF-MVD-DEP-00002	*Low Point Drain Vessel*

The low-point drain vessel (DEP-VSL-00001) normally collects drains of flush water after transfers of any radiological waste streams to/from the EMF. This includes the following transfers:

- Submerged bed scrubber condensate/plant washes from the LAW RLD system to the DEP-VSL-00002
- Caustic scrubber effluent from the LAW LVP system to the DEP-VSL-00004A/B
- Radioactive mixed waste effluents from the Lab RLD system to the DEP-VSL-00002
- Treated LAW feed from the TOC and recycled feed from DEP-VSL-00003A/B/C to the LAW LCP system

Additionally, the vessel collects effluent from sources within the EMF during off-normal scenarios, including:

- Drains of flush water from DEP-HX-00001 transfers to Tank Farms
- DEP system process vessel overflows (except for DEP-VSL-00008)
- Sumps with the potential to contain radioactive fluid (DEP-SUMP-00002A/B, DEP-SUMP-00004A/B)
- The truck unloading area sump (DEP-SUMP-00008)
- Drains from the sampling station (DEP-HOOD-00001)
- Off-specification evaporator concentrate from DEP-PMP-00007A/B
- Drains from the evaporator (DEP-EVAP-00001)

The low-point drain vessel has an inner diameter of 14 ft and a tangent to tangent height of 12 ft 9 in., is constructed of Type 316/316L stainless steel, and is located below grade in the drain tank cell (ED-B001) of the LAW effluent drain tank building. Note that based on calculation 24590-BOF-MVC-DEP-00001, rev 0, *DEP Low Point Drain Vessel (DEP-VSL-00001) – Vessel Sizing, Vessel Overflow Nozzle Sizing, and Plant Wash System Sizing*, assumption 6.1.5, it is assumed that only one drain or flush line into the low point drain vessel will be open at a time. This assumption is based on the expected operational strategy of the plant (24590-WTP-PL-PE-16-0001, Rev. 1, *WTP Direct Feed LAW Integrated Processing Strategy Description*, section 5.2.1.1.1.1). This is an operational constraint.

The vessel is designed and constructed to ASME BPVC Section VIII Division 1. The maximum operating volume is 13,900 gallons and the total volume of the vessel is 18,000 gallons. The vessel is fitted with temperature and level instrumentation, although only the vessel level is actively maintained within the normal operating range.

The low-point drain vessel is equipped with an agitator (DEP-AGT-00001) to help prevent buildup of settled solids in the waste. The agitator has a connection to facilitate maintenance access for oil changes, and is provided with a 3-phase/60 Hz/460 V motor (DEP-MTR-00001). The agitator impeller is constructed of Type 316L stainless steel. The vessel is also equipped with two fluid-driven rotating spray nozzles (DEP-NOZ-00001/00011) located on opposite sides of the vessel to wash both sides of the vessel interior with water from the DIW system.

DEP-VSL-00001 is designed with a 10-inch overflow line which discharges excess effluent to the low point drain vessel sump (DEP-SUMP-00001). The overflow line contains a loop seal which is filled with demineralized water to prevent potentially radioactive air from flowing out during normal operating conditions. The low point drain vessel is purged with air drawn into the vessel head space through a filtered air intake and is vented to the vessel vent header in the DVP system. The DVP system maintains a negative pressure in the vessel to prevent hydrogen accumulation in the vessel headspace.

4.1.1.2.1.2 Low Point Drain Vessel Sump (DEP-SUMP-00001)

Refer to:	24590-BOF-DD-25-00015	*Effluent Management Facility 24” Dia. Sump in Secondary Containment Sections and Details*
	24590-BOF-M6-DEP-00001002	*P&ID – BOF/EMF Direct Feed LAW - EMF Process System – Low Point Drain Vessel Pumps - DEP-PMP-00001A/B*

	24590-BOF-M6C-DEP-00001	*DEP Sump, Sump Pump and Pipeline Sizing*
	24590-BOF-MPD-DEP-00009	*Air Operated Diaphragm Pump*

The low point drain vessel sump (DEP-SUMP-00001) collects overflow from DEP-VSL-00001 and drains from the underground waste transfer line leak detection boxes. The outer shell of coaxial piping in the pipe chase that can be manually flushed using the local DIW utility station also discharges to the sump. The sump is located along the south wall of the drain tank cell (ED-B001) at the (-) 39'-0" elevation of the LAW effluent drain tank building. The cylindrical sump has a capacity of 58 gallons, is 2 ft in diameter, and is 30 in. deep. The pipe and plate sections of the sump are both constructed of Type 304L stainless steel, while the grating material is either Type 304L or 316L. The low point drain vessel sump pump (DEP-PMP-00031) is an air powered double diaphragm pump located above DEP-SUMP-00001 on platform EDPB001C that transfers the sump contents to the evaporator feed vessel (DEP-VSL-00002) through the evaporator feed pre-filter (DEP-FILT-00003). The suction standpipe of the pump is installed ½ in. off the bottom of the sump. The pump is constructed of Type 316/316L stainless steel, has a maximum capacity of 45 gal/min, and discharges effluent at 76 psig. A pressure safety valve is supplied on the PSA system supply line to the pump for overpressure protection of the air diaphragm section of the pump.

4.1.1.2.1.3 Low Point Drain Vessel Pumps (DEP-PMP-00001A/B)

Refer to:	24590-BOF-M6-DEP-00001002	*P&ID – BOF/EMF Direct Feed LAW - EMF Process System – Low Point Drain Vessel Pumps - DEP-PMP-00001A/B*
	24590-BOF-MPC-DEP-00002	*BOF DEP Low Point Drain Vessel Pump (DEP-PMP-00001A/B) Sizing and Line Sizing*
	24590-BOF-MPD-DEP-00015	*Low Point Drain Vessel Pumps*

The low point drain vessel pumps (DEP-PMP-00001A/B) in DEP-VSL-00001 are normally used to batch transfer the vessel contents to the evaporator feed vessel (DEP-VSL-00002) through the evaporator feed pre-filter (DEP-FILT-00003). The pumps are also capable of recirculating the vessel contents through the sampling station (DEP-HOOD-00001). The vertical turbine pumps have a rated capacity of 70 gpm, discharge effluent at 72.4 psig, are powered by 5hp, 3-phase/60 Hz/460 V induction motors (DEP-MTR-00001A/B), and are constructed of Type 316L stainless steel. The pump transfer lines include quick connection points to facilitate flushing with demineralized water from the local DIW system utility station. A hand pump cart is provided to supply makeup water to the pump seal accumulator associated with the 53B pump seal plan. PSW line interfaces provide bearing lubrication for pump startup.

4.1.1.2.1.4 Evaporator Feed Pre-Filter (DEP-FILT-00003)

Refer to:	24590-BOF-M6-DEP-00002004	*P&ID – BOF/EMF Direct Feed LAW EMF – Process System - Evaporator Feed Vessel - Prefilter DEP-FILT-00003*
	24590-BOF-PYD-DEP-00002	*Evaporator Feed Pre-Filter*

The evaporator feed pre-filter (DEP-FILT-00003) is a candle type unit that filters various effluents to a particle diameter of 5 micron before they enter the evaporator feed vessel (DEP-VSL-00002). The normal supply through the filter is radioactive liquid from the LAW and Lab RLD systems and effluent from DEP-VSL-00001. The filter is located on platform EP0103A in the northwest corner of the west evaporator process area (E-0103). In the off-normal scenario where the evaporator concentrate needs to be reprocessed, the filter also removes suspended solids from the DEP-VSL-00003A/B/C concentrate stream transferred to DEP-VSL-00002. Additionally, the off-specification concentrate stream transferred from DEP-VSL-00003A/B/C to Tank Farms through DEP-HX-00001 passes through the filter. The unit is rated for 162 gpm and is designed to process 16,000 gallons of fluid before requiring a periodic back pulse using air from the PSA system. Backflushes are sent to the evaporator concentrate vessels (DEP-VSL-00003A/B/C) for eventual transfer as feed to the LAW Facility. The filter and its downstream transfer lines can be flushed with demineralized water or process condensate. Pressure safety valves located on the piping line from the discharge of the filter to DEP-VSL-00002 protect the filter from over-pressurization.

4.1.1.2.1.5 Evaporator Feed Vessel (DEP-VSL-00002)

Refer to:	24590-BOF-M6-DEP-00002001	*P&ID – BOF/EMF - Direct Feed LAW EMF – Process System - Evaporator Feed Vessel - DEP-VSL-00002*
	24590-BOF-MPD-DEP-00016	*Mixing Eductors for Atmospheric Vessel DEP-VSL-00002*
	24590-BOF-MVC-DEP-00005	*DEP Evaporator Feed Vessel (DEP-VSL-00002) – Vessel Sizing, Vessel Overflow Nozzle Sizing, and Plant Wash System Sizing*
	24590-BOF-MVD-DEP-00003	*Evaporator Feed Vessel*

Under normal conditions, the evaporator feed vessel (DEP-VSL-00002) receives filtered effluent from the LAW RLD system, the Lab RLD system, and the low point drain vessel (DEP-VSL-00001). Additionally, the vessel can receive filtered evaporator concentrate from DEP-VSL-00003A/B/C for reprocessing, non-filtered off-specification evaporator concentrate directly from DEP-EVAP-00001, non-filtered off-specification condensate for reprocessing from the overhead sampling vessels (DEP-VSL-00004A/B), and contaminated reboiler condensate from DEP-VSL-00008. The vessel includes the capability to add sodium hydroxide from the SHR system to adjust the pH of the contents. Sodium hydroxide is added if necessary after each transferred input during normal operation for more advantageous corrosion conditions.

The evaporator feed vessel has an inside diameter of 14 ft and a tangent to tangent height of 32 ft, is constructed of UNS N08367, and is located in the northwest corner of the LAW effluent process building in the feed tank area (E-0105). The vessel is designed and constructed to ASME BPVC Section VIII Division 1. The maximum operating volume is 38,000 gallons and the total volume of the vessel is 42,300 gallons. The vessel is fitted with level instrumentation, which is used to maintain the vessel level in an acceptable range. The outlet piping of the vessel is fitted with temperature instrumentation to monitor vessel temperature.

The evaporator feed vessel is equipped with eductors (DEP-EDUC-00001A/B/C) to help prevent the buildup of settled solids in the waste and to provide a homogenous mixture for sampling. The eductors receive fluid from the evaporator feed vessel recirculation pumps (DEP-PMP-00012A/B/C) and operate while the pumps are running. The vessel also includes a fluid-driven rotating spray nozzle (DEP-NOZ-00003) to wash the vessel interior with demineralized water. The nozzle supplies 95 gpm of water at 80 psig.

DEP-VSL-00002 is designed with an 8-inch overflow line which discharges excess evaporator feed to the low point drain vessel (DEP-VSL-00001). The evaporator feed vessel is purged with air drawn through the vessel head space through a filtered air intake and is vented to the vessel vent header in the DVP system.

4.1.1.2.1.6 Evaporator Feed Vessel Recirculation Pumps (DEP-PMP-00012A/B/C)

Refer to:	24590-BOF-M6-DEP-00002002	*P&ID – BOF/EMF - Direct Feed LAW EMF – Process System - Evaporator Feed Vessel Recirculation Pumps – DEP-PMP-00012A/B/C*
	24590-BOF-MPC-DEP-00005	*DEP Evaporator Feed Vessel Recirculation Pump Sizing (DEP-PMP-00012A/B/C)*
	24590-BOF-MPD-DEP-00006	*BOF EMF Evaporator Feed Vessel Recirculation Pump*

The evaporator feed vessel recirculation pumps (DEP-PMP-00012A/B/C) are located in the west evaporator process area (E-0103) and are normally used to recirculate fluid back to the evaporator feed vessel (DEP-VSL-

00002) to power the mixing eductors (DEP-EDUC-00001A/B/C). Two pumps normally operate while one unit acts as a standby. While the vessel contents are recirculating, a sample can be drawn at DEP-HOOD-00001 to characterize the effluent in the vessel. In off-normal operating modes (e.g., the evaporator is off or not functioning), the pumps are used to transfer feed to the Tank Farms through the effluent cooler (DEP-HX-00001). The centrifugal pumps have a capacity of 160 gpm, discharge effluent at 99.1 psig, are powered by 20 hp, 3-phase/60 Hz/460 V induction motors (DEP-MTR-00012A/B/C), and are constructed of CD4MCu stainless steel.

4.1.1.2.1.7 Evaporator Feed Vessel Transfer Pumps (DEP-PMP-00002A/B)

Refer to:	24590-BOF-M6-DEP-00002003	*P&ID – BOF/EMF - Direct Feed LAW EMF – Process System - Evaporator Feed Vessel Transfer Pumps DEP-PMP-00002A/B*
	24590-BOF-MPC-DEP-00013	*DEP Evaporator Feed Vessel Transfer Pump (DEP-PMP-00002A/B) and Suction/Discharge Line Sizing*
	24590-BOF-MPD-DEP-00001	*BOF DEP Evaporator Feed Vessel Transfer Pump*

The evaporator feed vessel transfer pumps (DEP-PMP-00002A/B) are located in the west evaporator process area (E-0103) and transfer evaporator feed to the recirculation loop of the evaporator system. A recirculation loop back to DEP-VSL-00002 is provided to keep the pumps running at their minimum required flowrate when flow to the evaporator is not required. The recirculation loop includes a square-edge type restriction orifice (DEP-RO-00017) to increase the system resistance and provide pump protection. The centrifugal pumps have a capacity of 16.5 gpm, discharge effluent at 21.2 psig, are powered by 3 hp, 3-phase/60 Hz/460 V induction motors (DEP-MTR-00002A/B), and are constructed of CD4MCu stainless steel.

4.1.1.2.1.8 Effluent Cooler (DEP-HX-00001)

Refer to:	24590-BOF-M6-DEP-00002006	*P&ID – BOF/EMF - Direct Feed LAW EMF – Process System Evaporator Concentrate/Feed Vessels LAW Effluent Cooler DEP-HX-00001*
	24590-BOF-MEC-DEP-00002	*DFLAW EMF (DEP) Heat Exchanger DEP-HX-00001 Heat Duty*
	24590-BOF-MED-DEP-00001	*Evaporator Concentrate/Feed LAW Effluent Cooler*

To meet the waste acceptance requirements of ICD-31, evaporator concentrate and feed must be chemically adjusted and sufficiently cooled in the DEP system prior to transfer to Tank Farms. Sodium hydroxide is added to the evaporator feed vessel (DEP-VSL-00002) and the evaporator concentrate vessels (DEP-VSL-00003A/B/C) and mixed through vessel eductors. Once these feeds are transferred from their respective vessels, sodium nitrite is added via inline mixing for further corrosion mitigation. If evaporator concentrate is being transferred to Tank Farms because the LAW Facility is unavailable or the effluent does not meet the specifications required for the LAW Facility, then process condensate is also added. When the fluid temperature is greater than 95°F, the batch passes through the effluent cooler (DEP-HX-00001) before exiting the EMF. The spiral type, plate and frame heat exchanger is located in the west evaporator process area (E-0103), has a heat duty of 2,630,000 BTUH, and is designed for a flow rate of 94 gpm. The plates and nozzles of the unit are constructed of Type 316/316L stainless steel. The cold side of the unit receives 150 gpm of cooling water from the PCW system. Dual PSVs are provided on both the hot and cold side of the heat exchanger to provide protection from over-pressurization while eliminating the need for a service outage while performing maintenance on a relief valve. The cooling water return to the PCW system is monitored for conductivity and the transfer line can be flushed to DEP-SUMP-00002A/B if it is determined that the system has been contaminated. After the process fluid passes through the heat exchanger, it is monitored to determine whether the waste acceptance requirements of ICD-31 are met before transferring the batch to Tank Farms. The batch is transferred to the low point drain vessel (DEP-VSL-00001) if the corrosion mitigation controls are not met.

4.1.1.2.2 Evaporator Process Subsystem Description

The evaporator process subsystem concentrates dilute radionuclides and salts from the LAW and Lab RLD systems to recycle back into LAW Facility glass production operations and to produce low activity condensate for disposal at LERF/ETF.

4.1.1.2.2.1 Evaporator Separator Vessel (DEP-EVAP-00001)

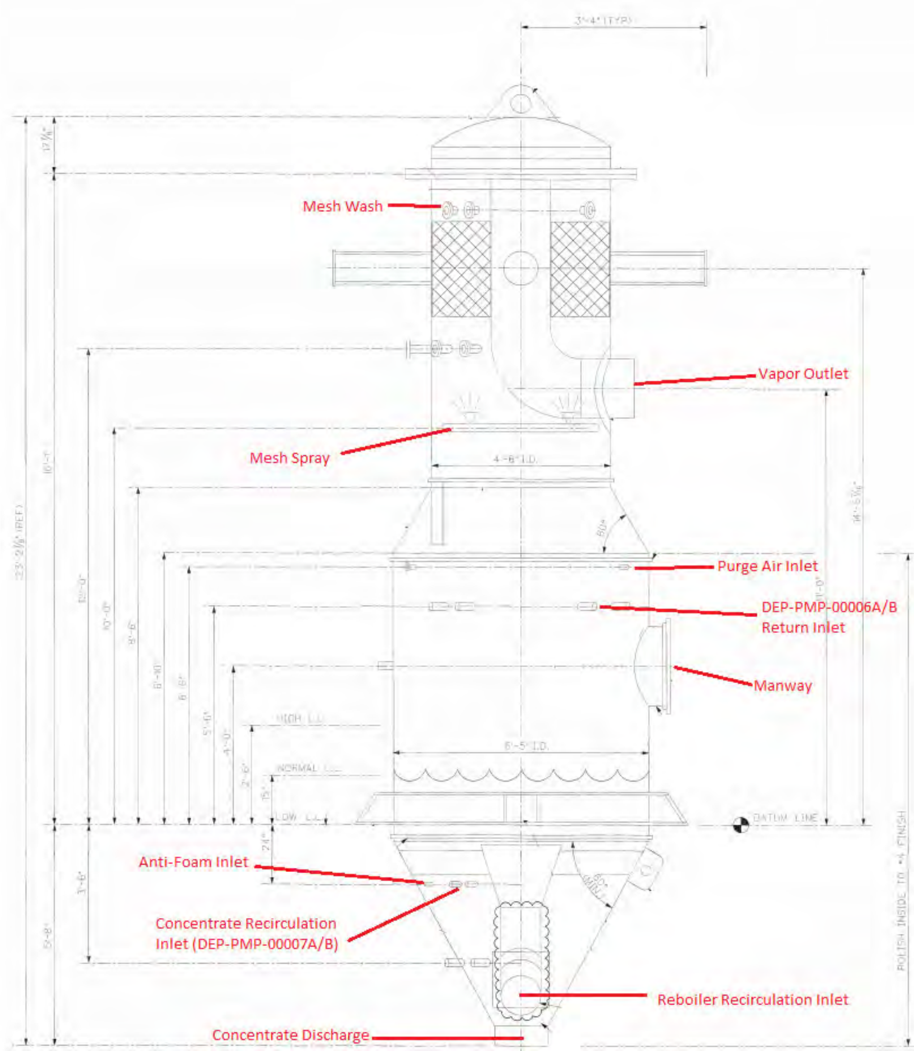
Refer to:	24590-BOF-M6-DEP-00003001	*P&ID – BOF/EMF Direct Feed LAW EMF - Evaporator Separator - DEP-EVAP-00001*
	24590-BOF-MEC-DEP-00003	*Process Data for the DEP Evaporator Separator Vessel (DEP-EVAP-00001), Reboiler (DEP-RBLR-00001), Primary Condenser (DEP-COND-00001), and Recirculation Pump (DEP-PMP-00017)*
	24590-BOF-MVD-DEP-00009	*Evaporator Separator Vessel*

The evaporator separator vessel (DEP-EVAP-00001) concentrates the nonvolatile species of the waste stream for recycling in the LAW Facility glass production operations. The unit primarily receives feed from the evaporator feed vessel (DEP-VSL-00002) through the reboiler (DEP-RBLR-00001). The DEP evaporator also receives concentrated evaporator effluent recirculated from the evaporator concentrate discharge pumps (DEP-PMP-00007A/B). Feed streams to the evaporator are combined with anti-foam reagent supplied by the anti-foam metering pumps (AFR-PMP-00014A/B) in batches to reduce foam generation during the evaporation process. Recirculated concentrate effluent from the evaporator reboiler is introduced below the liquid level and flashes in the vacuum atmosphere at the liquid surface. . The overhead vapors, mainly water, pass through mist eliminators to remove entrained liquid, with the overhead vapor continuing on to the primary condenser (DEP-COND-00001). The majority of the bottom liquid is recycled through DEP-RBLR-00001 with a small amount sent to the evaporator concentrate vessels (DEP-VSL-00003A/00003B/00003C).

The upper portion of the evaporator consists of a mesh pad, a mesh basket, a bubble cap tray, and a spray wash system. The mesh pad is a set of DEMISTER® multi-layered woven wire segments used to eliminate mist in the evaporator. The mesh pad is contained and supported by a mesh basket which is restrained using tabs and a bolted connection. A bubble cap tray (including downcomer pipe and seal pan assembly) is installed below the mesh basket to further reduce entrainment in the evaporator. The spray wash system consists of two spray headers: a lower spray that operates continuously to keep the bottom of the mesh pad wetted and an upper spray above the mesh pad that is operated as an intermittent/maintenance wash. In the event of off-specification condensate, the evaporator also receives recirculated effluent from the downstream condenser for reprocessing. The evaporator can be drained to the low point drain vessel (DEP-VSL-00001) through the use of a removable hose. The evaporator also receives purge air through a vacuum breaker HEPA filter (DEP-HEPA-00001A) for long term evaporator shutdown. Refer to Figure 4-2 for additional evaporator details.

The upper portion of the evaporator separator vessel has an inner diameter of 4 ft 6 in., the lower portion of the vessel has an inner diameter of 6 ft 5 in., and the unit has a tangent to tangent height of 17 ft 4 in. The evaporator is constructed of UNS N06022 and is located in the LAW effluent process building's west evaporator process area (E-0103). The maximum operating volume of the vessel is 1,177 gallons and the total volume of the vessel is 3,544 gallons. It is designed and constructed to ASME BPVC Section VIII Division 1. The evaporator separator vessel is fitted with level, , pressure, and differential pressure instrumentation that interface with the PCJ for remote monitoring of evaporator separator vessel conditions. The level and pressure in the vessel are monitored and maintained within an acceptable range. The pressure differential is monitored across the bubble cap tray and across the DEMISTER® pads.

Figure 4-2 DEP Evaporator Separator Vessel



4.1.1.2.2.2 DEP Evaporator Recirculation Pump (DEP-PMP-00017)

Refer to:	24590-BOF-M6-DEP-00003001	*P&ID – BOF/EMF Direct Feed LAW EMF - Process System Evaporator Reboiler - DEP-RBLR-00001*
	24590-BOF-MPC-DEP-00016	*DEP Evaporator Recirculation Pump (DEP-PMP-00017) Pump, Line, and Restriction Orifice Sizing*
	24590-BOF-MPD-DEP-00013	*DEP Evaporator Recirculation Pump*

The DEP evaporator recirculation pump (DEP-PMP-00017) is located in the west evaporator process area (E-0103) and is used to recirculate the contents of the evaporator and feed from the evaporator feed vessel (DEP-VSL-00002) through the reboiler (DEP-RBLR-00001). A restriction orifice is included on the discharge line from the pump to add resistance to the system and ensure that the centrifugal pump functions properly. The centrifugal pump has a capacity of 3,500 gpm, discharges concentrate at 11.66 psig, is powered by a 40 hp, 3-phase/60 Hz/460 V induction motor (DEP-MTR-00017), and is constructed of CD4MCuN stainless steel. The PSW system provides barrier makeup fluid for the mechanical pump seal.

4.1.1.2.2.3 Evaporator Concentrate Discharge Pumps (DEP-PMP-00007A/B)

Refer to:	24590-BOF-M6-DEP-00003003	*P&ID – BOF/EMF Direct Feed LAW EMF - Process System Evaporator Concentrate Discharge Pumps DEP-PMP-00007A/B*
	24590-BOF-MPC-DEP-00009	*DEP Evaporator Concentrate Discharge Pump (DEP-PMP-00007A/B) Sizing and Line Sizing*
	24590-BOF-MPD-DEP-00005	*BOF DEP Evaporator Concentrate Discharge Pump*

The evaporator concentrate discharge pumps (DEP-PMP-00007A/B) are located in the west evaporator process area (E-0103) and normally recirculate evaporator bottom concentrate through an instrumentation skid measuring density, radiation, and flow (DEP-SKID-00005) back to the evaporator (DEP-EVAP-00001). The skid includes control logic that maintains the density of the concentrate in the evaporator and serves as the primary means of controlling the radiation level in the fluid. If the concentrate meets the density and radiation standards of downstream equipment, then a fraction of the concentrate is transferred to the evaporator concentrate vessels (DEP-VSL-00003A/B/C). In the event of off-specification concentrate quality, the pumps transfer effluent back to the evaporator feed vessel (DEP-VSL-00002), with the remaining fluid in the piping drained to the low point drain vessel (DEP-VSL-00001). The centrifugal pumps have a capacity of 11 gpm, discharge concentrate at 41.6 psig, are powered by 5 hp, 3-phase/60 Hz/460 V induction motors (DEP-MTR-00007A/B), and are constructed of CD4MCu stainless steel. The PSW system provides barrier makeup fluid for the mechanical pump seals. The pump suctions include quick disconnects to facilitate flushing of the downstream transfer lines with water from a local DIW system utility station in the west evaporator process area.

4.1.1.2.2.4 DEP Evaporator Reboiler (DEP-RBLR-00001)

Refer to:	24590-BOF-M6-DEP-00003002	*P&ID – BOF/EMF Direct Feed LAW EMF - Process System Evaporator Reboiler - DEP-RBLR-00001*
	24590-BOF-MBD-DEP-00001	*DEP Evaporator Reboiler*
	24590-BOF-MEC-DEP-00003	*Process Data for the DEP Evaporator Separator Vessel (DEP-EVAP-00001, Reboiler (DEP-RBLR-00001), Primary Condenser (DEP-COND-00001), and Recirculation Pump (DEP-PMP-00017)*

The DEP evaporator reboiler **(**DEP-RBLR-00001) is a cylindrical, vertically oriented, counter-current forced flow shell and tube reboiler that heats the high flow rate bottoms stream (recirculated concentrate) from the evaporator separator vessel (DEP-EVAP-0001) and returns the stream to the evaporator. The process fluid flows through the tube side, with saturated steam from the HPS system secondary steam generator (HPS-HX-00011) provided on the shell side. Non-condensable vapor is vented to the inter-condenser (DEP-COND-00002) for further processing.

The DEP evaporator recirculation pump (DEP-PMP-00017) is used to transfer recirculated concentrate to the DEP Evaporator Reboiler (DEP-RBLR-00001) at a continuous flow of 3,500 gpm. The reboiler has temperature, conductivity, and level sensing capabilities on the utility outlet piping, and temperature sensing capability on the piping connected to the concentrate outlet of the reboiler. These sensors interface with the PCJ for remote monitoring of the conditions within the reboiler. The DEP reboiler conductivity measurement on the utility side of the reboiler is used to remotely monitor the reboiler for breakthrough of concentrated effluent to the secondary side of the reboiler, which may be an indicator of tube leaks. Steam condensate that collects on the utility side of the reboiler is transferred to the reboiler condensate collection vessel (DEP-VSL-00008) before returning to the SCW system.

The process side of the reboiler consists of 222 individual tubes, each with an outer diameter of 1½ in. and length of 8 ft. The shell has an inner diameter of 2 ft 9 in. and a tangent to tangent height of 12 ft 5 in. The shell is constructed of Type 316L stainless steel, and is designed in accordance with ASME BPVC Section VIII Division 1. The tubes are constructed of UNS N06022. The evaporator reboiler is located in the LAW effluent process building west evaporator process area near the evaporator separator vessel and has a heat duty of 6,013,000 BTUH. The unit is designed with provisions for 4-inch-thick heat conservation insulation and is accessible from the top and bottom heads for inspection, cleaning, and plugging tubes as needed.

4.1.1.2.2.5 Reboiler Condensate Skid (DEP-SKID-00004)

Refer to:	24590-BOF-M6-DEP-00003006	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Reboiler Condensate DEP-VSL-00008*
	24590-BOF-MPC-DEP-00017	*Reboiler Condensate Pump (DEP-PMP-00008A/B), Vessel (DEP-VSL-00008), and Line Sizing*
	24590-BOF-MVD-DEP-00008	*Reboiler Condensate Collection Vessel with Two (2) Reboiler Condensate Pumps*

The reboiler condensate skid (DEP-SKID-00004) is located in the east evaporator process area (E-0102) and consists of the reboiler condensate collection vessel (DEP-VSL-00008) and the reboiler condensate pumps (DEP-PMP-00008A/B). The reboiler condensate collection vessel receives steam condensate from the reboiler and stores the liquid prior to its transfer back to the SCW system. Makeup water for the vessel is provided by the DIW system. In the event of a tube leak in the reboiler, contaminated condensate is transferred to the evaporator feed vessel (DEP-VSL-00002) to avoid contaminating the secondary steam loop.

The reboiler condensate collection vessel is constructed of Type 304/304L stainless steel and is designed in accordance with ASME BPVC Section VIII Division 1. The vessel is fitted with level instrumentation, which is used to maintain the vessel level in an acceptable range. The vessel vent line to the inter-condenser (DEP-COND-00002) includes dual PSVs to protect the vessel from over-pressurization. Unlike the other DEP system vessels, DEP-VSL-00008 does not interface with the DVP system nor does it have an overflow line routed to the low point drain vessel. Instead, a valve is provided to manually drain the vessel to the east evaporator process area. This valve is also accessible to allow for vessel sampling.

The reboiler condensate pumps provide the motive force to convey reboiler condensate to the SCW system or to DEP-VSL-00002. The vertical pumps have a capacity of 15 gpm, discharge effluent at 18.3 psig, are powered by 3 hp, 3-phase/60 Hz/460 V induction motors (DEP-MTR-00008A/B), and are constructed of Type 316 stainless steel.

4.1.1.2.2.6 DEP Evaporator Primary Condenser (DEP-COND-00001) and First Stage Ejector (DEP-EJCTR-00001A/B)

Refer to:	24590-BOF-M6-DEP-00003004	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Evaporator Condensers - DEP-COND-00001/2/3*
	24590-BOF-MCD-DEP-00001	*DEP Evaporator First Stage Ejectors DEP Evaporator Second Stage Ejectors*
	24590-BOF-MEC-DEP-00003	*Process Data for the DEP Evaporator Separator Vessel (DEP-EVAP-00001, Reboiler (DEP-RBLR-00001), Primary Condenser (DEP-COND-00001), and Recirculation Pump (DEP-PMP-00017)*
	24590-BOF-MED-DEP-00004	*DEP Evaporator Primary Condenser*

The evaporator primary condenser (DEP-COND-00001) functions as the principal condenser for the DEP evaporator separator vessel (DEP-EVAP-00001). The overhead vapors from the top of the evaporator separator vessel are condensed in the shell side of the divided flow, shell and tube heat exchanger using a secondary cooling water loop on the tube side. The condensate gravity drained to the boot of the condenser is combined with minimum recirculation from the evaporator condensate pumps (DEP-PMP-00006A/B) and condensate from the inter and after-condensers (DEP-COND-00002/00003). The resulting effluent is transferred to the downstream users via DEP-PMP-00006A/B.

The vacuum that enables low temperature flashing in the evaporator separator vessel is established and maintained through the collapse of vapor into liquid in the primary condenser. The first stage ejector (DEP-EJCTR-00001A/B) is used for additional pressure control of the evaporator separator vessel. Non-condensable overhead vapors in DEP-COND-00001 are pulled into the first stage ejector and are entrained with high velocity steam supplied by the HPS system in the suction chamber of the ejector. The resulting gas is discharged to the inter-condenser (DEP-COND-00002). The vacuum created by the first stage ejector is regulated by adding air into the system via DEP-HEPA-00001A. The steam ejectors are both constructed of Type 316L stainless steel.

The utility side of the condenser consists of 406 individual tubes, each with an outer diameter of one inch and length of 16 ft. The shell has an inner diameter of 3 ft, a height of 7 ft 7¾ in., and a length of 18 ft 3 in. The evaporator primary condenser is constructed of Type 304L stainless steel and is located in the LAW effluent process building's east evaporator process area. It is designed and constructed to ASME BPVC-Section VIII Division 1. The unit is cooled by a secondary cooling water system which uses plant cooling water from the PCW system and has a heat duty of 5,527,620 Btu/hr. The PCW system supply line to DEP-COND-00001 is equipped with dual PSVs to protect the tube side of the unit from over-pressurization. A rupture disk is provided on the vapor line from DEP-EVAP-00001 to the primary condenser to protect DEP-EVAP-00001, the process side of DEP-RBLR-00001 and the shell side of DEP-COND-00001 from over-pressurization. A vortex breaker is installed in the boot of the primary condenser to prevent cavitation in the evaporator condensate pumps. Accessible areas of the condenser have 1.5-inch thick insulation for personnel protection, where feasible.

4.1.1.2.2.7 DEP Evaporator Inter and After-Condenser (DEP-COND-00002/00003) and Second Stage Ejector (DEP-EJCTR-00002A/B)

Refer to:	24590-BOF-M6-DEP-00003004	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Evaporator Condensers - DEP-COND-00001/2/3*
	24590-BOF-MCD-DEP-00001	*DEP Evaporator First Stage Ejectors DEP Evaporator Second Stage Ejectors*
	24590-BOF-MED-DEP-00005	*DEP Evaporator Inter-Condenser*
	24590-BOF-MED-DEP-00006	*DEP Evaporator After-Condenser*

The evaporator inter-condenser (DEP-COND-00002) and after-condenser (DEP-COND-00003) work with the steam ejectors (DEP-EJCTR-00001A/B and DEP-EJCTR-00002A/B) to create additional pressure control for the evaporator separator vessel (DEP-EVAP-00001). Gas discharged from the first stage ejector is combined with the vent of the reboiler condensate collection vessel (DEP-VSL-00008), and the vent of the reboiler (DEP-RBLR-00001) in DEP-COND-00002. The vapors are condensed on the shell side of the shell and tube heat exchanger using a secondary cooling water loop on the tube side. The condensate formed in the unit drains through a steam trap to the boot of DEP-COND-00001. The second stage ejector (DEP-EJCTR-00002A/B) pulls vapor into the after-condenser (DEP-COND-00003), where the remaining vapor is drawn off into the DVP system vessel vent header. The condensate from DEP-COND-00003 flows through a steam trap to the boot of the primary condenser.

The utility sides of DEP-COND-00002 and DEP-COND-00003 consist of 54 and 20 individual tubes, respectively, each with an outer diameter of 3/4 in. and length of 6 ft. The units are both constructed of Type 304 stainless steel and are designed to ASME Section VIII Division 1. The steam ejectors are both constructed of Type 316L stainless steel. Both condensers are located in the LAW effluent process building's east evaporator process area, near the primary condenser.

The DEP evaporator inter-condenser (DEP-COND-00002) is cooled by a secondary cooling water system that uses plant cooling water from the PCW system and has a heat duty of 361,681 Btu/hr. The DEP evaporator after-condenser (DEP-COND-00003) is also cooled by a secondary cooling water system that uses plant cooling water from the PCW system and has a heat duty of 279,497 Btu/hr. A rupture disk is provided on the vapor line from DEP-EJCTR-00001A/B to DEP-COND-00002 and on the vapor line from DEP-COND-00003 to the DVP system to protect the condensers from over-pressurization. Accessible areas of the condensers have 1.5-inch thick insulation for personnel protection, where feasible.

4.1.1.2.2.8 DEP Evaporator Condensate Pumps (DEP-PMP-00006A/B)

Refer to:	24590-BOF-M6-DEP-00003005	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Evaporator Condensate Pumps DEP-PMP-00006A/B*
	24590-BOF-MPC-DEP-00015	*DEP Evaporator Condensate Discharge Pump (DEP-PMP-00006A/B) Sizing and Line Sizing*
	24590-BOF-MPD-DEP-00012	*DEP Evaporator Condensate Pump*

The DEP evaporator condensate pumps (DEP-PMP-00006A/B) are located in the east evaporator process area (E-0102) and provide the motive force to transfer dilute evaporator condensate from DEP-COND-00001 to the overhead sampling vessels (DEP-VSL-00004A/B). If the condensate is off-specification, this transfer is shut off and the pumps fully recirculate the effluent back to DEP-EVAP-00001 for reprocessing. A portion of the condensate also flows continuously through the condensate duplex cartridge filter (DEP-FILT-00004A/B) to DEP-EVAP-00001 as mesh/wash spray. These filters retain particles of one micron or larger and are equipped with pressure safety valves to protect against over-pressurization. A minimum recirculation line is also provided back to DEP-COND-00001 and includes a restriction orifice for pump protection. The centrifugal pumps have a capacity of 15 gpm, discharge condensate at 26.2 psig, are constructed of Type 316 stainless steel, and are powered by 5 hp, 3-phase/60 Hz/460 V induction motors (DEP-MTR-00006A/B).

4.1.1.2.3 Evaporator Discharge Subsystem Description

The evaporator discharge subsystem collects the dilute and concentrated effluent produced by the evaporator process subsystem and transfers the solution out of the DEP system.

4.1.1.2.3.1 Evaporator Concentrate Vessels (DEP-VSL-00003A/B/C)

Refer to:	24590-BOF-M6-DEP-00005001	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Evaporator Concentrate Vessel - DEP-VSL-00003A*
	24590-BOF-M6-DEP-00005002	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Evaporator Concentrate Vessel - DEP-VSL-00003B*
	24590-BOF-M6-DEP-00005003	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Evaporator Concentrate Vessel - DEP-VSL-00003C*
	24590-BOF-MPD-DEP-00017	*Mixing Eductors for Atmospheric Vessels DEP-VSL-00003A/B/C*
	24590-BOF-MVC-DEP-00006	*Evaporator Concentrate Vessel (DEP-VSL-00003A/B/C) – Vessel Sizing, Vessel Overflow Nozzle Sizing, and Plant Wash System Sizing*
	24590-BOF-MVD-DEP-00004	*Evaporator Concentrate Vessel*

The evaporator concentrate vessels (DEP-VSL-00003A/B/C) are used to collect concentrated effluent from the evaporator separator vessel (DEP-EVAP-00001). Concentrated effluent can either be recycled to the LAW LCP system in combination with the waste feed from the TOC, returned to the Tank Farms DSTs, or sent to a tanker truck (option following an ALARA, viability, and safety study). The evaporator concentrate vessels receive evaporator concentrate from the evaporator concentrate discharge pumps (DEP-PMP-00007A/B),, backflush/off-normal solids slurry from DEP-FILT-00003, and caustic from SHR-TK-00013.

The evaporator concentrate vessels have an inner diameter of 12 ft and a tangent to tangent height of 13 ft 6 in., are constructed of UNS N08367 stainless steel, and are located on the LAW effluent process building's north side in the feed tank area (E-0105). They are designed and constructed to ASME BPVC Section VIII Division 1. The maximum operating volume of the vessels is 11,800 gallons and the total volume of the vessels is 14,900 gallons. The vessels are fitted with level instrumentation and the discharge from the vessels includes temperature instrumentation for remote indication on the PCJ. The level in the vessels is monitored and maintained within an acceptable range.

The vessels are equipped with eductors (DEP-EDUC-00003A/B for DEP-VSL-00003A, DEP-EDUC-00004A/B for DEP-VSL-00003B, and DEP-EDUC-00005A/B for DEP-VSL-00003C) to provide a homogenous mixture for sampling and to suspend solids in the vessel. The eductors receive fluid from DEP-PMP-00003A/B and run only when mixing is selected and the pumps are aligned to provide flow to the eductors. Each vessel also includes a fluid-driven rotating spray nozzle (DEP-NOZ-00004/00009/00010) to wash the vessel interior with demineralized water. The nozzles supply 95 gpm of water at 80 psig.

The vessels are designed with 10-inch overflow lines which discharge excess evaporator concentrate to the low point drain vessel (DEP-VSL-00001). The evaporator concentrate vessels are purged with filtered air drawn through the vessel head space and are vented to the vessel vent header in the DVP system. These vessels have the capability to receive sodium hydroxide reagent from the SHR system for chemical adjustment to meet ICD-31 criteria for returning concentrated effluent to Tank Farms. Insulation is included on the vessels for freeze protection because they are located outdoors.

4.1.1.2.3.2 Evaporator Concentrate Transfer/Recirculation Pumps (DEP-PMP-00003A/B)

Refer to:	24590-BOF-M6-DEP-00005004	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Evaporator Concentrate Vessel – Recirculation/Transfer Pumps DEP-PMP-00003A/B*
	24590-BOF-M6-DEP-00005005	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Evaporator Concentrate Vessel - Recirculation*
	24590-BOF-MPC-DEP-00007	*DEP Evaporator Concentrate Vessel Transfer/Recirculation Pump (Dep-PMP-00003A/B) Sizing and Line Sizing*
	24590-BOF-MPD-DEP-00002	*Evaporator Concentrate Transfer/Recirc Pumps*
	24590-BOF-MPC-DEP-00007	*DEP Evaporator Concentrate Vessel Transfer/Recirculation Pump (DEP-PMP-00003A/B) Sizing and Line Sizing*

The evaporator concentrate transfer/recirculation pumps (DEP-PMP-00003A/B) are located in the west evaporator process area (E-0103) and provide the motive force to transfer evaporator concentrate from the evaporator concentrate vessels (DEP-VSL-00003A/B/C) to the LAW LCP system in combination with the feed from the TOC. If the concentrate is off-specification, the pumps recycle the effluent through DEP-FILT-00003 to DEP-VSL-00002 for reprocessing in the evaporator. Additionally, the pumps are capable of transferring concentrate through the effluent cooler (DEP-HX-00001) to Tank Farms in the event that the LAW Facility is not available for transfers. A recirculation line is also provided back to DEP-VSL-00003A/B/C to mix the vessel contents through eductors to create a homogenous mixture for sampling. The pumps can also transfer tank contents to a tanker truck (if determined to be safe, acceptable following ALARA review). Per 24590-BOF-

MPC-DEP-00007, for transfers to a tanker truck, flow must be manually controlled (throttled using DEP-V-00200) to maintain flow between 61 and 120 gpm. The centrifugal pumps have a capacity of 120.7 gpm, discharge condensate at 118.3 psig, are powered by 20 hp, 3-phase/60 Hz/460 V induction motors (DEP-MTR-00003A/B), and are constructed of CD4MCu stainless steel. The pumps and their downstream transfer lines can be flushed with either demineralized water or process condensate stored in DEP-VSL-00005A/B. The PSW system provides barrier makeup fluid for the mechanical pump seals.

Note that based on calculation 24590-BOF-MPC-DEP-00007, Rev 0, *DEP Evaporator Concentrate Vessel Transfer/Recirculation Pump(DEP-PMP-00003A/B)Sizing and Line Sizing, assumption 6.1.20,* it is assumed that the pump flowrate for the transfer to the Tanker Truck (Mode A) is 90 gpm. to maintain the flowrate to the Tank Truck used in the previous revision of this calculation, the flowrate to the Tanker Truck is set to 90 gpm. The transfer line to the Tanker Truck (Mode A) contains a globe valve (DEP-V-00200) (Refer to 24590-BOF-M6-DEP-00005004, Rev. 1, *P&ID - BOF/EMF Direct Feed LAW EMF Process System Evap Conc Vsl Recirculation/Transfer Pumps DEP-PMP-00003A/B*). This component must be used to control flow between the minimum flowrate of 61 gpm and the maximum flowrate of the pump, 120 gpm (rounded down from 120.7). This assumption imposes an operational constraint.

In short, DEP-PMP-00003A/B feeds multiple end users in the transfer network. The line to the Tanker Truck contains a globe valve which is used to regulate flow and prevent pump runout. A flowrate of 90 gpm is chosen as the operating flowrate.

4.1.1.2.3.3 Overhead Sampling Vessels (DEP-VSL-00004A/B)

Refer to:	24590-BOF-M6-DEP-00004001	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Overhead Sampling Vessel - DEP-VSL-00004A*
	24590-BOF-M6-DEP-00004002	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Overhead Sampling Vessel - DEP-VSL-00004B*
	24590-BOF-MPD-DEP-00018	*Mixing Eductors for Atmospheric Vessels DEP-VSL-00004A/B*
	24590-BOF-MVC-DEP-00002	*Overhead Sampling Vessel (DEP-VSL-00004A/B) – Vessel Sizing, Vessel Overflow Nozzle Sizing, and Vessel Wash Nozzle Design*
	24590-BOF-MVD-DEP-00005	*Overhead Sampling Vessel*

The overhead sampling vessels (DEP-VSL-00004A/B) normally receive condensate from the evaporator via the evaporator condensate pumps (DEP-PMP-00006A/B) and caustic scrubber fluids from the LAW LVP system (LVP-TK-00001). In off-normal operating scenarios, DEP-VSL-00004A/B receives off-specification condensate from the process condensate lag storage vessels (DEP-VSL-00005A/B) via the lag storage vessel transfer pumps (DEP-PMP-00005A/B) and non-radioactive effluents from DEP sumps (DEP-SUMP-00002A/B and DEP-SUMP-00004A/B) and the chemical storage area NLD sump (NLD-SUMP-00032). Each batch is analyzed at the sampling station (DEP-HOOD-00001) and characterized before transfer to the process condensate lag storage vessels (DEP-VSL-00005A/B) via the overhead sampling vessel pumps (DEP-PMP-00004A/B/C).

The overhead sampling vessels have an inner diameter of 14 ft, a tangent to tangent height of 30.8 ft, are constructed of Type 304/304L stainless steel, and are located outdoors on the LAW effluent process building's north side in the process condensate tank area (E-0106). They have been designed and constructed to ASME BPVC Section VIII Division 1. The maximum operating volume is 36,600 gallons and the total volume of the vessels is 40,800 gallons. The vessels are fitted with level instrumentation and the discharge from the vessels includes temperature instrumentation. The level in the vessels is monitored and maintained within an acceptable range.

The overhead sampling vessels are equipped with eductors (DEP-EDUC-00006/00007 for DEP-VSL-00004A and DEP-EDUC-00008/00009 for DEP-VSL-00004B) to mix the contents to allow a representative sample to be taken. The eductors receive fluid from the overhead sampling vessel pumps (DEP-PMP-00004A/B/C) and run only when mixing is selected and the pumps are aligned to provide flow to the eductors. The vessels also include a fluid-driven rotating spray nozzle (DEP-NOZ-00005/00006) to wash the vessel interior with process service water. The nozzles supply 105 gpm of water at 44.02 psig.

DEP-VSL-00004A/B are designed with 8-inch overflow lines which discharge excess evaporator condensate to the low point drain vessel (DEP-VSL-00001). The overhead sampling vessel is purged with filtered air drawn through the vessel head space and is vented to the vessel vent header in the DVP system. Insulation is included on the vessels for freeze protection because they are located outdoors.

4.1.1.2.3.4 Overhead Sampling Vessel Transfer/Recirculation Pumps (DEP-PMP-00004A/B/C)

Refer to:	24590-BOF-M6-DEP-00004003	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Overhead Sampling Vessel Pumps DEP-PMP-00004A/B/C*
	24590-BOF-MPC-DEP-00004	*BOF DEP Overhead Sampling Vessel Pump (DEP-PMP-00004A/B/C) Sizing and Line Sizing*
	24590-BOF-MPD-DEP-00003	*BOF DEP Overhead Sampling Vessel Transfer/Recirculation Pump*

The overhead sampling vessel transfer/recirculation pumps (DEP-PMP-00004A/B/C) are located in the east evaporator process area (E-0102) and provide the motive force to transfer evaporator condensate from the overhead sampling vessels (DEP-VSL-00004A/B) to the process condensate lag storage vessels (DEP-VSL-00005A/B). If vessel sampling reveals that the vessel contents do not meet the waste acceptance requirements for transfer to LERF/ETF, the pumps recycle the solution back to DEP-VSL-00002 for reprocessing in the evaporator. A recirculation line is also provided back to DEP-VSL-00004A/B to mix the vessel contents through eductors to create a homogenous mixture for sampling. The centrifugal pumps have a capacity of 179.9 gpm, discharge condensate at 98.5 psig, are constructed of CD4MCu stainless steel, and are powered by 20 hp, 3-phase/60 Hz/460 V induction motors (DEP-MTR-00004A/B/C). A hose connection is provided at the common suction to the pumps to facilitate flushing with water from a local DIW/PSW utility station.

4.1.1.2.3.5 Process Condensate Lag Storage Vessels (DEP-VSL-00005A/B)

Refer to:	24590-BOF-M6-DEP-00006001	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Process Condensate Lag Storage Vessel - DEP-VSL-00005A*
	24590-BOF-M6-DEP-00006002	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Process Condensate Lag Storage Vessel - DEP-VSL-00005B*
	24590-BOF-MPD-DEP-00019	*Mixing Eductors for Atmospheric Vessels DEP-VSL-00005A/B*
	24590-BOF-MVC-DEP-00004	*Process Condensate Lag Storage Vessel (DEP-VSL-00005A/B) – Vessel Sizing, Vessel Overflow Sizing, and Wash Ring Sizing*
	24590-BOF-MVD-DEP-00006	*Process Condensate Lag Storage Vessel*
	24590-BOF-M6C-PSW-00008	*EMF Process Service Water (PSW) Line Sizing (PIPE-FLO)*

The process condensate lag storage vessels (DEP-VSL-00005A/B) receive batches of process condensate from the overhead sampling vessels (DEP-VSL-00004A/B), secondary steam blowdown from HPS-HX-00011, and effluent from sumps (DEP-SUMP-00003A/B and DEP-SUMP-00005A/B). These vessels allow for lag storage and characterization before transferring the condensate out of the DEP system to LERF/ETF for additional treatment and disposal.

The vessels are each equipped with eductors (DEP-EDUC-00010/00011/00012/00013 for DEP-VSL-00005A and DEP-EDUC-00014/00015/00016/00017 for DEP-VSL-00005B) and a recirculation system. This method of effluent mixing homogenizes the vessel contents in support of sampling activities, and mixing via the eductors continues until the process condensate lag storage recirculation pumps (DEP-PMP-00015A/B/C) are shut off. Each vessel also includes a series of wash rings to wash the vessel interior with process service water. The wash rings provide 105 gpm of water at approximately 42 psig. Based on 24590-BOF-M6C-PSW-00008, due to PSW system flowrate restrictions (Assumption 6.1.7 and Section 7.1), only one wash ring segment may be operated at a time. This is an operational constraint.

The process condensate lag storage vessels have an inside diameter of 25 ft and a tangent to tangent height of 29 ft 6 in., are constructed of Type 316/316L stainless steel, and are located on the north side of LAW effluent process building in the process condensate tank area (E-0106). They are designed and constructed to ASME BPVC Section VIII Division 1. The maximum operating volume of the vessels is 108,208 gallons and the total volume of the vessels is 127,260 gallons. The vessels are fitted with level and density instrumentation and the discharge from the vessels includes temperature instrumentation for remote indication in the PCJ. The level in the vessel is monitored and maintained within an acceptable range.

The vessels are designed with 10-inch overflow lines which discharge excess condensate to the low point drain vessel (DEP-VSL-00001). The process condensate lag storage vessels are purged with filtered air drawn through the vessel head space and vented to the vessel vent header in the DVP system. Additionally, DEP-VSL-00005A has a vacuum breaker line that vents to the transfer line to LERF/ETF to prevent the accumulation of negative pressure in the system. Insulation is included on the vessels for freeze protection because they are located outdoors.

4.1.1.2.3.6 Process Condensate Lag Storage Vessel Transfer Pumps (DEP-PMP-000005A/B)

Refer to:	24590-BOF-M6-DEP-00006003	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Lag Storage Vessel Transfer Pumps DEP-PMP-00005A/B*
	24590-BOF-MPC-DEP-00003	*24590-BOF-MP-DEP-PMP-00005A/B Lag Storage Vessel Transfer Pump Sizing*
	24590-BOF-MPD-DEP-00004	*Process Condensate Lag Storage Vessel Transfer Pump*

The process condensate lag storage vessel transfer pumps (DEP-PMP-00005A/B) are located in the east evaporator process area (E-0102) and provide the capability to transfer evaporator condensate out of the DEP system to LERF/ETF. If the condensate is off-specification, the pumps transfer the solution back to the overhead sampling vessels (DEP-VSL-00004A/B) through a restriction orifice. A recirculation line back to DEP-VSL-00005A/B is also provided for off-normal operating conditions.

The centrifugal pumps have a capacity of 201.1 gpm, discharge condensate at 42.4 psig, are constructed of CD4MCu stainless steel, and are powered by 7.5 hp, 3-phase/60 Hz/460 V induction motors (DEP-MTR-00005A/B). A hose connection is provided at the common suction to the pumps to facilitate flushing with demineralized water from a local DIW utility station. The discharge from the pumps is first monitored to determine whether it meets the acceptance criteria of ICD-06 for a transfer to LERF/ETF. Once the appropriate parameters are met, the effluent passes through the process condensate filter (DEP-FILT-00002) to remove particles larger than 5 microns. The supply line to the filter is equipped with dual PSVs to protect the filter from over-pressurization.

4.1.1.2.3.7 Process Condensate Lag Storage Vessel Recirculation Pumps (DEP-PMP-00015A/B/C)

Refer to:	24590-BOF-M6-DEP-00006004	*P&ID – BOF/EMF Direct Feed LAW EMF Process System Lag Storage Vessel Recirculation Pumps DEP-PMP-00015A/B/C*
	24590-BOF-MPC-DEP-00008	*DEP Process Condensate Lag Storage Vessel Recirculation Pump (DEP-PMP-00015A/B/C) Sizing and Line Sizing*
	24590-BOF-MPD-DEP-00007	*BOF Process Condensate Lag Storage Vessel Recirculation Pump*

The process condensate lag storage vessel recirculation pumps (DEP-PMP-00015A/B/C) are located in the east evaporator process area (E-0102) and provide the capability to recirculate the contents of DEP-VSL-00005A/B or to reduce demineralized water usage in the process by transferring process condensate to the outlet of the low point drain vessel pumps (DEP-PMP-00001A/B), the inlet of the evaporator concentrate transfer/recirculation pumps (DEP-PMP-00003A/B), and the sodium nitrite mixing tee (DEP-MTEE-00001). While the vessel contents are recirculating, a sample can be taken at DEP-HOOD-00001 to characterize the condensate in the vessels. The centrifugal pumps have a capacity of 294 gpm, discharge condensate at 96.8 psig, are constructed of CD4MCu stainless steel, and are powered by 25 hp, 3 phase/60 Hz/460 V induction motors (DEP-MTR-00015A/B/C). The pumps are each rated for 50% operations, such that two units are placed in operation while one remains on standby. A hose connection is provided at the common suction to the pumps to facilitate flushing with demineralized water from a local DIW utility station.

4.1.1.2.4 Other DEP System Equipment Description

4.1.1.2.4.1 Sampling Station (DEP-HOOD-00001)

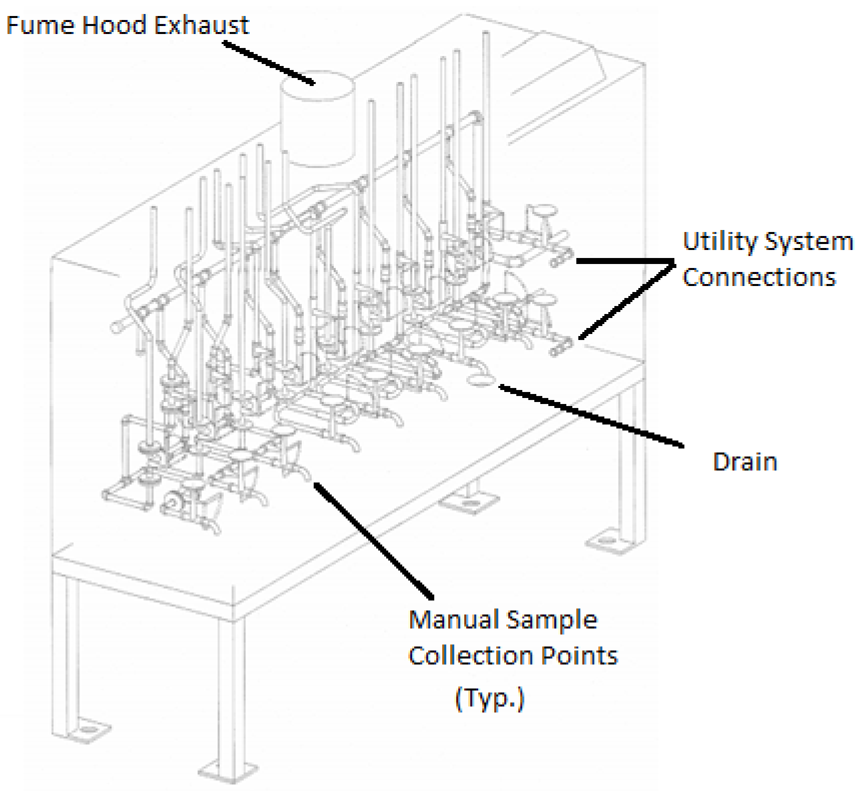
Refer to:	24590-BOF-M0-DEP-00001001	*BOF/EMF Design Proposal Drawing Sampling Fume Hood*
	24590-BOF-M0-DEP-00001002	*BOF/EMF Design Proposal Drawing Sampling Fume Hood*
	24590-BOF-M0-DEP-00001003	*BOF/EMF Design Proposal Drawing Sampling Fume Hood*
	24590-BOF-M0D-DEP-00001	*BOF/EMF Sampling Fume Hood*

The sampling station (DEP-HOOD-00001) is located in the east evaporator process area (E-0102) and provides the means for the manual sampling of eight unique EMF process fluid streams while maintaining the safety of the operator/worker. These streams include:

- The contents of the low point drain vessel (DEP-VSL-00001)
- The contents of the evaporator feed vessel (DEP-VSL-00002)
- The feed to Tank Farms through the effluent cooler (DEP-HX-00001)
- The evaporator (DEP-EVAP-00001) concentrate discharge
- The contents of the evaporator concentrate vessels (DEP-VSL-00003A/B/C)
- The contents of the overhead sampling vessels (DEP-VSL-00004A/B)
- The contents of the process condensate lag storage vessels (DEP-VSL-00005A/B)
- The contents of the feed vessel area sumps (DEP-SUMP-00004A/B)

The unit consists of a fume hood, the process pipelines and valves, manual sampling collection points, utility support systems, and a drain system. The fume hood serves to capture, confine, and exhaust fumes, vapors, and particulate matter produced or generated within the enclosure. These gases are exhausted by the ACV system and combined with the exhaust from the west evaporator process area (E-0103). The process pipelines provide primary confinement for the radioactive process fluid sampled in the fume hood space. A system of valves installed on these pipelines is used to control the flow during sampling activities. The manual sampling collection points are designed to hold and secure the sampling bottle during collection. PSA and DIW system utility connection points are included in DEP-HOOD-00001 to facilitate flushing of the sampling lines at the completion of a sampling campaign and/or cleanup (washing and drying) of the sampling station working area if needed. The drain system collects the liquid waste resulting from the flushing and cleaning operations and discharges the fluid to the low point drain vessel (DEP-VSL-00001). The hood body and frame are constructed of Type 304L stainless steel and the hood liner is constructed of Type 316L stainless steel. For an overview of the design of the sampling station, refer to Figure 4-3.

Figure 4-3 Sampling Station



4.1.1.2.4.2 West Process Area Sumps (DEP-SUMP-00002A/B)

Refer to:	24590-BOF-DD-25-00015	*Effluent Management Facility 24" Dia. Sump in Secondary Containment Sections and Details*
	24590-BOF-M6-DEP-00009001	*P&ID – BOF/EMF Direct Feed LAW EMF Process System – Process Area Sumps DEP-SUMP-00002A/B*
	24590-BOF-M6C-DEP-00001	*DEP Sump, Sump Pump and Pipeline Sizing*
	24590-BOF-MPD-DEP-00010	*Mechanical Data Sheet: Vertical Submersible Centrifugal Pumps*

The west process area sumps (DEP-SUMP-00002A/B) collect spills and leaks that occur in the west evaporator process area (E-0103). The sumps are located on the north and south walls of this area at the ground elevation of the LAW effluent process building. The cylindrical sumps have a capacity of 58 gallons, are 2 ft in diameter, and are 30 in. deep. The pipe and plate sections of the sump are both constructed of Type 304L stainless steel, while the grating material is either Type 304L or 316L. The west process area sump pumps (DEP-PMP-00032A/B) are permanently installed electrical units submerged within the sumps that transfer the sump contents to the low point drain vessel (DEP-VSL-00001). Upon the detection of liquid in the sump, the pumps are started as soon as practical to minimize the potential of effluent spilling from the C5 area into the C3 east evaporator process area (E-0102). The pumps have a maximum capacity of 120 gpm, discharge effluent at 47.2 psig, are powered by 10 hp, 3 phase/60 Hz/460 V induction motors, and are constructed of Type 316 stainless steel. A vacuum breaker is included on the transfer line to the low point drain vessel to prevent the accumulation of negative pressure in the system.

4.1.1.2.4.3 East Process Area Sumps (DEP-SUMP-00003A/B)

Refer to:	24590-BOF-DD-25-00015	*Effluent Management Facility 24” Dia. Sump in Secondary Containment Sections and Details*
	24590-BOF-M6-DEP-00009004	*P&ID – BOF/EMF Direct Feed LAW EMF Process System – Process Area Sumps DEP-SUMP-00003A/B*
	24590-BOF-M6C-DEP-00001	*DEP Sump, Sump Pump and Pipeline Sizing*
	24590-BOF-MPD-DEP-00010	*Mechanical Data Sheet: Vertical Submersible Centrifugal Pumps*

The east process area sumps (DEP-SUMP-00003A/B) collect spills and leaks that occur in the east evaporator process area (E-0102). The sumps are located on the north and south walls of this area at the ground elevation of the LAW effluent process building. The cylindrical sumps have a capacity of 58 gallons, are 2 ft in diameter, and are 30 in. deep. The pipe and plate sections of the sump are both constructed of Type 304L stainless steel, while the grating material is either Type 304L or 316L. The east process area sump pumps (DEP-PMP-00033A/B) are permanently installed electrical units submerged within the sumps that transfer the sump contents to the process condensate lag storage vessels (DEP-VSL-00005A/B). The pumps have a maximum capacity of 120 gpm, discharge effluent at 47.2 psig, are powered by 10 hp, 3 phase/60 Hz/460 V induction motors, and are constructed of Type 316 stainless steel.

4.1.1.2.4.4 Feed Vessel Area Sumps (DEP-SUMP-00004A/B)

Refer to:	24590-BOF-DD-25-00015	*Effluent Management Facility 24” Dia. Sump in Secondary Containment Sections and Details*
	24590-BOF-M6-DEP-00009002	*P&ID – BOF/EMF Direct Feed LAW EMF Process System – Process Vessel Area Sumps DEP-SUMP-00004A/B*
	24590-BOF-M6C-DEP-00001	*DEP Sump, Sump Pump and Pipeline Sizing*
	24590-BOF-MPD-DEP-00010	*Mechanical Data Sheet: Vertical Submersible Centrifugal Pumps*

The feed vessel area sumps (DEP-SUMP-00004A/B) collect spills and leaks that occur in the feed tank area (E-0105). The sumps are located in the northwest and northeast corners of this area at the ground elevation of the LAW effluent process building. The cylindrical sumps have a capacity of 58 gallons, are 2 ft in diameter, and are 30 in. deep. The pipe and plate sections of the sump are both constructed of Type 304L stainless steel, while the grating material is either Type 304L or 316L. The feed vessel area sump pumps (DEP-PMP-00034A/B) are permanently installed electrical units submerged within the sumps that transfer the sump contents to the low point drain vessel (DEP-VSL-00001) or the overhead sampling vessels (DEP-VSL-00004A/B). Prior to transfer, the sumps contents are sampled using the DEP sampling pumps (DEP-PMP-00042A/B). Radioactive mixed waste effluent leaked from the process vessels is transferred to DEP-VSL-00001 while rain and non-radioactive liquid is transferred to DEP-VSL-00004A/B. The pumps have a maximum capacity of 120 gpm, discharge effluent at 47.2 psig, are powered by 10 hp, 3 phase/60 Hz/460 V induction motors, and are constructed of Type 316 stainless steel. The effluent discharged from the pumps passes through the feed vessel area sump pump filter (DEP-FILT-00005) to remove particles larger than 5 microns. The supply line to the filter is equipped a PSV to protect the filter from over-pressurization.

4.1.1.2.4.5 Process Condensate Vessel Area Sumps (DEP-SUMP-00005A/B)

Refer to:	24590-BOF-DD-25-00015	*Effluent Management Facility 24" Dia. Sump in Secondary Containment Sections and Details*
	24590-BOF-M6-DEP-00009005	*P&ID – BOF/EMF Direct Feed LAW EMF Process System – Process Vessel Area Sumps DEP-SUMP-00005A/B*
	24590-BOF-M6C-DEP-00001	*DEP Sump, Sump Pump and Pipeline Sizing*
	24590-BOF-MPD-DEP-00010	*Mechanical Data Sheet: Vertical Submersible Centrifugal Pumps*

The process condensate vessel area sumps (DEP-SUMP-00005A/B) collect spills and leaks that occur in the process condensate tank area (E-0106). The sumps are located on the north and south walls of this area at the ground elevation of the LAW effluent process building. The cylindrical sumps have a capacity of 58 gallons, are 2 ft in diameter, and are 30 in. deep. The pipe and plate sections of the sump are both constructed of Type 304L stainless steel, while the grating material is either Type 304L or 316L. The process condensate vessel area sump pumps (DEP-PMP-00035A/B) are permanently installed electrical units submerged within the sumps that transfer the sump contents to the process condensate lag storage vessels (DEP-VSL-00005A/B). The pumps have a maximum capacity of 120 gpm, discharge effluent at 47.2 psig, are powered by 10 hp, 3 phase/60 Hz/460 V induction motors, and are constructed of Type 316 stainless steel. The effluent discharged from the pumps passes through the process condensate vessel area sump pump filter (DEP-FILT-00006) to remove particles larger than 5 microns. The supply line to the filter is equipped a PSV to protect the filter from over-pressurization.

4.1.1.2.4.6 Truck Bay Sump (DEP-SUMP-00008)

Refer to:	24590-BOF-DD-25-00014	*Effluent Management Facility 24" Dia. Sump with Grate Cover Sections and Details*
	24590-BOF-M6-DEP-00009003	*P&ID – BOF/EMF Direct Feed LAW EMF Process System – Miscellaneous Sumps DEP-SUMP-00008*
	24590-BOF-M6C-DEP-00001	*DEP Sump, Sump Pump and Pipeline Sizing*
	24590-BOF-MPD-DEP-00010	*Mechanical Data Sheet: Vertical Submersible Centrifugal Pumps*

The truck bay sump (DEP-SUMP-00008) collect spills and leaks that occur in the truck unloading area (E-0108). The sump is located on west wall of this area at the ground elevation of the LAW effluent process building. The cylindrical sump has a capacity of 58 gallons, is 2 ft in diameter, and is 30 in. deep. The pipe and plate sections of the sump are both constructed of Type 304L stainless steel, while the grating material is either Type 304L or 316L. The truck bay sump pump (DEP-PMP-00038) is a permanently installed electrical unit submerged within the sump that transfers the sump contents to the low point drain vessel (DEP-VSL-00001). The pump has a maximum capacity of 120 gpm, discharges effluent at 47.2 psig, is powered by 10 hp, 3 phase/60 Hz/460 V induction motor, and is constructed of Type 316 stainless steel.

4.1.1.2.4.7 Leak Detection Boxes (DEP-LDB-00001 Through DEP-LDB-00006)

Refer to:	24590-BOF-M6-DEP-00011001	*P&ID – BOF/EMF Direct Feed LAW EMF Process System – Effluent Facility Leak Detection DEP-LDB-00001 Thru DEP-LDB-00006*
	24590-BOF-MX-DEP-00011001	*Equipment Assembly BOF/EMF Direct Feed LAW EMF Process System Effluent Facility Leak Detection DEP-LDB-00001 Through DEP-LDB-00006*

The DEP system leak detection boxes (DEP-LDB-00001 through DEP-LDB-00006) are located in the drain tank cell (ED-B001) of the drain tank building and provide the capability of detecting leaks in the primary containment of coaxial underground transfer lines. The following transfer lines are provided with this capability:

- The Tank Farms return from the DEP system effluent cooler (DEP-LDB-00001)
- The TOC feed to the EMF (DEP-LDB-00002)
- The combined TOC and DEP system feed from the EMF to the LAW Facility (DEP-LDB-00003)
- The LAW RLD system to DEP-VSL-00002 (DEP-LDB-00004)
- The LAW LVP system to DEP-VSL-00004A/B (DEP-LDB-00005)
- The Lab RLD system to DEP-VSL-00002 (DEP-LDB-00006)

The leak detection boxes include level instrumentation that initiates various system responses when liquid is present in the boxes. The drain plug in the box is installed in the closed position to create a detectable level. Upon level detection, the operator uses rods that extend up to the (-)22’-6” elevation to remotely lift the plugs and drain the box to the low point drain vessel sump (DEP-SUMP-00001). An overflow plug is also provided and installed in the open position to provide overflow protection. The leak detection boxes are also equipped with quick connections for pneumatic testing of the box and pipe jacket with air from the PSA system utility station in the drain tank cell. The units are each constructed of Type 316L stainless steel.

4.1.1.2.4.8 Sump Sampling Pumps (DEP-PMP-00042A/B)

Refer to:	24590-BOF-M6-DEP-00012001	*P&ID – BOF/EMF Direct Feed LAW EMF Process System – Sampling Pumps DEP-PMP-00042A/B*
	24590-BOF-M6C-DEP-00016	*EMF DEP-SUMP-00004A/B Sampling System Design*
	24590-BOF-MPC-DEP-00014	*EMF DEP Sampling Pumps (DEP-PMP-00042A/B) Sizing*
	24590-BOF-MPD-DEP-00020	*BOF/EMF DEP Sampling Pumps*

The sump sampling pumps (DEP-PMP-00042A/B) are located adjacent to the feed vessel area sump pumps (DEP-PMP-00034A/B) and convey liquid contained in the feed vessel area sumps (DEP-SUMP-00004A/B) to DEP-HOOD-00001 for sampling. When the accumulation of liquids due to small leaks, spills, or precipitation is detected in DEP-SUMP-00004A/B, the fluid is sampled to determine the composition and cause. The primary sump pumps cannot be used to support this sampling as their flow rate is too high for small volumes.

The sump sampling pumps are operated manually from panels (DEP-PNL-00002/00003) located near DEP-HOOD-00001 in the east evaporator process area (E-0102). The pumps can be run in reverse to drain the transfer line when the sampling is complete. The sampling pumps also have the capability to be operated to minimize the residual liquid in the sumps when the level in the sumps is too low for DEP-PMP-00034A/B. The peristaltic pumps have a capacity of 0.1 gpm, discharge effluent at 7.14 psig, are powered by 0.5 hp, 3 phase/60 Hz/460 V induction motors (DEP-MTR-00042A/B), and are constructed of Type 316L stainless steel.

4.1.1.2.4.9 Underground Waste Transfer Lines

Refer to:	24590-BOF-M6-RLD-00012001	*P&ID – BOF Radioactive Liquid Waste Disposal System Underground Transfer Lines*
	24590-BOF-M6-RLD-00012002	*P&ID – BOF Radioactive Liquid Waste Disposal System Underground Transfer Lines*
	24590-PTF-M6-PWD-00058002	*P&ID – PTF Plant Wash and Disposal System Underground Transfer Lines*

The underground waste transfer lines installed to support the DFLAW configuration are coaxial lines constructed of a stainless steel primary pipe, with a carbon steel encasement pipe for secondary containment. A fusion bonded epoxy coating is applied to the exterior surface of the encasement piping, followed by rigid polyurethane foam insulation. At final installation, a non-metallic jacket or thermoplastic barrier made of high density polyethylene is added to the pipe to provide a waterproof barrier. Cathodic protection is not needed for these transfer lines because the system is constructed of corrosion-resistant materials which isolate the pipe from the soil and moisture. There are eight underground waste transfer lines used for the operation of the DFLAW configuration, summarized in Table 4-1, below.

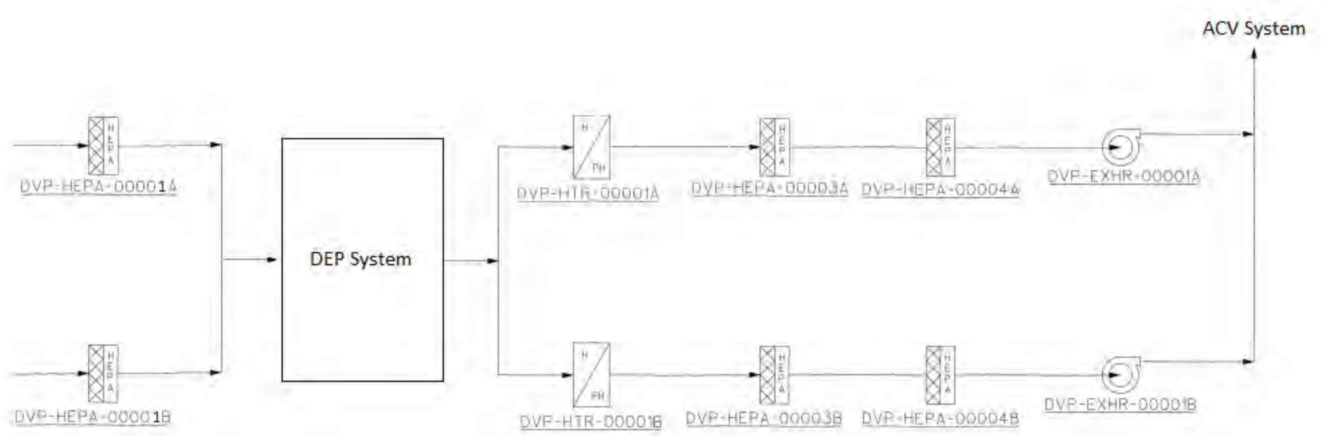
Table 4-1 DFLAW Underground Waste Transfer Lines

Line Number	Origin	Destination	Description
DEP-PB-00009-S32B-03	WTP Interface Node 13	ED-B001	Treated low-activity waste feed from the TOC to EMF which enables the ability to flush the line to DEP-VSL-00001 and to tie-in evaporator concentrate for recycle to the LAW Facility
DEP-ZS-00069-W31A-03	ED-B001	WTP Interface Node 14	Conditioned liquid effluent returned from the EMF to Tank Farms DSTs
LCP-PB-03368-S32B-03	ED-B001	LAW Facility	Combined feed from the TOC and the DEP system concentrate for vitrification in the LAW Facility. The portion of this line in BOF up until it is 5 ft outside the LAW Facility is included in the scope of this document.
RLD-WU-22142-S32B-03	Lab	ED-B001	Radioactive liquid effluent from RLD-VSL-00164 in the Lab. This transfer line is in the scope of the Lab RLD system.
RLD-ZS-66998-W31A-03	LAW Facility	ED-B001	SBS condensate collection from RLD-VSL-00005 in the LAW Facility. This transfer line is in the scope of the LAW RLD system.
LVP-ZY-00172-W31A-03	LAW Facility	ED-B001	Caustic scrubber blowdown from LVP-TK-00001 in the LAW Facility. This transfer line is in the scope of the LVP system.
RLD-ZS-66989-W31A-04 RLD-ZS-03382-W31A-04 RLD-ZS-03382-F10A-04	E-0106	WTP Interface Node 8A	Dilute evaporator effluent from DEP-VSL-00005A/B to LEFT/ETF (primary).
RLD-ZS-66991-W31A-03 RLD-ZS-03383-W31A-03 RLD-ZS-03383-F10A-03	E-0106	WTP Interface Node 8B	Dilute evaporator effluent from DEP-VSL-00005A/B to LEFT/ETF (backup).

4.1.1.3 DVP System Description

The DFLAW EMF Vessel Vent Process (DVP) system provides the nine major DEP system process vessels with filtered purge air and ventilates the vessel head space to prevent the accumulation of hydrogen in the vessels. Additionally, the DVP system removes non-condensable vapor from the evaporator system via DEP-COND-00003. The vessel vapors are combined in a common header, heated, filtered to remove particulates, and then exhausted to the ACV system where they are discharged to the atmosphere through the EMF stack. The DVP exhaust system consists of two 100% trains; one is placed in operation while the other serves as a standby. For an overview of the DVP system in relation to the DEP and ACV systems, refer to Figure 4-4.

Figure 4-4 DVP System Overview



4.1.1.3.1 Process Ventilation Air Supply HEPA Filters (DVP-HEPA-00001A/B)

Refer to:	24590-BOF-M6-DVP-00001001	*P&ID – BOF/EMF Direct Feed LAW EMF Vessel Vent Process System DVP-EXHR-00001A/B*
	24590-BOF-MAC-DVP-00001	*DFLAW EMF Vessel Vent Process System (DVP) HEPA Filter, Preheater, and Exhaust Fan Sizing*
	24590-BOF-MKD-DVP-00005	*HEPA Filter Data Sheet for Process Ventilation Air Supply HEPA Filters (DVP-HEPA-00001A/B)*

The process ventilation air supply HEPA filters (DVP-HEPA-00001A/B) are located in the east evaporator process area (E-0102) and serve as the intake filters for the DVP system. C3 area air is drawn in through the filters and distributed to the low point drain vessel (DEP-VSL-00001), the evaporator feed vessel (DEP-VSL-00002), the evaporator concentrate vessels (DEP-VSL-00003A/B/C), the overhead sampling vessels (DEP-VSL-00004A/B), and the process condensate lag storage vessels (DEP-VSL-00005A/B). Each filter housing contains one 100% HEPA filter and normally only one housing/filter is placed in service at a time. The 99.97% efficiency circular filters are designed to ASME AG-1 (Section FK, Type 3) and are rated for a maximum flow of 250 acfm. The filter frame is constructed of Type 304L stainless steel.

4.1.1.3.2 Process Ventilation Preheaters (DVP-HTR-00001A/B)

Refer to:	24590-BOF-M6-DVP-00001001	*P&ID – BOF/EMF Direct Feed LAW EMF Vessel Vent Process System DVP-EXHR-00001A/B*
	24590-BOF-MAC-DVP-00001	*DFLAW EMF Vessel Vent Process System (DVP) HEPA Filter, Preheater, and Exhaust Fan Sizing*

	24590-BOF-MED-DVP-00001	*Process Ventilation HEPA Filter Preheater*

The process ventilation preheaters (DVP-HTR-00001A/B) are located on DVP-SKID-00001 in the east evaporator process area (E-0102) and heat the air ventilated from the DEP system process vessels and DEP-COND-00003 before it enters the primary and secondary HEPA filters (DVP-HEPA-00003A/B and DVP-HEPA-00004A/B). The air is preheated to limit the relative humidity to 40% to prevent degradation of the HEPA filters due to moisture. The circulation immersion heaters have a maximum output of 3 kW, are constructed of Type 316/316L stainless steel, and are designed to ASME AG-1 and ASME Section VIII, Division 1. Pressure safety valves are included on the supply piping to the preheaters to protect the units and the downstream HEPA filters from over-pressurized ventilation exhaust. The supply piping also includes a utility station connection to flush the piping upstream of DVP-HEPA-00003A/B with demineralized water upon contamination.

4.1.1.3.3 Process Ventilation HEPA Filters (DVP-HEPA-00003A/B and DVP-HEPA-00004A/B)

Refer to:	24590-BOF-M6-DVP-00001001	*P&ID – BOF/EMF Direct Feed LAW EMF Vessel Vent Process System DVP-EXHR-00001A/B*
	24590-BOF-MAC-DVP-00001	*DFLAW EMF Vessel Vent Process System (DVP) HEPA Filter, Preheater, and Exhaust Fan Sizing*
	24590-BOF-MKD-DVP-00006	*HEPA Filter Data Sheet for Process Ventilation Primary HEPA Filters (DVP-HEPA-00003A/B) and Secondary HEPA Filters (DVP-HEPA-00004A/B)*

The process ventilation primary and secondary HEPA filters (DVP-HEPA-00003A/B and DVP-HEPA-00004A/B) are located in the HEPA filter room (E-0102A) and remove particulates before DEP system process vessel and DEP-COND-00003 vapor is discharged to the atmosphere. Each filter housing frame is constructed of Type 304L stainless steel and includes an injection port and two sample ports for testing. The filter housings contain one 100% HEPA filter and normally only one filter train is placed in service at a time (i.e., DVP-HEPA-00003A/DVP-HEPA-00004A or DVP-HEPA-00003B/DVP-HEPA-00004B). The 99.97% efficiency circular filters are designed to ASME AG-1 (Section FC, Size 9) and are rated for 250 scfm.

4.1.1.3.4 Process Ventilation Exhausters (DVP-EXHR-00001A/B)

Refer to:	24590-BOF-M6-DVP-00001001	*P&ID – BOF/EMF Direct Feed LAW EMF Vessel Vent Process System DVP-EXHR-00001A/B*
	24590-BOF-MAC-DVP-00001	*DFLAW EMF Vessel Vent Process System (DVP) HEPA Filter, Preheater, and Exhaust Fan Sizing*
	24590-BOF-MAD-DVP-00001	*Process Ventilation Exhauster*

The process ventilation exhausters (DVP-EXHR-00001A/B) are located in the east evaporator process area (E-0102) and vent the filtered DEP system vapor to the EMF stack via the ACV system ductwork. The exhausters are 100% capacity units that operate on a rotating basis; one is placed in operation while the other serves as a standby. Discharge valves are provided downstream of each exhauster and are closed when their associated exhauster is in the standby mode to maintain a constant flow path. Each exhauster is provided with an adjustable speed drive to vary the fan speed to compensate for filter loading. The adjustable speed drives control the 7.5 hp, 3 phase/60 Hz/460 V premium efficiency motors (DVP-MTR-00001A/B) that power each exhauster. DVP-EXHR-00001A/B are designed for a volumetric flow of 160 acfm, are direct drive, and are equipped with isolation springs. The units are each constructed of Type 316/316L stainless steel.

4.1.1.4 HVAC Systems Description

The HVAC systems that provide conditioned air to the EMF serve areas that are segmented into four contamination zones. These areas are classified by contamination zones C1, C2, C3, and C5 to establish a hierarchy for pressure control and decreased likelihood of contamination. The facility control philosophy for process and utility areas uses a cascading ventilation system wherein air cascades from areas of less potential for contamination to areas of greater potential for contamination to provide confinement of contamination at or near the source. C1 areas not supplied by the ACV system have no direct interface with process or utility areas (i.e., no credible potential for exposure to contamination), and therefore receives conditioned air and ventilation from the C1V system, which is independent of the ACV system. Cascade airflow is not utilized in areas served by the C1V system due to the lack of potential for exposure to source contamination. The EMF HVAC systems provide heating, cooling, and humidification in support of maintaining the internal design conditions tabulated below in Table 4-2.

Table 4-2 EMF Internal Design Conditions

Area	Minimum Temperature	Maximum Temperature	Relative Humidity
Internal unoccupied C2 areas (1) (3)	59°F	80°F	10% minimum
Electrical equipment rooms (1)	50°F	95°F	
Plant rooms (1)	50°F	95°F	
Internal C5 areas (2)	59°F	113°F	
C1 control/computer rooms	68°F	75°F	40% - 55%
Battery Rooms	72°F	77°F	
LAW Effluent Utility Building	59°F	95°F	10% minimum
LAW Effluent Process and Drain Tank Buildings C3 Areas	59°F	104°F	10% minimum
LAW Effluent Drain Tank Building Chase	40°F	135°F	
LAW Effluent Process Building AFR Skid Room	40°F	90°F	

(1) The indicated maximum temperature is for normal operation. During maintenance and surveillance activities, the maximum temperature is lower as required for worker protection requirements.
(2) The indicated maximum temperature does not apply to process areas where high radiation heat transfer loads make it impractical to attain this temperature.
(3) The indicated relative humidity value is for instrumentation requirements only.

4.1.1.4.1 ACV System Description

The ACV system utilizes the cascade principle with the direction of airflow from areas of low or no contamination to areas of higher potential contamination. Conditioned air supplied to the process and utility areas of the EMF cascades through the C1/C2/C3/C5 zones and exits via the ACV system filtered exhaust. The vessels, piping, and vessel ventilation act as the primary confinement while the HVAC system provides secondary confinement for the EMF. Confinement of any potential contamination within the fume hood sampling area is provided by the ACV system, which maintains a constant exhaust flow rate.

4.1.1.4.1.1 Supply Air Handling Units (ACV-AHU-00001A/B)

Refer to:	24590-BOF-M8-ACV-00001001	*BOF/EMF Utility/Process Buildings Plant Room V&ID Air Handling Unit ACV-AHU-00001A*
	24590-BOF-M8-ACV-00001008	*BOF/EMF Utility/Process Buildings Plant Room V&ID Air Handling Unit ACV-AHU-00001B*
	24590-BOF-M8C-ACV-00003	*DFLAW EMF Supply Fan, Exhaust Fan, and Transfer Duct Sizing*
	24590-BOF-M8C-ACV-00004	*EMF ACV System Equipment Calculation*
	24590-BOF-MAD-ACV-00001	*24590-BOF-MA-ACV-AHU-00001A/B – ACV Supply Air Handling Unit*

The ACV system supply air handling units (ACV-AHU-00001A/B) are located outdoors between the LAW effluent process building and the LAW effluent utility building. The 100% capacity AHUs (one in operation, the other on standby) are evaporative cooling type units that condition and supply air throughout the process and utility areas in the EMF. Each AHU has a primary and secondary air stream. When the aluminum intake damper on the primary supply side is opened, outside air is drawn into the AHUs through a ¾-inch bird screen. If necessary, the outside air is first preheated for freeze protection using distributing-type steam coils supplied with steam from the LPS system. The primary air stream then passes through a filter bank consisting of both low (30-59%) and high (86-95%) efficiency filters that are installed in metal mounting frames. After the air is filtered, the primary supply fans provide the motive force to convey the air at the design flow rate through the remaining portions of the AHU and the ACV system. Depending on the temperature and humidity of the primary air stream, two flow control dampers determine the amount of air that passes through the evaporative cooling portion of the AHU. If additional cooling adjustment is required to meet the indoor design conditions of the EMF, then a secondary air stream is used to cool the primary supply air stream using the direct evaporative cooler and an energy recovery wheel. The secondary air stream is pulled into the AHU through the secondary inlet louvers via two scavenger fans. If cooling is not required, then the primary air stream bypasses this section of the AHU and is supplied directly to the reheat steam coils. Like the preheat coils, the reheat coils are also supplied with steam from the LPS system. After the air is conditioned, it passes through the discharge damper of the AHU into the supply ductwork of the ACV system.

4.1.1.4.1.2 Unit Heaters (ACV-UH-00003A/B/C/D/E and ACV-UH-00004A/B)

Refer to:	24590-BOF-M8-ACV-00001004	*BOF/EMF Evaporator Process Building – Volumetric V&ID ACV System*
	24590-BOF-M8C-ACV-00003	*DFLAW EMF Supply Fan, Exhaust Fan, and Transfer Duct Sizing*

The ACV system unit heaters, ACV-UH-00003A/B/C/D/E and ACV-UH-00004A/B, provide supplemental heating in the east evaporator process area (E-0102) and the drain tank maintenance area (ED-0102), respectively, due to the limitation of the maximum supply air temperature of the AHUs. Each unit heater in the east evaporator process area has a total heating capacity of 20 kW and each unit heater in the drain tank maintenance area has a total heating capacity of 5 kW.

4.1.1.4.1.3 HEPA Filters (ACV-HEPA-00001A/B/C/D/E)

Refer to:	24590-BOF-M8-ACV-00001005	*BOF/EMF Utility/Process Buildings – Plant Room V&ID ACV Exhaust System*
	24590-BOF-M8-ACV-00001006	*BOF/EMF Utility/Process Buildings – Plant Room V&ID ACV Exhaust System*

	24590-BOF-MKC-ACV-00001	*DFLAW EMF ACV HEPA Filter Housing Design Pressures and Maximum Allowable Leakage*
	24590-BOF-MKD-ACV-00001	*24590-BOF-MK-ACV-HEPA-00001A-E - Primary Stage (Stage 1), Type 1 Filter Housings for BOF/EMF ACV Exhaust System*

The ACV system HEPA filters (ACV-HEPA-00001A/B/C/D/E) are located in the filter room (EU-0102) of the LAW effluent utility building and remove particulates in the ACV system exhaust air before it is discharged to the atmosphere. Each filter housing frame is constructed of Type 304L stainless steel and includes an inlet aerosol injection port, an inlet sample port, and an outlet sample port. The filter housings contain four radial flow HEPA filters arranged in a two by two configuration. Although there are five filter banks included in the design, only four are active while the fifth acts as a standby. The 99.97% efficiency filters are designed to ASME AG-1 and are each nominally rated for 2,000 acfm such that the housing as a whole is rated for a design flow of 8,000 acfm. The filters are bagged-out using the safe change procedure when the pressure drop across the filters becomes unacceptably high.

4.1.1.4.1.4 Exhaust Fans (ACV-FAN-00001A/B)

Refer to:	24590-BOF-M8-ACV-00001007	*BOF/EMF Utility/Process Buildings – Plant Room V&ID ACV Exhaust System*
	24590-BOF-M8C-ACV-00003	*DFLAW EMF Supply Fan, Exhaust Fan, and Transfer Duct Sizing*
	24590-BOF-M8C-ACV-00004	*EMF ACV System Equipment Calculation*
	24590-BOF-MAD-ACV-00002	*Exhaust Fan/Blower for Active Ventilation System*

The ACV system exhaust fans (ACV-FAN-00001A/B) are located in the utility room (EU-0101) of the LAW effluent utility building and provide the motive force to discharge the filtered ACV system through the EMF stack while maintaining the required room pressures to preserve a cascade airflow. The fans are 100% capacity units that normally operate with one in service and one on standby. Inlet and outlet dampers are provided for each exhaust fan. While the inlet dampers are normally open, the outlet dampers only open when their corresponding fan receives a start signal and must remain open throughout the operation of the unit. Each fan is provided with an adjustable speed drive to vary the fan speed to compensate for filter loading. The adjustable speed drives control the 150 hp, 3 phase/60 Hz/460 V induction motors (ACV-MTR-00002A/B) that power each exhaust fan. ACV-FAN-00001A/B are designed for a normal volumetric flow of 28,130 scfm, are direct drive, and are equipped with isolation springs.

4.1.1.4.1.5 Ventilation Stack

Refer to:	24590-BOF-M8C-ACV-00006	*EMF Stack Height Evaluation Calculation*
	24590-BOF-P1-26-00002	*Balance of Facilities LAW Effluent Utility Building & LAW Effluent Electrical Building General Arrangement Sections A & B*

The EMF ventilation stack is located on the east side of the LAW effluent utility building. The concrete structure is 150 ft tall, has an inner diameter of 38 in., and discharges air at a velocity above 2,500 fpm, which is the velocity recommended to prevent rainwater intrusion. The ACV system exhaust ductwork downstream of ACV-FAN-00001A/B has provisions for instrumentation and/or sampling to support the radiological monitoring that occurs before the exhaust stream is discharged to the atmosphere through the stack. The ACV system interfaces with the SDJ system for stack monitoring functions.

4.1.1.4.1.6 HVAC Fire Protection Features

Refer to:	24590-BOF-M0-25-00003	*Balance of Facilities LAW Effluent Process Bldg. & LAW Effluent Drain Tank Bldg. & LAW Effluent Utility Bldg. Wall Penetration Schedule*

As per 24590-WTP-FC- M-20-0049, formerly credited fire dampers remain installed but are no longer credited as fire dampers, because the walls in which they are located are no longer designated as fire barriers.

The ductwork at the discharge from the AHUs contains smoke detectors that are wired to the fire alarm control panel. The smoke detectors are designed to shut down the AHUs via a hardwired interlock between the smoke detector contact and the associated fan motor ASD controller starter circuit.

4.1.1.4.2 C1V System Description

Refer to:	24590-BOF-M8-C1V-00002	*BOF/EMF C1 Annex Areas Volumetric V&ID*
	24590-BOF-M8C-C1V-00004	*EMF C1V Area Heating and Cooling Equipment Sizing Calculation*

The AFR skid room (E-0103A), C&I room (E-0103B), drain tank building chase (EDCH01), fire riser rooms (ED-0103, EU-0103, E-0101A), and the LAW effluent electrical building at the EMF are classified as C1 areas and do not interface with the ACV system for HVAC functions. These rooms have independent heating and/or cooling systems to meet the design requirements of the BOD. Because these areas are normally unoccupied except during maintenance activities, no ventilation or outside air is required. Table 4-3 summarizes the equipment provided in these locations.

Table 4-3 C1V System Equipment at the EMF

Room	Equipment	Capacity	Reference Document
Fire Riser Room – Building 25 (E-0101A)	C1V-UH-00111	1 KW (electric heating)	TBD
AFR Skid Room (E-0103A)	C1V-FCU-00050 C1V-COND-00034	24,000 Btu/h (DX cooling) 1 KW (electric heating)	24590-BOF-MAD-C1V-00009 24590-BOF-MED-C1V-00008
Electrical C&I Room (E-0103B)	C1V-FCU-00051 C1V-COND-00035	18,000 Btu/h (DX cooling) 3 KW (electric heating)	24590-BOF-MAD-C1V-00010 24590-BOF-MED-C1V-00010
Fire Riser Room – Building 25A (ED-0103)	C1V-UH-00110	1 KW (electric heating)	TBD
Drain Tank Building Chase (EDCH01)	C1V-FCU-00049	20 KW (electric heating)	24590-BOF-MAD-C1V-00011
Fire Riser Room – Building 26 (EU-0103)	C1V-UH-00112	1 KW (electric heating)	TBD
LAW effluent electrical building UPE battery room (EE-0103)	C1V-FAN-27001 C1V-PNL-27001 C1V-ANN-27001	TBD	24590-CM-POA-EKL1-00001-04-00032

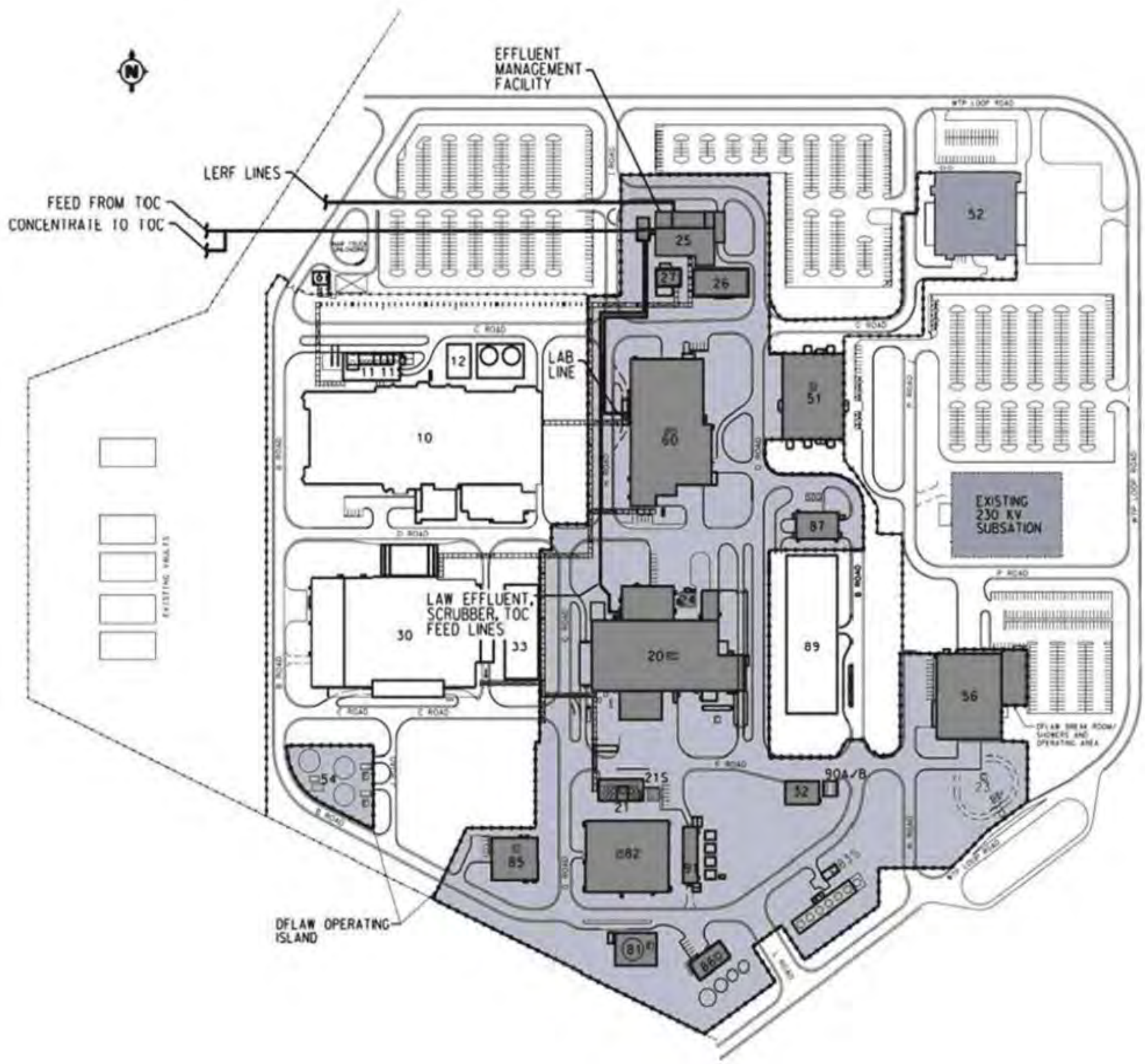
4.1.2 Facility/Process Boundaries and Interfaces

Refer to Section 2.3 of this document for a detailed table of interfaces and boundaries.

4.1.3 Physical Layout and Location

The Effluent Management Facility is comprised of buildings 25, 25A, 26, and 27 located on the north side of the WTP site. These buildings house the DEP, DVP, HVAC, and utility system equipment required for the operation of the DFLAW configuration. Additionally, the DEP system includes the underground waste transfer lines associated with DFLAW operations. Refer to 24590-BOF-P1-50-00001, *RPP-WTP Plot Plan*, for additional information on the overall WTP site layout. The EMF location relative to the WTP site is shown in Figure 4-5.

Figure 4-5 Effluent Management Facility Location



4.1.3.1 Effluent Management Facility

For the location of specific DEP, DVP, utility, and HVAC system equipment, refer to the following general arrangement drawings:

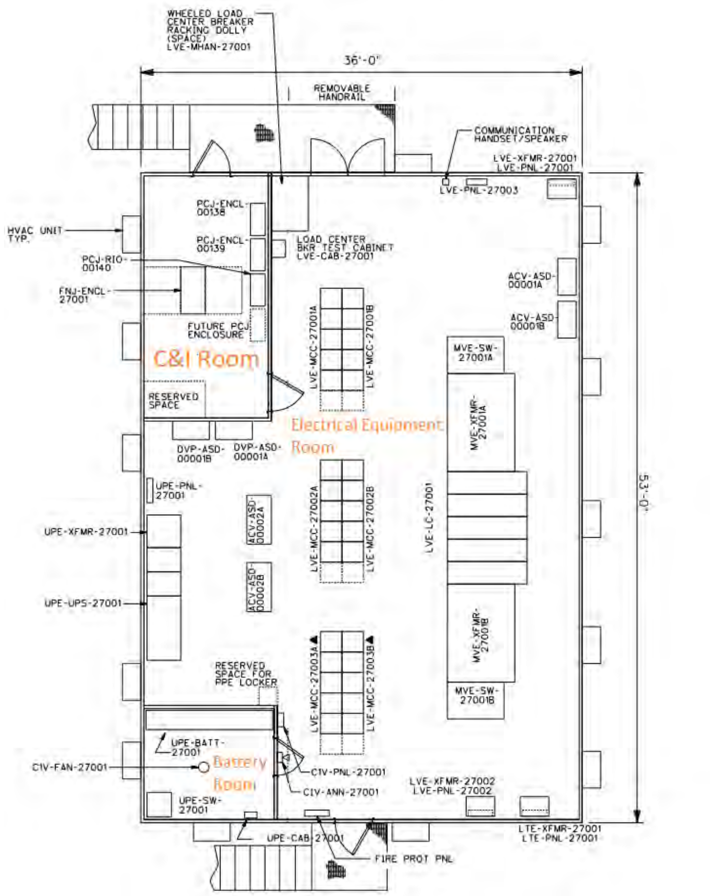
- 24590-BOF-P1-25-00003, *Balance of Facilities LAW Effluent Process Bldg. & LAW Effluent Drain Tank Bldg. Equipment Location Drawing Plan at Elev. 0 Foot – 0 Inches – Area 1*
- 24590-BOF-P1-25-00004, *Balance of Facilities LAW Effluent Process Bldg. & LAW Effluent Drain Tank Bldg. Equipment Location Drawing Plan at Elev. 0 Foot – 0 Inches – Area 2*
- 24590-BOF-P1-26-00003, *Balance of Facilities LAW Effluent Utility Building Equipment Location Drawing Plan at Elev. 0 Foot – 0 Inches*

4.1.3.1.1 LAW Effluent Electrical Building (Building 27)

The electrical building is a vendor-supplied, single-story structure located (+) 6'- 0" above the grade foundation. This building is approximately 36 ft wide by 53 ft long and includes the following rooms:

- The electrical equipment room houses the electrical substation used to step down the 13.8kV utility voltage to 480V and distribute power to the process systems in the EMF.
- The battery room houses the UPE system battery that supplies power to the EMF equipment during a loss of site power event. This room also includes a dedicated exhaust fan to mitigate the potential for hydrogen accumulation in the room.
- The C&I room contains the electrical equipment that supports the monitoring and control functions of the process systems at the EMF.

Figure 4-6 LAW Effluent Electrical Building Conceptual Layout

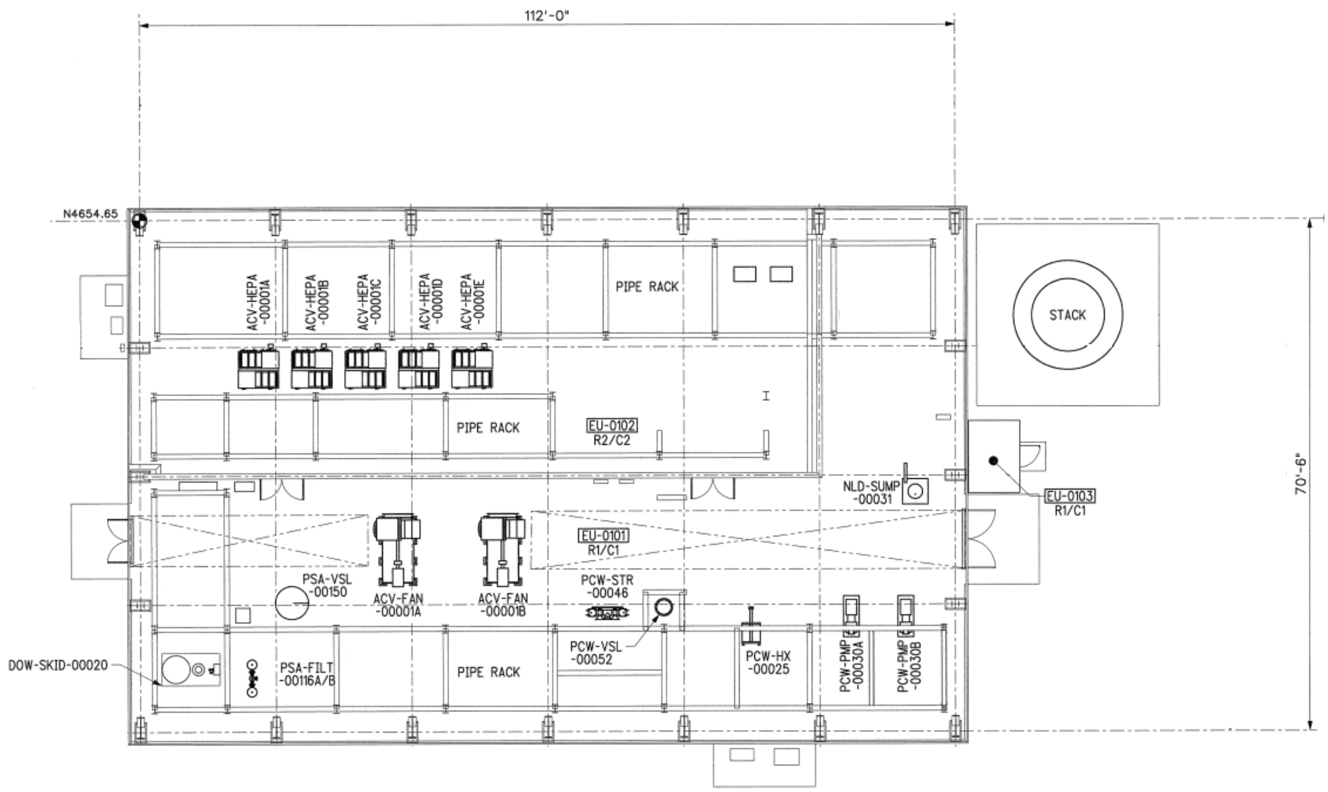


4.1.3.1.2 LAW Effluent Utility Building (Building 26)

The utility building is a single-story, steel frame and metal panel structure located at ground level to the east of the LAW effluent electrical building. This building is approximately 112 ft long, 70.5 ft wide, 28 ft tall, and includes the following rooms:

- The utility room (EU-0101) contains the utility system equipment used in support of the EMF process and ventilation systems, as well as the ACV system exhaust fans (ACV-FAN-00001A/B).
- The filter room (EU-0102) contains the ACV system HEPA filter banks (ACV-HEPA-00001A/B/C/D/E).
- The fire riser room (EU-0103) is located on the east side of the building
- The ventilation system exhaust stack is located outside of the northeast corner of the building.

Figure 4-7 LAW Effluent Utility Building Layout



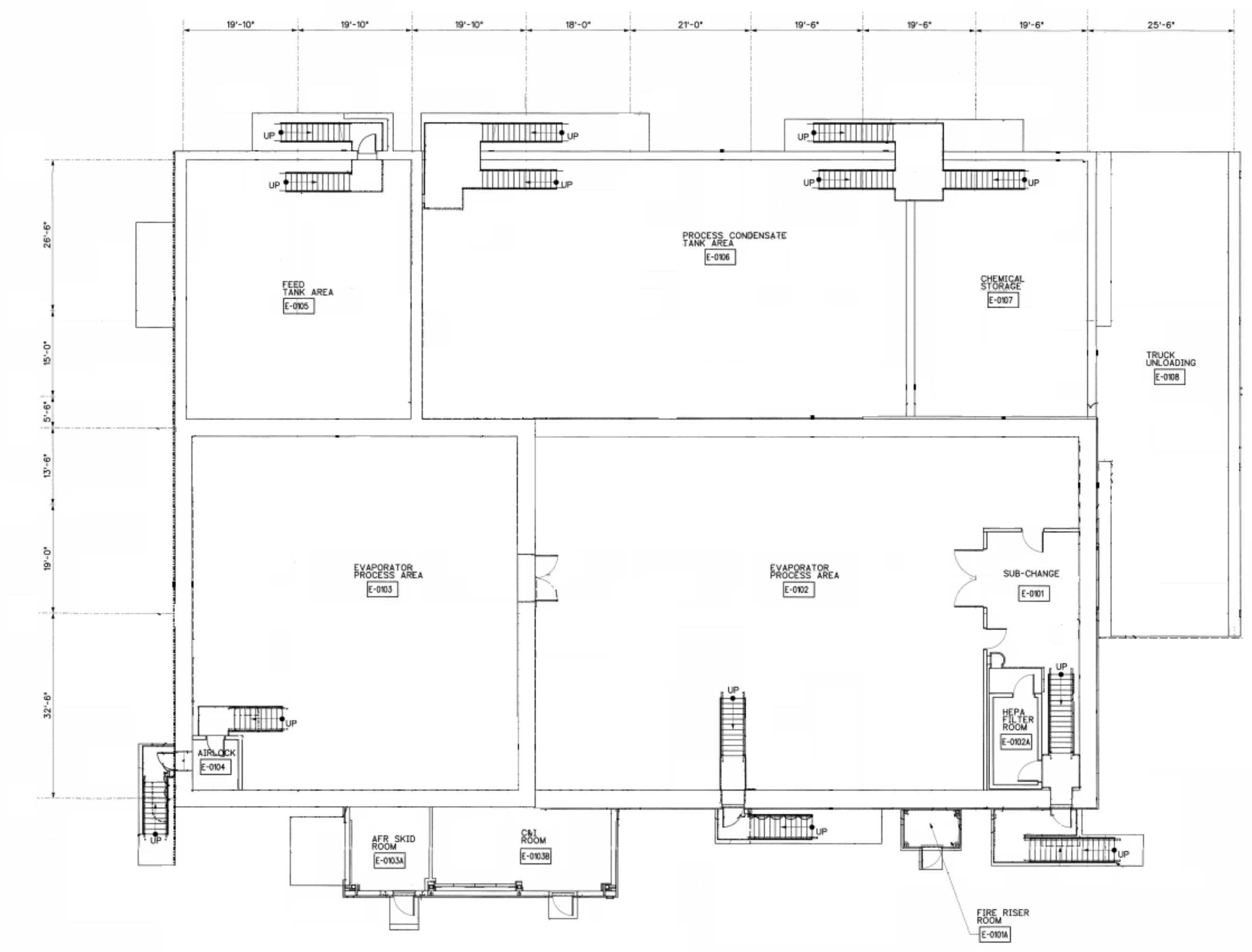
4.1.3.1.3 LAW Effluent Process Building (Building 25)

The LAW effluent process building is a single-story steel frame and concrete structure located at ground level to the north of the LAW effluent utility and electrical buildings. This building includes the following rooms:

- The sub-change (E-0101) is located at grade in the southeast corner of the building and provides the space for operators to change into personal protective equipment when moving between C2 and C3 areas. The room is normally accessible from the outside via a staircase located on the south side of the LAW effluent process building.
- The fire riser room (E-0101A) is located at grade on the south side of the building, outside of the main concrete shell.
- The east evaporator process area (E-0102) is the largest room in the building and is located at grade in the southeast quadrant of the building. This C3 area mainly consists of the DEP system equipment that handles dilute evaporator effluent and the DVP system preheaters and exhausters.
- The HEPA filter room (E-0102A) is located at an elevation of 9 ft 8 in. in the southeast corner of the building and contains the DVP system HEPA filter trains.
- The west evaporator process area (E-0103) is located at grade in the southwest quadrant of the building. This C5 area houses the DEP system evaporator and its supporting equipment.
- The AFR skid room (E-0103A) is located at grade on the south side of the building, outside of the main concrete shell. This room contains the AFR system skid that supplies anti-foam reagent to the DEP system evaporator.

- The C&I room (E-0103B) is located at grade on the south side of the building, outside of the main concrete shell. This room contains the control and electrical system panels and enclosures supporting the EMF process systems.
- The airlock (E-0104) is located at an elevation of 6 ft in the southwest corner of the building and acts as the emergency exit in the event that rapid evacuation of the process area is required during maintenance activities.
- The feed tank area (E-0105) is located at grade in the northwest corner of the building. This outdoor area is surrounded by concrete shield walls due to the radioactive liquid contained in the DEP system feed and concentrate vessels.
- The process condensate tank area (E-0106) is located at grade on the north side of the building. This outdoor area houses the DEP system vessels containing dilute evaporator effluent.
- The chemical storage area (E-0107) is located at grade on the north side of the building. This outdoor area contains the SHR and SNR system equipment used to support the DEP system process.
- The truck unloading area (E-0108) is located on the east end of the building. This covered area supports the receipt of chemical reagents and contains a monorail hoist to facilitate equipment replacement.

Figure 4-8 LAW Effluent Process Building Layout

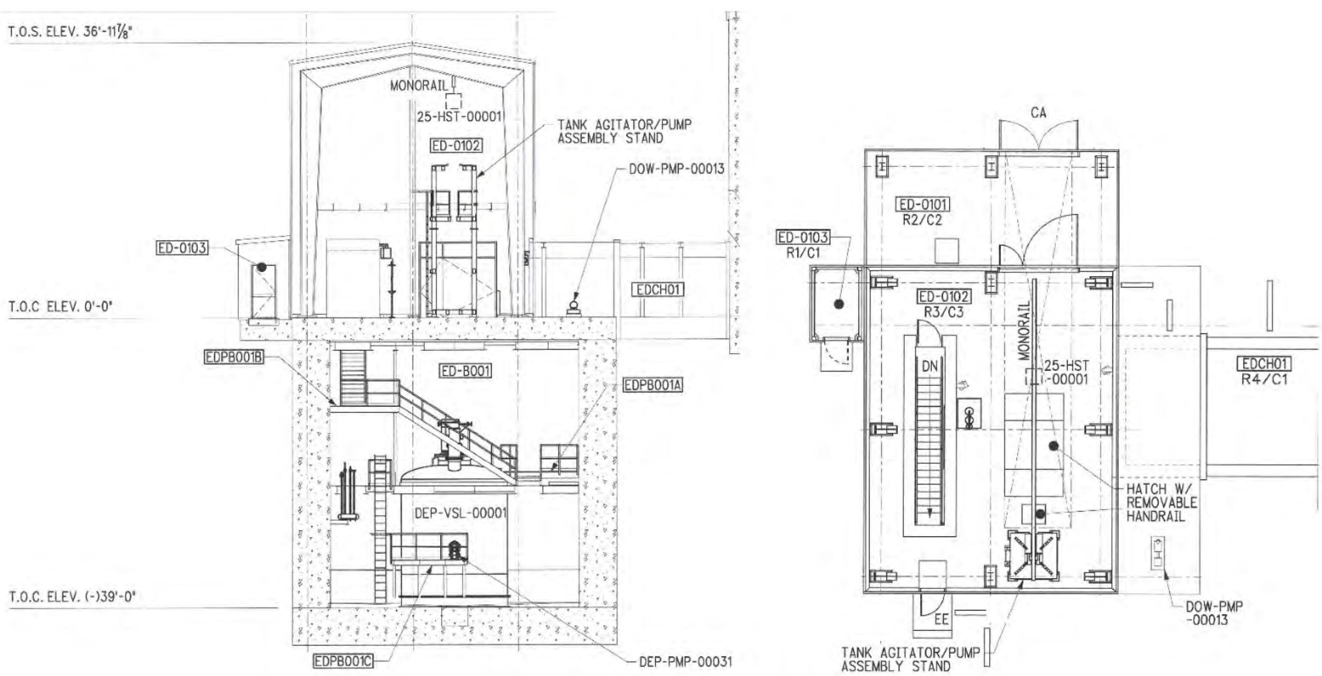


4.1.3.1.4 LAW Effluent Drain Tank Building (Building 25A)

The LAW effluent drain tank building is located to the west of the LAW effluent process building. This two-story, steel-paneled building includes the following rooms:

- The drain tank cell (ED-B001) is located at an elevation of −39 ft and houses the low point drain vessel and the DEP system leak detection boxes. This area is surrounded by concrete shield walls due to the radioactive mixed waste effluent contained in the low point drain vessel.
- The drain tank maintenance area (ED-0102) is located at grade above the drain tank cell and provides the space necessary to perform maintenance on the low point drain vessel. This C3 area contains a hoist to facilitate maintenance activities.
- The sub-change (ED-0101) is located at grade on the north side of the building and provides the space for operators to change into personal protective equipment when moving into the drain tank maintenance area.
- The fire riser room (ED-0103) is located on the west side of the building.
- The LAW effluent drain tank building chase (EDCH01) is a concrete structure that provides radiological shielding of the DEP system piping that runs between the LAW effluent drain tank building and the LAW effluent process building.

Figure 4-9 LAW Effluent Drain Tank Building Layout & Elevation



4.1.4 Principles of Operation

4.1.4.1 EMF Facility Operations

The EMF is capable of supporting the following modes and states: startup mode, normal operation, off-normal operation, and shutdown. The EMF modes and status are normally driven by the modes and status of the LAW melters.

4.1.4.1.1 Startup Mode

Startup or restart of the EMF in the DFLAW configuration requires realignment of the TOC feed supply valves and the LAW Facility and Lab effluent discharge valves. Utility isolation from the PT Facility and HLW Facility is required until these facilities are operational. An operations readiness review is required preceding startup or restart of the EMF following a prolonged shutdown.

4.1.4.1.2 Normal Operations

Normal operations are defined as the operating conditions in which all EMF internal systems, and external interfacing systems, are operational and functioning without limitations to achieve the design throughput for the LAW Facility of 30 MTG per day. The EMF introduces feed to the evaporator and separates the waste via evaporation. The dilute waste is sent to LERF/ETF and the concentrated waste is sent to the LAW LCP system or Tank Farm DSTs. Normal operations include routine activities, such as flushing of transfer piping, performed in conjunction with effluent processing activities.

4.1.4.1.3 Off-Normal Operations

The EMF is in off-normal operation when the evaporator is unavailable and all waste (feed or secondary effluents) from the TOC, the LAW Facility, and/or Lab is returned to Tank Farm DSTs.

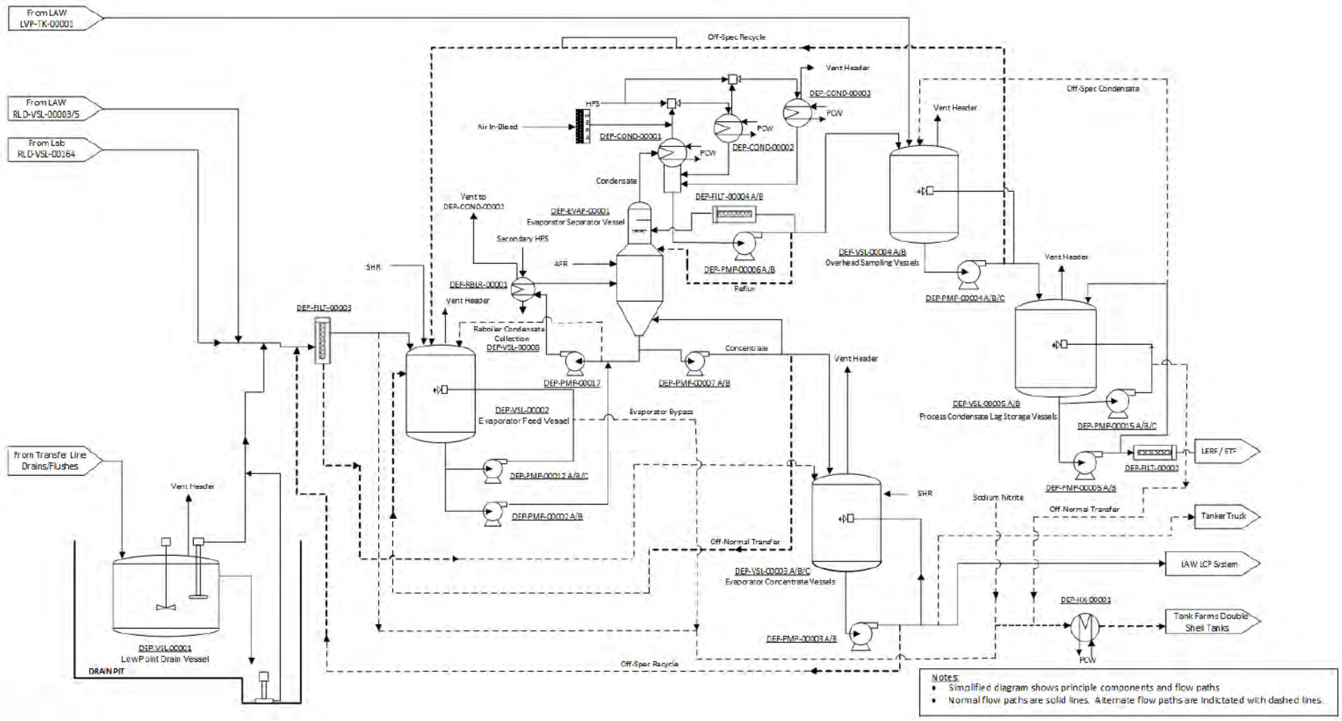
4.1.4.1.4 Shutdown Mode

The EMF is in shutdown mode when all processing of LAW and Lab waste has stopped and waste transfers out of the facility have stopped. The EMF is in shutdown mode any time the PT and HLW facilities are in operation. The system may be placed in a long-term layup state and returned to service if the PT Facility is unavailable. The process areas are placed in a stable condition that is unlikely to challenge limiting conditions for operation (LCO) or to result in an uncontrolled release of hazardous chemical or radioactive material. Maintenance activities may be performed unless prohibited by an LCO.

4.1.4.2 DEP System Normal Operations

The DEP system utilizes an evaporator to concentrate received waste and recycle the resulting concentrate to the LAW Facility in combination with the TOC feed for glass production. Recycling waste causes build-up in the recycle loop until steady state conditions are achieved. The evaporator condensate and LVP system stream (caustic scrubber) are blended and transferred to LERF/ETF after qualification in accordance with ICD-06. Refer to Figure 4-10 for an overview of the DEP system process.

Figure 4-10 DEP System Process Overview



The EMF has the following major feeds during normal operating conditions:

- Radiological waste from Lab RLD system vessel RLD-VSL-000164 to the DEP system
- Radiological waste (SBS condensate and plant wash vessel contents) from LAW RLD system vessels RLD-VSL-00003/00005 to the DEP system
- Caustic scrubber fluids from LAW LVP system tank LVP-TK-00001 to the DEP system
- Vitrification feed from the TOC and the DEP system to the LAW Facility

After each of the waste transfers listed above, the underground transfer pipe is flushed with water to remove the remaining contents. The flush water is drained to the low point drain vessel (DEP-VSL-00001), which stores up to 10 transfers in a 48-hour time cycle. Once the cycle time has elapsed, the vessel contents are transferred by the low point drain vessel pumps (DEP-PMP-00001A/B) to the evaporator feed vessel (DEP-VSL-00002) through the evaporator feed pre-filter (DEP-FILT-00003). The vessel contents are mixed with an agitator both prior to and during this transfer to maintain the suspension of solids within the vessel.

DEP-VSL-00002 receives filtered effluent streams in batches for staging prior to evaporation. Sources of the filtered effluent through DEP-FILT-00003 include radiological waste from the LAW RLD system plant wash and SBS condensate collection vessels (RLD-VSL-00003/00005), radiological waste from the Lab RLD system C3 collection vessel (RLD-VSL-00164), and contents from DEP-VSL-00001. The pressure drop across DEP-FILT-00003 is continuously monitored and when the filter is sufficiently loaded, the captured solids are back-pulsed to the evaporator concentrate vessels (DEP-VSL-00003A/B/C) through a control sequence using air supplied by the PSA system.

The evaporator feed vessel recirculation pumps (DEP-PMP-00012A/B/C) are placed in service prior to receiving transfers in DEP-VSL-00002 for proper vessel mixing and to measure the pH of the solution. Sodium hydroxide from the SHR system is added to the vessel if the measured pH is less than 12 for more advantageous corrosion conditions after each transferred input is received. Once the solution has been mixed and adjusted, the feed is continuously pumped by the evaporator feed vessel transfer pumps (DEP-PMP-00002A/B) from DEP-VSL-00002 to the high-flow recirculation loop of the evaporator (DEP-EVAP-00001). The level in the evaporator controls the flow of feed supplied to DEP-EVAP-00001 to maintain a constant liquid level in the evaporator.

The evaporator recirculation pump (DEP-PMP-00017) provides the motive force to continuously convey the feed introduced to the recirculation loop of DEP-EVAP-00001 to the DEP evaporator reboiler (DEP-RBLR-00001). The DEP evaporator reboiler heats the feed from DEP-VSL-00002 in combination with the bottom concentrate from DEP-EVAP-00001 and returns the effluent back to the DEP evaporator separator vessel. . DEP-RBLR-00001 utilizes steam from the HPS system secondary steam loop. As the saturated steam condenses against the tubes of the heat exchanger, the latent heat of vaporization is transferred to the process fluids contained within the tubes. The steam condensate from DEP-RBLR-00001 is collected in the reboiler condensate collection vessel (DEP-VSL-00008) and transferred to the SCW system by the reboiler condensate pumps (DEP-PMP-00008A/B). The conductivity of the condensate leaving DEP-RBLR-00001 is continuously monitored to detect low levels of breakthrough and if the conductivity limit is exceeded, the steam condensate is routed to DEP-VSL-00002 instead. The steam supply to DEP-RBLR-00001 is controlled by the temperature of the concentrate returned to DEP-EVAP-00001, such that the desired temperature produces the desired boiloff rate in the evaporator. The process stream from DEP-RBLR-00001 is introduced below the liquid level in DEP-EVAP-00001 and flashes as it rises (due to the temperature gradient of the evaporator liquid), creating vapor. The evaporator operates at a low vacuum generated by condensing the evaporator vapor and through the use of steam ejectors. This reduced pressure lowers the boiling point of the liquid in DEP-EVAP-00001. To prevent foaming, antifoam reagent is batch transferred from the AFR system tote to the evaporator.

The overhead vapors from DEP-EVAP-00001, mainly water, pass through a bubble cap tray to increase the vapor-liquid contact area, causing condensable vapors to fall back into the evaporator. An additional two layers of mesh pads are used to remove any remaining aerosols and particulates in the vapor. The lower mesh pad is continuously sprayed with process condensate to further cool the vapor and prevent the formation of solids, and the vapor continues on to the DEP evaporator primary condenser (DEP-COND-00001).. The evaporator gas is condensed in the shell side of the shell-and-tube heat exchanger, with process cooling water supplied to the tube side of the unit by the PCW system. The resulting condensate is gravity drained to the boot of DEP-COND-00001.

The DEP evaporator inter-condenser (DEP-COND-00002) and the DEP evaporator after-condenser (DEP-COND-00003) work with the first stage ejector (DEP-EJCTR-00001A/B) and second stage ejector (DEP-EJCTR-00002A/B) to create a vacuum in the evaporator separator vessel and enable low temperature flashing. The vapors from DEP-COND-00001 are pulled into the first stage ejector using a vacuum created by high pressure steam from the HPS system. The gases are entrained with the high velocity steam in the suction chamber of the ejector and transferred to DEP-COND-00002, in combination with non-condensable vapors from DEP-VSL-00008 and DEP-RBLR-00001. The condensate from DEP-COND-00002 drains to the boot of DEP-COND-00001. The vapors from DEP-COND-00002 are pulled into DEP-EJCTR-00002A/B using a vacuum created by high pressure steam from the HPS system. The gases are entrained with the high velocity steam in the suction chamber of the ejector and transferred to DEP-COND-00003. The condensate from DEP-COND-00003 drains to the boot of DEP-COND-00001. The non-condensable vapors in DEP-COND-00003 are pulled into the DVP system, which maintains the vacuum for the DEP process equipment. The total condensate collected in the boot of DEP-COND-00001 is primarily transferred to the overhead sampling vessels (DEP-VSL-00004A/B) using the DEP evaporator condensate pumps (DEP-PMP-0006A/B). This transfer is based on the level of the condensate contained within DEP-COND-00001. A portion of the condensate discharged from DEP-PMP-00006A/B is continuously recirculated through a filter back to DEP-EVAP-00001 to provide spray for the lower mesh pad.

The concentrate produced at the bottom of DEP-EVAP-00001 is primarily introduced into the high-flow reboiler recirculation loop, although a small portion is drawn through the evaporator concentrate discharge pumps (DEP-PMP-00007A/B) for monitoring at the DEP evaporator metering station (DEP-SKID-00005). Once steady-state conditions are achieved and the specific gravity of the concentrate meets the pre-established target for the feed type measured at DEP-SKID-00005, the feed is bled off the recirculation loop and transferred to the evaporator concentrate vessels (DEP-VSL-00003A/B/C). This transfer is modulated to maintain the specific gravity setpoint of the concentrate.

DEP-VSL-00003A/B/C receive a continuous feed from DEP-PMP-00007A/B and a batch transfer from DEP-FILT-00003. After receiving the concentrates, the evaporator concentrate vessel transfer/recirculation pumps (DEP-PMP-00003A/B) operate to recirculate the vessel contents through eductors for mixing. Once the solution has been well mixed and solids have been suspended, a sample is taken at DEP-HOOD-00001 to confirm evaporator performance and to determine whether sodium hydroxide is needed from the SHR system for corrosion mitigation. Once the solution meets the applicable acceptance criteria, the contents of the evaporator concentrate vessels are mixed to suspend solids and recycled to the LCP system for combination with the waste feed stream from the TOC. The sequenced transfer system is designed to first convey concentrated DEP system effluent, followed by a transfer of feed from the TOC, with the combined feed pushed into the LCP system with flush water from the TOC.

DEP-VSL-00004A/B receive a continuous stream of condensate from DEP-COND-00001 and batch transfers of caustic scrubber effluent from the LAW LVP system caustic collection tank (LVP-TK-00001). After receiving the condensates, the overhead sampling vessel transfer/recirculation pumps (DEP-PMP-00004A/B/C) operate to recirculate the vessel contents through eductors for mixing and blending. Once the solution has been well mixed and any solids have been suspended, a sample is taken at DEP-HOOD-00001 to confirm that the waste acceptance requirements of LERF/ETF are met. Once these parameters are confirmed, the batch is sent to the process condensate lag storage vessels (DEP-VSL-00005A/B).

DEP-VSL-00005A/B receive multiple batches of process condensate from DEP-VSL-00004A/B. After receiving the condensates, the process condensate lag storage vessel recirculation pumps (DEP-PMP-00015A/B/C) operate to recirculate the vessel contents through eductors for mixing. Once the solution has been well mixed and any solids have been suspended, a sample is taken at DEP-HOOD-00001 to confirm that the effluent complies with the LERF/ETF treatability envelope. This sample is taken once every tenth batch if the initial five to ten batches of waste comply with the treatability envelope. After confirming the condensate characteristics, the vessel contents are once again mixed using DEP-PMP-00015A/B/C and then cycled through a second recirculation loop using the process condensate lag storage vessel transfer pumps (DEP-PMP-00005A/B). Inline monitoring of the flow rate, radiation, pH, and conductivity is provided while the solution recirculates in accordance with the requirements of ICD 06. The vessel contents are then transferred to LERF/ETF.

4.1.4.3 DVP System Normal Operations

The DVP system uses a passive system to supply purge air to the DEP system process vessels. C3 area air is drawn through the process ventilation air supply HEPA filters (DVP-HEPA-00001A/B) by air flow created by the process ventilation exhausters (DVP-EXHR-00001A/B) and enters the headspace of the vessels. The negative pressure created by DVP-EXHR-00001A/B draws air from the headspace of the vessels into an exhaust header through manually adjustable valves that are locked in position to provide the needed flow rates for proper system operation. Once the vessel exhaust is combined, the stream passes through the process ventilation preheater (DVP-HTR-00001A/B) to reduce the relative humidity of the vapor before it enters the process ventilation primary (DVP-HEPA-00003A/B) and secondary (DVP-HEPA-00004A/B) HEPA filters. After particulates are removed from the vessel exhaust, DVP-EXHR-00001A/B sends the resulting vapor to the ACV system exhaust duct for SDJ system monitoring before it is discharged to the atmosphere. The exhausters are controlled by ASDs that maintain a negative pressure throughout the DVP system.

4.1.4.4 ACV System Normal Operations

The ACV system uses air handling units (ACV-AHU-00001A/B) to supply 100% outdoor air to the process and utility areas of the EMF. The AHUs are typically automatically controlled based on the temperature and moisture of the air discharged from the unit. However, temperature indication is also provided in each room supplied by the ACV system to manually correct the setpoint of the AHU discharge temperature. Once one of the ACV system exhaust fans (ACV-FAN-00001A/B) is placed in operation, the supply fan of the AHU selected for duty is started and the inlet damper automatically opens. Upon receiving a signal that the supply fan is running, the discharge damper automatically opens. Conditioned air that is discharged from the AHU is directly supplied through ductwork to the utility room (EU-0101) and filter room (EU-0102) in the LAW effluent utility building, the sub-change in the LAW effluent drain tank building (ED-0101), and the sub-change (E-0101), airlock (E-0104), and east evaporator process area (E-0102) of the LAW effluent process building.

The drain tank maintenance area (ED-0102), drain tank cell (ED-B001), HEPA filter room (E-0102A), and the west evaporator process area (E-0103) are not directly supplied by the ACV system and instead receive cascaded air from adjacent rooms. Manual volume dampers are located throughout the supply ductwork and are positioned to maintain a negative system pressure and a cascading airflow. Differential pressure instruments are provided in each room that interfaces with the ACV system to assist in positioning these dampers. Supplemental unit heaters are provided in the east evaporator process area (ACV-UH-00003A/B/C/D/E) and the drain tank maintenance area (ACV-UH-00004A/B) due to the low supply air temperature used to ensure that the indoor summer temperature is not exceeded.

The ACV exhaust subsystem design is based on cascading air to the building rooms with the highest potential for contamination before entering the HEPA filters located in the LAW effluent utility building. In the LAW effluent process building, air cascades to the C5 west evaporator process area (E-0103) before it is routed to the system HEPA filters (ACV-HEPA-00001A/B/C/D/E) in combination with the exhaust from the fume hood space of DEP-HOOD-00001. In the LAW effluent utility building, air is cascaded to the C2 filter room (EU-0102) before it is combined with the exhaust from the LAW effluent process building upstream of the system HEPA filters. This combined stream passes through the four HEPA filters placed in operation before it is discharged to the atmosphere by ACV-FAN-00001A/B through the EMF stack.

4.1.4.5 C1V System Normal Operations

The C1V system consists of standalone HVAC units located in EMF areas that do not interface with the ACV system. The control and operation of these units is based on the HVAC subcontractor design and the required temperature range of the rooms in which they are installed.

4.1.5 System Reliability Features

4.1.5.1 DEP System Reliability Features

A redundant pump and transfer line is provided for DEP-VSL-00001 in the event of pump failure or maintenance to allow for continuous system operation. For pump protection, restriction orifices are installed on the recirculation (DEP-RO-00011) and transfer (DEP-RO-00010) lines.

A pressure safety valve (DEP-PSV-8123) is provided on the plant service air supply to DEP-PMP-00031 to protect the air diaphragm section of the pump due to the discrepancy between the PSA system air supply pressure and the maximum rated pressure of the pump.

Three evaporator feed vessel recirculation pumps (DEP-PMP-00012A/B/C) are provided. Two units are normally placed in operation while the third acts as a standby in the event that one of the operating pumps fails.

A redundant evaporator feed vessel transfer pump (DEP-PMP-00002A/B) is provided for DEP-VSL-00002 to allow for continuous system operation. A minimum flow recirculation loop with a restriction orifice (DEP-RO-00017) is used to keep the operating pump running at its minimum required flowrate when flow to DEP-EVAP-00001 is not required.

Dual pressure safety valves (DEP-PSV-8918/8919) are provided on the plant service air supply to DEP-FILT-00003 to protect the PSA system piping installed in BOF per the requirements of ASME B31.3.

Dual pressure safety valves (DEP-PSV-8924/8925) are provided on the Lab RLD system supply line to DEP-FILT-00003 because the design pressure of the pipe is lower than the maximum pressure of the systems that it ties into at the filter. These valves also protect the LAW RLD system supply line to the filter for the same reason.

Dual pressure safety valves (DEP-PSV-8195/8917) are provided on DEP-FILT-00003 to protect the unit from over-pressurization, as required by ASME Section VIII.

A restriction orifice (DEP-RO-00009) is provided on the line between DEP-MTEE-00002 and DEP-HX-00001 to increase the system resistance and cause branch flow for a sample to be transferred to DEP-HOOD-00001 to meet the requirement for sampling prior to transferring conditioned effluent to Tank Farms.

Dual pressure safety valves are provided on the process side (DEP-PSV-8399/8400) and the utility side (DEP-PSV-8413/8414) of DEP-HX-00001 to protect the heat exchanger from over-pressurization.

DEP-HX-00001 can be manually bypassed using DEP-V-00829 in the event of failure or maintenance to allow for continuous transfer to Tank Farms.

A redundant thermal type flow element (DEP-FE-8284) is provided on the continuous mesh spray line to DEP-EVAP-00001 in the event that the primary element (DEP-FE-8203) requires maintenance.

Redundant level elements (DEP-LE-8210/8211) and level transmitters (DEP-LT-8210/8211) are provided for DEP-EVAP-00001 to ensure DEP-LV-8211 maintains the required flow rate of feed to the evaporator.

A restriction orifice (DEP-RO-00018) is installed downstream of DEP-PMP-00017 to add resistance to the evaporator recirculation loop and ensure that the centrifugal pump functions properly.

A redundant evaporator concentrate discharge pump (DEP-PMP-00007A/B) is provided for DEP-EVAP-00001 so that the concentrate can be continuously monitored at DEP-SKID-00005 if one pump were to fail.

Thermal type flow element (DEP-FE-8230) can be manually bypassed using DEP-V-44469 if the instrument is plugged due to the solids contained in the concentrated effluent.

Redundant steam ejectors (DEP-EJCTR-00001B and DEP-EJCTR-00002B) are provided to ensure a continuous vacuum during evaporator operations.

Three rupture disks (DEP-PSE-8281/8282 and DVP-PSE-8214) are provided in the condenser/ejector system to protect DEP-EVAP-00001 and the process sides of DEP-RBLR-00001 and the condensers from over-pressurization.

Dual pressure safety valves (DEP-PSV-8252/8253) are installed on the cooling water supply line from the PCW system to the DEP system condensers to protect the utility side of the heat exchangers from over-pressurization.

A restriction orifice (DEP-RO-00015) is included on the minimum recirculation line from DEP-PMP-00006A/B to DEP-COND-00001 to add resistance to the loop and facilitate proper pump operation.

The swirl meters on the cooling water return lines to the PCW system from the DEP system condensers (DEP-FE-8254/8255/8256) can be manually bypassed using DEP-V-44494/44495/44498, respectively.

A redundant evaporator condensate pump (DEP-PMP-00006A/B) is provided for DEP-COND-00001 to ensure the required level is maintained in the boot of the condenser if the operating pump fails.

The thermal type flow elements downstream of DEP-PMP-00006A/B (DEP-FE-8261 and DEP-FE-8263) can each be manually bypassed using DEP-V-00451 and DEP-V-44672, respectively, if the instrument is plugged or requires maintenance.

Redundant condensate duplex cartridge filters (DEP-FILT-00004A/B) are provided to ensure continuous system operation during events such as filter change-out.

Each of these filters (DEP-FILT-00004A/B) is provided with a pressure safety valve (DEP-PSV-8265/8266) to protect the filter from over-pressurization.

A restriction orifice (DEP-RO-00019) is located on the demineralized water line providing make-up water for DEP-VSL-00008 to limit the flow rate to the vessel.

Dual pressure relief valves (DEP-PSV-8267/8268) are provided on the vent of DEP-VSL-00008 to ensure the vessel does not exceed its design pressure, as required by ASME Section VIII

Three overhead sampling vessel transfer/recirculation pumps (DEP-PMP-00004A/B/C) are provided. Two units are normally placed in operation while the third acts as a standby in the event that one of the operating pumps fails.

A redundant evaporator concentrate transfer/recirculation pump (DEP-PMP-00003A/B) is provided for DEP-VSL-00003A/B/C to ensure that the system can transfer vitrification feed to the LAW Facility without interruption.

The magnetic type flow transmitter (DEP-FT-8419) downstream of DEP-PMP-00003A/B can be manually bypassed using DEP-V-44818 if the instrument becomes plugged or requires maintenance.

The effluent concentrate line from the EMF to the LAW Facility can be manually flushed with sodium hydroxide using DEP-V-44269 in the event that the TOC is not available for timely transfers.

A redundant process condensate lag storage vessel transfer pump (DEP-PMP-00005A/B) is provided for DEP-VSL-00005A/B to ensure that the system can transfer condensate to LERF/ETF without interruption.

A restriction orifice (DEP-RO-00014) is installed on the off-specification condensate return line from DEP-PMP-00005A/B to DEP-VSL-00004A/B to limit the flow rate back to the receiving vessels.

Dual pressure relief valves (DEP-PSV-8495/8500) are provided on the inlet to DEP-FILT-00002 to protect the unit from over-pressurization, as required by ASME Section VIII.

A spare underground condensate transfer line is provided from the EMF to LERF/ETF which can be manually placed in service using DEP-V-00279.

Three process condensate lag storage vessel recirculation pumps (DEP-PMP-00015A/B/C) are provided. Two units are normally placed in operation while the third acts as a standby in the event that one of the operating pumps fails.

A pressure safety valve (DEP-PSV-8660) is provided on the inlet of DEP-FILT-00005 to protect the unit from over-pressurization, in accordance with ASME Section VIII.

A pressure safety valve (DEP-PSV-8686) is provided on the inlet of DEP-FILT-00006 to protect the unit from over-pressurization, in accordance with ASME Section VIII.

Dual pressure relief valves (DEP-PSV-8680/8681) are provided on the transfer line from the TOC and EMF to the LAW Facility for over-pressurization protection by ensuring the inline components do not exceed the maximum operating pressure required by ICD-30.

4.1.5.2 DVP System Reliability Features

Redundant exhauster trains provide continuous exhaust of the DEP system process vessels and the DEP evaporator after condenser. The trains are operated on a rotating basis, one operating and one on standby.

Pressure safety valves (DVP-PSV-8123/8124) are installed at the inlet to each preheater (DVP-HTR-00001A/B) to protect the preheaters and HEPA filters from over-pressurization that could occur upon failure of the evaporator system or improper operation of the flush system.

A backup air supply HEPA filter (DVP-HEPA-00001B) is included in the design for occasions when the primary filter (DVP-HEPA-00001A) is changed out. The unit is manually placed in service using DVP-V-00041.

4.1.5.3 ACV System Reliability Features

Two 100%-capacity air handling units (ACV-AHU-00001A/B) are included in the design for continuous air supply. One unit is placed in operation while the other serves as a standby.

A standby HEPA filter (ACV-HEPA-00001E) is provided to facilitate filter change out without interrupting the exhaust process.

Two 100%-capacity exhaust fans (ACV-FAN-00001A/B) are included in the design for continuous system functionality. One unit is placed in operation while the other serves as a standby.

4.1.6 System Control Features

The following sections describe the DEP, DVP, and ACV system indications, alarms, and system control features that are used for operation and performance monitoring. Refer to the detailed design documentation for additional detail.

4.1.6.1 System Monitoring

The following subsections describe important system monitoring that is used for operation and performance monitoring. Refer to the detailed design documentation for additional detail.

4.1.6.1.1 DEP System Monitoring

4.1.6.1.1.1 Evaporator Feed Subsystem Monitoring

4.1.6.1.1.1.1 Low Point Drain Vessel Temperature Indication

Temperature indication is provided in the control room via DEP-TI-8128 to inform the operator of the operating temperature of DEP-VSL-00001. There are no alarms associated with this indicator.

4.1.6.1.1.1.2 Low Point Drain Vessel Level Indication

Level indication is provided in the control room via DEP-LI-8109 to inform the operator of the volume of liquid that has been drained to DEP-VSL-00001. DEP-LI-8109 has high and low alarms to warn the operator that the vessel is close to overfilling or that the transfer out of the vessel should be stopped, respectively.

4.1.6.1.1.1.3 Low Point Drain Vessel Sump Level Indication and Leak Detection

Level indication is provided in the control room via DEP-LI-8112A to inform the operator of the volume of liquid that has collected in DEP-SUMP-00001. DEP-LI-8112A has high alarms to warn the operator that the sump is close to overfilling. A leak detection alarm is provided in the control room via DEP-LKY-8112A to inform the operator that there is a high rate of change into DEP-SUMP-00001, indicating a leak in DEP-VSL-00001 or in the coaxial piping within the drain tank chase.

4.1.6.1.1.1.4 Low Point Drain Vessel Pump Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8110 to inform the operator that DEP-PMP-00001A/B is providing sufficient pressure to the system. DEP-PI-8110 has high and low alarms to warn the operator of a mechanical issue with the pumps or abnormally high and low discharge pressures.

4.1.6.1.1.1.5 Seal Water Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8182 and DEP-PI-8136 to inform the operator of the seal water pressure supplied from the PSW system to DEP-PMP-00001A and DEP-PMP-00001B, respectively. These indicators have low alarms to warn the operator of a loss of the seal barrier.

4.1.6.1.1.1.6 Evaporator Feed Pre-Filter Pressure Indication

Unfiltered fluid chamber pressure, filtered fluid chamber pressure, and differential pressure indication are provided in the control room via DEP-PI-8192, DEP-PI-8194, and DEP-PDI-8192, respectively, to inform the operator whether DEP-FILT-00003 requires backwash. These indicators all have high and low alarms to warn the operator that the filter requires backwashing to DEP-VSL-00003A/B/C.

4.1.6.1.1.1.7 Evaporator Feed Pre-Filter Level Indication

Level indication is provided in the control room via DEP-LI-8191 to inform the operator of the liquid level in DEP-FILT-00003 above the filter element. DEP-LI-8191 has a high alarm to warn the operator that there is a potential blockage in the downstream transfer piping.

4.1.6.1.1.1.8 Evaporator Feed Vessel Level Indication

Level indication is provided in the control room via DEP-LI-8156 to inform the operator of the volume of liquid that has collected in DEP-VSL-00002. DEP-LI-8156 has high and low alarms to warn the operator that the vessel is close to overfilling or that the transfer out of the vessel should be stopped, respectively.

4.1.6.1.1.1.9 Evaporator Feed Vessel Temperature Indication

Temperature indication is provided in the control room via DEP-TI-8157 to inform the operator of the temperature of the evaporator feed that is discharged from DEP-VSL-00002. There are no alarms associated with this indicator.

4.1.6.1.1.1.10 Evaporator Feed Vessel pH Indication

pH indication is provided in the control room via DEP-AI-8907 to inform the operator whether the pH of the evaporator feed discharged from DEP-VSL-00002 is within the range established for advantageous corrosion conditions. DEP-AI-8907 has high and low alarms to warn the operator that the feed is off-specification and should be returned to Tank Farms.

4.1.6.1.1.1.11 Evaporator Feed Vessel Recirculation Pump Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8168 to inform the operator that DEP-PMP-00012A/B/C are providing sufficient pressure to transfer off-specification feed to the effluent cooler or to recirculate the vessel contents through DEP-EDUC-00001A/B/C. DEP-PI-8168 has high and low alarms to warn the operator of a mechanical issue with the pumps or abnormally high and low discharge pressures.

4.1.6.1.1.1.12 Evaporator Feed Vessel Transfer to Tank Farms Flow Indication

Instantaneous and totalized flow indication is provided in the control room via DEP-FI-8908 and DEP-FQI-8908, respectively, to inform the operator of the transfer flow rate and volume of evaporator feed to Tank Farms. There are no alarms associated with these indicators.

4.1.6.1.1.1.13 Evaporator Feed Vessel Recirculation Flow Indication

Instantaneous and totalized flow indication is provided in the control room via DEP-FI-8172 and DEP-FQI-8172, respectively, to inform the operator of the recirculation flow rate and volume through DEP-EDUC-00001A/B/C. There are no alarms associated with these indicators.

4.1.6.1.1.1.14 Evaporator Feed Vessel Transfer Pump Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8181 to inform the operator that DEP-PMP-00002A/B are providing sufficient pressure to transfer evaporator feed to DEP-EVAP-00001 or recirculate the contents of DEP-VSL-00002. DEP-PI-8181 has high and low alarms to warn the operator of a mechanical issue with the pumps or abnormally high and low discharge pressures.

4.1.6.1.1.1.15 Evaporator Feed Vessel Transfer Pump Flow Indication

Instantaneous and totalized flow indication is provided in the control room via DEP-FI-8182 and DEP-FQI-8182, respectively, to inform the operator of the flow rate and volume of feed transferred to DEP-EVAP-00001. DEP-FI-8182 has low alarms to warn the operator that the pumps are not meeting the required feed flow rate to the evaporator.

4.1.6.1.1.1.16 Process Condensate Transfer to Tank Farms Flow Indication

Instantaneous and totalized flow indication is provided in the control room via DEP-FI-8910 and DEP-FQI-8910, respectively, to inform the operator of the transfer flow rate and volume of process condensate added to the evaporator feed transferred to Tank Farms. There are no alarms associated with these indicators.

4.1.6.1.1.1.17 Effluent Cooler Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8401 and DEP-PI-8415 to inform the operator of the pressure of the process fluid and cooling water return, respectively, discharged from DEP-HX-00001. Differential pressure indication is provided in the control room via DEP-PDI-8401 to inform the operator of the pressure difference between these two streams. DEP-PDI-8401 has a low alarm to warn the operator of a potential leak between the hot and cold sides of DEP-HX-00001.

4.1.6.1.1.1.18 Effluent Cooler PCW Return Conductivity Indication

Conductivity indication is provided in the control room via DEP-CI-8417 to inform the operator of the conductivity of the cooling water returned to the PCW system from DEP-HX-00001. DEP-CI-8417 has high alarms to warn the operator of a leak in the effluent cooler.

4.1.6.1.1.1.19 Effluent Cooler Temperature, pH, Flow, and Density Indication

Temperature, pH, instantaneous flow, totalized flow, and density indication are provided in the control room via DEP-TI-8402, DEP-AI-8403, DEP-FI-8404, DEP-FQI-8404, and DEP-DI-8404, respectively, to inform the operator of the characteristics of the process fluid discharged from the hot side of DEP-HX-00001. DEP-TI-8402 has a high alarm and DEP-AI-8403 has a low alarm to warn the operator that the effluent does not meet the waste acceptance requirements of ICD-31 for transfer to Tank Farms.

4.1.6.1.1.2 Evaporator Process Subsystem Monitoring

4.1.6.1.1.2.1 Evaporator Mesh Wash Flow Indication

Flow indication is provided in the control room via DEP-FI-8201 to inform the operator that the intermittent/maintenance mesh wash function of DEP-EVAP-00001 is in use. There are no alarms associated with this indicator.

4.1.6.1.1.2.2 Evaporator Mesh Spray Flow Indication

Flow indication is provided in the control room via DEP-FI-8203 and DEP-FI-8284 to inform the operator of the flow rate of process condensate to the continuous lower mesh spray nozzles (DEP-NOZ-00013A/B/C/D) in DEP-EVAP-00001. DEP-FI-8284 is only used during maintenance activities when DEP-FI-8203 and its associated transmitter are out of service. DEP-FI-8203 and DEP-FI-8284 have high and low alarms to warn the operator of an abnormal flow to the lower nozzles.

4.1.6.1.1.2.3 Evaporator Purge Air Flow Indication

Flow indication is provided in the control room via DEP-FI-8286 to inform the operator of the purge air supply flow from DEP-HEPA-00001A to DEP-EVAP-00001. There are no alarms associated with this indicator.

4.1.6.1.1.2.4 Evaporator Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8209 to inform the operator of the pressure in DEP-EVAP-00001. DEP-PI-8209 has high and low alarms to warn the operator of a loss of vacuum or over-pressurization in the unit.

4.1.6.1.1.2.5 Evaporator Differential Pressure Indication

Differential pressure indication is provided in the control room via DEP-PDI-8207 and DEP-PDI-8208 to inform the operator of the pressure differential across the mesh pad and bubble cap tray, respectively, in DEP-EVAP-00001. DEP-PDI-8207 and DEP-PDI-8208 have high and low alarms to warn the operator that DEP-EVAP-00001 is not maintaining the required pressure drop across the mesh pad and bubble cap tray.

4.1.6.1.1.2.6 Evaporator Level Indication

Primary and secondary level indication are provided in the control room via DEP-LI-8211 and DEP-LI-8210, respectively, to inform the operator of the operating level in DEP-EVAP-00001. DEP-LI-8211 and DEP-LI-8210 have high and low alarms to warn the operator that the DEP system is not maintaining the required level in the evaporator.

4.1.6.1.1.2.7 Evaporator Recirculation Pump Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8200 to inform the operator whether DEP-PMP-00017 is supplying sufficient pressure to feed DEP-RBLR-00001. There are no alarms associated with this indicator.

4.1.6.1.1.2.8 Seal Water Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8236, DEP-PI-8237, and DEP-PI-8292 to inform the operator of the seal water pressure supplied from the PSW system to DEP-PMP-00007A, DEP-PMP-00007B, and DEP-PMP-00017, respectively. These indicators have low alarms to warn the operator of a loss of the seal barrier.

4.1.6.1.1.2.9 Evaporator and Reboiler Temperature Indication

Temperature indication is provided in the control room via DEP-TI-8212 and DEP-TI-8214 to inform the operator of the temperature of the process fluid discharged from DEP-EVAP-00001 and DEP-RBLR-00001, respectively. Differential temperature indication is provided in the control room via DEP-TDI-8212 to inform the operator of the temperature rise across the reboiler. DEP-TI-8212 and DEP-TI-8214 have high alarms to warn the operator that the temperature of the process fluid is above the operational limit.

4.1.6.1.1.2.10 Reboiler Condensate Temperature Indication

Temperature indication is provided in the control room via DEP-TI-8280 to inform the operator whether the temperature of the steam condensate collected from the cold side of DEP-RBLR-00001 is within the normal operating range. DEP-TI-8280 has a high alarm to warn the operator that the condensate is hotter than expected.

4.1.6.1.1.2.11 Reboiler Condensate Level Indication

Level indication is provided in the control room via DEP-LI-8216 to inform the operator of the amount of liquid condensate collected from the cold side of DEP-RBLR-00001. DEP-LI-8216 has high and low alarms to warn the operator that the level is outside the normal operating range.

4.1.6.1.1.2.12 Reboiler Condensate Conductivity Indication

Conductivity indication is provided in the control room via DEP-CI-8218 to inform the operator of the conductivity of the steam condensate collected from the cold side of DEP-RBLR-00001. DEP-CI-8218 has high alarms to warn the operator of a tube leak in the reboiler.

4.1.6.1.1.2.13 Reboiler Condensate Collection Vessel Level Indication

Level indication is provided in the control room via DEP-LI-8274 to inform the operator of the volume of liquid that has collected in DEP-VSL-00008. DEP-LI-8274 has high and low alarms to warn the operator that the vessel is close to overfilling or that the transfer out of the vessel should be stopped, respectively.

4.1.6.1.1.2.14 Evaporator Concentrate Discharge Pump Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8231 to inform the operator whether DEP-PMP-00007A/B are providing sufficient pressure to transfer evaporator concentrate to the downstream vessel. DEP-PI-8231 has high and low alarms to warn the operator of a mechanical issue with the pumps or abnormally high and low discharge pressures.

4.1.6.1.1.2.15 Density, Radiation, and Flow Monitoring Skid Indication

Radiation, volumetric flow, density, temperature, and time indication are provided in the control room via DEP-RI-8229, DEP-FI-8227, DEP-DI-8228, DEP-TI-8228, and DEP-UI-8233, respectively, to inform the operator whether the characteristics of the evaporator concentrate meet the density and radiation standards of the downstream equipment. DEP-RI-8229 has a high alarm, DEP-FI-8227 has low alarms, DEP-DI-8228 has high and low alarms to warn the operator that the concentrate does not meet the criteria for transfer to DEP-VSL-00003A/B/C and should either be routed for recirculation or transferred to DEP-VSL-00002. A separate fault-alarm (DEP-UA-8233) is included to warn the operator that the skid is incapable of monitoring radiation or if a failure occurs in any component or circuit that would affect the accuracy of the readout.

4.1.6.1.1.2.16 Normal Evaporator Concentrate Flow Indication

Instantaneous and totalized flow indication is provided in the control room via DEP-FI-8230 and DEP-FQI-8230, respectively, to inform the operator of the flow rate and volume of evaporator concentrate transferred to DEP-VSL-00003A/B/C. There are no alarms associated with these indicators.

4.1.6.1.1.2.17 Off-Specification Evaporator Concentrate Flow Indication

Totalized flow indication is provided in the control room via DEP-FQI-8227 to inform the operator of the volume of off-specification evaporator concentrate that has been transferred to DEP-VSL-00002. There are no alarms associated with this indicator.

4.1.6.1.1.2.18 Overhead Vapor Pressure and Temperature Indication

Pressure and temperature indication are provided in the control room via DEP-PI-8250 and DEP-TI-8249 to inform the operator whether the pressure and temperature of the overhead vapor transferred from DEP-EVAP-00001 to DEP-COND-00001 are within the normal operating range. These indicators have high and low alarms to warn the operator of a mechanical issue in DEP-EVAP-00001.

4.1.6.1.1.2.19 Primary Condenser Level Indication

Level indication is provided in the control room via DEP-LI-8251 to inform the operator of the amount of liquid that has condensed in the boot of DEP-COND-00001. DEP-LI-8251 has high and low alarms to warn the operator there may be a mechanical issue with DEP-PMP-00006A/B.

4.1.6.1.1.2.20 Primary Condenser Vent Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8241 to inform the operator whether DEP-EJCTR-00001A/B is providing sufficient pressure control to maintain the pressure in the system. There are no alarms associated with this indicator.

4.1.6.1.1.2.21 Inter-Condenser Vent Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8245 to inform the operator whether DEP-EJCTR-00002A/B is providing sufficient pressure control to maintain the pressure in the system. DEP-PI-8245 has high and low alarms to warn the operator of a loss of vacuum or over-pressurization in the system.

4.1.6.1.1.2.22 Steam Supply Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8235 to inform the operator whether the HPS system is providing sufficient steam to DEP-EJCTR-00001A/B and DEP-EJCTR-00002A/B. DEP-PI-8235 has high and low alarms to warn the operator of a mechanical issue in the BOF HPS system.

4.1.6.1.1.2.23 Ejector Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8239 and DEP-PI-8243 to inform the operator whether DEP-EJCTR-00001A/B and DEP-EJCTR-00002A/B, respectively, are providing sufficient pressure to pull vapor into their respective condensers. There are no alarms associated with these indicators.

4.1.6.1.1.2.24 Ejector Temperature Indication

Temperature indication is provided in the control room via DEP-TI-8240 and DEP-TI-8244 to inform the operator whether DEP-EJCTR-00001A/B and DEP-EJCTR-00002A/B, respectively, are providing vapor to their respective condensers at a sufficient temperature. There are no alarms associated with these indicators.

4.1.6.1.1.2.25 Cooling Water Return Temperature and Flow Indication

Temperature and flow indication are provided in the control room via DEP-TI-8255/DEP-FI-8255 (DEP-COND-00001), DEP-TI-8254/DEP-FI-8254 (DEP-COND-00002), and DEP-TI-8256/DEP-FI-8256 (DEP-COND-00003) to inform the operator whether the cooling water returned from the DEP condensers to the PCW system is being transferred at a sufficient rate and temperature. The temperature indicators have high and low alarms to warn the operator that the DEP system is returning water at abnormally high or low temperatures.

4.1.6.1.1.2.26 Evaporator Condensate Pump Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8260 to inform the operator whether DEP-PMP-00006A/B are providing sufficient pressure to transfer evaporator condensate to the appropriate location. DEP-PI-8260 has high and low alarms to warn the operator of a mechanical issue with the pumps or abnormally high and low discharge pressures.

4.1.6.1.1.2.27 Evaporator Condensate Pump Conductivity Indication

Conductivity indication is provided in the control room via DEP-CI-8257 to inform the operator of the conductivity of the condensate discharged from DEP-PMP-00006A/B. DEP-CI-8257 has high alarms to warn the operator that the condensate is off-specification and should be returned to DEP-EVAP-00001.

4.1.6.1.1.2.28 Evaporator Condensate Pump Flow Indication

Flow indication is provided in the control room via DEP-FI-8261 and DEP-FI-8263 to inform the operator of the rate of condensate transfer from DEP-PMP-00006A/B to DEP-VSL-00004A/B or recirculated back to DEP-EVAP-00001 for reprocessing, respectively. There are no alarms associated with these indicators.

4.1.6.1.1.2.29 Condensate Filter Differential Pressure Indication

Differential pressure indication is provided in the control room via DEP-PDI-8264 to inform the operator of the pressure drop across DEP-FILT-00004A/B. DEP-PDI-8264 has a high alarm to warn the operator that the filter has loaded and requires change-out.

4.1.6.1.1.3 Evaporator Discharge Subsystem Monitoring

4.1.6.1.1.3.1 Evaporator Concentrate Vessels Level Indication

Level indication is provided in the control room via DEP-LI-8357, DEP-LI-8368, and DEP-LI-8379 to inform the operator of the volume of liquid that has collected in DEP-VSL-00003A, DEP-VSL-00003B, and DEP-VSL-00003C, respectively. These indicators have high and low alarms to warn the operator that the vessel is close to overfilling or that the transfer out of the vessel should be stopped, respectively.

4.1.6.1.1.3.2 Evaporator Concentrate Vessels Temperature Indication

Temperature indication is provided in the control room via DEP-TI-8358, DEP-TI-8369, and DEP-TI-8380 to inform the operator whether the temperature of the concentrate that is discharged from DEP-VSL-00003A, DEP-VSL-00003B, and DEP-VSL-00003C, respectively, is within the operational limit. These indicators have high alarms to warn the operator that the process fluid is too hot to transfer to the LAW Facility.

4.1.6.1.1.3.3 Seal Water Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8387 and DEP-PI-8392 to inform the operator of the seal water pressure supplied from the PSW system to DEP-PMP-00003A and DEP-PMP-00003B, respectively. These indicators have low alarms to warn the operator of a loss of the seal barrier.

4.1.6.1.1.3.4 Evaporator Concentrate Transfer/Recirculation Pump Pressure and Flow Indication

Pressure and flow indication are provided in the control room via DEP-PI-8394 and DEP-FI-8419 to inform the operator whether DEP-PMP-00003A/B are providing sufficient pressure and flow to transfer evaporator concentrate to the appropriate location. DEP-PI-8394 has high and low alarms and DEP-FI-8419 has low alarms to warn the operator of a mechanical issue with the pumps.

4.1.6.1.1.3.5 Evaporator Concentrate Transfer to LAW Flow and Density Indication

Instantaneous flow, totalized flow, and density indication are provided in the control room via DEP-FI-8395, DEP-FQI-8395, and DEP-DI-8395 respectively, to inform the operator whether the flow rate, volume, and density of evaporator concentrate transferred to the LAW Facility is within the acceptance criteria limits of ICD-30 and the design capacity of the LCP system. DEP-FI-8395 has a high alarm to warn the operator that the transfer rate is above the maximum acceptance rate of the LCP system.

4.1.6.1.1.3.6 TOC Feed Indication

Radiation, instantaneous flow, totalized feed flow, totalized flush water flow, density and pressure indication are provided in the control room via DEP-RI-8676, DEP-FI-8677, DEP-FQI-8677A, DEP-FQI-8677B, DEP-DI-8677, and DEP-PI-8678, respectively, to inform the operator whether the feed received from the TOC is within the specifications established in ICD-30. DEP-RI-8676 has a high alarm, DEP-FI-8677 has high and low alarms, DEP-DI-8677 has a high alarm, and DEP-PI-8678 has a high alarm to warn the operator that the feed does not meet the acceptance criteria for transfer to the LAW Facility and should be returned to Tank Farms.

4.1.6.1.1.3.7 LAW Facility Feed Temperature Indication

Temperature indication is provided in the control room via DEP-TI-8685 to inform the operator whether the combined feed from EMF and the TOC is within the specifications established in ICD-30 and can be transferred to the LAW Facility. DEP-TI-8685 has high alarms to warn the operator that the feed temperature is too high to transfer to the LAW Facility.

4.1.6.1.1.3.8 Off-Specification Evaporator Concentrate Transfer Flow Indication

Instantaneous and totalized flow indication is provided in the control room via DEP-FI-8909 and DEP-FQI-8909, respectively, to inform the operator of the transfer flow rate and volume of evaporator concentrate to Tank Farms or DEP-VSL-00002 through DEP-FILT-00003. DEP-FI-8909 has a high alarm to warn the operator that the transfer rate is above the maximum expected value.

4.1.6.1.1.3.9 Evaporator Concentrate Vessel Eductor and Recirculation Flow Indication

Flow indication is provided in the control room via DEP-FI-8423 and DEP-FI-8427 to inform the operator of the recirculation and eductor mixing flow rates, respectively, for DEP-VSL-00003A/B/C. The flow rate to the eductors is totalized and displayed by DEP-FQI-8427. There are no alarms associated with these indicators.

4.1.6.1.1.3.10 Overhead Sampling Vessel Level Indication

Level indication is provided in the control room via DEP-LI-8305 and DEP-LI-8312 to inform the operator of the volume of liquid that has collected in DEP-VSL-00004A and DEP-VSL-00004B, respectively. These indicators have high and low alarms to warn the operator that the vessel is close to overfilling or that the transfer out of the vessel should be stopped, respectively.

4.1.6.1.1.3.11 Overhead Sampling Vessel Temperature Indication

Temperature indication is provided in the control room via DEP-TI-8306 and DEP-TI-8313 to inform the operator whether the temperature of the condensate that is discharged from DEP-VSL-00004A and DEP-VSL-00004B, respectively, is within the operational limit. There are no alarms associated with these indicators.

4.1.6.1.1.3.12 Overhead Sampling Vessel Transfer/Recirculation Pump Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8322 to inform the operator whether DEP-PMP-00004A/B/C are providing sufficient pressure to transfer evaporator condensate to the appropriate location. DEP-PI-8322 has high and low alarms to warn the operator of a mechanical issue with the pumps or abnormally high and low discharge pressures.

4.1.6.1.1.3.13 Overhead Sampling Vessel Transfer/Recirculation Pump Flow Indication

Instantaneous and totalized flow indication are provided in the control room via DEP-FI-8321 and DEP-FQI-8321, respectively, to inform the operator whether DEP-PMP-00004A/B/C are transferring evaporator condensate at a sufficient flow rate. DEP-FI-8321 has low alarms to warn the operator that the flow through the eductors or to DEP-VSL-00005A/B is insufficient.

4.1.6.1.1.3.14 Lag Storage Vessel Density Indication

Density indication is provided in the control room via DEP-DI-8455 and DEP-DI-8481 to inform the operator of the concentration of the condensate stored in DEP-VSL-00005A and DEP-VSL-00005B, respectively. There are no alarms associated with these indicators.

4.1.6.1.1.3.15 Lag Storage Vessel Level Indication

Level indication is provided in the control room via DEP-LI-8458 and DEP-LI-8468 to inform the operator of the volume of liquid that has collected in DEP-VSL-00005A and DEP-VSL-00005B, respectively. These indicators have high and low alarms to warn the operator that the vessel is close to overfilling or that the transfer out of the vessel should be stopped, respectively.

4.1.6.1.1.3.16 Lag Storage Vessel Temperature Indication

Temperature indication is provided in the control room via DEP-TI-8459 and DEP-TI-8469 to inform the operator whether the temperature of the condensate that is discharged from DEP-VSL-00005A and DEP-VSL-00005B, respectively, is within the operational limit. There are no alarms associated with these indicators.

4.1.6.1.1.3.17 Lag Storage Vessel Recirculation Pump Pressure and Flow Indication

Pressure, instantaneous flow, and totalized flow indication are provided in the control room via DEP-PI-8492, DEP-FI-8493, and DEP-FQI-8493, respectively, to inform the operator whether DEP-PMP-00015A/B/C are providing sufficient pressure and flow to recirculate the vessel and the total volume of effluent that has been transferred. DEP-PI-8492 has high and low alarms and DEP-FI-8493 has low alarms to warn the operator of a mechanical issue with the pumps or a blockage in the flow path.

4.1.6.1.1.3.18 Lag Storage Vessel Recirculation Pump Flush Flow Indication

Instantaneous and totalized flow indication are provided in the control room via DEP-FI-8496 and DEP-FQI-8496, respectively, to inform the operator whether DEP-PMP-00015A/B/C are providing sufficient flow to flush DEP system piping and the total volume of effluent that has been transferred. There are no alarms associated with these indicators.

4.1.6.1.1.3.19 Lag Storage Vessel Transfer Pump Pressure and Flow Indication

Pressure, instantaneous flow, and totalized flow indication are provided in the control room via DEP-PI-8474, DEP-FI-8475, and DEP-FQI-8475, respectively, to inform the operator whether DEP-PMP-00005A/B are providing sufficient pressure and flow to transfer evaporator concentrate to the appropriate location and the total volume of effluent that has been transferred. DEP-PI-8474 has high and low alarms and DEP-FI-8475 has low alarms to warn the operator of a mechanical issue with the pumps or a blockage in the flow path.

4.1.6.1.1.3.20 Lag Storage Vessel Transfer Line Indication

Radiation, conductivity, pH, and temperature indication are provided in the control room via DEP-RI-8476, DEP-CI-8477, DEP-AI-8478, and DEP-TI-8479 to inform the operator whether the condensate transferred from DEP-VSL-00005A/B meets the acceptance criteria for transfer to LERF/ETF. DEP-RI-8476 has a high alarm, DEP-CI-8477 has high alarms, DEP-AI-8478 has high and low alarms, and DEP-TI-8479 has high alarms to warn the operator that the effluent does not meet the criteria established in ICD-06 and should be diverted back to DEP-VSL-00004A/B.

4.1.6.1.1.3.21 Lag Storage Vessel to LERF/ETF Transfer Line Flow and Pressure Indication

Instantaneous flow, totalized flow, and pressure indication are provided in the control room via DEP-FI-8482, DEP-FQI-8482, and DEP-PI-8484, respectively, to inform the operator of the flow rate and volume of condensate transferred to DEP-FILT-00002 and pressure of the condensate discharged from DEP-FILT-00002 to LERF/ETF. DEP-PI-8484 has high alarms to warn the operator that the pressure safety valves are not sufficiently protecting DEP-FILT-00002 from over-pressurization.

4.1.6.1.1.3.22 Process Condensate Filter Differential Pressure Indication

Differential pressure indication is provided in the control room via DEP-PDI-8483 to inform the operator of the pressure drop across DEP-FILT-00002. DEP-PDI-8483 has a high alarm to warn the operator that the filter has loaded and requires change-out.

4.1.6.1.1.3.23 LERF/ETF Vent Line Pressure Indication

Pressure indication is provided in the control room via DEP-PI-8499 to inform the operator whether the vent line installed on the transfer line to LERF/ETF is preventing the accumulation of negative pressure in the system. DEP-PI-8499 has low alarms to warn the operator that a vacuum is present in the system. DEP-Pl-8499 informs the operator of high pressure on the transfer to LERF/ETF in the unlikely event the path is blocked and the line backfills. DEP-Pl-8499 has a high alarm to warn the operator that high pressure is present in the system and will close DEP-YV-8488.

4.1.6.1.1.4 Other DEP System Monitoring

4.1.6.1.1.4.1 East Evaporator Process Area Sump Level Indication and Leak Detection

Level indication is provided in the control room via DEP-LI-8646A and DEP-LI-8647A to inform the operator of the volume of liquid that has collected in DEP-SUMP-00003A and DEP-SUMP-00003B, respectively. These indicators have high alarms to warn the operator that the sump is close to overfilling. Leak detection alarms are provided in the control room via DEP-LKY-8646A and DEP-LKY-8647A to inform the operator that there is a high rate of change into DEP-SUMP-00003A/B, indicating a leak in the east evaporator process area (E-0102).

4.1.6.1.1.4.2 West Evaporator Process Area Sump Level Indication and Leak Detection

Level indication is provided in the control room via DEP-LI-8626A and DEP-LI-8629A to inform the operator of the volume of liquid that has collected in DEP-SUMP-00002A and DEP-SUMP-00002B, respectively. These indicators have high alarms to warn the operator that the sump is close to overfilling. Leak detection alarms are provided in the control room via DEP-LKY-8626A and DEP-LKY-8629A to inform the operator that there is a high rate of change into DEP-SUMP-00002A/B, indicating a leak in the west evaporator process area (E-0103).

4.1.6.1.1.4.3 Feed Tank Area Sump Level Indication and Leak Detection

Level indication is provided in the control room via DEP-LI-8632A and DEP-LI-8656A to inform the operator of the volume of liquid that has collected in DEP-SUMP-00004A and DEP-SUMP-00004B, respectively. These indicators have high alarms to warn the operator that the sump is close to overfilling. Leak detection alarms are provided in the control room via DEP-LKY-8632A and DEP-LKY-8656A to inform the operator that there is a high rate of change into DEP-SUMP-00004A/B, indicating a leak in the feed tank area (E-0105).

4.1.6.1.1.4.4 Process Condensate Area Sump Level Indication and Leak Detection

Level indication is provided in the control room via DEP-LI-8638A and DEP-LI-8641A to inform the operator of the volume of liquid that has collected in DEP-SUMP-00005A and DEP-SUMP-00005B, respectively. These indicators have high alarms to warn the operator that the sump is close to overfilling. Leak detection alarms are provided in the control room via DEP-LKY-8638A and DEP-LKY-8641A to inform the operator that there is a high rate of change into DEP-SUMP-00005A/B, indicating a leak in the process condensate tank area (E-0106).

4.1.6.1.1.4.5 Truck Unloading Area Sump Level and Leak Detection

Level indication is provided in the control room via DEP-LI-8648A to inform the operator of the volume of liquid that has collected in DEP-SUMP-00008. DEP-LI-8648A has high alarms to warn the operator that the sump is close to overfilling. A leak detection alarm is provided in the control room via DEP-LKY-8648A to inform the operator that there is a high rate of change into DEP-SUMP-00008, indicating a leak in the truck unloading area (E-0108).

4.1.6.1.1.4.6 Tank Farms Transfer Line Leak Detection

A leak detection alarm is provided in the control room via DEP-LAH-8701 to warn the operator of a leak in the transfer line between DEP-HX-00001 and Tank Farms.

4.1.6.1.1.4.7 TOC Transfer Line Leak Detection

A leak detection alarm is provided in the control room via DEP-LAH-8702 to warn the operator of a leak in the transfer line between the TOC and the EMF.

4.1.6.1.1.4.8 LAW Facility Transfer Line Leak Detection

A leak detection alarm is provided in the control room via DEP-LAH-8703 to warn the operator of a leak in the transfer line between the EMF and the LAW Facility.

4.1.6.1.1.4.9 LAW RLD System Transfer Line Leak Detection

A leak detection alarm is provided in the control room via DEP-LAH-8704 to warn the operator of a leak in the transfer line between the LAW RLD system and the EMF.

4.1.6.1.1.4.10 LAW LVP System Transfer Line Leak Detection

A leak detection alarm is provided in the control room via DEP-LAH-8705 to warn the operator of a leak in the transfer line between the LAW LVP system and the EMF.

4.1.6.1.1.4.11 Lab RLD System Transfer Line Leak Detection

A leak detection alarm is provided in the control room via DEP-LAH-8706 to warn the operator of a leak in the transfer line between the Lab RLD system and the EMF.

4.1.6.1.2 DVP System Monitoring

4.1.6.1.2.1 Evaporator Concentrate Vessel Flow Indication

Flow indication is provided in the control room via DVP-FI-8211, DVP-FI-8212, and DVP-FI-8213 to inform the operator of the purge air supply flow rate to DEP-VSL-00003A, DEP-VSL-00003B, and DEP-VSL-00003C, respectively. There are no alarms associated with these indicators.

4.1.6.1.2.2 Vessel Vent Header Differential Pressure Indication

Differential pressure indication is provided in the control room via DVP-PDI-8105 to inform the operator of the difference between the room pressure in the east evaporator process area (E-0102) and the pressure in the common vessel vent header. DVP-PDI-8105 has high and low alarms to warn the operator that the exhausters (DVP-EXHR-00001A/B) are either running too fast or not meeting the demand of the system.

4.1.6.1.2.3 Vessel Vent Header Temperature Indication

Temperature indication is provided in the control room via DVP-TI-8118 to inform the operator of the temperature of the vent supply to DVP-HTR-00001A/B to help determine whether the units are operating correctly. There are no alarms associated with this indication.

4.1.6.1.2.4 Preheater Outlet Temperature Indication

Temperature indication is provided in the control room via DVP-TI-8107 and DVP-TI-8113 to inform the operator of the temperature of the air discharged from DVP-HTR-00001A and DVP-HTR-00001B, respectively, to help determine whether the units are operating correctly. These indicators have high alarms to warn the operator that the units are providing too much heat to the system.

4.1.6.1.2.5 Preheater Differential Temperature Indication

Differential temperature indication is provided in the control room via DVP-TDI-8107 and DVP-TDI-8113 to inform the operator of the difference between the temperature of the air supplied to DVP-HTR-00001A and DVP-HTR-00001B, respectively, and the temperature of the air discharged from the units. These indicators have low alarms to warn the operator of a mechanical issue with the preheaters while the exhausters are in operation.

4.1.6.1.2.6 Primary HEPA Filter Differential Pressure Indication

Differential pressure indication is provided in the control room via DVP-PDI-8108 and DVP-PDI-8114 to inform the operator of the pressure drop across DVP-HEPA-00003A and DVP-HEPA-00003B, respectively. These indicators have high alarms to warn the operator that the filters have loaded to a point where they could potentially affect the design flow rate of the system and should be changed out.

4.1.6.1.2.7 Secondary HEPA Filter Differential Pressure Indication

Differential pressure indication is provided in the control room via DVP-PDI-8109 and DVP-PDI-8115 to inform the operator of the pressure drop across DVP-HEPA-00004A and DVP-HEPA-00004B, respectively. These indicators have high alarms to warn the operator that the filters have loaded to a point where they could potentially affect the design flow rate of the system and should be changed out.

4.1.6.1.2.8 Exhauster Speed Indication

Speed indication is provided in the control room via DVP-SI-8110 and DVP-SI-8116 to inform the operator of the fan motor shaft speed of DVP-EXHR-00001A and DVP-EXHR-00001B, respectively. These indicators have low alarms to warn the operator of a mechanical issue with the exhausters while the units are running.

4.1.6.1.2.9 Exhauster Flow Indication

Flow indication is provided in the control room via DVP-FI-8111 and DVP-FI-8117 to inform the operator of the discharge flow rate from DVP-EXHR-00001A and DVP-EXHR-00001B, respectively. These indicators have low alarms to warn the operator of a mechanical issue with the exhausters while the units are running.

4.1.6.1.3 ACV System Monitoring

4.1.6.1.3.1 Outside Air Temperature and Humidity Indication

Temperature and humidity indication is provided in the control room via ACV-TI-8101 and ACV-MI-8102, respectively, to assist the operator in the air handling unit evaporator cooler control. There are no alarms associated with these indicators.

4.1.6.1.3.2 AHU Preheater Discharge Temperature Indication

Temperature indication is provided in the control room via ACV-TI-8104 and ACV-TI-8121 to inform the operator of the air temperature downstream of the preheat steam coils in ACV-AHU-00001A and ACV-AHU-00001B, respectively. These indicators have high and low alarms to warn the operator of a mechanical issue with the steam coils.

4.1.6.1.3.3 AHU Low Efficiency Filter Differential Pressure Indication

Differential pressure indication is provided in the control room via ACV-PDI-8105 and ACV-PDI-8122 to inform the operator whether the low efficiency filters in ACV-AHU-00001A and ACV-AHU-00001B, respectively, need to be changed out. There are no alarms associated with these indicators.

4.1.6.1.3.4 AHU High Efficiency Filter Differential Pressure Indication

Differential pressure indication is provided in the control room via ACV-PDI-8106 and ACV-PDI-8123 to inform the operator whether the high efficiency filters in ACV-AHU-00001A and ACV-AHU-00001B, respectively, need to be changed out. There are no alarms associated with these indicators.

4.1.6.1.3.5 AHU Supply Fan Differential Pressure Indication

Differential pressure indication is provided in the control room via ACV-PDI-8116 and ACV-PDI-8133 to inform the operator of the pressure drop across the supply fans in ACV-AHU-00001A and ACV-AHU-00001B, respectively. These indicators have low alarms to warn the operator of a mechanical issue with the fans.

4.1.6.1.3.6 AHU Supply Fan Flow Indication

Flow indication is provided in the control room via ACV-FI-8112 and ACV-FI-8129 to inform the operator of the flow through the supply fans of ACV-AHU-00001A and ACV-AHU-00001B, respectively. These indicators have low alarms to warn the operator that the fans are not providing sufficient flow to the downstream system.

4.1.6.1.3.7 AHU Supply Fan Speed Indication

Speed indication is provided in the control room via ACV-SI-8115 and ACV-SI-8132 to inform the operator of the speed of the supply fans of ACV-AHU-00001A and ACV-AHU-00001B, respectively. These indicators have low alarms to warn the operator of a mechanical issue with the fans.

4.1.6.1.3.8 AHU Supply Fan Inboard Bearing Temperature Indication

Temperature indication is provided in the control room via ACV-TI-8113 and ACV-TI-8130 to inform the operator of the inboard bearing temperature of the supply fans of ACV-AHU-00001A and ACV-AHU-00001B, respectively. These indicators have high alarms to warn the operator that the inboard bearing lubrication is overheating.

4.1.6.1.3.9 AHU Supply Fan Outboard Bearing Temperature Indication

Temperature indication is provided in the control room via ACV-TI-8114 and ACV-TI-8131 to inform the operator of the outboard bearing temperature of the supply fans of ACV-AHU-00001A and ACV-AHU-00001B, respectively. These indicators have high alarms to warn the operator that the outboard bearing lubrication is overheating.

4.1.6.1.3.10 AHU Evaporative Cooling Unit Differential Pressure Indication

Differential pressure indication is provided in the control room via ACV-PDI-8107 and ACV-PDI-8124 to inform the operator of the pressure drop across the evaporative cooling units of ACV-AHU-00001A and ACV-AHU-00001B, respectively. These indicators have high and low alarms to warn the operator of a blockage in the system.

4.1.6.1.3.11 AHU Indirect Evaporative Cooling Differential Temperature Indication

Differential temperature indication is provided in the control room via ACV-TDI-8192 and ACV-TDI-8200 to inform the operator of the temperature drop across the indirect evaporative cooling portion of ACV-AHU-00001A and ACV-AHU-00001B, respectively. There are no alarms associated with these indicators.

4.1.6.1.3.12 AHU Discharge Temperature Indication

Temperature indication is provided in the control room via ACV-TI-8117 and ACV-TI-8134 to inform the operator of the temperature of the air discharged from ACV-AHU-00001A and ACV-AHU-00001B, respectively. There are no alarms associated with these indicators.

4.1.6.1.3.13 AHU Discharge Humidity Indication

Moisture indication is provided in the control room via ACV-MI-8119 and ACV-MI-8136 to inform the operator of the humidity of the air discharged from ACV-AHU-00001A and ACV-AHU-00001B, respectively. These indicators have high and low alarms to warn the operator of a malfunction in the evaporative cooling section of the AHUs.

4.1.6.1.3.14 AHU Discharge Flow Indication

Flow indication is provided in the control room via ACV-FI-8137A to inform the operator of the total flow discharged from the ACV system AHUs to the LAW effluent utility, drain tank, and process buildings. This indicator has high alarms to warn the operator that the total flow has exceeded a predetermined setpoint.

4.1.6.1.3.15 Air Supply to Utility Building Temperature, Pressure, and Flow Indication

Temperature, pressure, and flow indication are provided in the control room via ACV-TI-8138, ACV-PI-8138, and ACV-FI-8138, respectively, to inform the operator of the properties of the air supplied to the LAW effluent utility building. ACV-FI-8138 has a low alarm to warn the operator that the ACV system is not supplying sufficient air flow to the building.

4.1.6.1.3.16 Air Supply to Process Building Temperature, Pressure, and Flow Indication

Temperature, pressure, and flow indication are provided in the control room via ACV-TI-8137, ACV-PI-8137, and ACV-FI-8137, respectively, to inform the operator of the properties of the air supplied to the LAW effluent process building. ACV-FI-8137 has a low alarm to warn the operator that the ACV system is not supplying sufficient air flow to the building.

4.1.6.1.3.17 EU-0101 Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8140 and ACV-PDI-8139, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) maintained in the utility room (EU-0101) of the LAW effluent utility building. ACV-TI-8140 has high and low alarms to warn the operator that the AHUs are not performing correctly and ACV-PDI-8139 has a high alarm to warn the operator of a potential loss of cascade airflow.

4.1.6.1.3.18 EU-0102 Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8142 and ACV-PDI-8141, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) maintained in the filter room (EU-0102) of the LAW effluent utility building. ACV-TI-8142 has high and low alarms to warn the operator that the AHUs are not performing correctly and ACV-PDI-8141 has a high alarm to warn the operator of an excess exhaust fan speed.

4.1.6.1.3.19 E-0101 Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8146 and ACV-PDI-8145, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) maintained in the subchange (E-0101) of the LAW effluent process building. ACV-TI-8146 has high and low alarms to warn the operator that the AHUs are not performing correctly and ACV-PDI-8145 has a high alarm to warn the operator of a potential loss of cascade airflow.

4.1.6.1.3.20 E-0102 Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8158 and ACV-PDI-8157, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) maintained in the east evaporator process area (E-0102) of the LAW effluent process building. ACV-TI-8158 has high and low alarms to warn the operator that the AHUs and unit heaters are not performing correctly and ACV-PDI-8157 has a high alarm to warn the operator of a potential loss of cascade airflow.

4.1.6.1.3.21 E-0102A Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8144 and ACV-PDI-8143, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) maintained in the HEPA filter room (E-0102A) of the LAW effluent process building. ACV-TI-8144 has high and low alarms to warn the operator that the AHUs are not performing correctly and ACV-PDI-8143 has a high alarm to warn the operator of a potential loss of cascade airflow.

4.1.6.1.3.22 E-0103 Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8156 and ACV-PDI-8155, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) maintained in the west evaporator process area (E-0103) of the LAW effluent process building. ACV-TI-8156 has high and low alarms to warn the operator that the AHUs and unit heaters are not performing correctly and ACV-PDI-8155 has a high alarm to warn the operator of an excess exhaust fan speed.

4.1.6.1.3.23 E-0104 Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8148 and ACV-PDI-8147, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) maintained in the airlock (E-0104) of the LAW effluent process building. ACV-TI-8148 has high and low alarms to warn the operator that the AHUs are not performing correctly and ACV-PDI-8147 has a high alarm to warn the operator of a potential loss of cascade airflow.

4.1.6.1.3.24 ED-0101 Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8150 and ACV-PDI-8149, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) maintained in the subchange (ED-0101) of the LAW effluent drain tank building. ACV-TI-8150 has high and low alarms to warn the operator that the AHUs are not performing correctly and ACV-PDI-8149 has a high alarm to warn the operator of a potential loss of cascade airflow.

4.1.6.1.3.25 ED-0102 Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8152 and ACV-PDI-8151, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) maintained in the drain tank maintenance area (ED-0102) of the LAW effluent drain tank building. ACV-TI-8152 has high and low alarms to warn the operator that the AHUs and unit heaters are not performing correctly and ACV-PDI-8151 has a high alarm to warn the operator of a potential loss of cascade airflow.

4.1.6.1.3.26 ED-B001 Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8154 and ACV-PDI-8153, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) maintained in the drain tank cell (ED-B001) of the LAW effluent drain tank building. ACV-TI-8154 has high and low alarms to warn the operator that the AHUs and unit heaters are not performing correctly and ACV-PDI-8153 has a high alarm to warn the operator of a potential loss of cascade airflow.

4.1.6.1.3.27 Fume Hood Temperature, Pressure, and Flow Indication

Temperature, pressure, and flow indication are provided in the control room via ACV-TI-8159, ACV-PI-8159, and ACV-FI-8159, respectively, to inform the operator of the properties of the air exhausted from DEP-HOOD-00001. ACV-FI-8159 has a high alarm to warn the operator that the air flow from the fume hood to the exhaust header has exceeded the operational limit established during system balancing.

4.1.6.1.3.28 Exhaust Header Temperature and Differential Pressure Indication

Temperature and differential pressure indication are provided in the control room via ACV-TI-8163 and ACV-PDI-8161, respectively, to inform the operator of the temperature and pressure (relative to atmospheric) of the combined exhaust from the LAW effluent process and utility buildings. ACV-TI-8163 has a high alarm to warn the operator that the exhaust has the potential to damage the HEPA filters and ACV-PDI-8161 has a high alarm to warn the operator of an excess exhaust fan speed.

4.1.6.1.3.29 HEPA Filter Differential Pressure Indication

Differential pressure indication is provided in the control room via ACV-PDI-8160 to inform the operator of the pressure drop across the ACV system HEPA filter bank. ACV-PDI-8160 has a high alarm to warn the operator that the HEPA filters need to be changed out.

4.1.6.1.3.30 Exhaust Fan Differential Pressure Indication

Differential pressure indication is provided in the control room via ACV-PDI-8183 and ACV-PDI-8189 to inform the operator of the pressure drop across ACV-FAN-00001A and ACV-FAN-00001B, respectively. These indicators have low alarms to warn the operator of a mechanical issue with the fans.

4.1.6.1.3.31 Exhaust Fan Speed Indication

Speed indication is provided in the control room via ACV-SI-8181 and ACV-SI-8187 to inform the operator of the speed of ACV-FAN-00001A and ACV-FAN-00001B, respectively. These indicators have low alarms to warn the operator of a mechanical issue with the fans.

4.1.6.1.3.32 Exhaust Fan Inboard Bearing Temperature Indication

Temperature indication is provided in the control room via ACV-TI-8180 and ACV-TI-8186 to inform the operator of the inboard bearing temperature of ACV-FAN-00001A and ACV-FAN-00001B, respectively. These indicators have high alarms to warn the operator that the inboard bearing lubrication is overheating.

4.1.6.1.3.33 Exhaust Fan Outboard Bearing Temperature Indication

Temperature indication is provided in the control room via ACV-TI-8182 and ACV-TI-8188 to inform the operator of the outboard bearing temperature of ACV-FAN-00001A and ACV-FAN-00001B, respectively. These indicators have high alarms to warn the operator that the outboard bearing lubrication is overheating.

4.1.6.1.3.34 Exhaust Air Temperature, Pressure, and Flow Indication

Temperature, pressure, and flow indication are provided in the control room via ACV-TI-8191, ACV-PI-8191, and ACV-FI-8191, respectively, to inform the operator of the properties of the air stream exhausted from the ACV system to the atmosphere through the EMF stack. ACV-FI-8191 has low alarms to warn the operator that the system is not providing the required exhaust air flow to meet the requirements of the ORD.

4.1.6.2 Control Capability and Locations

The following components are manually operated during normal operations and can be operated locally (at the panel/component):

4.1.6.2.1 DEP System Control Capability and Locations

- DEP-V-44462 and DEP-V-44647 are manually opened to provide demineralized water and plant service air, respectively, to DEP-HOOD-00001 during sampling campaigns.
- DEP-V-44212 is manually throttled to prevent cavitation of the demineralized water addition valve (DVP-YV-8117) supplying the DEP-VSL-00001 overflow loop seal.
- DEP-PMP-00042A and DEP-PMP-00042B are manually operated from DEP-PNL-00002 and DEP-PNL-00003, respectively, located near DEP-HOOD-00001 in room E-0102.

4.1.6.2.2 DVP System Control Capability and Locations

- The vessel balancing valves are manually positioned to align the flow rate from the headspace of the DEP system vessels to the established flow rate and then locked in position. DVP-V-00020 controls the flow rate from DEP-VSL-00001, DVP-V-00018 controls the flow rate from DEP-VSL-00002, DVP-V-00012/00014/00016 controls the flow rate from DEP-VSL-00003A/B/C, DVP-V-00006/00008 controls the flow rate from DEP-VSL-00004A/B, DVP-V-00002/00004 controls the flow rate from DEP-VSL-00005A/B, and DVP-V-00010 controls the flow rate from DEP-COND-00003.

4.1.6.2.3 ACV System Control Capability and Locations

There are no system features that require direct manual operation at the component location.

4.1.6.3 Automatic and Manual Actions

The following subsections describe the conditions under which important features are activated and whether these features are activated automatically or manually. For additional details, refer to the operating procedures that govern the operator responses to alarms.

Note: Sections marked with [*] are instances where the C&I control logic diagrams are not in alignment with the issued P&IDs. These sections are completed in accordance with the P&IDs and will be confirmed at a later document revision once the logic diagrams are re-issued.

4.1.6.3.1 DEP System Automatic and Manual Actions

4.1.6.3.1.1 Evaporator Feed Subsystem Automatic and Manual Actions

4.1.6.3.1.1.1 LAW RLD, LAW LVP, and Lab RLD Drain Valves

The drain valves on the transfer lines from the LAW RLD, LAW LVP, and Lab RLD systems to the EMF, DEP-YV-8101 (DEP-YC-8101), DEP-YV-8102 (DEP-YC-8102), and DEP-YV-8103 (DEP-YC-8103), are controlled in the manual mode. The operator can open and close the valves as needed to drain the transfer piping to the low point drain vessel (DEP-VSL-00001). [Reference: 24590-BOF-J3-DEP-70101]

4.1.6.3.1.1.2 Low Point Drain Vessel Agitator

The low point drain vessel agitator, DEP-AGT-00001 (DEP-YC-8104), is controlled in the manual mode. The operator can start and stop the unit as needed to mix the contents of DEP-VSL-00001 and to help prevent buildup of settled solids in the waste. [Reference: 24590-BOF-J3-DEP-70106]

4.1.6.3.1.1.3 Low Point Drain Vessel Loop Seal Valve*

The low point drain vessel loop seal valve, DEP-YV-8117 (DEP-YC-8117), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to add demineralized water to the loop seal. When it is operated in the auto mode, the valve is controlled by DEP-LSH-8113A. [Reference: 24590-BOF-J3-DEP-70104]

4.1.6.3.1.1.4 Low Point Drain Vessel Pumps

The low point drain vessel pumps, DEP-PMP-00001A/B (DEP-YC-8105/8107), can be controlled in either the manual or auto mode. When the pumps are placed in the manual mode, the operator can start and stop the pumps as needed to transfer DEP-VSL-00001 effluent to DEP-FILT-00003 or recirculate the vessel contents. When they are placed in the auto mode, the pumps are controlled by DEP-HS-8105. [Reference: 24590-BOF-J3-DEP-70102]

4.1.6.3.1.1.5 Low Point Drain Vessel Pump Handswitch

The low point drain vessel pump handswitch (DEP-HS-8105D) is operated manually to start and stop DEP-PMP-00001A/B. [Reference: 24590-BOF-J3-DEP-70003]

4.1.6.3.1.1.6 Low Point Drain Vessel Pump Flush Valve

The low point drain vessel pump flush valve, DEP-YV-8119 (DEP-YC-8119), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to flush the common discharge line from DEP-PMP-00001A/B with process condensate from DEP-VSL-00005A/B. When it is operated in the auto mode, the valve is controlled by DEP-HS-8199. [Reference: 24590-BOF-J3-DEP-70104]

4.1.6.3.1.1.7 Low Point Drain Vessel Recirculation Valve

The low point drain vessel recirculation valve, DEP-YV-8106 (DEP-YC-8106) is controlled in the manual mode. The operator can open and close the valve as needed to recirculate the contents of DEP-VSL-00001 for sampling. [Reference: 24590-BOF-J3-DEP-70103]

4.1.6.3.1.1.8 Low Point Drain Vessel Transfer Valve

The low point drain vessel transfer valve, DEP-YV-8108 (DEP-YC-8108), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to allow the transfer of DEP-VSL-00001 effluent to DEP-FILT-00003. When it is operated in the auto mode, the valve is controlled by DEP-HS-8199. [Reference: 24590-BOF-J3-DEP-70103]

4.1.6.3.1.1.9 Evaporator Feed Vessel Inlet Valve

The evaporator feed vessel inlet valve, DEP-YV-8152 (DEP-YC-8152), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to allow filtered effluent into DEP-VSL-00002. When it is operated in the auto mode, the valve is controlled by DEP-HS-8199. [Reference: 24590-BOF-J3-DEP-70201]

4.1.6.3.1.1.10 Evaporator Feed Vessel Sodium Hydroxide Valve

The evaporator feed vessel sodium hydroxide valve, DEP-YV-8151 (DEP-YC-8151), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to add caustic to DEP-VSL-00002. When it is operated in the auto mode, the valve is controlled by SHR-HS-8310. [Reference: 24590-BOF-J3-DEP-70201]

4.1.6.3.1.1.11 Evaporator Feed Vessel Recycled Condensate Valve

The evaporator feed vessel recycled condensate valve, DEP-YV-8153 (DEP-YC-8153), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to add off-specification recycled condensate from DEP-VSL-00004A/B to DEP-VSL-00002. When it is operated in the auto mode, the valve is controlled by DEP-HS-8323B. [Reference: 24590-BOF-J3-DEP-70202]

4.1.6.3.1.1.12 Evaporator Feed Vessel Transfer Pump Suction Valve

The evaporator feed vessel transfer pump suction valve, DEP-YV-8154 (DEP-YC-8154) is controlled manually. The operator can open and close the valve to enable the transfer of feed to DEP-EVAP-00001. [Reference: 24590-BOF-J3-DEP-70203]

4.1.6.3.1.1.13 Evaporator Feed Vessel Recirculation Pump Suction Valve

The evaporator feed vessel recirculation pump suction valve, DEP-YV-8155 (DEP-YC-8155) is controlled manually. The operator can open and close the valve to recirculate the contents of DEP-VSL-00002 through the vessel eductors. [Reference: 24590-BOF-J3-DEP-70203]

4.1.6.3.1.1.14 Evaporator Feed Vessel Transfer Pumps

The evaporator feed vessel transfer pumps, DEP-PMP-00002A/B (DEP-YC-8176/8179) can be controlled in either the manual or auto mode. When the pumps are placed in the manual mode, the operator can start and stop the pumps as needed to transfer evaporator feed from DEP-VSL-00002 to DEP-EVAP-00001. When they are operated in the auto mode, the pumps are controlled by DEP-HS-8176. [Reference: 24590-BOF-J3-DEP-70205]

4.1.6.3.1.1.15 Evaporator Feed Flow Control Valve

The evaporator feed flow control valve (DEP-LV-8211) is automatically controlled by DEP-FC-8182, based on inputs from DEP-LC-8211 and DEP-FI-8182. [Reference: 24590-BOF-J3-DEP-71206]

4.1.6.3.1.1.16 Evaporator Feed Totalizer

The evaporator feed totalizer (DEP-FQI-8182) can be manually reset using its associated handswitch. [Reference: 24590-BOF-J3-DEP-71206]

4.1.6.3.1.1.17 Evaporator Feed Vessel Recirculation Pumps

The evaporator feed vessel recirculation pumps, DEP-PMP-00012A/B/C (DEP-YC-8160/8163/8166) can be controlled in either the manual or auto mode. When the pumps are placed in the manual mode, the operator can start and stop the pumps as needed to recirculate the contents of DEP-VSL-00002 through the vessel eductors. When they are operated in the auto mode, the pumps are controlled by DEP-HS-8160. [Reference: 24590-BOF-J3-DEP-70204]

4.1.6.3.1.1.18 Evaporator Feed Vessel Recirculation Pump Handswitch

The evaporator feed vessel recirculation pump handswitch (DEP-HS-8160D) is operated manually to start and stop DEP-PMP-00012A/B/C. The operator can choose whether to recirculate the contents of DEP-VSL-00002 or transfer conditioned effluent to Tank Farms. [Reference: 24590-BOF-J3-DEP-70003]

4.1.6.3.1.1.19 Evaporator Feed Vessel Mixing & Transfer Handswitch

The evaporator feed vessel mixing and transfer handswitch (DEP-HS-8902) is operated manually to select whether to recirculate the contents of DEP-VSL-00002 through eductors for mixing or to transfer the vessel contents to Tank Farms. The handswitch can be manually reset after the selected operation has completed. [Reference: 24590-BOF-J3-DEP-70218]

4.1.6.3.1.1.20 Evaporator Feed Vessel Eductor Supply Valve

The evaporator feed vessel eductor supply valve (DEP-FV-8172) is automatically controlled by DEP-FC-8172, based on input from DEP-FI-8172, DEP-LI-8156, and whether vessel mixing is selected using DEP-HS-8902. [Reference: 24590-BOF-J3-DEP-71203]

4.1.6.3.1.1.21 Evaporator Feed Vessel Eductor Flow Totalizer

The evaporator feed vessel eductor flow totalizer (DEP-FQI-8172) is manually reset using its associated handswitch after the vessel contents are mixed for an appropriate amount of time. [Reference: 24590-BOF-J3-DEP-71204]

4.1.6.3.1.1.22 Tank Farm Transfer Flow Control Valve

The tank farm transfer flow control valve (DEP-FV-8908) is automatically controlled by DEP-FC-8908, based on input from DEP-FI-8908 and whether a tank farm transfer is selected using DEP-HS-8902. [Reference: 24590-BOF-J3-DEP-71205]

4.1.6.3.1.1.23 Tank Farm Transfer Flow Totalizer

The tank farm transfer flow totalizer (DEP-FQI-8908) is manually reset using its associated handswitch after the transfer volume reaches a predetermined setpoint and DEP-PMP-00012A/B/C are stopped. [Reference: 24590-BOF-J3-DEP-71205]

4.1.6.3.1.1.24 Evaporator Feed Mixing Valve

The evaporator feed mixing valve, DEP-YV-8912 (DEP-YC-8912), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to transfer evaporator feed from DEP-VSL-00002 to Tank Farms via DEP-HX-00001. When it is operated in the auto mode, the valve is controlled by DEP-HS-8902. [Reference: 24590-BOF-J3-DEP-70210]

4.1.6.3.1.1.25 Filtered Concentrate Mixing Valve

The filtered concentrate mixing valve, DEP-YV-8911 (DEP-YC-8911), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to transfer off-specification concentrate from DEP-VSL-00003A/B/C to Tank Farms via DEP-HX-00001. When it is operated in the auto mode, the valve is controlled by DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-70210]

4.1.6.3.1.1.26 Demineralized Water Mixing Valve

The demineralized water mixing valve, DEP-YV-8913 (DEP-YC-8913), is controlled manually. The operator can open and close the valve to flush the effluent return line to Tank Farms. [Reference: 24590-BOF-J3-DEP-70211]

4.1.6.3.1.1.27 Process Condensate Mixing Valve

The process condensate mixing valve, DEP-YV-8914 (DEP-YC-8914), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to dilute the evaporator feed/concentrate transferred from DEP-VSL-00003A/B/C to Tank Farms. When it is operated in the auto mode, the valve is controlled by DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-70211]

4.1.6.3.1.1.28 Sodium Nitrite Mixing Valve

The sodium nitrite mixing valve, DEP-YV-8915 (DEP-YC-8915), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to add sodium nitrite to the evaporator feed/concentrate stream transferred to Tank Farms in accordance with ICD-31 requirements. When it is operated in the auto mode, the valve is controlled by DEP-HS-8902 and DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-70212]

4.1.6.3.1.1.29 Effluent Cooler Flow Control Valve

The effluent cooler flow control valve (DEP-FV-8910) is automatically controlled by DEP-FC-8910, based on input from DEP-FI-8909, DEP-FI-8910 and whether a tank farm transfer is selected using DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-71208]

4.1.6.3.1.1.30 Process Condensate Flow Totalizer

The process condensate flow totalizer (DEP-FQI-8910) is manually reset using its associated handswitch after the transfer of evaporator feed/concentrate to Tank Farms has completed. [Reference: 24590-BOF-J3-DEP-71208]

4.1.6.3.1.1.31 Effluent Cooler Discharge Valve

The effluent cooler discharge valve, DEP-YV-8405 (DEP-YC-8405), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to transfer conditioned effluent to Tank Farms. When it is operated in the auto mode, the valve is controlled by DEP-HS-8902 and DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-70213]

4.1.6.3.1.1.32 Effluent Cooler Drain Valve

The effluent cooler drain valve, DEP-YV-8409 (DEP-YC-8409), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to divert the Tank Farms transfer line to DEP-VSL-00001. When it is operated in the auto mode, the valve is controlled by DEP-HS-8431A and DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-70213/70515]

4.1.6.3.1.1.33 Plant Cooling Water Return Valve

The plant cooling water return valve, DEP-YV-8412 (DEP-YC-8412), is controlled manually. The operator can open and close the valve to return water to the PCW system from DEP-HX-00001. [Reference: 24590-BOF-J3-DEP-70213]

4.1.6.3.1.1.34 Effluent Cooler Discharge Flow Totalizer*

The effluent cooler discharge flow totalizer (DEP-FQI-8404) is manually reset using its associated handswitch after the transfer from DEP-HX-00001 to Tank Farms has completed. [Reference: TBD]

4.1.6.3.1.1.35 Evaporator Feed Prefilter Air Supply Valve

The evaporator feed prefilter air supply valve, DEP-YV-8184 (DEP-YC-8184), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to backflush DEP-FILT-00003 with air from the PSA system. When it is operated in the auto mode, the valve is controlled by DEP-UK-8901. [Reference: 24590-BOF-J3-DEP-70206]

4.1.6.3.1.1.36 Evaporator Feed Prefilter Lab Effluent Supply Valve

The evaporator feed prefilter Lab effluent supply valve, DEP-YV-8188 (DEP-YC-8188), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to transfer Lab RLD system effluent to DEP-VSL-00002 through DEP-FILT-00003. When it is operated in the auto mode, the valve is controlled by DEP-HS-8199. [Reference: 24590-BOF-J3-DEP-70207]

4.1.6.3.1.1.37 Evaporator Feed Prefilter LAW Effluent Supply Valve

The evaporator feed prefilter LAW effluent supply valve, DEP-YV-8189 (DEP-YC-8189), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to transfer LAW RLD system effluent to DEP-VSL-00002 through DEP-FILT-00003. When it is operated in the auto mode, the valve is controlled by DEP-HS-8199. [Reference: 24590-BOF-J3-DEP-70207]

4.1.6.3.1.1.38 Evaporator Feed Prefilter Low Point Drain Supply Valve*

The evaporator feed prefilter low point drain supply valve, DEP-YV-8186 (DEP-YC-8186), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to transfer DEP-VSL-00001 and DEP-SUMP-00001 effluent to DEP-VSL-00002 through DEP-FILT-00003. When it is operated in the auto mode, the valve is controlled by TBD. [Reference: TBD]

4.1.6.3.1.1.39 Evaporator Feed Prefilter RLD Effluent Supply Valve*

The evaporator feed prefilter RLD effluent supply valve, DEP-YV-8187 (DEP-YC-8187), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to transfer RLD system (LAW and Lab) effluent to DEP-VSL-00002 through DEP-FILT-00003. When it is operated in the auto mode, the valve is controlled by TBD. [Reference: TBD]

4.1.6.3.1.1.40 Evaporator Feed Prefilter Backflush Valve*

The evaporator feed prefilter backflush valve, DEP-YV-8190 (DEP-YC-8190), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to backflush solids in DEP-FILT-00003 to DEP-VSL-00003A/B/C. When it is operated in the auto mode, the valve is controlled by TBD. [Reference: 24590-BOF-J3-DEP-70219]

4.1.6.3.1.1.41 Evaporator Feed Prefilter Handswitch

The evaporator feed prefilter handswitch (DEP-HS-8199) is operated manually to align DEP system valves to allow transfers through DEP-FILT-00003. [Reference: 24590-BOF-J3-DEP-70214]

4.1.6.3.1.1.42 Evaporator Feed Prefilter Backflush Sequence

DEP-UK-8901 is the automated sequence controller and interface for DEP-FILT-00003 backflushes and is used to transfer entrained solids to DEP-VSL-00003A/B/C using air from the PSA system. When the sequence handswitch is placed in the auto mode, the sequence is initiated by input from DEP-PI-8194 and DEP-PDI-8192. The sequence can also be started manually. [Reference: 24590-BOF-J3-DEP-72201001/2/3/4]

4.1.6.3.1.2 Evaporator Process Subsystem Automatic and Manual Actions

4.1.6.3.1.2.1 Evaporator Recirculation Pump*

The evaporator recirculation pump, DEP-PMP-00017 (DEP-YC-8213) can be controlled in either the manual or auto mode. When the pump is placed in the manual mode, the operator can start and stop the pump as needed to recirculate the concentrated effluent in DEP-EVAP-00001 through DEP-RBLR-00001. When it is operated in the auto mode, the pump is controlled by TBD. [Reference: 24590-BOF-J3-DEP-70303]

4.1.6.3.1.2.2 Evaporator Mesh Spray Flow Control Valve

The evaporator mesh spray flow control valve (DEP-FV-8203) is automatically controlled by DEP-FC-8203, based on input from DEP-FI-8203 and whether DEP-YV-8204 is open. [Reference: 24590-BOF-J3-DEP-71301]

4.1.6.3.1.2.3 Evaporator Mesh Spray Valve

The evaporator mesh spray valve, DEP-YV-8204 (DEP-YC-8204), is controlled in the manual mode. The operator can open and close the valve to allow for the continuous washing of the bottom of the evaporator mesh pad. [Reference: 24590-BOF-J3-DEP-70301]

4.1.6.3.1.2.4 Evaporator Anti-foam Addition Valve

The evaporator anti-foam addition valve, DEP-YV-8205 (DEP-YC-8205), is controlled in the manual mode. The operator can open and close the valve to prevent foam accumulation in DEP-EVAP-00001. [Reference: 24590-BOF-J3-DEP-70302]

4.1.6.3.1.2.5 Evaporator Purge Air Valve

The evaporator purge air valve, DEP-YV-8287 (DEP-YC-8287), is controlled in the manual mode. The operator can open and close the valve to break the vacuum of the evaporator system for maintenance activities. [Reference: 24590-BOF-J3-DEP-70304]

4.1.6.3.1.2.6 Evaporator Pressure Control Valve

The evaporator pressure control valve (DEP-PV-8209) is automatically controlled by DEP-PC-8209, based on input from DEP-PI-8209. [Reference: 24590-BOF-J3-DEP-71303]

4.1.6.3.1.2.7 Reboiler Temperature Control*

The temperature of the reboiler and evaporator is automatically controlled by DEP-TC-8214, based on input from DEP-TI-8214. The temperature controller uses the temperature input to throttle the steam control valve in the HPS system. [Reference: 24590-BOF-J3-DEP-71305]

4.1.6.3.1.2.8 Reboiler Level Control Valve

The reboiler level control valve (DEP-LV-8216) is automatically controlled by DEP-LC-8216, based on input from DEP-LI-8216 and DEP-CI-8218. [Reference: 24590-BOF-J3-DEP-71306]

4.1.6.3.1.2.9 Evaporator Concentrate Discharge Pumps

The evaporator concentrate discharge pumps, DEP-PMP-00007A/B (DEP-YC-8222/8225) can be controlled in either the manual or auto mode. When the pumps are placed in the manual mode, the operator can start and stop the pumps as needed to monitor the concentrate at DEP-SKID-00005 and eventually transfer the solution to DEP-VSL-00003A/B/C. When they are operated in the auto mode, the pumps are controlled by DEP-HS-8222. [Reference: 24590-BOF-J3-DEP-70306]

4.1.6.3.1.2.10 Evaporator Concentrate Handswitch

The evaporator concentrate handswitch (DEP-HS-8220) is operated manually to select the destination vessel for DEP-EVAP-00001 concentrate. The operator can select DEP-VSL-00003A, DEP-VSL-00003B, DEP-VSL-00003C, or reset the switch. [Reference: 24590-BOF-J3-DEP-70308]

4.1.6.3.1.2.11 Evaporator Concentrate Flow and Density Control Valves*

The evaporator concentrate flow control valves (DEP-FV-8227A/B) and density control valve (DEP-DV-8228) can be controlled in either the manual or auto mode. When the valves are placed in the manual mode using DEP-HK-8227A, DEP-HK-8227B, and DEP-HK-8228, respectively, the operator can change the setpoint of the density control valve and set the flow control valve percentage to a desired value. Additionally, DEP-FV-8227B can be operated manually using DEP-YC-8227B. When they are operated in the auto mode, the valves are controlled by the density, radiation, and flow programmable logic controller (DEP-UC-8233), based on inputs from DEP-FT-8227, DEP-FT-8228, and DEP-RT-8229. [Reference: 24590-BOF-J3-DEP-71308]

4.1.6.3.1.2.12 Off-Specification Evaporator Concentrate Totalizer

The off-specification evaporator concentrate totalizer (DEP-FQI-8227) is manually reset using its associated handswitch after the transfer of concentrate from DEP-PMP-00007A/B to DEP-VSL-00002 has completed. [Reference: 24590-BOF-J3-DEP-71307]

4.1.6.3.1.2.13 Evaporator Concentrate Totalizer

The evaporator concentrate totalizer (DEP-FQI-8230) is manually reset using its associated handswitch. [Reference: 24590-BOF-J3-DEP-71307]

4.1.6.3.1.2.14 Off-Specification Evaporator Concentrate Drain Valve

The off-specification evaporator concentrate drain valve, DEP-YV-8285 (DEP-YC-8285), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve to drain the remaining off-specification concentrate and flush water in the off-specification transfer line to DEP-VSL-00001. When it is operated in the auto mode, the valve is controlled by DEP-FV-8227B. [Reference: 24590-BOF-J3-DEP-70307]

4.1.6.3.1.2.15 Steam Ejector Inlet Valve

The steam ejector inlet valve, DEP-YV-8234 (DEP-YC-8234), is controlled in the manual mode. The operator can open and close the valve to transfer high pressure steam to DEP-EJCTR-00001A/B and DEP-EJCTR-00002A/B from the HPS system. [Reference: 24590-BOF-J3-DEP-70309]

4.1.6.3.1.2.16 Steam Ejector Purge Air Valve

The steam ejector purge air valve, DEP-YV-8248 (DEP-YC-8248), is controlled in the manual mode. The operator can open and close the valve to break the vacuum of the steam ejector system for maintenance activities. [Reference: 24590-BOF-J3-DEP-70309]

4.1.6.3.1.2.17 Condenser Inlet Valve

The condenser inlet valve, DEP-YV-8217 (DEP-YC-8217), is controlled in the manual mode. The operator can open and close the valve to transfer cooling water to DEP-COND-00001/2/3 from the PCW system. [Reference: 24590-BOF-J3-DEP-70309]

4.1.6.3.1.2.18 Steam Ejector Pressure Control Valve*

The steam ejector pressure control valve (DEP-PV-8241A) is automatically controlled by DEP-PC-8241, based on input from DEP-PI-8241. [Reference: 24590-BOF-J3-DEP-71310]

4.1.6.3.1.2.19 Evaporator Condensate Pumps

The evaporator condensate pumps, DEP-PMP-00006A/B (DEP-YC-8258/8259) can be controlled in either the manual or auto mode. When the pumps are placed in the manual mode, the operator can start and stop the pumps as needed to transfer DEP-COND-00001 condensate to the downstream users. When they are operated in the auto mode, the pumps are controlled by DEP-HS-8258. [Reference: 24590-BOF-J3-DEP-70311]

4.1.6.3.1.2.20 Condenser Transfer Level Control Valve

The condenser transfer level control valve (DEP-LV-8251A) is automatically controlled by DEP-LC-8251A, based on input from DEP-LI-8251, DEP-CI-8257, and the position of DEP-YV-8301/8308. [Reference: 24590-BOF-J3-DEP-71311]

4.1.6.3.1.2.21 Condenser Recirculation Level Control Valve

The condenser recirculation level control valve (DEP-LV-8251B) is automatically controlled by DEP-LC-8251B, based on input from DEP-LI-8251, DEP-CI-8257, and the position of DEP-YV-8301/8308 and DEP-LV-8251B. [Reference: 24590-BOF-J3-DEP-71311]

4.1.6.3.1.2.22 Reboiler Condensate Make-Up Valve*

The reboiler condensate make-up valve, DEP-YV-8219 (DEP-YC-8219), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve to add demineralized water from the DIW system to DEP-VSL-00008. When it is operated in the auto mode, the valve is controlled by DEP-LI-8274. [Reference: 24590-BOF-J3-DEP-70313]

4.1.6.3.1.2.23 Reboiler Condensate Pumps*

The reboiler condensate pumps, DEP-PMP-00008A/B (DEP-YC-8269) can be controlled in either the manual or auto mode. When the pumps are placed in the manual mode, the operator can start and stop the pumps as needed to transfer reboiler condensate from DEP-VSL-00008 to the SCW system. When they are operated in the auto mode, the pumps are controlled by DEP-LI-8274. [Reference: 24590-BOF-J3-DEP-70314]

4.1.6.3.1.2.24 Reboiler Condensate Transfer Valve

The reboiler condensate transfer valve, DEP-YV-8275 (DEP-YC-8275), is controlled in the manual mode. The operator can open and close the valve to allow the transfer of reboiler condensate from DEP-VSL-00008 to the SCW system. [Reference: 24590-BOF-J3-DEP-70313]

4.1.6.3.1.2.25 Contaminated Reboiler Condensate Transfer Valve

The contaminated reboiler condensate transfer valve, DEP-YV-8276 (DEP-YC-8276), is controlled in the manual mode. The operator can open and close the valve to allow the transfer of contaminated reboiler condensate from DEP-VSL-00008 to DEP-VSL-00002. [Reference: 24590-BOF-J3-DEP-70313]

4.1.6.3.1.3 Evaporator Discharge Subsystem Automatic and Manual Actions

4.1.6.3.1.3.1 Evaporator Concentrate Vessel Backflush Inlet Valves

The evaporator concentrate vessel backflush inlet valves, DEP-YV-8196/8197/8198 (DEP-YC-8196/8197/8198), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves as needed to transfer DEP-FILT-00003 solids to DEP-VSL-00003A/B/C, respectively. When they are operated in the auto mode, the valves are controlled by DEP-HS-8220 and DEP-UK-8901. [Reference: 24590-BOF-J3-DEP-70208/70209]

4.1.6.3.1.3.2 Evaporator Feed Prefilter Concentrate Supply Valve

The evaporator feed prefilter concentrate supply valve, DEP-YV-8397 (DEP-YC-8397), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve as needed to transfer evaporator concentrate from DEP-VSL-00003A/B/C to Tank Farms through DEP-FILT-00003. When it is operated in the auto mode, the valve is controlled by DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-70510]

4.1.6.3.1.3.3 Evaporator Concentrate Vessels Supply Handswitch*

The evaporator concentrate vessels supply handswitch (DEP-HS-8431A) is operated manually to select the evaporator concentrate vessel (DEP-VSL-00003A/B/C) to empty or flush. The operator can choose which vessel to discharge from, to flush the vessel discharge line with process condensate, or reset the handswitch. [Reference: 24590-BOF-J3-DEP-70501]

4.1.6.3.1.3.4 Evaporator Concentrate Vessel Inlet Valves

The evaporator concentrate vessel inlet valves, DEP-YV-8353/8364/8375 (DEP-YC-8353/8364/8375), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves as needed to fill DEP-VSL-00003A/B/C with concentrate from DEP-EVAP-00001. When they are operated in the auto mode, the valves are controlled by DEP-HS-8220. [Reference: 24590-BOF-J3-DEP-70503/70505/70507]

4.1.6.3.1.3.5 Evaporator Concentrate Vessel Sodium Hydroxide Valves

The evaporator concentrate vessel sodium hydroxide valves, DEP-YV-8354/8367/8378 (DEP-YC-8354/8367/8378), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to transfer sodium hydroxide from the SHR system to DEP-VSL-00003A/B/C. When they are operated in the auto mode, the valves are controlled by SHR-HS-8310. [Reference: 24590-BOF-J3-DEP-70503/70505/70507]

4.1.6.3.1.3.6 Evaporator Concentrate Vessel Outlet Valves

The evaporator concentrate vessel outlet valves, DEP-YV-8360/8371/8382 (DEP-YC-8360/8371/8382), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to transfer DEP-VSL-00003A/B/C concentrate to the downstream users. When they are operated in the auto mode, the valves are controlled by DEP-HS-8431A. [Reference: 24590-BOF-J3-DEP-70504/70506/70508]

4.1.6.3.1.3.7 Evaporator Concentrate Vessel Flush Valve

The evaporator concentrate vessel flush valve, DEP-YV-8361 (DEP-YC-8361), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve to flush the DEP-VSL-00003A/B/C combined outlet line with process condensate from DEP-VSL-00005A/B. When it is operated in the auto mode, the valve is controlled by DEP-HS-8431A. [Reference: 24590-BOF-J3-DEP-70504]

4.1.6.3.1.3.8 Evaporator Concentrate Transfer/Recirculation Pumps

The evaporator concentrate transfer/recirculation pumps, DEP-PMP-00003A/B (DEP-YC-8386/8391) can be controlled in either the manual or auto mode. When the pumps are placed in the manual mode, the operator can start and stop the pumps as needed to transfer DEP-VSL-00003A/B/C concentrate to the LAW Facility or recirculate the vessel contents through eductors for mixing. When they are operated in the auto mode, the pumps are controlled by DEP-HS-8386. [Reference: 24590-BOF-J3-DEP-70509]

4.1.6.3.1.3.9 Evaporator Concentrate Transfer/Recirculation Pump Handswitch

The evaporator concentrate transfer/recirculation pump handswitch (DEP-HS-8386D) is operated manually to start and stop DEP-PMP-00003A/B. The operator can choose whether to start the pumps for normal operations, initiate a transfer of concentrate to Tank Farms in the event that the LAW Facility is unavailable for transfers, or stop the pumps. [Reference: 24590-BOF-J3-DEP-70003]

4.1.6.3.1.3.10 Evaporator Concentrate Vessels Transfer Handswitch

The evaporator concentrate vessels transfer handswitch (DEP-HS-8431B) is operated manually to either select the evaporator concentrate vessel (DEP-VSL-00003A/B/C) to mix, transfer concentrate to the LAW Facility, transfer concentrate to Tank Farms through DEP-FILT-00003, or reset the handswitch. [Reference: 24590-BOF-J3-DEP-70515]

4.1.6.3.1.3.11 Concentrate to LAW Flow Control Valve

The concentrate to LAW flow control valve (DEP-FV-8395) is automatically controlled by DEP-FC-8395, based on input from DEP-FI-8395 and whether a LAW transfer is selected using DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-71507]

4.1.6.3.1.3.12 Concentrate to LAW Flow Totalizer

The concentrate to LAW flow totalizer (DEP-FQI-8395) is manually reset using its associated handswitch after the transfer of concentrate from DEP-PMP-00003A/B to the LAW Facility has completed. [Reference: 24590-BOF-J3-DEP-71507]

4.1.6.3.1.3.13 Evaporator Concentrate Vessel Transfer Valve

The evaporator concentrate vessel transfer valve, DEP-YV-8396 (DEP-YC-8396), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve to allow the transfer of evaporator concentrate to the LAW Facility. When it is operated in the auto mode, the valve is controlled by DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-70510]

4.1.6.3.1.3.14 Concentrate to Tank Farms Flow Control Valve

The concentrate to Tank Farms flow control valve (DEP-FV-8909) is automatically controlled by DEP-FC-8909, based on input from DEP-FI-8909 and whether a Tank Farms transfer is selected using DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-71508]

4.1.6.3.1.3.15 Concentrate to Tank Farms Flow Totalizer

The concentrate to Tank Farms flow totalizer (DEP-FQI-8909) is manually reset using its associated handswitch after the transfer of concentrate from DEP-PMP-00003A/B to Tank Farms has completed. [Reference: 24590-BOF-J3-DEP-71508]

4.1.6.3.1.3.16 TOC Transfer Valves*

The TOC transfer valves, DEP-YV-8679 (DEP-YC-8679) and DEP-YV-8687 (DEP-YC-8687), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to allow the transfer of treated feed from the TOC to the LAW Facility.While in automatic mode, the LAWPS process transfer and flush are initiated by DEP-HS-8684.Valve DEP-YV-8679 cannot begin closing until DEP-YV-8687 has fully closed. [Reference: 24590-BOF-J3-DEP-70001/70006]

4.1.6.3.1.3.17 TOC Drain Valve

The TOC drain valve, DEP-YV-8682 (DEP-YC-8682), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve to drain the combined DEP/TOC transfer line to DEP-VSL-00001. When it is operated in the auto mode, the valve is controlled by DEP-FQI-8677A and DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-70001]

4.1.6.3.1.3.18 LAW Facility Transfer Valve

The LAW Facility transfer valve, DEP-YV-8683 (DEP-YC-8683), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve to allow the transfer of the TOC feed and DEP-EVAP-00001 concentrate to the LAW Facility. When it is operated in the auto mode, the valve is controlled by DEP-YC-8684, DEP-HS-8431B, and SHR-HS-8310. [Reference: 24590-BOF-J3-DEP-70001]

4.1.6.3.1.3.19 TOC Flow Totalizers

The TOC flow totalizers (DEP-FQI-8677A/B) are manually reset using their associated handswitches after the transfer of feed and flush water, respectively, from the TOC is complete. [Reference: 24590-BOF-J3-DEP-71001]

4.1.6.3.1.3.20 DEP Transfer Line Event Controller

The DEP transfer line event controller (DEP-YC-8684) is operated manually using its associated handswitches to align the transfer valves and establish a flow path from the TOC and EMF to the LAW Facility. [Reference: 24590-BOF-J3-DEP-70002]

4.1.6.3.1.3.21 Evaporator Concentrate Vessel Recirculation Flow Control Valve

The evaporator concentrate vessel recirculation flow control valve (DEP-FV-8423) is automatically controlled by DEP-FC-8423, based on input from DEP-FI-8423, DEP-HS-8431B, and eductor flow setpoints. [Reference: 24590-BOF-J3-DEP-71505]

4.1.6.3.1.3.22 Evaporator Concentrate Vessel Eductor Flow Control Valve

The evaporator concentrate vessel eductor flow control valve (DEP-FV-8427) is automatically controlled by DEP-FC-8427, based on input from DEP-FI-8427, DEP-HS-8431B, and eductor flow setpoints. [Reference: 24590-BOF-J3-DEP-71506]

4.1.6.3.1.3.23 Evaporator Concentrate Vessel Mixing Totalizer*

The evaporator concentrate vessel mixing totalizer (DEP-FQI-8427) is manually reset using its associated handswitch after the eductor mixing setpoint of DEP-VSL-00003A/B/C is reached. [Reference: 24590-BOF-J3-DEP-71505]

4.1.6.3.1.3.24 Evaporator Concentrate Vessel Recirculation Valves*

The evaporator concentrate vessel recirculation valves, DEP-YV-8424/8425/8426 (DEP-YC-8424/8425/8426), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to establish a minimum recirculation loop during DEP-PMP-00003A/B transfers. When they are operated in the auto mode, the valves are controlled by DEP-HS-8431A. [Reference: 24590-BOF-J3-DEP-70512/70513/70514]

4.1.6.3.1.3.25 Evaporator Concentrate Vessel Eductor Valves*

The evaporator concentrate vessel eductor valves, DEP-YV-8428/8429/8430 (DEP-YC-8428/8429/8430), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to establish a flow path for DEP-VSL-00003A/B/C eductor mixing. When they are operated in the auto mode, the valves are controlled by DEP-HS-8431B. [Reference: 24590-BOF-J3-DEP-70512/70513/70514]

4.1.6.3.1.3.26 Overhead Sampling Vessel Inlet Valves

The overhead sampling vessel inlet valves, DEP-YV-8301/8308 (DEP-YC-8301/8308), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to allow the transfer of evaporator condensate from DEP-PMP-00006A/B to DEP-VSL-00004A/B. When they are operated in the auto mode, the valves are controlled by DEP-LI-8305/8312. [Reference: 24590-BOF-J3-DEP-70405/70408]

4.1.6.3.1.3.27 Overhead Sampling Vessel LVP Valves

The overhead sampling vessel LVP valves, DEP-YV-8302/8309 (DEP-YC-8302/8309), are controlled in the manual mode. The operator can open and close the valves to allow the transfer of condensate from the LAW LVP system to DEP-VSL-00004A/B. [Reference: 24590-BOF-J3-DEP-70405/70408]

4.1.6.3.1.3.28 Overhead Sampling Vessel Off-Specification Condensate Valves

The overhead sampling vessel off-specification condensate valves, DEP-YV-8316/8318 (DEP-YC-8316/8318), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to return off-specification condensate from DEP-VSL-00005A/B to DEP-VSL-00004A/B. When they are operated in the auto mode, the valves are controlled by DEP-HS-8480B. [Reference: 24590-BOF-J3-DEP-70405/70408]

4.1.6.3.1.3.29 Overhead Sampling Vessel Eductor Valves

The overhead sampling vessel eductor valves, DEP-YV-8304/8311 (DEP-YC-8304/8311), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to mix the DEP-VSL-00004A/B contents through eductors. When they are operated in the auto mode, the valves are controlled by DEP-HS-8323B. [Reference: 24590-BOF-J3-DEP-70404/70407]

4.1.6.3.1.3.30 Overhead Sampling Vessel Outlet Valves

The overhead sampling vessel outlet valves, DEP-YV-8307/8314 (DEP-YC-8307/8314), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to empty DEP-VSL-00004A/B. When they are operated in the auto mode, the valves are controlled by DEP-HS-8323B. [Reference: 24590-BOF-J3-DEP-70406/70409]

4.1.6.3.1.3.31 Overhead Sampling Vessel Transfer/Recirculation Pumps

The overhead sampling vessel transfer/recirculation pumps, DEP-PMP-00004A/B/C (DEP-YC-8315/8317/8319) can be controlled in either the manual or auto mode. When the pumps are placed in the manual mode, the operator can start and stop the pumps as needed to transfer DEP-VSL-00004A/B condensate to DEP-VSL-00005A/B or recirculate the vessel contents through eductors for mixing. When they are operated in the auto mode, the pumps are controlled by DEP-HS-8315. [Reference: 24590-BOF-J3-DEP-70403]

4.1.6.3.1.3.32 Overhead Sampling Vessel Transfer/Recirculation Pump Handswitch

The overhead sampling vessel transfer/recirculation pump handswitch (DEP-HS-8315D) is operated manually to start and stop DEP-PMP-00004A/B/C. [Reference: 24590-BOF-J3-DEP-70003]

4.1.6.3.1.3.33 Overhead Sampling Vessels Supply Handswitch

The overhead sampling vessels supply handswitch (DEP-HS-8323A) is operated manually to select the evaporator concentrate vessel (DEP-VSL-00004A/B) to empty. The operator can choose which vessel to discharge from or can reset the handswitch. [Reference: 24590-BOF-J3-DEP-70402]

4.1.6.3.1.3.34 Overhead Sampling Vessels Transfer Handswitch

The overhead sampling vessels transfer handswitch (DEP-HS-8323B) is operated manually to either select the overhead sampling vessel (DEP-VSL-00004A/B) to mix, transfer off-specification condensate to DEP-VSL-00002, transfer mixed and sampled condensate to DEP-VSL-00005A or DEP-VSL-00005B, or reset the handswitch. [Reference: 24590-BOF-J3-DEP-70401]

4.1.6.3.1.3.35 Overhead Sampling Vessel Flow Totalizer

The overhead sampling vessel flow totalizer (DEP-FQI-8321) is manually reset using its associated handswitch after the batch transfer from DEP-VSL-00004A/B is complete. [Reference: 24590-BOF-J3-DEP-71404]

4.1.6.3.1.3.36 Overhead Sampling Vessel Transfer Flow Control Valve

The overhead sampling vessel transfer flow control valve (DEP-FV-8321A) is automatically controlled by DEP-FC-8321A, based on input from DEP-FI-8321 and DEP-HS-8323B. [Reference: 24590-BOF-J3-DEP-71404]

4.1.6.3.1.3.37 Overhead Sampling Vessel Eductor Flow Control Valve

The overhead sampling vessel eductor flow control valve (DEP-FV-8321B) is automatically controlled by DEP-FC-8321B, based on input from DEP-FI-8321, DEP-HS-8323B, and eductor mixing setpoints. [Reference: 24590-BOF-J3-DEP-71404]

4.1.6.3.1.3.38 Process Condensate Lag Storage Vessel Inlet Valves

The process condensate lag storage vessel inlet valves, DEP-YV-8451/8461 (DEP-YC-8451/8461), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to allow the transfer of evaporator condensate from DEP-PMP-00004A/B/C to DEP-VSL-00005A/B. When they are operated in the auto mode, the valves are controlled by DEP-HS-8323B. [Reference: 24590-BOF-J3-DEP-70606/70609]

4.1.6.3.1.3.39 Process Condensate Lag Storage Vessel Primary Recirculation Valves

The process condensate lag storage vessel primary recirculation valves, DEP-YV-8452/8462 (DEP-YC-8452/8462), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to establish a recirculation loop back to DEP-VSL-00005A/B during DEP-PMP-00015A/B/C transfers. When they are operated in the auto mode, the valves are controlled by DEP-HS-8480A. [Reference: 24590-BOF-J3-DEP-70606/70609]

4.1.6.3.1.3.40 Process Condensate Lag Storage Vessel Minimum Recirculation Valves

The process condensate lag storage vessel minimum recirculation valves, DEP-YV-8453/8463 (DEP-YC-8453/8463), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to establish a minimum recirculation loop back to DEP-VSL-00005A/B during DEP-PMP-00005A/B transfers. When they are operated in the auto mode, the valves are controlled by DEP-HS-8480A. [Reference: 24590-BOF-J3-DEP-70607/70611]

4.1.6.3.1.3.41 Process Condensate Lag Storage Vessel Steam Blowdown Valves

The process condensate lag storage vessel steam blowdown valves, DEP-YV-8454/8464 (DEP-YC-8454/8464), are controlled in the manual mode. The operator can open and close the valves to allow the transfer of HPS-HX-00011 blowdown from the SCW system to DEP-VSL-00005A/B. [Reference: 24590-BOF-J3-DEP-70607/70611]

4.1.6.3.1.3.42 Process Condensate Lag Storage Vessel Eductor Valves

The process condensate lag storage vessel eductor valves, DEP-YV-8456/8467 (DEP-YC-8456/8467), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to mix the DEP-VSL-00005A/B contents through eductors. When they are operated in the auto mode, the valves are controlled by DEP-HS-8497. [Reference: 24590-BOF-J3-DEP-70608/70610]

4.1.6.3.1.3.43 Process Condensate Lag Storage Vessel Outlet Valves

The process condensate lag storage vessel outlet valves, DEP-YV-8460/8494 (DEP-YC-8460/8494), can be controlled in either the manual or auto mode. When the valves are placed in the manual mode, the operator can open and close the valves to empty DEP-VSL-00005A/B. When they are operated in the auto mode, the valves are controlled by DEP-HS-8480A. [Reference: 24590-BOF-J3-DEP-70612/70613]

4.1.6.3.1.3.44 Process Condensate Lag Storage Vessel Transfer Pumps

The process condensate lag storage vessel transfer pumps, DEP-PMP-00005A/B (DEP-YC-8472/8473) can be controlled in either the manual or auto mode. When the pumps are placed in the manual mode, the operator can start and stop the pumps as needed to transfer DEP-VSL-00005A/B condensate to LERF/ETF. When they are operated in the auto mode, the pumps are controlled by DEP-HS-8472. [Reference: 24590-BOF-J3-DEP-70605]

4.1.6.3.1.3.45 Process Condensate Lag Storage Vessel Transfer Pump Handswitch

The process condensate lag storage vessel transfer pump handswitch (DEP-HS-8472D) is operated manually to start and stop DEP-PMP-00005A/B. [Reference: 24590-BOF-J3-DEP-70003]

4.1.6.3.1.3.46 Process Condensate Lag Storage Vessels Supply Handswitch

The process condensate lag storage vessels supply handswitch (DEP-HS-8480A) is operated manually to select the process condensate lag storage vessel (DEP-VSL-00005A/B) to empty. The operator can choose which vessel to discharge from or can reset the handswitch. [Reference: 24590-BOF-J3-DEP-70602]

4.1.6.3.1.3.47 Process Condensate Lag Storage Vessels Transfer Handswitch

The process condensate lag storage vessels transfer handswitch (DEP-HS-8480B) is operated manually to either select the overhead sampling vessel (DEP-VSL-00004A/B) for off-specification condensate, the primary or secondary LERF transfer line, or reset the handswitch. [Reference: 24590-BOF-J3-DEP-70601]

4.1.6.3.1.3.48 Process Condensate Lag Storage Vessel Flow Totalizer

The process condensate lag storage vessel flow totalizer (DEP-FQI-8475) is manually reset using its associated handswitch after the batch transfer from DEP-VSL-00005A/B to LERF/ETF or DEP-VSL-00004A/B is complete. [Reference: 24590-BOF-J3-DEP-71607]

4.1.6.3.1.3.49 Process Condensate Lag Storage Vessel Minimum Recirculation Flow Control Valve

The process condensate lag storage vessel minimum recirculation flow control valve (DEP-FV-8475) is automatically controlled by DEP-FC-8475, based on input from DEP-FI-8475 and DEP-HS-8480B. [Reference: 24590-BOF-J3-DEP-71607]

4.1.6.3.1.3.50 Process Condensate Lag Storage Vessel LERF Flow Totalizer

The process condensate lag storage vessel LERF flow totalizer (DEP-FQI-8482) is manually reset using its associated handswitch after the batch transfer from DEP-VSL-00005A/B to LERF/ETF is complete. [Reference: 24590-BOF-J3-DEP-71608]

4.1.6.3.1.3.51 Process Condensate Lag Storage Vessel Transfer Flow Control Valve

The process condensate lag storage vessel transfer flow control valve (DEP-FV-8482) is automatically controlled by DEP-FC-8482, based on input from DEP-FI-8482 and DEP-HS-8480B. [Reference: 24590-BOF-J3-DEP-71608]

4.1.6.3.1.3.52 Process Condensate Lag Storage Vessel LERF Transfer Valve

The process condensate lag storage vessel LERF transfer valve, DEP-YV-8487 (DEP-YC-8487), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve to allow a transfer from DEP-VSL-00005A/B to LERF/ETF. When it is operated in the auto mode, the valve is controlled by DEP-HS-8480B. [Reference: 24590-BOF-J3-DEP-70616]

4.1.6.3.1.3.53 Process Condensate Lag Storage Vessel Vent Valve

The process condensate lag storage vessel vent valve, DEP-YV-8488 (DEP-YC-8488), can be controlled in either the manual or auto mode. When the valve is placed in the manual mode, the operator can open and close the valve to increase the pressure in the transfer line to LERF/ETF. When it is operated in the auto mode, the valve is controlled by DEP-PI-8499. [Reference: 24590-BOF-J3-DEP-70614]

4.1.6.3.1.3.54 Process Condensate Lag Storage Vessel Recirculation Pumps

The process condensate lag storage vessel recirculation pumps, DEP-PMP-00015A/B/C (DEP-YC-8489/8490/8491) can be controlled in either the manual or auto mode. When the pumps are placed in the manual mode, the operator can start and stop the pumps as needed to recirculate the contents of DEP-VSL-00005A/B or transfer process condensate to multiple locations for flushing. When they are operated in the auto mode, the pumps are controlled by DEP-HS-8489. [Reference: 24590-BOF-J3-DEP-70604]

4.1.6.3.1.3.55 Process Condensate Lag Storage Vessel Recirculation Pump Handswitch

The process condensate lag storage vessel recirculation pump handswitch (DEP-HS-8489D) is operated manually to start and stop DEP-PMP-00015A/B/C. [Reference: 24590-BOF-J3-DEP-70003]

4.1.6.3.1.3.56 Process Condensate Lag Storage Vessels Supply Handswitch

The process condensate lag storage vessels mixing handswitch (DEP-HS-8497) is operated manually to select the process condensate lag storage vessel (DEP-VSL-00005A/B) to mix. The operator can choose which vessel to mix or can reset the handswitch. [Reference: 24590-BOF-J3-DEP-70603]

4.1.6.3.1.3.57 Process Condensate Lag Storage Vessel Mixing Totalizer

The process condensate lag storage vessel mixing totalizer (DEP-FQI-8493) is manually reset using its associated handswitch after the eductor mixing setpoint of DEP-VSL-00005A/B is reached. [Reference: 24590-BOF-J3-DEP-71605]

4.1.6.3.1.3.58 Process Condensate Lag Storage Vessel Eductor Flow Control Valve

The process condensate lag storage vessel eductor flow control valve (DEP-FV-8493A) is automatically controlled by DEP-FC-8493A, based on input from DEP-FI-8493, DEP-HS-8497, and eductor flow setpoints. [Reference: 24590-BOF-J3-DEP-71605]

4.1.6.3.1.3.59 Process Condensate Lag Storage Vessel Recirculation Flow Control Valve

The process condensate lag storage vessel recirculation flow control valve (DEP-FV-8493B) is automatically controlled by DEP-FC-8493B, based on input from DEP-FI-8493 and whether a flow path is available. [Reference: 24590-BOF-J3-DEP-71605]

4.1.6.3.1.3.60 Process Condensate Lag Storage Vessel Flush Totalizer

The process condensate lag storage vessel flush totalizer (DEP-FQI-8496) is manually reset using its associated handswitch after the batch transfer setpoint of process condensate is reached. [Reference: 24590-BOF-J3-DEP-71604]

4.1.6.3.1.3.61 Process Condensate Lag Storage Vessel Flush Flow Control Valve

The process condensate lag storage vessel flush flow control valve (DEP-FV-8496) is automatically controlled by DEP-FC-8496, based on input from DEP-FI-8496, DEP-HS-8431A, and DEP-HS-8199. [Reference: 24590-BOF-J3-DEP-71604]

4.1.6.3.1.4 Other DEP System Automatic and Manual Actions

4.1.6.3.1.4.1 West Process Area Sump Pumps

The west process area sump pumps, DEP-PMP-00032A/B (DEP-YC-8627/8630), are controlled in the manual mode. The operator can start and stop the pumps as needed to transfer DEP-SUMP-00002A/B content to DEP-VSL-00001 or DEP-VSL-00004A/B. [Reference: 24590-BOF-J3-DEP-70901]

4.1.6.3.1.4.2 West Process Area Sump Valves

The west process area sump valves, DEP-YV-8628/8631 (DEP-YC-8628/8631), are controlled in the manual mode. The operator can open and close the valves as needed to transfer DEP-SUMP-00002A/B content to DEP-VSL-00001 or DEP-VSL-00004A/B. [Reference: 24590-BOF-J3-DEP-70902]

4.1.6.3.1.4.3 Feed Vessel Area Sump Pumps

The feed vessel area sump pumps, DEP-PMP-00034A/B (DEP-YC-8634/8657), are controlled in the manual mode. The operator can start and stop the pumps as needed to transfer DEP-SUMP-00004A/B content to DEP-VSL-00001 or DEP-VSL-00004A/B. [Reference: 24590-BOF-J3-DEP-70903]

4.1.6.3.1.4.4 Truck Bay Sump Pump

The truck bay sump pump, DEP-PMP-00038 (DEP-YC-8649), is controlled in the manual mode. The operator can start and stop the pump as needed to transfer DEP-SUMP-00008 content to DEP-VSL-00001. [Reference: 24590-BOF-J3-DEP-70906]

4.1.6.3.1.4.5 East Process Area Sump Pumps

The east process area sump pumps, DEP-PMP-00033A/B (DEP-YC-8651/8653), are controlled in the manual mode. The operator can start and stop the pumps as needed to transfer DEP-SUMP-00003A/B content to DEP-VSL-00005A/B. [Reference: 24590-BOF-J3-DEP-70908]

4.1.6.3.1.4.6 Process Condensate Vessel Area Sump Pumps

The feed vessel area sump pumps, DEP-PMP-00035A/B (DEP-YC-8639/8642), are controlled in the manual mode. The operator can start and stop the pumps as needed to transfer DEP-SUMP-00005A/B content to DEP-VSL-00005A/B. [Reference: 24590-BOF-J3-DEP-70910]

4.1.6.3.2 DVP System Automatic and Manual Actions

4.1.6.3.2.1 Process Ventilation Preheaters

The process ventilation preheaters, DVP-HTR-00001A/B (DVP-YC-8106/8112), can be controlled in either the manual or auto mode. When the units are placed in the manual mode, the operator can start and stop the preheaters as needed to protect the DVP system HEPA filters from degradation due to moisture. When they are placed in the auto mode, the preheaters are started and stopped based on whether their associated exhauster is running. The heating coil output is regulated based on internal temperature elements and controllers. [Reference: 24590-BOF-J3-DVP-70002/70003]

4.1.6.3.2.2 Process Ventilation Exhausters*

The process ventilation exhausters, DVP-EXHR-00001A/B (DVP-YC-8105A/B), can be controlled in either the manual or auto mode. When the units are placed in the manual mode, the operator can start and stop the exhausters to purge hydrogen from the DEP system process vessels. To start the units, the operator selects one unit as duty and one as standby using DVP-HS-8105. The operator then manually starts the duty unit and places both units in the auto mode using DEP-YC-8105A/B. Upon failure of the duty exhauster, the standby unit automatically starts upon receipt of the start command from DVP-HS-8105. When the exhausters are placed in the auto mode, the units are controlled by DVP-PDC-8105A/B and DVP-FC-8111/8117. [Reference: 24590-BOF-J3-DVP-70001/70002/70003]

4.1.6.3.2.3 Exhauster Outlet Valves

The exhauster outlet valves, DVP-YV-8120/8122 (DVP-YC-8120/8122), can be controlled in either the manual or auto mode. When the units are placed in the manual mode, the operator can open and close the valves as needed to create an exhaust flow path to the EMF stack. When they are placed in the auto mode, the valves are opened and closed based on whether their associated exhauster is running. If neither of the exhausters are running, then both of the outlet valves are automatically opened. [Reference: 24590-BOF-J3-DVP-70002/70003]

4.1.6.3.3 ACV System Automatic and Manual Actions

This section will be updated at a later revision when the C&I logic diagrams are issued for the ACV system.

4.1.6.4 Setpoints and Ranges

4.1.6.4.1 DEP System Setpoints and Ranges

The setpoints and ranges associated with the ICN indications that have an engineering basis for the DEP system are provided in (TBD), *Configuration Data Index for the DEP System*.

The setpoints and ranges associated with the ICN indications that are configurable by the operator for the DEP system are provided in (TBD), *DEP System Tunable Report*.

4.1.6.4.2 DVP System Setpoints and Ranges

The setpoints and ranges associated with the ICN indications that have an engineering basis for the DVP system are provided in (TBD), *Configuration Data Index for the DVP System*.

The setpoints and ranges associated with the ICN indications that are configurable by the operator for the DVP system are provided in (TBD), *DVP System Tunable Report*.

4.1.6.4.3 ACV System Setpoints and Ranges

The setpoints and ranges associated with the ICN indications that have an engineering basis for the ACV system are provided in (TBD), *Configuration Data Index for the ACV System*.

The setpoints and ranges associated with the ICN indications that are configurable by the operator for the ACV system are provided in (TBD), *ACV System Tunable Report*.

4.1.6.5 Interlocks, Bypasses, and Permissives

The following sections describe the important system interlocks, bypasses, and permissives that are used for operation and performance monitoring. Refer to the detailed design documentation for additional detail.

Note: Sections marked with [*] are instances where the C&I control logic diagrams are not in alignment with the issued P&IDs. These sections are completed in accordance with the most recent revision to the P&IDs and will be confirmed once the logic diagrams are re-issued.

4.1.6.5.1 DEP System Interlocks, Bypasses, and Permissives

4.1.6.5.1.1 Evaporator Feed Subsystem Interlocks, Bypasses, and Permissives

4.1.6.5.1.1.1 Low Point Drain Vessel High Level Interlock*

This interlock protects DEP-VSL-00001 from overfilling by preventing the transfer of drains from various sources within the EMF to DEP-VSL-00001. The following actions occur when a high level is detected by DEP-LI-8109:

- The Lab RLD drain valve, DEP-YV-8101 (DEP-YC-8101), closes
- The LAW LVP drain valve, DEP-YV-8102 (DEP-YC-8102), closes
- The LAW RLD drain valve, DEP-YV-8103 (DEP-YC-8103), closes
- The effluent cooler drain valve, DEP-YV-8409 (DEP-YC-8409), closes
- The TOC drain valve, DEP-YV-8682 (DEP-YC-8682), closes

- The DEP-SUMP-00002A/B pumps, DEP-PMP-00032A/B (DEP-YC-8627/8630), stop
- The DEP-SUMP-00004A/B pumps, DEP-PMP-00034A/B (DEP-YC-8634/8657), stop
- The DEP-SUMP-00008 pump, DEP-PMP-00038 (DEP-YC-8649), stops

[Reference: 24590-BOF-J3-DEP-70001/70101/70213/70901/70903/70906/71101]

4.1.6.5.1.1.2 Low Point Drain Vessel Low Level Interlock

This interlock protects the low point drain vessel pumps from dry-running and overheating by stopping DEP-PMP-00001A/B (DEP-YC-8105/8107) when a low level is detected by DEP-LI-8109. Additionally, this interlock protects the DEP-VSL-00001 agitator from blade and shaft damage by stopping the vessel agitator, DEP-AGT-00001 (DEP-YC-8104), when a low level is detected by DEP-LI-8109. [Reference: 24590-BOF-J3-DEP-70102/70106/71101]

4.1.6.5.1.1.3 Loop Seal Valve Interlock*

This interlock protects the DEP-VSL-00001 overflow line loop seal from overfilling by closing DEP-YV-8117 (DEP-YC-8117) when the high level setpoint of DEP-LSH-8113A is reached. [Reference: TBD]

4.1.6.5.1.1.4 Low Point Drain Vessel Pump Flow Path Interlock*

This interlock protects the low point drain vessel pumps from overheating by stopping DEP-PMP-00001A/B (DEP-YC-8105/8107) when a flow path does not exist and the pumps have been placed in the manual mode. DEP-YV-8106 must be open or the following condition must be met:

- DEP-YV-8108, DEP-YV-8152, and DEP-YV-8186 are open
- DEP-YV-8119, DEP-YV-8184, DEP-YV-8188, DEP-YV-8189, DEP-YV-8190, DEP-YV-8397, and DEP-YV-8911 are closed

[Reference: 24590-BOF-J3-DEP-70003/70102/70215/70216]

4.1.6.5.1.1.5 Low Point Drain Vessel Pump Discharge Pressure Interlock*

This interlock prevents cavitation and mechanical failure by stopping DEP-PMP-00001A/B (DEP-YC-8105/8107) when either an abnormally high or low pressure is detected by DEP-PI-8110. [Reference: TBD]

4.1.6.5.1.1.6 Evaporator Feed Vessel High Level Interlock*

This interlock protects DEP-VSL-00002 from overfilling by preventing transfers from various sources within the EMF to DEP-VSL-00002. The following actions occur when a high level is detected by DEP-LI-8156:

- The evaporator feed vessel sodium hydroxide valve, DEP-YV-8151 (DEP-YC-8151), closes
- The evaporator feed vessel inlet valve, DEP-YV-8152 (DEP-YC-8152), closes
- The evaporator feed vessel recycled condensate valve, DEP-YV-8153 (DEP-YC-8153), closes
- The off-specification evaporator concentrate flow control valve (DEP-FV-8227B) closes
- The contaminated reboiler condensate valve, DEP-YV-8276 (DEP-YC-8276), closes

[Reference: 24590-BOF-J3-DEP-70201/70202/70313/71201/71308]

4.1.6.5.1.1.7 Evaporator Feed Vessel Low Level Interlock

This interlock maintains an adequate heel in DEP-VSL-00002 by stopping DEP-PMP-00002A/B (DEP-YC-8176/8179) and DEP-PMP-00012A/B/C (DEP-YC-8160/8163/8166) when a low level is detected by DEP-LI-8156. [Reference: 24590-BOF-J3-DEP-70204/70205/71201]

4.1.6.5.1.1.8 Evaporator Feed Vessel Transfer Pump Not Running Interlock

This interlock prevents transfers from DEP-VSL-00002 to DEP-EVAP-00001 by closing DEP-YV-8154 (DEP-YC-8154) when both DEP-PMP-00002A and DEP-PMP-00002B are not running. [Reference: 24590-BOF-J3-DEP-70203/70220]

4.1.6.5.1.1.9 Evaporator Feed Vessel Transfer Pump Start Permissive

This permissive prevents both DEP-PMP-00002A and DEP-PMP-00002B (DEP-YC-8176/8179) from starting unless their common suction valve (DEP-YV-8154) is open, as indicated by DEP-ZI-8154. [Reference: 24590-BOF-J3-DEP-70205]

4.1.6.5.1.1.10 Evaporator Feed Vessel Transfer Pump Discharge Flow Interlock

This interlock provides pump protection by stopping DEP-PMP-00002A/B (DEP-YC-8176/8179) when an abnormally low flow is detected by DEP-FI-8182 while either pump is running. [Reference: 24590-BOF-J3-DEP-70205/70220/71206]

4.1.6.5.1.1.11 Evaporator Feed Vessel Transfer Pump Suction Valve Interlock

This interlock provides protection from cavitation by stopping DEP-PMP-00002A/B (DEP-YC-8176/8179) when the suction valve (DEP-YV-8154) closes, as indicated by DEP-ZI-8154, and the pump is in operation. [Reference: 24590-BOF-J3-DEP-70205/70220]

4.1.6.5.1.1.12 Evaporator Feed Vessel Transfer Pump Discharge Pressure Interlock

This interlock prevents cavitation and mechanical failure by stopping DEP-PMP-00002A/B (DEP-YC-8176/8179) when an abnormally high pressure is detected by DEP-PI-8181. The pumps are also stopped when an abnormally low pressure is detected by DEP-PI-8181 and the units are in operation. [Reference: 24590-BOF-J3-DEP-70205/70220/71206]

4.1.6.5.1.1.13 Evaporator Feed Vessel Recirculation Pump Not Running Interlock

This interlock prevents transfers from DEP-VSL-00002 to Tank Farms by closing DEP-YV-8155 (DEP-YC-8155) when each of DEP-PMP-00012A, DEP-PMP-00012B, and DEP-PMP-00012C are not running. [Reference: 24590-BOF-J3-DEP-70203/70221]

4.1.6.5.1.1.14 Evaporator Feed Vessel Recirculation Pump Flow Path Interlock*

This interlock protects the evaporator feed vessel recirculation pumps from overheating by stopping DEP-PMP-00012A/B/C (DEP-YC-8160/8163/8166) when a flow path does not exist and any pump has been placed in the manual mode. The pumps stop if the following conditions are not met:

- DEP-YV-8155 is open
- Either DEP-HS-8902 is set to mix and DEP-YV-8912 is closed, or
- DEP-YV-8405, DEP-YV-8912, and DEP-YV-8915 are open; DEP-YV-8409, DEP-YV-8911, DEP-YV-8913, and DEP-YV-8914 are closed; and DEP-PMP-00012A/B/C and SNR-PMP-00022 are running

[Reference: 24590-BOF-J3-DEP-70003/70204/70218]

4.1.6.5.1.1.15 Evaporator Feed Vessel Recirculation Pump Setpoint Interlock

This interlock stops DEP-PMP-00012A/B/C (DEP-YC-8160/8163/8166) when the Tank Farms transfer volume setpoint of DEP-FQSH-8908 is reached. [Reference: 24590-BOF-J3-DEP-70003/70204/71205]

4.1.6.5.1.1.16 Evaporator Feed Vessel Recirculation Pump Discharge Pressure Interlock

This interlock prevents cavitation and mechanical failure by stopping DEP-PMP-00012A/B/C (DEP-YC-8160/8163/8166) when an abnormally high pressure is detected by DEP-PI-8168. The pumps are also stopped when an abnormally low pressure is detected by DEP-PI-8168 and any of the units are in operation. [Reference: 24590-BOF-J3-DEP-70204/70221/71202]

4.1.6.5.1.1.17 Filtered Concentrate Mixing Valve Open Permissive*

This permissive prevents DEP-YV-8911 (DEP-YC-8911) from opening unless the demineralized water mixing valve, DEP-YV-8913 (DEP-YC-8913), is closed. [Reference: 24590-BOF-J3-DEP-70210]

4.1.6.5.1.1.18 Evaporator Feed Mixing Valve Open Permissive*

This permissive prevents DEP-YV-8912 (DEP-YC-8912) from opening unless the demineralized water mixing valve, DEP-YV-8913 (DEP-YC-8913), is closed. [Reference: 24590-BOF-J3-DEP-70210]

4.1.6.5.1.1.19 Demineralized Water Mixing Valve Open Permissive

This permissive prevents DEP-YV-8913 (DEP-YC-8913) from opening unless the filtered concentrate mixing valve (DEP-YV-8911), the evaporator feed mixing valve (DEP-YV-8912), the process condensate mixing valve (DEP-YV-8914), and sodium nitrite mixing valve (DEP-YV-8915) are all closed. [Reference: 24590-BOF-J3-DEP-70211]

4.1.6.5.1.1.20 Process Condensate Mixing Valve Open Permissive

This permissive prevents DEP-YV-8914 (DEP-YC-8914) from opening unless the demineralized water mixing valve, DEP-YV-8913 (DEP-YC-8913), is closed. [Reference: 24590-BOF-J3-DEP-70211]

4.1.6.5.1.1.21 Sodium Nitrite Mixing Valve Open Permissive

This permissive prevents DEP-YV-8915 (DEP-YC-8915) from opening unless the demineralized water mixing valve, DEP-YV-8913 (DEP-YC-8913), is closed. [Reference: 24590-BOF-J3-DEP-70212]

4.1.6.5.1.1.22 Effluent Cooler pH Interlock

This interlock prevents transfers of off-specification effluent to Tank Farms by closing DEP-YV-8405 (DEP-YC-8405) when a low pH is detected by DEP-AI-8403. [Reference: 24590-BOF-J3-DEP-70213/71210]

4.1.6.5.1.1.23 Effluent Cooler Temperature Interlock

This interlock prevents transfers of off-specification effluent to Tank Farms by closing DEP-YV-8405 (DEP-YC-8405) when a high temperature is detected by DEP-TI-8402. [Reference: 24590-BOF-J3-DEP-70213/71210]

4.1.6.5.1.1.24 Effluent Cooler Differential Pressure Interlock

This interlock detects leaks in the process and utility fluids in DEP-HX-00001 and prevents operation of the Tank Farms transfer system through the following actions when a low differential pressure is detected by DEP-PDI-8401:

- DEP-PMP-00012A/B/C (DEP-YC-8160/8163/8166) are stopped if DEP-HS-8902 is set to Tank Farms
- DEP-PMP-00015A/B/C (DEP-YC-8489/8490/8491) are stopped
- SNR-PMP-00022 (SNR-YC-8204) is stopped
- DEP-PMP-00003A/B (DEP-YC-8386/8391) are stopped if DEP-HS-8431B is set to Tank Farms
- DEP-YV-8405, DEP-YV-8412, DEP-YV-8911, DEP-YV-8912, DEP-YV-8913, DEP-YV-8914, and DEP-YV-8915 close
- PCW-PMP-00030A/B (PCW-YC-8517/8519) are stopped
- DEP-HS-8431B and DEP-HS-8902 are reset

[Reference: 24590-BOF-J3-DEP-70204/70210/70211/70212/70213/70218/70509/70515/70604/71219, 24590-BOF-J3-SNR-70002, 24590-BOF-J3-PCW-70001]

4.1.6.5.1.1.25 Effluent Cooler Conductivity Interlock*

This interlock detects breakthrough in the cooling water discharged from DEP-HX-00001 and prevents operation of the Tank Farms transfer system through the following actions when a high conductivity is detected by DEP-CI-8417:

- DEP-PMP-00012A/B/C (DEP-YC-8160/8163/8166) are stopped if DEP-HS-8902 is set to Tank Farms
- DEP-PMP-00015A/B/C (DEP-YC-8489/8490/8491) are stopped if DEP-HS-8431B is set to Tank Farms
- SNR-PMP-00022 (SNR-YC-8204) is stopped
- DEP-PMP-00003A/B (DEP-YC-8386/8391) are stopped if DEP-HS-8431B is set to Tank Farms
- DEP-YV-8405, DEP-YV-8412, DEP-YV-8911, DEP-YV-8912, DEP-YV-8913, DEP-YV-8914, and DEP-YV-8915 close
- PCW-PMP-00030A/B (PCW-YC-8517/8519) are stopped
- DEP-HS-8431B and DEP-HS-8902 are reset

[Reference: 24590-BOF-J3-DEP-70204/70210/70211/70212/70213/70218/70509/70515/70604/71219, 24590-BOF-J3-SNR-70002, 24590-BOF-J3-PCW-70001]

4.1.6.5.1.2 Evaporator Process Subsystem Interlocks, Bypasses, and Permissives

4.1.6.5.1.2.1 Evaporator High Level Interlock

This interlock prevents the liquid level in DEP-EVAP-00001 from exceeding the operating band by stopping AFR-PMP-00014A/B (AFR-YC-8102A/B), stopping DEP-PMP-00002A/B (DEP-YC-8176/8179), and closing DEP-YV-8205 (DEP-YC-8205) when a high level is detected by either DEP-LI-8210 or DEP-LI-8211. [Reference: 24590-BOF-J3-DEP-70205/70302/71304, 24590-BOF-J3-AFR-70002]

4.1.6.5.1.2.2 Evaporator Low Level Interlock

This interlock maintains a minimum liquid level in DEP-EVAP-00001 by stopping DEP-PMP-00007A/B (DEP-YC-8222/8225) and stopping DEP-PMP-00017 (DEP-YC-8213) when a low level is detected by either DEP-LI-

8210 or DEP-LI-8211. The interlock also stops DEP-PMP-00002A/B (DEP-YC-8176/8179) in a delayed fashion based on different low level setpoints. However, if the level continues to decrease, the pumps are immediately shut down. [Reference: 24590-BOF-J3-DEP-70205/70303/70306/71304]

4.1.6.5.1.2.3 AFR Setpoint Interlock

This interlock prevents the excess transfer of anti-foam reagent from the AFR system to DEP-EVAP-00001 by closing DEP-YV-8205 (DEP-YC-8205) when the demineralized water transfer volume setpoint of AFR-FQSH-8102B is reached. [Reference: 24590-BOF-J3-DEP-70302, 24590-BOF-J3-AFR-71001]

4.1.6.5.1.2.4 AFR Pressure Interlock*

This interlock prevents evaporator fluid from back-flowing into AFR-PMP-00014A/B by closing DEP-YV-8205 (DEP-YC-8205) when abnormal discharge pressures are detected by AFR-PI-8207. [Reference: 24590-BOF-J3-DEP-70302]

4.1.6.5.1.2.5 Reboiler Condensate Conductivity Interlock*

This interlock detects breakthrough in the steam condensate collected from DEP-RBLR-00001 and prevents operation of the evaporator system through the following actions when a high conductivity is detected by DEP-CI-8218:

- DEP-LV-8216 is opened
- DEP-PMP-00017 (DEP-YC-8213) is stopped
- HPS-PV-8902 is closed
- DEP-PMP-00002A/B (DEP-YC-8176/8179) are stopped
- DEP-YV-8276 (DEP-YC-8276) and DEP-FV-8227B are opened
- DEP-YV-8275 (DEP-YC-8275), DEP-YV-8219 (DEP-YC-8219), and DEP-FV-8227A are closed

[Reference: 24590-BOF-J3-DEP-70205/70303/70313/71306/71308, 24590-BOF-J3-HPS-71001]

4.1.6.5.1.2.6 Evaporator Concentrate Discharge Pumps Pressure Interlock

This interlock prevents evaporator concentrate from back-flowing into DEP-EVAP-00001 by stopping DEP-PMP-00007A/B (DEP-YC-8222/8225) when insufficient discharge pressure is detected by DEP-PI-8231 and either of the pumps is running. [Reference: 24590-BOF-J3-DEP-70306/71307]

4.1.6.5.1.2.7 Evaporator Concentrate Discharge Pumps Start Permissive

This interlock prevents DEP-PMP-00007A/B (DEP-YC-8222/8225) from starting if both DEP-LV-8227A and DEP-LV-8227B are closed, as indicated by DEP-ZI-8227A and DEP-ZI-8227B, respectively. [Reference: 24590-BOF-J3-DEP-70306/71308]

4.1.6.5.1.2.8 Evaporator Concentrate Discharge Pumps Flow Path Interlock

This interlock protects the evaporator concentrate discharge pumps from overheating by stopping DEP-PMP-00007A/B (DEP-YC-8222/8225) when a flow path does not exist, as indicated by DEP-ZI-8227A and DEP-ZI-8227B, and either pump is running. [Reference: 24590-BOF-J3-DEP-70306/71308]

4.1.6.5.1.2.9 Evaporator Concentrate Discharge Pumps Flow Interlock

This interlock indicates mechanical failure and prevents further system operation by stopping DEP-PMP-00007A/B (DEP-YC-8222/8225) when insufficient flow is detected by DEP-FI-8227 and either of the pumps is running. [Reference: 24590-BOF-J3-DEP-70306/71308]

4.1.6.5.1.2.10 Evaporator Concentrate High Density Interlock*

This interlock prevents the transfer of off-specification evaporator concentrate by closing DEP-YV-8353, DEP-YV-8364, DEP-YV-8375, DEP-FV-8227A, and DEP-DV-8228 and opening DEP-FV-8227B when a high density is detected by DEP-DI-8228. [Reference: 24590-BOF-J3-DEP-70503/70505/70507/71308]

4.1.6.5.1.2.11 Evaporator Concentrate Low Density Interlock

This interlock prevents the transfer of off-specification evaporator concentrate by closing DEP-YV-8353, DEP-YV-8364, DEP-YV-8375, and DEP-DV-8228 when a low density is detected by DEP-DI-8228. [Reference: 24590-BOF-J3-DEP-70503/70505/70507/71308]

4.1.6.5.1.2.12 Evaporator Concentrate Radiation Interlock

This interlock prevents the transfer of off-specification evaporator concentrate by closing DEP-YV-8353, DEP-YV-8364, DEP-YV-8375, DEP-FV-8227A, and DEP-DV-8228 and opening DEP-FV-8227B when high radiation is detected by DEP-RI-8229. [Reference: 24590-BOF-J3-DEP-70503/70505/70507/71307/71308]

4.1.6.5.1.2.13 Steam Supply Pressure Interlock*

This interlock prevents evaporator overhead vapor from back flowing into and contaminating the HPS system by closing DEP-YV-8234 (DEP-YC-8234) when a low pressure is detected by DEP-PI-8235. This interlock also closes DEP-YV-8217 (DEP-YC-8217) because cooling water is not required when the condenser system is not in operation. [Reference: 24590-BOF-J3-DEP-70309/71309]

4.1.6.5.1.2.14 Evaporator Primary Condenser Level Interlock

This interlock maintains the liquid level in the boot of DEP-COND-00001 within the operating band by stopping DEP-PMP-00006A/B (DEP-YC-8258/8259) when a low level is detected by DEP-LI-8251. [Reference: 24590-BOF-J3-DEP-70311/71311]

4.1.6.5.1.2.15 Evaporator Condensate Pump Start Permissive

This interlock prevents DEP-PMP-00006A/B (DEP-YC-8258/8259) from starting unless DEP-FV-8251B is open, as indicated by DEP-ZI-8251B, or either of DEP-YV-8301/8308 is open while DEP-FV-8251A is open, as indicated by DEP-ZI-8251A. [Reference: 24590-BOF-J3-DEP-70311/71311]

4.1.6.5.1.2.16 Evaporator Condensate Pump Flow Path Interlock

This interlock protects the evaporator condensate pumps from overheating by stopping DEP-PMP-00007A/B (DEP-YC-8222/8225) when both of the following flow paths do not exist and either pump is running:

- DEP-FV-8251B is open
- DEP-FV-8251A is open and either DEP-YV-8301 or DEP-YV-8308 is open

[Reference: 24590-BOF-J3-DEP-70311/71311]

4.1.6.5.1.2.17 Evaporator Condensate Pump Pressure Interlock

This interlock prevents evaporator condensate from back-flowing into DEP-COND-00001 by stopping DEP-PMP-00006A/B (DEP-YC-8258/8259) when insufficient discharge pressure is detected by DEP-PI-8260 and either of the pumps is running. [Reference: 24590-BOF-J3-DEP-70311/71314]

4.1.6.5.1.2.18 Evaporator Condensate Conductivity Interlock

This interlock detects breakthrough in the evaporator condensate and prevents a transfer of the solution to DEP-VSL-00004A/B by closing DEP-YV-8301, DEP-YV-8308, and DEP-LV-8251A and opening DEP-LV-8251B when high conductivity is detected by DEP-CI-8257. [Reference: 24590-BOF-J3-DEP-70405/70408/71311/71314]

4.1.6.5.1.2.19 Reboiler Condensate Collection Vessel High Level Interlock*

This interlock protects DEP-VSL-00008 from overfilling by starting DEP-PMP-00008A/B (DEP-YC-8269) and closing DEP-YV-8219 (DEP-YC-8219) if a high level is detected by DEP-LI-8274 and the equipment is placed in the manual mode. [Reference: 24590-BOF-J3-DEP-70313/70314/71315]

4.1.6.5.1.2.20 Reboiler Condensate Collection Vessel Low Level Interlock*

This interlock maintains an adequate heel in DEP-VSL-00008 by stopping DEP-PMP-00008A/B (DEP-YC-8269) if a low level is detected by DEP-LI-8274 and the units are in operation. [Reference: 24590-BOF-J3-DEP-70314/71315]

4.1.6.5.1.2.21 Reboiler Condensate Pump Permissive

This interlock prevents DEP-PMP-00008A/B (DEP-YC-8269) from starting unless either DEP-YV-8275 or DEP-YV-8276 is open, establishing a discharge flow path for the pumps. [Reference: 24590-BOF-J3-DEP-70314]

4.1.6.5.1.3 Evaporator Discharge System Interlocks, Bypasses, and Permissives

4.1.6.5.1.3.1 Evaporator Concentrate Vessel High Level Interlock

This interlock protects DEP-VSL-00003A/B/C from overfilling by preventing transfers from various sources within the EMF to DEP-VSL-00003A/B/C. The following actions occur when a high level is detected by DEP-LI-8357/8368/8379:

- The evaporator concentrate vessel backflush inlet valves, DEP-YV-8196/8197/8198 close
- The evaporator concentrate vessel inlet valves, DEP-YV-8353/8364/8375 close
- The evaporator concentrate vessel sodium hydroxide valves, DEP-YV-8354/8367/8378 close

[Reference: 24590-BOF-J3-DEP-70208/70209/70503/70505/70507/71501/71502/71503]

4.1.6.5.1.3.2 Evaporator Concentrate Vessel Low Level Interlock

This interlock protects the evaporator concentrate transfer/recirculation pumps from dry-running and overheating by stopping DEP-PMP-00003A/B (DEP-YC-8386/8391) when a low level is detected by DEP-LI-8357, DEP-LI-8368, or DEP-LI-8379 and the associated vessel outlet valve (DEP-YV-8360, DEP-YV-8371, or DEP-YV-8382) is open, indicating that the associated vessel is emptying. [Reference: 24590-BOF-J3-DEP-70509/71501/71502/71503]

4.1.6.5.1.3.3 Evaporator Concentrate Vessel Temperature Interlock

This interlock prevents the transfer of concentrate from DEP-VSL-00003A/B/C to the LAW Facility that exceeds the design basis temperature of the LCP system by closing DEP-YV-8396 (DEP-YC-8396) when a high temperature is detected by DEP-TI-8358, DEP-TI-8369, or DEP-TI-8380 and the associated vessel outlet valve (DEP-YV-8360, DEP-YV-8371, or DEP-YV-8382) is open, indicating that the associated vessel is emptying. [Reference: 24590-BOF-J3-DEP-70510/71501/71502/71503]

4.1.6.5.1.3.4 Evaporator Concentrate Vessel Outlet Valve Permissive

This interlock precludes simultaneous transfers from multiple evaporator concentrate vessels by preventing the vessel outlet valves from opening unless the two other vessel outlet valves are both closed. DEP-YV-8360 cannot open unless DEP-YV-8371 and DEP-YV-8382 are both closed, DEP-YV-8371 cannot open unless DEP-YV-8360 and DEP-YV-8382 are both closed, and DEP-YV-8382 cannot open unless DEP-YV-8360 and DEP-YV-8371 are both closed. [Reference: 24590-BOF-J3-DEP-70504/70506/70508]

4.1.6.5.1.3.5 Evaporator Concentrate Transfer/Recirculation Pump Discharge Pressure Interlock

This interlock prevents cavitation and mechanical failure by stopping DEP-PMP-00003A/B (DEP-YC-8386/8391) when an abnormally high pressure is detected by DEP-PI-8394. The pumps are also stopped when an abnormally low pressure is detected by DEP-PI-8394 and the units are in operation. [Reference: 24590-BOF-J3-DEP-70509/71504]

4.1.6.5.1.3.6 Evaporator Feed Vessel Transfer Pump Discharge Flow Interlock

This interlock provides pump protection by stopping DEP-PMP-00003A/B (DEP-YC-8386/8391) when an abnormally low flow is detected by DEP-FI-8419 and the units are in operation. [Reference: 24590-BOF-J3-DEP-70509/71504]

4.1.6.5.1.3.7 Evaporator Concentrate to LAW Transfer Volume Interlock

This interlock prevents excess evaporator concentrate transfers from DEP-VSL-00003A/B/C to the LAW Facility by stopping DEP-PMP-00003A/B (DEP-YC-8386/8391) when the high transfer volume setpoint of DEP-FQSH-8395 is reached and the pumps are in the manual mode. [Reference: 24590-BOF-J3-DEP-70003/70509/71507]

4.1.6.5.1.3.8 Evaporator Concentrate to Evaporator Feed Vessel Transfer Volume Interlock

This interlock prevents excess evaporator concentrate transfers from DEP-VSL-00003A/B/C to DEP-VSL-00002 by stopping DEP-PMP-00003A/B (DEP-YC-8386/8391) when the high transfer volume setpoint of DEP-FQSH-8909 is reached and the pumps are in the manual mode. [Reference: 24590-BOF-J3-DEP-70003/70509/71508]

4.1.6.5.1.3.9 Evaporator Concentrate Transfer/Recirculation Pump Valve Alignment Interlock

This interlock prevents inadvertent transfers of evaporator concentrate by stopping DEP-PMP-00003A/B (DEP-YC-8386/8391) when the vessel outlet and flush valves are not aligned with the configuration selected at DEP-HS-8431A or the downstream transfer valves are not in alignment for LAW Facility transfers, vessel mixing, or Tank Farms transfers. [Reference: 24590-BOF-J3-DEP-70003/70502/70509/70516]

4.1.6.5.1.3.10 Tank Farms Transfer Pumps Not Running Interlock

This interlock prevents the transfer of un-conditioned evaporator concentrate from DEP-VSL-00003A/B/C to Tank Farms by stopping DEP-PMP-00003A/B (DEP-YC-8386-8391) if DEP-PMP-00003A/B, DEP-PMP-00015A/B/C, and SNR-PMP-00022 are not running at the same time and DEP-HS-8431B is aligned for a Tank Farms transfer. [Reference: 24590-BOF-J3-DEP-70003/70509]

4.1.6.5.1.3.11 Feed to LAW Temperature Interlock*

This interlock prevents the transfer of feed from DEP-VSL-00003A/B/C and from the TOC to the LAW Facility that exceeds the design basis temperature of the LCP system by closing DEP-YV-8396 (DEP-YC-8396), DEP-YV-8679 (DEP-YC-8679), DEP-YV-8687 (DEP-YC-8687), and DEP-YV-8683 (DEP-YV-8683) when a high temperature is detected by DEP-TI-8685. Off-specification feed is then manually drained to DEP-VSL-00001 by the operators. [Reference: 24590-BOF-J3-DEP-70001/70510/71001/70006]

4.1.6.5.1.3.12 Feed to LAW Pressure Interlock*

This interlock protects the underground transfer piping feeding the LAW Facility by closing DEP-YV-8679 (DEP-YC-8679), DEP-YV-8687 (DEP-YC-8687), and DEP-YV-8683 (DEP-YV-8683) when a high pressure is detected by DEP-PI-8678. Off-specification feed is then manually drained to DEP-VSL-00001 by the operators.[Reference: 24590-BOF-J3-DEP-70001/70002/71001/70006]

4.1.6.5.1.3.13 Feed to LAW Radiation Interlock*

This interlock diverts feed from the TOC to DEP-VSL-00001 when excessive radiation is detected in the TOC feed byclosing DEP-YV-8679 (DEP-YC-8679), DEP-YV-8687 (DEP-YC-8687), and DEP-YV-8683 (DEP-YV-8683) when high radiation is detected by DEP-RI-8676. Off-specification feed is then manually drained to DEP-VSL-00001 by the operators.[Reference: 24590-BOF-J3-DEP-70001/70002/71001/70006]

4.1.6.5.1.3.14 Feed to LAW Density Interlock*

This interlock diverts feed from the TOC to DEP-VSL-00001 when excessive density is detected in the TOC feed by closing DEP-YV-8679 (DEP-YC-8679), DEP-YV-8687 (DEP-YC-8687), and DEP-YV-8683 (DEP-YV-8683) when a high density is detected by DEP-DI-8677. Off-specification feed is then manually drained to DEP-VSL-00001 by the operators. [Reference: 24590-BOF-J3-DEP-70001/70002/71001/70006]

4.1.6.5.1.3.15 Feed to LAW Flow Interlock*

This interlock protects the underground transfer piping feeding the LAW Facility by closing DEP-YV-8679 (DEP-YC-8679), DEP-YV-8687 (DEP-YC-8687), and DEP-YV-8683 (DEP-YV-8683) when a high flow is detected by DEP-FI-8677. Off-specification feed is then manually drained to DEP-VSL-00001 by the operators.[Reference: 24590-BOF-J3-DEP-70001/70002/71001/70006]

4.1.6.5.1.3.16 Evaporator Concentrate Vessel Recirculation/Eductor Valve Interlock

This interlock maintains alignment between the vessel outlet valves and recirculation/eductor valves by closing the applicable recirculation and eductor valves when the associated vessel outlet valve closes. DEP-YV-8424 (DEP-YC-8424) and DEP-YV-8428 (DEP-YC-8428) are closed when the DEP-VSL-00003A outlet valve (DEP-YV-8360) closes. DEP-YV-8425 (DEP-YC-8425) and DEP-YV-8429 (DEP-YC-8429) are closed when the DEP-VSL-00003B outlet valve (DEP-YV-8371) closes. DEP-YV-8426 (DEP-YC-8426) and DEP-YV-8430 (DEP-YC-8430) are closed when the DEP-VSL-00003C outlet valve (DEP-YV-8382) closes. [Reference: 24590-BOF-J3-DEP-70512/70513/70514]

4.1.6.5.1.3.17 Overhead Sampling Vessel High Level Interlock*

This interlock protects DEP-VSL-00004A/B from overfilling by preventing transfers from various sources within the EMF to DEP-VSL-00004A/B. The following actions occur when a high level is detected by DEP-LI-8305/8312:

- The overhead sampling vessel inlet valves, DEP-YV-8301/8308 close
- The overhead sampling vessel LVP valves, DEP-YV-8302/8309 close
- The overhead sampling vessel off-specification condensate valves, DEP-YV-8316/8318 close
- The east process area sump pumps, DEP-PMP-00032A/B, stop
- The feed vessel area sump pumps, DEP-PMP-00034A/B, stop

[Reference: 24590-BOF-J3-DEP-70405/70408/71401/41402]

4.1.6.5.1.3.18 Overhead Sampling Vessel Low Level Interlock

This interlock protects the overhead sampling vessel transfer/recirculation pumps from dry-running and overheating by stopping DEP-PMP-00004A/B/C (DEP-YC-8315/8317/8319) when a low level is detected by DEP-LI-8305 or DEP-LI-8312 and the associated vessel outlet valve (DEP-YV-8307 or DEP-YV-8314) is open, indicating that the associated vessel is emptying. [Reference: 24590-BOF-J3-DEP-70403/70410/71401/71402]

4.1.6.5.1.3.19 Overhead Sampling Vessel Transfer/Recirculation Pump Discharge Pressure Interlock

This interlock prevents cavitation and mechanical failure by stopping DEP-PMP-00004A/B/C (DEP-YC-8315/8317/8319) when an abnormally high pressure is detected by DEP-PI-8322. The pumps are also stopped when an abnormally low pressure is detected by DEP-PI-8322 and the units are in operation. [Reference: 24590-BOF-J3-DEP-70403/70410/71403]

4.1.6.5.1.3.20 Overhead Sampling Vessel Transfer/Recirculation Pump Flow Interlock

This interlock provides pump protection by stopping DEP-PMP-00004A/B/C (DEP-YC-8315/8317/8319) when an abnormally low flow is detected by DEP-FI-8321 and any two units are in operation. If any pump is operating and the flow continues to decrease, the unit is stopped. [Reference: 24590-BOF-J3-DEP-70403/70410/71404]

4.1.6.5.1.3.21 Overhead Sampling Vessel Outlet Valve Permissive

This interlock prevents the simultaneous transfer from DEP-VSL-00004A and DEP-VSL-00004B by preventing the outlet valves, DEP-YV-8307/8314 (DEP-YC-8307/8314) from opening unless the other vessel outlet valve is closed. [Reference: 24590-BOF-J3-DEP-70406/70409]

4.1.6.5.1.3.22 Overhead Sampling Vessel Eductor Valve Interlock

This interlock prevents the cross-mixing of DEP-VSL-00004A/B by closing the overhead sampling vessel eductor valves, DEP-YV-8304/8311 (DEP-YC-8304/8311), when their associated vessel outlet valve (DEP-YV-8307/8314) is not open. [Reference: 24590-BOF-J3-DEP-70404/70407]

4.1.6.5.1.3.23 Overhead Sampling Vessel Transfer Volume Interlock

This interlock prevents excess evaporator condensate transfers from DEP-VSL-00004A/B to DEP-VSL-00002 or DEP-VSL-00005A/B by stopping DEP-PMP-00004A/B/C (DEP-YC-8315/8317/8319) when the high transfer volume setpoint of DEP-FQSH-8321 is reached and the pumps are in the manual mode. [Reference: 24590-BOF-J3-DEP-70003/70403/71404]

4.1.6.5.1.3.24 Overhead Sampling Vessel Valve Alignment Interlock

This interlock prevents inadvertent transfers from DEP-VSL-00004A/B by stopping DEP-PMP-00004A/B/C (DEP-YC-8315/8317/8319) when the vessel outlet valves are not aligned in accordance with the selection made at DEP-HS-8323A or when the downstream transfer valves are not aligned in accordance with the selection made at DEP-HS-8323B. [Reference: 24590-BOF-J3-DEP-70003/70401/70402/70403]

4.1.6.5.1.3.25 Process Condensate Lag Storage Vessel High Level Interlock*

This interlock protects DEP-VSL-00005A/B from overfilling by preventing transfers from various sources within the EMF to DEP-VSL-00005A/B. The following actions occur when a high level is detected by DEP-LI-8458/8468:

- The process condensate lag storage vessel inlet valves, DEP-YV-8451/8461 close
- The process condensate lag storage vessel steam blowdown valves, DEP-YV-8454/8464 close
- The east process area sump pumps, DEP-PMP-00033A/B, stop
- The process condensate vessel sump pumps, DEP-PMP-00035A/B, stop

[Reference: 24590-BOF-J3-DEP-70606/70607/70609/70611/71601/71602]

4.1.6.5.1.3.26 Process Condensate Lag Storage Vessel Low Level Interlock

This interlock protects the process condensate lag storage transfer and process condensate lag storage recirculation pumps from dry-running and overheating by stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) and DEP-PMP-00015A/B/C (DEP-YC-8489/8490/8491) when a low level is detected by DEP-LI-8458 or DEP-LI-8468. [Reference: 24590-BOF-J3-DEP-70604/70605/71601/71602]

4.1.6.5.1.3.27 Process Condensate Lag Storage Vessel Recirculation Pump Discharge Pressure Interlock

This interlock prevents cavitation and mechanical failure by stopping DEP-PMP-00015A/B/C (DEP-YC-8489/8490/8491) when an abnormally high pressure is detected by DEP-PI-8492. The pumps are also stopped when an abnormally low pressure is detected by DEP-PI-8492 and any of the units is in operation. [Reference: 24590-BOF-J3-DEP-70604/70617/71603]

4.1.6.5.1.3.28 Process Condensate Lag Storage Vessel Recirculation Pump Discharge Flow Interlock

This interlock provides pump protection by stopping DEP-PMP-00015A/B/C (DEP-YC-8489/8490/8491) when an abnormally low flow is detected by DEP-FI-8493 and any of the units is in operation. [Reference: 24590-BOF-J3-DEP-70604/70617/71605]

4.1.6.5.1.3.29 Process Condensate Lag Storage Vessel Primary Recirculation Valve Interlock

This interlock provides pump protection by stopping DEP-PMP-00015A/B/C (DEP-YC-8489/8490/8491) when neither of the process condensate lag storage vessel primary recirculation valves (DEP-YV-8452/8462) are open and any of the units is in operation. [Reference: 24590-BOF-J3-DEP-70604/70617]

4.1.6.5.1.3.30 Process Condensate Lag Storage Vessel Flush Volume Interlock

This interlock prevents excess process condensate flush transfers from DEP-VSL-00005A/B to the outlet of DEP-VSL-00003A/B/C and DEP-FILT-00003 by stopping DEP-PMP-00015A/B/C (DEP-YC-8489/8490/8491) when the high transfer volume setpoint of DEP-FQSH-8496 is reached and any of the pumps is in the manual mode. [Reference: 24590-BOF-J3-DEP-70003/70604/71604]

4.1.6.5.1.3.31 Process Condensate Lag Storage Vessel Recirculation Pump Valve Alignment Interlock*

This interlock prevents inadvertent transfers from DEP-VSL-00005A/B by stopping DEP-PMP-00015A/B/C (DEP-YC-8489/8490/8491) when the vessel outlet and primary recirculation valves are not aligned in accordance with the selection of DEP-VSL-00005A or DEP-VSL-00005B made at DEP-HS-8480A or all the following mis-alignments occur simultaneously:

- The DEP-VSL-00005A/B valves are not aligned for mixing in accordance with DEP-HS-8497
- The DEP-PMP-00001A/B flush valves are not aligned in accordance with DEP-HS-8199
- The DEP-VSL-00003A/B/C valves are not aligned for a Tank Farms transfer in accordance with DEP-HS-8431B
- The DEP-VSL-00003A/B/C valves are not aligned for a Tank Farms transfer in accordance with DEP-HS-8431A and DEP-HS-8431B

[Reference: 24590-BOF-J3-DEP-70003/70215/70502/70516/70602/70603]

4.1.6.5.1.3.32 Process Condensate Lag Storage Vessel Eductor Valve Interlock

This interlock prevents the cross-mixing of DEP-VSL-00005A/B by closing the process condensate lag storage vessel eductor valves, DEP-YV-8456/8467 (DEP-YC-8456/8467), when their associated vessel outlet valve (DEP-YV-8460/8494) is not open. [Reference: 24590-BOF-J3-DEP-70608/70610]

4.1.6.5.1.3.33 Process Condensate Lag Storage Vessel Outlet Valve Permissive

This interlock prevents the simultaneous transfer from DEP-VSL-00005A and DEP-VSL-00005B by preventing the outlet valves, DEP-YV-8460/8494 (DEP-YC-8460/8494) from opening unless the other vessel outlet valve is closed. [Reference: 24590-BOF-J3-DEP-70612/70613]

4.1.6.5.1.3.34 Process Condensate Lag Storage Vessel Transfer Pump Discharge Pressure Interlock

This interlock prevents cavitation and mechanical failure by stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) when an abnormally high pressure is detected by DEP-PI-8474. The pumps are also stopped when an abnormally low pressure is detected by DEP-PI-8474 and either of the units is in operation. [Reference: 24590-BOF-J3-DEP-70605/70618/71609]

4.1.6.5.1.3.35 Process Condensate Lag Storage Vessel Transfer Pump Discharge Flow Interlock

This interlock provides pump protection by stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) when an abnormally low flow is detected by DEP-FI-8475 and either of the units is in operation. [Reference: 24590-BOF-J3-DEP-70605/70618/71607]

4.1.6.5.1.3.36 Process Condensate Lag Storage Vessel Transfer Volume Interlock

This interlock prevents excess evaporator condensate transfers from DEP-VSL-00005A/B by stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) when the transfer volume setpoint of DEP-FQSH-8475 is reached and either of the pumps is in the manual mode. [Reference: 24590-BOF-J3-DEP-70003/70605/71607]

4.1.6.5.1.3.37 Condensate to LERF Radiation Interlock

This interlock prevents the transfer of radioactive process condensate that would exceed the acceptance limits of LERF/ETF by initiating the following when high radiation is detected by DEP-RI-8476:

- Stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) when the transfer valves are aligned for LERF transfers in accordance with the selection made at DEP-HS-8480B
- Closing DEP-YV-8487 (DEP-YC-8487)

[Reference: 24590-BOF-J3-DEP-70605/70616/71606]

4.1.6.5.1.3.38 Condensate to LERF Conductivity Interlock

This interlock prevents the transfer of off-specification process condensate that would exceed the acceptance limits of LERF/ETF by initiating the following when high conductivity is detected by DEP-CI-8477:

- Stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) when the transfer valves are aligned for LERF transfers in accordance with the selection made at DEP-HS-8480B
- Closing DEP-YV-8487 (DEP-YC-8487)

[Reference: 24590-BOF-J3-DEP-70605/70616/71606]

4.1.6.5.1.3.39 Condensate to LERF pH Interlock

This interlock prevents the transfer of off-specification process condensate that would exceed the acceptance limits of LERF/ETF by initiating the following when either high or low pH is detected by DEP-AI-8478:

- Stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) when the transfer valves are aligned for LERF transfers in accordance with the selection made at DEP-HS-8480B
- Closing DEP-YV-8487 (DEP-YC-8487)

[Reference: 24590-BOF-J3-DEP-70605/70616/71606]

4.1.6.5.1.3.40 Condensate to LERF Temperature Interlock

This interlock prevents the transfer of off-specification process condensate that would exceed the acceptance limits of LERF/ETF by initiating the following when high temperature is detected by DEP-TI-8479:

- Stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) when the transfer valves are aligned for LERF transfers in accordance with the selection made at DEP-HS-8480B
- Closing DEP-YV-8487 (DEP-YC-8487)

[Reference: 24590-BOF-J3-DEP-70605/70616/71606]

4.1.6.5.1.3.41 Process Condensate Lag Storage Transfer Pump Valve Alignment Interlock

This interlock prevents inadvertent transfers of evaporator condensate when a flow path is not available or a valve mis-alignment is present by stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) when the vessel inlet and outlet valves are not aligned with the configuration selected at DEP-HS-8480A or the downstream transfer valves are not in alignment with the configuration selected at DEP-HS-8480B while either of the pumps is in the manual mode. [Reference: 24590-BOF-J3-DEP-70003/70601/70602/70605]

4.1.6.5.1.3.42 Condensate to LERF Transfer Volume Interlock

This interlock prevents excess evaporator condensate transfers from DEP-VSL-00005A/B to LERF/ETF by stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) when the transfer volume setpoint of DEP-FQSH-8482 is reached and either of the pumps is in the manual mode. [Reference: 24590-BOF-J3-DEP-70003/70605/71608]

4.1.6.5.1.3.43 Process Condensate Filter Pressure Interlock

This interlock protects DEP-FILT-00002 and the downstream transfer line from over-pressurization by stopping DEP-PMP-00005A/B (DEP-YC-8472/8473) when a high pressure is detected by DEP-PI-8498. [Reference: 24590-BOF-J3-DEP-70605/71610]

4.1.6.5.1.4 Other DEP System Interlocks, Bypasses, and Permissives

4.1.6.5.1.4.1 West Process Area Sump Level Interlock

This interlock prevents the west process area sump pumps from dry-running by stopping DEP-PMP-00032A/B (DEP-YC-8627/8630) when a low level is detected by DEP-LI-8626/8629. [Reference: 24590-BOF-J3-DEP-70901/71901]

4.1.6.5.1.4.2 West Process Area Sump Pump Interlock

This interlock prevents the west process area sump pumps from overheating by stopping DEP-PMP-00032A/B (DEP-YC-8627/8630) when their associated discharge valves, DEP-YV-8628/8631, are closed. The interlock also seals the flow path from DEP-SUMP-00002A/B by closing DEP-YV-8628/8631 (DEP-YC-8628/8631) when their associated pump is not running. [Reference: 24590-BOF-J3-DEP-70901/70902]

4.1.6.5.1.4.3 Feed Vessel Area Sump Level Interlock

This interlock prevents the feed vessel area sump pumps from dry-running by stopping DEP-PMP-00034A/B (DEP-YC-8634/8657) when a low level is detected by DEP-LI-8632/8656. [Reference: 24590-BOF-J3-DEP-70903/71901]

4.1.6.5.1.4.4 Truck Bay Sump Level Interlock

This interlock prevents the truck bay sump pump from dry-running by stopping DEP-PMP-00038 (DEP-YC-8649) when a low level is detected by DEP-LI-8648. [Reference: 24590-BOF-J3-DEP-70906/71901]

4.1.6.5.1.4.5 East Process Area Sump Level Interlock

This interlock prevents the east process area sump pumps from dry-running by stopping DEP-PMP-00033A/B (DEP-YC-8651/8653) when a low level is detected by DEP-LI-8646/8647. [Reference: 24590-BOF-J3-DEP-70908/71901]

4.1.6.5.1.4.6 East Process Area Sump Pump Interlock*

This interlock prevents the east process area sump pumps from overheating by stopping DEP-PMP-00033A/B (DEP-YC-8651/8653) when the process condensate lag storage vessel minimum recirculation valves, DEP-YV-8453/8663, are closed. [Reference: TBD]

4.1.6.5.1.4.7 Process Condensate Vessel Area Sump Level Interlock

This interlock prevents the process condensate vessel area sump pumps from dry-running by stopping DEP-PMP-00035A/B (DEP-YC-8639/8642) when a low level is detected by DEP-LI-8638/8641. [Reference: 24590-BOF-J3-DEP-70910/71901]

4.1.6.5.1.4.8 Process Condensate Vessel Area Sump Pump Interlock*

This interlock prevents the process condensate vessel area sump pumps from overheating by stopping DEP-PMP-00035A/B (DEP-YC-8639/8642) when the process condensate lag storage vessel minimum recirculation valves, DEP-YV-8453/8663, are closed. [Reference: TBD]

4.1.6.5.1.4.9 Tank Farms Transfer Line Leak Interlock

This interlock terminates the transfer of conditioned evaporator concentrate/feed to Tank Farms by initiating the following when a leak is detected by DEP-LAH-8701:

- Stopping DEP-PMP-00012A/B/C when DEP-HS-8902 is aligned for a Tank Farms transfer
- Stopping DEP-PMP-00003A/B when DEP-HS-8431B is aligned for a Tank Farms transfer
- Stopping DEP-PMP-00015A/B/C
- Stopping SNR-PMP-00022
- Closing DEP-YV-8405

[Reference: 24590-BOF-J3-DEP-70004/70204/70213/70509/70604, 24590-BOF-J3-SNR-70002]

4.1.6.5.1.4.10 LAW Facility Feed Transfer Line Leak Interlock

This interlock terminates the transfer of evaporator concentrate and the TOC feed to the LAW Facility by initiating the following when a leak is detected by DEP-LAH-8703:

- Stopping DEP-PMP-00003A/B when DEP-HS-8431B is aligned for a LAW Facility transfer
- Stopping SHR-PMP-00025 when SHR-HS-8310 is aligned for a LAW Facility transfer
- Closing DEP-YV-8683

[Reference: 24590-BOF-J3-DEP-70001/70004/70509, 24590-BOF-J3-SHR-70002]

4.1.6.5.1.4.11 LAW RLD Transfer Line Leak Interlock

This interlock terminates the transfer of LAW RLD system effluent to DEP-VSL-00002 by stopping LAW-RLD-PMP-00001A/B and LAW-RLD-PMP-00003A/B when a leak is detected by DEP-LAH-8706. [Reference: 24590-BOF-J3-DEP-70005, 24590-LAW-J3-RLD-00002/00003/00007/00008]

4.1.6.5.1.4.12 LAW LVP Transfer Line Leak Interlock

This interlock terminates the transfer of LAW LVP system effluent to DEP-VSL-00004A/B by stopping LVP-PMP-00002A/B when a leak is detected by DEP-LAH-8705. [Reference: 24590-BOF-J3-DEP-70005, 24590-LAW-J3-LVP-00006]

4.1.6.5.1.4.13 Lab RLD Transfer Line Leak Interlock

This interlock terminates the transfer of Lab RLD system effluent to DEP-VSL-00002 by stopping LAB-RLD-PMP-00182A/B when a leak is detected by DEP-LAH-8704. [Reference: 24590-BOF-J3-DEP-70005, 24590-LAB-J3-RLD-00003]

4.1.6.5.2 DVP System Interlocks, Bypasses, and Permissives

4.1.6.5.2.1 Exhauster Start Permissive

This permissive prevents DVP-EXHR-00001A/B (DVP-YC-8105A/B) from starting unless their associated inlet valve (DVP-V-00031/00023) is open, as indicated by DVP-ZI-8119/8121. [Reference: 24590-BOF-J3-DVP-70002/70003]

4.1.6.5.2.2 Inlet Valve Interlock

This interlock provides exhauster protection by stopping DVP-EXHR-00001A/B (DVP-YC-8105A/B) when their associated inlet valve closes, as indicated by DVP-ZI-8119/8121, while the exhauster is in operation. [Reference: 24590-BOF-J3-DVP-70002/70003]

4.1.6.5.2.3 Outlet Valve Interlock

This interlock provides exhauster protection by stopping DVP-EXHR-00001A/B (DVP-YC-8105A/B) when their associated outlet valve (DVP-YV-8120/8122) closes while the exhauster is in operation. [Reference: 24590-BOF-J3-DVP-70002/70003]

4.1.6.5.2.4 Low Speed Interlock

This interlock stops DVP-EXHR-00001A/B (DVP-YC-8105A/B) when a low speed is detected by DVP-SI-8110/8116 and the unit is running, indicating that there may be a mechanical issue with the operating exhauster and initiating the switch-over to the other exhauster train. [Reference: 24590-BOF-J3-DVP-71002/71003]

4.1.6.5.2.5 Low Flow Interlock

This interlock stops DVP-EXHR-00001A/B (DVP-YC-8105A/B) when a low flow is detected by DVP-FI-8111/8117 and the unit is running, indicating that there may be a mechanical issue with the operating exhauster and initiating the switch-over to the other exhauster train. [Reference: 24590-BOF-J3-DVP-71002/71003]

4.1.6.5.2.6 High Temperature Interlock

This interlock stops DVP-HTR-00001A/B (DVP-YC-8106/8112) when a high temperature is detected by DVP-TI-8107/8113, indicating that there may be a mechanical issue with the preheater integral temperature elements and controller. [Reference: 24590-BOF-J3-DVP-71002/71003]

4.1.6.5.3 ACV System Interlocks, Bypasses, and Permissives

This section will be updated at a later revision when the C&I logic diagrams are issued for the ACV system.

4.2 Operations

4.2.1 Initial Configuration (Pre-startup)

This section provides the proper configuration for system operation prior to those systems being started. The supply of power and the operation of the individual components of the systems are verified prior to startup of the DEP, DVP, ACV, and C1V systems.

This section will be updated at a later revision upon the issuance of the preliminary system operating manuals.

4.2.2 System Startup

This section will be updated at a later revision upon the issuance of the preliminary system operating manuals.

4.2.3 Normal Operations

This section will be updated at a later revision upon the issuance of the preliminary system operating manuals.

4.2.3.1 Operational Constraint

An operational constraint is established in calculation 24590-BOF-Z0C-W13T-00002. During normal operations, dose rates in the areas of several penetrations in the EMF facility shielding will result in dose rates higher than the target dose rates. If it is necessary to perform work in the areas containing these penetrations, surveys are to be performed and work activities limited to reduce radiation exposure to facility workers. Penetrations identified in 24590-BOF-Z0C-W13T-00002 are located above the normally occupied work areas outside the facility. The specific penetrations to which this operational constraint applies are detailed in the calculation and in Attachment A to 24590-BOF-EIE-ENG-16-0001.

4.2.4 Off-Normal Operations

This section will be updated at a later revision upon the issuance of the preliminary system operating manuals.

4.2.4.1 Operational Constraint

An operational constraint is established in calculation 24590-BOF-M4C-V11T-00003. If, during off-normal operations, an undiluted line of feed (1500 gal) from the TOC that would normally be transferred to LCP-VSL-00001A/B is drained to DEP-VSL-00001, the degree of concentration in DEP-EVAP-00001 must be adjusted after the batch from DEP-VSL-00001 is transferred to DEP-VSL-00002. The flow rate of concentrate leaving the vessel should be no less than 1/10th the feed rate. This will prevent the overconcentration of hydrogen generating organics and ions in DEP-EVAP-00001 and DEP-VSL-00003A/B/C and ensure that the ventilation systems in each of these vessels can vent hydrogen faster than it can be generated. Per 24590-BOF-M4C-V11T-00001, an operational constraint is established that 137Cs activity in the DEP-VSL-00001 is limited to 4.5 E-05 Ci/L.

4.2.5 System Shutdown

This section will be updated at a later revision upon the issuance of the preliminary system operating manuals.

4.2.6 Safety Management Programs and Administrative Controls

RESERVED

4.3 Testing and Maintenance

RESERVED

4.3.1 Temporary Configurations

RESERVED

4.3.2 TSR-Required Surveillances

RESERVED

4.3.3 Non-TSR Inspections and Testing

RESERVED

4.3.4 Maintenance

4.3.4.1 Low Point Drain Vessel Agitator and Pumps

The low point drain vessel agitator (DEP-AGT-00001) is maintained in accordance with vendor documentation. Instructions and tasks required to change the agitator shaft and blades may require removal of the 50 in. vessel flange along with the agitator itself for disposal. Should any seal or bearing replacement be necessary that requires removal of the wet end of the unit, special considerations such as (TBD) are made. Packaging the agitator for removal precludes size reduction, although the drives can be packaged separately. Any replacement flange is procured in accordance with the applicable vendor documentation. Replacement assemblies can therefore utilize the flange lugs for lifting and placement into the operating configuration.

The low point drain vessel submersible pumps (DEP-PMP-00001A/B) are maintained in accordance with vendor documentation. Should any seal of bearing replacement be necessary that requires removal of the wet end, special considerations such as (TBD) are made. Packaging the pumps for removal precludes size reduction. Replacement pumps can be assembled exterior to the LAW effluent drain tank building and the wet end is complete prior to installation from the top of the vessel.

4.4 Supplemental Information

RESERVED

5 References and Design Documents List

5.1 Source / Basis References

Document Number	Title	Text Reference
24590-WTP-DB-ENG-01-001	*Basis of Design*	BOD
24590-WTP-ICD-MG-01-006	*ICD-06 Interface Control Document for Dilute Radioactive Dangerous Liquid Effluents*	ICD-06
24590-WTP-ICD-MG-01-009	*ICD 09 – Interface Control Document for Land for Siting*	ICD-09
24590-WTP-ICD-MG-01-030	*ICD 30 - Interface Control Document for Direct LAW Feed*	ICD-30
24590-WTP-ICD-MG-01-031	*ICD-31 Interface Control Document for DFLAW Effluent Returns to Double-Shell Tanks*	ICD-31
24590-WTP-PD-RAWS-SS-0003	*Chemical Safety Management Program Description*	CSMPD
24590-WTP-COR-MGT-15-00001	Engineering, Procurement, and Construction (EPC) Code of Record	COR
24590-WTP-RPP-ESH-01-001	*Radiation Protection Program for Design, Construction, Commissioning, and Operations*	RPP
24590-WTP-RPT-ENV-15-008	*WDOH Radioactive Air Emissions NOC Approval for the WTP Effluent Management Facility – Permit Conditions*	NOC 1043
24590-WTP-RPT-OP-01-001	*Operations Requirements Document*	ORD
24590-WTP-SRD-ESH-01-001-02	*Safety Requirements Document, Volume II*	SRD
DE-AC27-01RV14136	*DOE Contract*	WTP Contract
WA7890008967	*Dangerous Waste Portion of RCRA Permit*	DWP

5.2 Other References

Document Number	Title
24590-BOF-3YD-50-00002	*Facility Description for the Balance of Facilities*
24590-BOF-A5-25-05200001	*LAW Effluent Process BLDG 25 Drain Tank BLDG 25A Utility BLDG 26 Architectural Room Finish Schedule*
24590-BOF-DD-25-00015	*Effluent Management Facility 24 Inch Dia. Sump in Secondary Containment Sections and Details*
24590-BOF-FHA-RAFP-FP-0001	*Fire Hazards Analysis (FHA) for the Effluent Management Facility (EMF)*
24590-BOF-J0-EMJ-00001	*Balance of Facilities Effluent Management Facility Sys. EMJ & RPJ CAMS, Friskers, & PCMs Supplemental Instr. Diagram Plan at Elev. 0'-0"*
24590-BOF-M0-25-00003	*Balance of Facilities LAW Effluent Process Bldg. & LAW Effluent Drain Tank Bldg. & LAW Effluent Utility Bldg. Wall Penetration Schedule*
24590-BOF-M0-DEP-00001001	*BOF/EMF Design Proposal Drawing Sampling Fume Hood*
24590-BOF-PER-J-16-001	*System Logic Description for the Direct Feed LAW Effluent Management Facility Process System (DEP)*
24590-BOF-PER-M-16-003	*Dangerous Waste Permit (DWP) Liner Heights in the Effluent Management Facility (EMF)*
24590-BOF-RPT-PR-15-001	*Direct Feed LAW Process Corrosion Data*

Document Number	Title
24590-BOF-S1-25-00101	*LAW Effluent Drain Tank*
24590-BOF-U1-25-00001	*Balance of Facilities LAW Effluent Process BLDG & LAW Effluent Drain Tank BLDG Fire Barrier Drawing Elevation 0 Feet – 0 Inches*
24590-BOF-U1-26-00001	*Balance of Facilities LAW Effluent Utility BLDG & LAW Effluent Electrical BLDG Fire Barrier Drawing Elevation 0 Feet – 0 Inches*
24590-LAW-3ZD-20-00002	*LAW Facility Design Description*
24590-WTP-3DP-G04R-00046	*Engineering Drawings*
24590-WTP-3DP-G04B-00092	*System Verification*
24590-WTP-3DP-G04B-00093	*System and Facility Design Descriptions*
24590-WTP-3ZD-GRE-00001	*System Design Description for the Grounding and Lightning Protection Electrical (GRE) System*
24590-WTP-3ZD-MVE-00001	*LAW BOF and Lab Medium Voltage Electrical (MVE) Low Voltage Electrical (LVE) and DC Electrical (DCE) System Design Description*
24590-WTP-3ZD-SHR-00001	*System Design Description for the WTP Process Reagent Systems (AFR, MXR, NAR, SHR, SNR, SPR, STR)*
24590-WTP-B2-C12T-00001	*Interface Control Drawing*
24590-WTP-DC-ST-01-001	*Structural Design Criteria*
24590-WTP-DC-ST-04-001	*Seismic Analysis and Design Criteria*
24590-WTP-ES-J-11-001	*Guidance for the Application of Emergency Stops on Equipment at the WTP*
24590-WTP-GPG-ENG-0170	*Impact Evaluation*
24590-WTP-GPG-M-027	*Recommended Slopes for Piping Systems*
24590-WTP-RPT-ENG-02-009	*Systems and Area Locators List and System Division of Responsibility*
CCN 033014	*Operations Level of Automation Criteria*
CCN 275986	*Liquid Waste Processing Facilities Waste Acceptance Criteria, HNF-3172*

5.3 System and Facility Design Documents

Document Number	Title
General Arrangement/Equipment Location Drawings	
24590-BOF-C2-C12T-00002	*RPP-WTP Site General Arrangement Plan*
24590-BOF-P1-25-00001	*Balance of Facilities LAW Effluent Process BLDG & LAW Effluent Drain Tank BLDG General Arrangement Plan at ELEV 0 FT – 0 IN*
24590-BOF-P1-25-00002	*Balance of Facilities LAW Effluent Process BLDG & LAW Effluent Drain Tank BLDG General Arrangement Sections A, B & C*
24590-BOF-P1-25-00003	*Balance of Facilities LAW Effluent Process BLDG & LAW Effluent Drain Tank BLDG Equipment Location Drawing Plan at ELEV 0 Foot – 0 Inches – Area 1*
24590-BOF-P1-25-00004	*Balance of Facilities LAW Effluent Process BLDG & LAW Effluent Drain Tank BLDG Equipment Location Drawing Plan at ELEV 0 Foot – 0 Inches – Area 2*
24590-BOF-P1-26-00001	*Balance of Facilities LAW Effluent Utility BLDG & LAW Effluent Electrical BLDG General Arrangement Plan at ELEV. 0 FT - 0 IN*
24590-BOF-P1-26-00002	*Balance of Facilities LAW Effluent Utility BLDG & LAW Effluent Electrical BLDG General Arrangement Sections A and B*

Document Number	Title
24590-BOF-P1-26-00003	*Balance of Facilities LAW Effluent Utility Building Equipment Location Drawing Plan at ELEV 0 Foot – 0 Inches*
24590-BOF-P1-50-00001	*RPP-WTP Plot Plan*
24590-CM-POA-EKL1-00001-04-00032	*Drawing – General Arrangements/Outline Dimension Drawings*
Facility Communication Layout Drawings	
24590-BOF-EF-25-00001	*EMF Process Building B25 & Low Point Drain Tank Building B25A Communication Layout Drawing*
24590-BOF-EF-26-00001	*EMF Utility Building B26 Communication Layout Drawing*
24590-BOF-EF-27-00001	*EMF Electrical Building B27 Communication Layout Drawing*
Facility Grounding Layout Drawings	
24590-BOF-EG-25-00001	*EMF Process Building 25 Grounding Layout Drawing Area 1*
24590-BOF-EG-25-00002	*EMF Process Building 25 Grounding Layout Drawing Area 2*
24590-BOF-EG-25-00003	*EMF Process Building 25 Grounding Layout Drawing Area 3*
24590-BOF-EG-25-00004	*EMF Process Building 25 Grounding Layout Drawing Area 4*
24590-BOF-EG-25-00005	*EMF Grounding Details*
24590-BOF-EG-25-00006	*EMF Process Building 25 Lightning Protection Plan Area 3*
24590-BOF-EG-25-00007	*EMF Process Building 25 Lightning Protection Plan Area 4*
24590-BOF-EG-25-00008	*EMF Process Building 25 Lightning Protection Plan Area 2*
24590-BOF-EG-25-00009	*EMF Process Building 25 Lightning Protection Plan Area 1*
24590-BOF-EG-25A-00001	*EMF Process Building 25A Grounding Layout Drawing*
24590-BOF-EG-25A-00002	*EMF Low Point Drain Tank Building 25A Lightning Protection Plan*
24590-BOF-EG-26-00001	*EMF Process Building 26 Grounding Layout Drawing Area 1*
24590-BOF-EG-26-00002	*EMF Process Building 26 Grounding Layout Drawing Area 2*
24590-BOF-EG-26-00003	*EMF Utility Building B26 Lightning Protection Plan*
24590-BOF-EG-27-00001	*EMF Process Building 27 Grounding Layout Drawing*
24590-BOF-EG-27-00002	*EMF Electrical Building B27 Lightning Protection Plan*
24590-BOF-EG-E41T-00003	*BOF LAW Effluent Main Ground Grid*
Facility Lighting Layout Drawings	
24590-BOF-EL-25-00001	*EMF Process Building 25 Lighting Layout Drawing at El. 0 Ft. – 0 In. Area 1*
24590-BOF-EL-25-00002	*EMF Process Building 25 Lighting Layout Drawing at El. 0 Ft. – 0 In. Area 2*
24590-BOF-EL-25-00003	*EMF Process Building 25 Lighting Layout Drawing at El. 0 Ft. – 0 In. Area 3*
24590-BOF-EL-25-00004	*EMF Process Building 25 Lighting Layout Drawing at El. 0 Ft. – 0 In. Area 4*
24590-BOF-EL-25-00005	*EMF Process Building 25 Lighting Layout Drawing at El. 0 Ft. – 0 In. Area 3 Partial Plan*
24590-BOF-EL-25-00006	*EMF Process Building 25 Lighting Layout Drawing at El. 0 Ft. – 0 In. Area 4 Partial Plan*
24590-BOF-EL-25A-00001	*EMF Low Point Drain Tank Building 25A Lighting Layout Drawing*
24590-BOF-EL-26-00001	*EMF Utility Building 26 Electrical Lighting Layout Drawing Area 1*
24590-BOF-EL-26-00002	*EMF Utility Building 26 Electrical Lighting Layout Drawing Area 2*

Document Number	Title
Facility Structural Design Calculations	
24590-BOF-DBC-25-00001	*LAW Effluent Process Building Concrete Basemat and Wall Design*
24590-BOF-DBC-25-00002	*LAW Effluent Drain Tank Building Design*
24590-BOF-DBC-26-00001	*Foundation Design for LAW Effluent Utility and Electrical Buildings*
24590-BOF-DDC-25-000001	*LAW Effluent Process and Drain Tank Buildings Vessels Support Anchorage Design*
24590-BOF-DDC-25-000002	*LAW Effluent Process Building Pipe Rack Support Anchorage Design*
24590-BOF-DDC-25-000003	*LAW Effluent Process Building Evaporator and Equipment Support Anchorage Design*
24590-BOF-DDC-25-000004	*LAW Effluent Process and Drain Tank Buildings Sumps and Liner Grillage Anchorage Design*
24590-BOF-DDC-25-000005	*LAW Effluent Process Building Gang Plate Design*
24590-BOF-DDC-25-000006	*LAW Effluent Process Building Equipment Platforms Transition Steel Design*
24590-BOF-DDC-25-000007	*LAW Effluent Process Building Column Anchors*
24590-BOF-DDC-25-000008	*LAW Effluent Process and Drain Tank Buildings Ring Beam Design*
24590-BOF-DDC-25-000009	*LAW Effluent Process Building Pump Frame Design*
24590-BOF-DDC-25-000010	*LAW Effluent Process Building Sub-Change Room Structural Framing Supports Design*
24590-BOF-DDC-25-000011	*LAW Effluent Process Building Caustic Tanks Embeds and Transition Frame Design*
24590-BOF-DDC-25-000012	*LAW Effluent Drain Tank Building Subgrade Structural Embed Design (-30 Feet up to 0 Feet)*
24590-BOF-DDC-25-000013	*LAW Effluent Management Facility Standard Stanchion Design*
24590-BOF-DDC-25-000014	*LAW Effluent Process Building Embed Design for Main Steel Frame and Other Miscellaneous Items*
24590-BOF-DDC-25-000015	*LAW Effluent Process Building Miscellaneous Equipment Frame Design*
24590-BOF-S0C-25-00001	*LAW Effluent Process Building Load Case and Load Combination Development*
24590-BOF-S0C-25-00002	*LAW Effluent Process Building Finite Element Model*
24590-BOF-SSC-25-00001	*LAW Effluent Process Building Steel Frame Design*
24590-BOF-SSC-25-00002	*Effluent Management Facility Pipe Rack Standard Connections*
24590-BOF-SSC-25-00003	*LAW Effluent Process Building Platforms EP0102B, EP0103B, and Modular Pipe Racks Steel Design*
24590-BOF-SSC-25-00004	*LAW Effluent Process Building Roof Steel Purlin and Deck System*
24590-BOF-SSC-25-00005	*LAW Effluent Process Building Truck Bay Canopy Design*
24590-BOF-SSC-25-00006	*LAW Effluent Process Building Primary Steel Connection Design*
24590-BOF-SSC-25-00007	*LAW Effluent Process Building Design of Girts, Sag Rods, and Other Secondary Steel Members*
24590-BOF-SSC-25-00008	*LAW Effluent Process Building LERF Area Platforms Steel Design*
24590-BOF-SSC-25-00009	*LAW Effluent Process Building Steel Member Design of Platform EP0103C*
24590-BOF-SSC-25-00010	*LAW Effluent Process Building Platform EP0102A Steel and Connection Design*
24590-BOF-SSC-25-00011	*LAW Effluent Process Building Steel Connection Design for Platform EP0103C*
24590-BOF-SSC-25-00012	*LAW Effluent Process Building Room E-0104 Airlock Platform Design*
24590-BOF-SSC-25-00013	*LAW Effluent Process Building Subchange & HEPA Rooms Steel Connections Design*
24590-BOF-SSC-25-00014	*LAW Effluent Process Building Subchange & HEPA Rooms Steel Connections Design*

Document Number	Title
24590-BOF-SSC-25-00015	*LAW Effluent Process Building Platform for DEP-FILT-00003 (Platform EP0103A)*
24590-BOF-SSC-25-00016	*LAW Effluent Process Building Steel Design for Condenser Support*
24590-BOF-SSC-25-00017	*LAW Effluent Process and Utility Building Misc. Pipe & Electrical Support Design*
24590-BOF-SSC-25-00018	*LAW Effluent Drain Tank Building Steel Design for Platform EDPB001C*
24590-BOF-SSC-25-00019	*LAW Effluent Process Building LERF Area Pipe Rack Steel Design*
24590-BOF-SSC-25-00020	*Design of Steel Supports for SNR-HTR-00002 and SHR-HTR-00007*
24590-BOF-SSC-25-00021	*LAW Effluent Process Building Pump Frame Design*
24590-BOF-SSC-25-00022	*LAW Effluent Process Building HEPA Filter Support Frame Design*
24590-BOF-SSC-25-00026	*EMF Non-Standard Cable Tray Support Design*
24590-BOF-SSC-26-00001	*Utility Building Pipe Rack Design*
24590-BOF-SSC-S15T-00026	*Utility Rack Steel Design for DFLAW Extension of Rack*
Structural Steel Platform Plans	
24590-BOF-S1-25-00003	*LAW Effluent Process BLDG 25 Structural Steel Platform EP0103A Plan and Sections*
24590-BOF-S1-25-00004	*LAW Effluent Process BLDG 25 Structural Steel Platform EP0102A Plan and Sections*
24590-BOF-S1-25-00005	*LAW Effluent Process BLDG 25 Structural Steel Platform EP0106A Plan and Sections*
24590-BOF-S1-25-00006	*LAW Effluent Process BLDG 25 Structural Steel Platform EP0106C and EP0106B Plans*
24590-BOF-S1-25-00010	*LAW Effluent Process BLDG 25 Structural Steel Platform EP0103C Plans*
24590-BOF-S1-25-00011	*LAW Effluent Process BLDG 25 Structural Steel Platform EP0103B Plans*
24590-BOF-S1-25-00012	*LAW Effluent Process BLDG 25 Structural Steel Platform EP0102B Plans*
24590-BOF-S1-25-00013	*LAW Effluent Process BLDG 25 Structural Steel Platform EP0102B Plan and Sections*
24590-BOF-S1-25-00101	*LAE Effluent Drain Tank Building 25A Structural Steel Platform EDPB001C Plan Sections and Details*
24590-BOF-S1-25-00102	*LAE Effluent Drain Tank Building 25A Structural Steel Platforms EDPB001A & EDPB001B Plans and Sections*
Process Flow Diagrams/Data	
24590-BOF-M5-V17T-00011	*Process Flow Diagram Direct Feed Effluent Transfer (System DEP)*
24590-BOF-M5-V17T-00012	*Process Flow Diagram Direct Feed Effluent Evaporator (System DEP)*
24590-BOF-M5-V17T-00013	*Process Flow Diagram Direct Feed Concentrate Transfer (System DEP and DVP)*
24590-BOF-M5-V17T-00014	*Process Flow Diagram Direct Feed Process Condensate Transfer (System DEP)*
P&IDs – DEP and DVP Systems	
24590-BOF-M6-DEP-00001001	*P&ID - BOF/EMF Direct Feed LAW - EMF Process System - Low Point Drain Vessel - DEP-VSL-00001*
24590-BOF-M6-DEP-00001002	*P&ID - BOF/EMF Direct Feed LAW EMF - Process System- Low Point Drain Vessel Pumps - DEP-PMP-00001A/B*
24590-BOF-M6-DEP-00002001	*P&ID - BOF/EMF - Direct Feed LAW EMF - Process System - Evaporator Feed Vessel - DEP-VSL-00002*
24590-BOF-M6-DEP-00002002	*P&ID - BOF/EMF Direct Feed LAW EMF – Process System Evaporator - Feed Vessel Recirculation Pumps - DEP-PMP-00012A/B/C*
24590-BOF-M6-DEP-00002003	*P&ID - BOF/EMF Direct Feed LAW EMF - Process System Evap Feed Vessel Trans Pumps - DEP-PMP-00002A/B*

Document Number	Title
24590-BOF-M6-DEP-00002004	*P&ID - BOF/EMF Direct Feed LAW EMF - Process System - Evaporator Feed Vessel - Prefilter DEP-FILT-00003*
24590-BOF-M6-DEP-00002005	*P&ID - BOF/EMF Direct Feed LAW EMF - Process System Evaporator - Chemical Mixing - DEP-MTEE-00001/00002*
24590-BOF-M6-DEP-00002006	*P&ID - BOF/EMF Direct Feed LAW EMF - Process System Evaporator Concentrate / Feed Vessels - LAW Effluent Cooler DEP-HX-00001*
24590-BOF-M6-DEP-00003001	*P&ID - BOF/EMF Direct Feed LAW EMF - Process System - Evaporator Separator - DEP-EVAP-00001*
24590-BOF-M6-DEP-00003002	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Evaporator Reboiler - DEP-RBLR-00001*
24590-BOF-M6-DEP-00003003	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Evaporator Concentrated Discharge Pumps - DEP-PMP-00007A/B*
24590-BOF-M6-DEP-00003004	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Evaporator Condensers - DEP-COND-00001/2/3*
24590-BOF-M6-DEP-00003005	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Evaporator Condensate Pumps - DEP-PMP-00006A/B*
24590-BOF-M6-DEP-00003006	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Reboiler Condensate - DEP-VSL-00008*
24590-BOF-M6-DEP-00004001	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Overhead Sampling Vessel - DEP-VSL-00004A*
24590-BOF-M6-DEP-00004002	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Overhead Sampling Vessel - DEP-VSL-00004B*
24590-BOF-M6-DEP-00004003	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Overhead Sampling VSL Pumps - DEP-PMP-00004A/B/C*
24590-BOF-M6-DEP-00005001	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Evaporator Concentrate Vessel - DEP-VSL-00003A*
24590-BOF-M6-DEP-00005002	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Evaporator Concentrate Vessel - DEP-VSL-00003B*
24590-BOF-M6-DEP-00005003	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Evaporator Concentrate Vessel - DEP-VSL-00003C*
24590-BOF-M6-DEP-00005004	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Evap Conc VSL Recirculation / Transfer Pumps - DEP-PMP-00003A/B*
24590-BOF-M6-DEP-00005005	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Evap Concentrate Vessel Recirculation*
24590-BOF-M6-DEP-00006001	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Process Condensate Lag Storage Veseel - DEP-VSL-00005A*
24590-BOF-M6-DEP-00006002	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Process Condensate Lag Storage Vessel - DEP-VSL-00005B*
24590-BOF-M6-DEP-00006003	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Lag Storage Vessel Transfer Pumps - DEP-PMP-00005A/B*
24590-BOF-M6-DEP-00006004	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Lag Storage Vessel Recirc Pumps - DEP-PMP-00015A/B/C*
24590-BOF-M6-DEP-00009001	*P&ID - BOF/EMF Direct Feed LAW EMF Process System – Process Area Sumps - DEP-SUMP-00002A/B*

Document Number	Title
24590-BOF-M6-DEP-00009002	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Process Vessel Area Sumps - DEP-SUMP-00004A/B*
24590-BOF-M6-DEP-00009003	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Miscellaneous Sumps - DEP-SUMP-00008*
24590-BOF-M6-DEP-00009004	*P&ID - BOF/EMF Direct Feed LAW EMF - Process System – Process Area Sumps - DEP-SUMP-00003A/B*
24590-BOF-M6-DEP-00009005	*P&ID - BOF/EMF Direct Feed LAW Process System – Process Vessel Area Sumps - DEP-SUMP-00005A/B*
24590-BOF-M6-DEP-00010001	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Underground Transfer Lines*
24590-BOF-M6-DEP-00011001	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Effluent Facility Leak Detection DEP-LDB-00001 thru DEP-LDB-00006*
24590-BOF-M6-DEP-00012001	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Sampling Pumps DEP-PMP-00042A/B*
24590-BOF-M6-DVP-00001001	*P&ID - BOF/EMF Direct Feed LAW EMF Vessel Vent Process System - DVP-EXHR-00001A/B*
P&IDs – Utility Systems	
24590-BOF-M6-AFR-00001001	*P&ID - BOF / EMF Direct Feed LAW EMF - Process System - Anti-Foam Reagent System*
24590-BOF-M6-BSA-00003001	*P&ID - BOF/EMF Breathing Service Air System Distribution*
24590-BOF-M6-DIW-00002001	*P&ID - BOF/EMF Demineralized Water System Distribution*
24590-BOF-M6-DIW-00002002	*P&ID - BOF/EMF Demineralized Water System Booster Pump DIW-PMP-00013*
24590-BOF-M6-DOW-00005001	*P&ID - BOF/EMF Domestic (Potable) Water System Distribution*
24590-BOF-M6-DOW-00005002	*P&ID - BOF/EMF Domestic (Potable) Water System Distribution*
24590-BOF-M6-FPW-00017	*P&ID - BOF FPW System EMF Process and Utility Building*
24590-BOF-M6-HPS-00022001	*P&ID - BOF/EMF High Pressure Steam System Distribution*
24590-BOF-M6-HPS-00023001	*P&ID - BOF/EMF High Pressure Steam System Secondary Loop HPS-HX-00011 and SCW-VSL-00054*
24590-BOF-M6-ISA-00001001	*P&ID - BOF-EMF Instrument Service Air System Distribution to EMF*
24590-BOF-M6-LPS-00001001	*P&ID - BOF/EMF Low Pressure Steam System Steam Condensate Water System LPS/SCW*
24590-BOF-M6-LPS-00001002	*P&ID - BOF/EMF Low Pressure Steam System Steam Condensate Water System LPS/SCW*
24590-BOF-M6-NLD-00008001	*P&ID - BOF / EMF Direct Feed LAW - Non-Radioactive Liquid Waste Disposal System Misc. Sumps - NLD-SUMP-00031 & 00032*
24590-BOF-M6-PCW-00005001	*P&ID - BOF/EMF Plant Cooling Water System Heat Exchanger PCW-HX-00025*
24590-BOF-M6-PCW-00005002	*P&ID - BOF/EMF Plant Cooling Water System Distribution PCW-PMP-00030A/B AND PCW-VSL-00052*
24590-BOF-M6-PSA-00007001	*P&ID - BOF / EMF Plant Service Air System Distribution to EMF PSA-VSL-00150*
24590-BOF-M6-PSW-00004001	*P&ID - BOF/EMF Process Service Water System EMF Distribution*
24590-BOF-M6-SCW-00008001	*P&ID - BOF/EMF Steam Condensate Water System SCW-TK-00025 Primary Condensate*
24590-BOF-M6-SHR-00003001	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Caustic Tank - SHR-TK-00013*

Document Number	Title
24590-BOF-M6-SNR-00002001	*P&ID - BOF/EMF Direct Feed LAW EMF Process System Sodium Nitrite Tank - SNR-TK-00002*
P&IDs – Inter-Facility Underground Piping	
24590-BOF-M6-RLD-00012001	*P&ID - BOF Radioactive Liquid Waste Disposal System Underground Transfer Lines*
24590-BOF-M6-RLD-00012002	*P&ID - BOF Radioactive Liquid Waste Disposal System Underground Transfer Lines*
24590-LAB-M6-RLD-00002003	*P&ID - LAB Radioactive Liquid Waste Disposal System C3 Collection and Transfer RLD-PMP-00182A/B*
24590-LAW-M6-LCP-00001001	*P&ID - LAW LAW Concentrate Receipt Process System LCP-BULGE-00001*
24590-LAW-M6-LVP-00002005	*P&ID-LAW - LAW Secondary Offgas/Vessel Vent Process System Transfer Pumps LVP-PMP-00002A/B*
24590-LAW-M6-RLD-00001005	*P&ID - LAW Radioactive Liquid Waste Disposal System Plant Wash & SBS Condensate Collection RLD-BULGE-00004*
24590-LAW-M6-RLD-00001006	*P&ID - LAW Radioactive Liquid Waste Disposal System Plant Wash & SBS Condensate Collection RLD-BULGE-00004*
24590-PTF-M6-PWD-00058001	*P&ID-PTF Plant Wash and Disposal System Underground Transfer Lines*
24590-PTF-M6-PWD-00058002	*P&ID-PTF Plant Wash and Disposal System Underground Transfer Lines*
DEP and DVP System Design Calculations	
24590-BOF-JVC-DEP-00001	*Pressure Safety Valve Sizing for DEP-PSV-8680, -8681, and DEP-PSV-8399, -8400*
24590-BOF-JVC-DEP-00002	*Pressure Relief Valve (DEP-PSV-8495/-8500) Sizing for Process Condensate Filter (DEP-FILT-00002)*
24590-BOF-JVC-DEP-00004	*Relief Valve Sizing Calculation for the EMF Reboiler Condensate Collection Vessel (DEP-VSL-00008)*
24590-BOF-JVC-DEP-00007	*Pressure Relief Valve Sizing (PSV-8265, PSV-8266) on Process Condensate Filter (DEP-FILT-00004)*
24590-BOF-JVC-DEP-00010	*Relief Valve Sizing Calculation for the Evaporator Feed Vessel Prefilter (DEP-FILT-00003), DEP-PSV-8917/-8195)*
24590-BOF-JVC-DEP-00011	*Relief Valve Sizing Calculation for DEP-PSV-8918/8919 on PSA Line to DEP-FILT-00003*
24590-BOF-JVC-DEP-00012	*Relief Valve Sizing Calculation for SBS Condensate and Lab Effluent Supply Lines to DEP-FILT-00003 (DEP-PSV-8924/8925)*
24590-BOF-JVC-DEP-00015	*Relief Valve Sizing Calculation for DEP-PSV-8660, NLD-PSV-8809, and DEP-PSV-8686*
24590-BOF-JVC-DVP-00001	*Relief Valve Sizing for DVP-PSV-8123/8124*
24590-BOF-M0C-DEP-00001	*Flooding/Liner Heights Calculation in the EMF*
24590-BOF-M0C-DEP-00002	*Maximum Leakage Rate and Operator Response Time in the West Evaporator Process Area of the EMF*
24590-BOF-M4C-DEP-00001	*DFLAW Effluent Management Facility Air Emissions Estimate*
24590-BOF-M4C-V11T-00001	*DFLAW EMF Process (DEP) Estimated Radionuclide Concentrations for Shielding*
24590-BOF-M4C-V11T-00002	*DFLAW EMF Process (DEP) Estimated Radionuclide Concentrations for Inhalation Dose*
24590-BOF-M4C-V11T-00003	*Calculation of Hydrogen Generation Rates and Times to Low Flammability Limit for EMF*
24590-BOF-M4C-V11T-00004	*DFLAW EMF Process (DEP) Flowsheet Mass Balance Analysis for Input to Material Selection and Corrosion Assessments*

Document Number	Title
24590-BOF-M4C-V11T-00005	*Calculation of Effluent Management Facility Stream Chemical Ion Data*
24590-BOF-M4C-V11T-00006	*Calculation of Process Stream Properties for the Effluent Management Facility*
24590-BOF-M6C-DEP-00001	*DEP Sump, Sump Pump and Pipeline Sizing*
24590-BOF-M6C-DEP-00002	*DEP, SHR, and SNR Line Sizing for Miscellaneous Lines*
24590-BOF-M6C-DEP-00008	*DEP Evaporator System Line Sizing*
24590-BOF-M6C-DEP-00009	*Design Pressure and Temperature Calculation for the EMF DEP/DVP/AFR/NLD/SHR/SNR Systems*
24590-BOF-M6C-DEP-00011	*Leak Detection Capabilities in the EMF Facility*
24590-BOF-M6C-DEP-00012	*Overpressure Protection Calculation for DEP-VSL-00001, DEP-VSL-00002, DEP-VSL-00003A/B/C, DEP-VSL-00004A/B, DEP-VSL-00005A/B*
24590-BOF-M6C-DEP-00013	*DEP Vacuum Breaker Sizing*
24590-BOF-M6C-DEP-00014	*Relief Valve Sizing (DEP-PSV-8123) Calculation for DEP-PMP-00031*
24590-BOF-M6C-DEP-00016	*EMF DEP-SUMP-00004A/B Sampling System Design*
24590-BOF-M6C-DEP-00017	*Rupture Disk Sizing Calculation for DEP-PSE-8281, DEP-PSE-8282, and DVP-PSE-8214 (Overpressure Protection Calculation for DEP-EVAP-00001, DEP-COND-00001/2/3, and DEP-RBLR-00001)*
24590-BOF-M6C-DEP-00018	*Restriction Orifice Sizing Calculation for DEP-RO-00009*
24590-BOF-M6C-DVP-00001	*DFLAW EMF Vessel Vent Process System (DVP) Line Sizing*
24590-BOF-M6C-LCP-00001	*Pressure, Temperature, and Pipe Size for Transferring Treated LAW Feed from the ICD 30 Interface Point to the EMF and LAW Facility for DFLAW Operations*
24590-BOF-M6C-RLD-00002	*Pressure and Temperature for the RLD and DEP Pipelines from the EMF to the ICD 06 and ICD 31 Interface Point Nodes, for DFLAW Operations*
24590-BOF-MAC-DVP-00001	*DFLAW EMF Vessel Vent Process System (DVP) HEPA Filter, Preheater, and Exhaust Fan Sizing*
24590-BOF-MEC-DEP-00002	*DFLAW EMF (DEP) Heat Exchanger DEP-HX-00001 Heat Duty*
24590-BOF-MEC-DEP-00003	*Process Data for the DEP Evaporator Separator Vessel (DEP-EVAP-00001), Reboiler (DEP-RBLR-00001), Primary Condenser (DEP-COND-00001), and Recirculation Pump (DEP-PMP-00017)*
24590-BOF-MPC-DEP-00002	*BOF DEP Low Point Drain Vessel Pump (DEP-PMP-00001A/B) Sizing and Line Sizing*
24590-BOF-MPC-DEP-00003	*24590-BOF-MP-DEP-PMP-00005A/B Lag Storage Vessel Transfer Pump Sizing*
24590-BOF-MPC-DEP-00004	*BOF DEP Overhead Sampling Vessel Pump (DEP-PMP-00004A/B/C) Sizing and Line Sizing*
24590-BOF-MPC-DEP-00005	*DEP Evaporator Feed Vessel Recirculation Pump Sizing (DEP-PMP-00012A/B/C)*
24590-BOF-MPC-DEP-00006	*Mixing Eductor Sizing Calculation for Dep Vessels in the EMF Facility*
24590-BOF-MPC-DEP-00007	*DEP Evaporator Concentrate Vessel Transfer/Recirculation Pump (DEP-PMP-00003A/B) Sizing and Line Sizing*
24590-BOF-MPC-DEP-00008	*DEP Process Condensate Lag Storage Vessel Recirculation Pump (DEP-PMP-00015A/B/C) Sizing and Line Sizing*
24590-BOF-MPC-DEP-00009	*DEP Evaporator Concentrate Discharge Pump (DEP-PMP-00007A/B) Sizing and Line Sizing*
24590-BOF-MPC-DEP-00013	*DEP Evaporator Feed Vessel Transfer Pump (DEP-PMP-00002A/B) and Suction/Discharge Line Sizing*
24590-BOF-MPC-DEP-00014	*EMF DEP Sampling Pumps (DEP-PMP-00042A/B) Sizing*

Document Number	Title
24590-BOF-MPC-DEP-00015	*DEP Evaporator Condensate Discharge Pump (DEP-PMP-00006A/B) Sizing and Line Sizing*
24590-BOF-MPC-DEP-00016	*DEP Evaporator Recirculation Pump (DEP-PMP-00017) Pump, Line, and Restriction Orifice Sizing Calculation*
24590-BOF-MPC-DEP-00017	*Reboiler Condensate Pump (DEP-PMP-00008A/B), Vessel (DEP-VSL-00008), and Line Sizing*
24590-BOF-MVC-DEP-00001	*DEP Low Point Drain Vessel (DEP-VSL-00001) – Vessel Sizing, Vessel Overflow Nozzle Sizing, and Plant Wash System Sizing*
24590-BOF-MVC-DEP-00002	*Overhead Sampling Vessel (DEP-VSL-00004A/B) – Vessel Sizing, Vessel Overflow Nozzle Sizing, and Plant Wash System Sizing*
24590-BOF-MVC-DEP-00003	*Process Data for the Evaporator Feed Vessel (DEP-VSL-00002), Transfer Pumps (DEP-PMP-00002A/B), and Recirculation Pumps (DEP-PMP-00012A/B/C)*
24590-BOF-MVC-DEP-00004	*Process Condensate Lag Storage Vessel (DEP-VSL-00005A/B) – Vessel Sizing, Vessel Overflow Sizing, and Plant Wash System Sizing*
24590-BOF-MVC-DEP-00005	*DEP Evaporator Feed Vessel (DEP-VSL-00002) – Vessel Sizing, Vessel Overflow Nozzle Sizing, and Plant Wash System Sizing*
24590-BOF-MVC-DEP-00006	*Evaporator Concentrate Vessel (DEP-VSL-00003A/B/C) – Vessel Sizing, Vessel Overflow Sizing, and Plant Wash System Sizing*
24590-BOF-MVC-DEP-00007	*Process Data for the Overhead Sampling Vessels (DEP-VSL-00004A/B) and Pumps (DEP-PMP-00004A/B/C)*
24590-BOF-MVC-DEP-00008	*Process Data for the Process Condensate Lag Storage Vessels (DEP-VSL-00015A/B), Transfer Pumps (DEP-PMP-00005A/B), and Recirculation Pumps (DEP-PMP-00015A/B/C)*
24590-BOF-MVC-DEP-00009	*Batch Sizing Calculation of DEP (Direct Feed LAW Effluent Management Facility Process System) Vessels: DEP-VSL-00001, -00002, -00003A/B/C, -00004A/B, -00005A/B*
24590-BOF-MVC-DEP-00010	*Process Data for the Evaporator Concentrate Vessels, DEP-VSL-00003A/B/C, and Pumps, DEP-PMP-00003A/B*
24590-BOF-MVC-DEP-00011	*Process Data for the Low Point Drain Vessel, DEP-VSL-00001, and Pumps, DEP-PMP-00001A/B*
24590-BOF-MVC-M80T-00001	*DFLAW EMF Vessel Cyclic Datasheet Inputs and Fatigue Evaluation*
24590-BOF-P6C-DEP-00001	*BOF DEP Rad Transfer Piping System*
24590-PTF-M6C-PWD-00043	*WTP Underground Transfer Lines Minimum Detectable Leak Rate*
DEP and DVP System Mechanical Equipment Datasheets	
24590-BOF-M0D-DEP-00001	*BOF/EMF Sampling Fume Hood*
24590-BOF-MAD-DVP-00001	*Process Ventilation Exhauster*
24590-BOF-MBD-DEP-00001	*DEP Evaporator Reboiler*
24590-BOF-MCD-DEP-00001	*DEP Evaporator First Stage Ejectors DEP Evaporator Second Stage Ejectors*
24590-BOF-MED-DEP-00001	*Evaporator Concentrate/Feed LAW Effluent Cooler*
24590-BOF-MED-DVP-00001	*Process Ventilation HEPA Filter Preheater*
24590-BOF-MED-DEP-00004	*DEP Evaporator Primary Condenser*
24590-BOF-MED-DEP-00005	*DEP Evaporator Inter-Condenser*
24590-BOF-MED-DEP-00006	*DEP Evaporator After-Condenser*
24590-BOF-MFD-DEP-00001	*Mechanical Agitator DEP-AGT-00001 for Low Point Drain Vessel DEP-VSL-00001*

Document Number	Title
24590-BOF-MKD-DEP-00011	*HEPA Filter Data Sheet for DEP Evaporator Vacuum Breaker HEPA Filters (DEP-HEPA-00001A/B)*
24590-BOF-MKD-DVP-00005	*HEPA Filter Data Sheet for Process Ventilation Air Supply HEPA Filters (DVP-HEPA-00001A/B)*
24590-BOF-MKD-DVP-00006	*HEPA Filter Data Sheet for Process Ventilation Primary HEPA Filters (DVP-HEPA-00003A/B) and Secondary HEPA Filters (DVP-HEPA-00004A/B)*
24590-BOF-MPD-DEP-00001	*BOF DEP Evaporator Feed Vessel Transfer Pump*
24590-BOF-MPD-DEP-00002	*Evaporator Concentrate Transfer/Recirc Pumps*
24590-BOF-MPD-DEP-00003	*BOF DEP Overhead Sampling Vessel Transfer/Recirculation Pump*
24590-BOF-MPD-DEP-00004	*Process Condensate Lag Storage Vessel Transfer Pump*
24590-BOF-MPD-DEP-00005	*BOF DEP Evaporator Concentrate Discharge Pump*
24590-BOF-MPD-DEP-00006	*BOF EMF Evaporator Feed Vessel Recirculation Pump*
24590-BOF-MPD-DEP-00007	*BOF Process Condensate Lag Storage Vessel Recirculation Pump*
24590-BOF-MPD-DEP-00009	*Air Operated Diaphragm Pump*
24590-BOF-MPD-DEP-00010	*Mechanical Data Sheet: Vertical Submersible Centrifugal Pumps*
24590-BOF-MPD-DEP-00012	*DEP Evaporator Condensate Pump*
24590-BOF-MPD-DEP-00013	*DEP Evaporator Recirculation Pump*
24590-BOF-MPD-DEP-00015	*Low Point Drain Vessel Pumps*
24590-BOF-MPD-DEP-00016	*Mixing Eductors for Atmospheric Vessel DEP-VSL-00002*
24590-BOF-MPD-DEP-00017	*Mixing Eductors for Atmospheric Vessels DEP-VSL-00003A/B/C*
24590-BOF-MPD-DEP-00018	*Mixing Eductors for Atmospheric Vessels DEP-VSL-00004A/B*
24590-BOF-MPD-DEP-00019	*Mixing Eductors for Atmospheric Vessels DEP-VSL-00005A/B*
24590-BOF-MPD-DEP-00020	*BOF/EMF DEP Sampling Pumps*
24590-BOF-MVD-DEP-00002	*Low Point Drain Vessel*
24590-BOF-MVD-DEP-00003	*Evaporator Feed Vessel*
24590-BOF-MVD-DEP-00004	*Evaporator Concentrate Vessel*
24590-BOF-MVD-DEP-00005	*Overhead Sampling Vessel*
24590-BOF-MVD-DEP-00006	*Process Condensate Lag Storage Vessel*
24590-BOF-MVD-DEP-00008	*Reboiler Condensate Collection Vessel with Two (2) Reboiler Condensate Pumps*
24590-BOF-MVD-DEP-00009	*Evaporator Separator Vessel*
C&I Logic Diagrams	
24590-BOF-J3-DVP-70001	*Logic Diagram DFLAW DVP Exhauster Motor Duty/Standby DVP-HS-8105*
24590-BOF-J3-DVP-70002	*Logic Diagram DFLAW DVP Exhauster DVP-EXHR-00001A, Heater DVP-HTR-00001A, & Valves DVP-YV-8119, -8120*
24590-BOF-J3-DVP-70003	*Logic Diagram DFLAW DVP Exhauster DVP-EXHR-00001B, Heater DVP-HTR-00001B, & Valves DVP-YV-8121, -8122*
24590-BOF-J3-DVP-71001	*Functional Diagram DFLAW DVP Exhaust Header Instrumentation*
24590-BOF-J3-DVP-71002	*Functional Diagram DFLAW DVP Exhauster DVP-EHXR-00001A Instrumentation*
24590-BOF-J3-DVP-71003	*Functional Diagram DFLAW DVP Exhauster DVP-EHXR-00001B Instrumentation*
24590-BOF-J3-DVP-71004	*Functional Diagram DFLAW DVP Vessel Purge Air & Vent Instrumentation*

Document Number	Title
HVAC System V&IDs	
24590-BOF-M8-ACV-00001001	*BOF/EMF Utility/Process Bldgs. Plant Room V&ID Air Handling Unit ACV-AHU-00001A*
24590-BOF-M8-ACV-00001002	*BOF/EMF Utility Bldg. Volumetric V&ID ACV System*
24590-BOF-M8-ACV-00001003	*BOF/EMF Evaporator Process Drain Tank Bldgs. Volumetric V&ID ACV System*
24590-BOF-M8-ACV-00001004	*BOF/EMF Evaporator Process Bldg. Volumetric V&ID ACV System*
24590-BOF-M8-ACV-00001005	*BOF.EMF Utility/Process Bldgs. – Plant Room V&ID ACV Exhaust System*
24590-BOF-M8-ACV-00001006	*BOF.EMF Utility/Process Bldgs. – Plant Room V&ID ACV Exhaust System*
24590-BOF-M8-ACV-00001007	*BOF.EMF Utility/Process Bldgs. – Plant Room V&ID ACV Exhaust System*
24590-BOF-M8-ACV-00001008	*BOF/EMF Utility/Process Bldgs. Plant Room V&ID Air Handling Unit ACV-AHU-00001B*
24590-BOF-M8-C1V-00002	*BOF/EMF C1 Annex Areas Volumetric V&ID*
24590-BOF-M8-SDJ-00001	*BOF/EMF Buildings SDJ Plant Room V&ID Exhaust Stack Monitoring System*
HVAC System Design Calculations	
24590-BOF-M8C-ACV-00001	*Cooling and Heating Load Calculation for EMF C1 and C2 Areas*
24590-BOF-M8C-ACV-00002	*Cooling and Heating Load Calculation for EMF C3 and C5 Areas*
24590-BOF-M8C-ACV-00003	*DFLAW EMF Supply Fan, Exhaust Fan, and Transfer Duct Sizing*
24590-BOF-M8C-ACV-00004	*EMF ACV System Equipment Calculation*
24590-BOF-M8C-ACV-00005	*EMF ACV Exhaust Ductwork Pressure, Temperature and Ductwork Class Designation*
24590-BOF-M8C-ACV-00006	*EMF Stack Height Evaluation Calculation*
24590-BOF-M8C-C1V-00004	*EMF C1V Area Heating and Cooling Equipment Sizing Calculation*
24590-BOF-MKC-ACV-00001	*DFLAW EMF ACV HEPA Filter Housing Design Pressures and Maximum Allowable Leakage*
HVAC System Equipment Datasheets	
24590-BOF-MAD-ACV-00001	*24590-BOF-MA-ACV-AHU-00001A/B – ACV Supply Air Handling Unit*
24590-BOF-MAD-ACV-00002	*Exhaust Fan/Blower for Active Ventilation System*
24590-BOF-MED-ACV-00001	*E-0102 Unit Heaters*
24590-BOF-MED-ACV-00002	*ED-0102 Unit Heaters*
24590-BOF-MED-C1V-00008	*Air Cooled Condensing Unit Serving 24590-BOF-MA-C1V-FCU-00050: AFR Skid Room*
24590-BOF-MED-C1V-00010	*Air Cooled Condensing Unit Serving 24590-BOF-MA-C1V-FCU-00051: Electrical/C&I Room*
24590-BOF-MED-C1V-00012	*Fire Riser Room Convection Unit Heaters*
24590-BOF-MKD-ACV-00001	*24590-BOF-MK-ACV-HEPA-00001A-E - Primary Stage (Stage 1), Type 1 Filter Housings for BOF/EMF ACV Exhaust System*
Mechanical Handling Design Documents	
24590-WTP-M0-25-00001	*BOF/EMF Design Proposal Drawing Drain Vessel Monorail Hoist*
24590-WTP-M0D-25-00001	*24590-WTP-MJ-25-HST-00001 – BOF/EMF Monorails Maintenance Monorail Hoist*
24590-WTP-M0D-25-00002	*24590-WTP-MJ-25-HST-00002 – BOF/EMF Monorails Maintenance Monorail Hoist*
24590-WTP-M0D-25-00003	*24590-WTP-MJ-25-HST-00003 – BOF/EMF Monorails Maintenance Monorail Hoist*
24590-WTP-M0D-25-00004	*24590-WTP-MJ-25-HST-00004 – BOF/EMF Monorails Maintenance Monorail Hoist*

Document Number	Title
24590-WTP-M0D-25-00005	*24590-WTP-MJ-25-HST-00005 – BOF/EMF Monorails Maintenance Monorail Hoist*
24590-WTP-M0D-25-00006	*BOF/EMF Maintenance Monorail Hoist for Filter DEP-FILT-00003*
24590-WTP-M7-25-00001	*BOF/EMF Mechanical Handling Diagram Drain Vessel Monorail Hoist*
Electrical Single Line Diagrams	
24590-BOF-E1-MVE-00002	*Switchgear Building 13.8kV Switchgear MVE-SWGR-87001A & 87001B Single Line Diagram*
24590-BOF-E1-LVE-00010	*BOF/EMF Secondary Unit Substation LVE-LC-27001 Single Line Diagram*
24590-BOF-E1-LVE-00011	*BOF/EMF Motor Control Center LVE-MCC-27001A Single Line Diagram*
24590-BOF-E1-LVE-00012	*BOF/EMF Motor Control Center LVE-MCC-27001B Single Line Diagram*
24590-BOF-E1-LVE-00013	*BOF/EMF Motor Control Center LVE-MCC-27002A Single Line Diagram*
24590-BOF-E1-LVE-00014	*BOF/EMF Motor Control Center LVE-MCC-27002B Single Line Diagram*
24590-BOF-E1-LVE-00015	*BOF/EMF Motor Control Center LVE-MCC-27003A Single Line Diagram*
24590-BOF-E1-LVE-00016	*BOF/EMF Motor Control Center LVE-MCC-27003B Single Line Diagram*
24590-BOF-E1-UPE-00001	*BOF/EMF Uninterruptible Power Supply UPE-UPS-27001 Single Line Diagram*
Electrical Motor Control Center Schedules	
24590-BOF-EC-LVE-00001	*Motor Control Center Schedule LVE-MCC-27001A (EL 6 FT)*
24590-BOF-EC-LVE-00002	*Motor Control Center Schedule LVE-MCC-27001B (EL 6 FT)*
24590-BOF-EC-LVE-00003	*Motor Control Center Schedule LVE-MCC-27002A (EL 6 FT)*
24590-BOF-EC-LVE-00004	*Motor Control Center Schedule LVE-MCC-27002B (EL 6 FT)*
24590-BOF-EC-LVE-00005	*Motor Control Center Schedule LVE-MCC-27003A (EL 6 FT)*
24590-BOF-EC-LVE-00006	*Motor Control Center Schedule LVE-MCC-27003B (EL 6 FT)*
Electrical Panel Schedules and Load Lists	
24590-BOF-M8-LTE-25001	*BOF/EMF Process Building Lighting 480/277V Panel Schedule LTE-PNL-25001*
24590-BOF-M8-LTE-25002	*BOF/EMF Process Building Lighting 480/277V Panel Schedule LTE-PNL-25002*
24590-BOF-M8-LTE-26001	*BOF/EMF Utility Building Lighting 480/277V Panel Schedule LTE-PNL-26001*
24590-BOF-E8-LVE-00002	*BOF/EMF 480V Electrical Load List*
24590-BOF-E8-LVE-25001	*BOF/EMF Process Building 208/120V Power Distribution Panel Schedule LVE-PNL-25001*
24590-BOF-E8-LVE-25002	*BOF/EMF Process Building 208/120V Power Distribution Panel Schedule LVE-PNL-25002*
24590-BOF-E8-LVE-25003	*BOF/EMF Process Building 480V Electrical Distribution Panel Schedule LVE-PNL-25003*
24590-BOF-E8-LVE-26001	*BOF/EMF Utility Bldg. 208/120V Power Distribution Panel Schedule LVE-PNL-26001*
24590-BOF-E8-LVE-26002	*BOF/EMF Utility Bldg. 208/120V Power Distribution Panel Schedule LVE-PNL-26002*
24590-BOF-E8-LVE-27001	*BOF/EMF E-Power House 208/120V Power Distribution Panel Schedule LVE-PNL-27001*
24590-BOF-E8-LVE-27002	*BOF/EMF E-Power House 208/120V Power Distribution Panel Schedule LVE-PNL-27002*
24590-BOF-E8-LVE-27003	*BOF/EMF E-Power House 480V Electrical Distribution Panel Schedule LVE-PNL-27003*
24590-BOF-E8-UPE-25001	*BOF/EMF Process Building UPS Power 208/120V Panel Schedule UPE-PNL-25001*

Document Number	Title
24590-BOF-E8-UPE-26001	*BOF/EMF Utility Bldg. UPS Power 208/120V Panel Schedule UPE-PNL-26001*
24590-BOF-E8-UPE-27001	*BOF/EMF E-Power House UPS Power 208/120V Panel Schedule UPE-PNL-27001*
Corrosion Evaluations	
24590-BOF-N1D-DEP-00001	*DEP-VSL-00001 - Low Point Drain Vessel Corrosion Evaluation*
24590-BOF-N1D-DEP-00002	*DEP-VSL-00002 - Evaporator Feed Vessel Corrosion Evaluation*
24590-BOF-N1D-DEP-00003	*DEP-VSL-00003A/B/C - Evaporator Concentrate Vessels Corrosion Evaluation*
24590-BOF-N1D-DEP-00004	*DEP-VSL-00004A/B - Overhead Sampling Vessel Corrosion Evaluation*
24590-BOF-N1D-DEP-00005	*DEP-VSL-00005A/B - Process Condensate Lag Storage Vessel A & B*
24590-BOF-N1D-DEP-00006	*DEP-VSL-00008 - Reboiler Condensate Collection Vessel Corrosion Evaluation*
24590-BOF-N1D-DEP-00007	*Corrosion Evaluation DEP-COND-00001, 2, & 3 DEP Evaporator Primary Condenser, Inter-Condenser, and After-Condenser*
24590-BOF-N1D-DEP-00008	*Corrosion Evaluation DEP-HX-00001 Evaporator Concentrate/Feed LAW Effluent Cooler*
24590-BOF-N1D-DEP-00009	*DEP-RBLR-00001 - DEP Evaporator Reboiler Corrosion Evaluation*
24590-BOF-N1D-DEP-00010	*DEP-EVAP-00001 - Corrosion Evaluation DEP Evaporator Separator Vessel*
24590-BOF-N1D-DVP-00001	*Corrosion Evaluation DVP-EXHR-00001A/B Process Ventilation Exhauster*
24590-BOF-N1D-DVP-00002	*Corrosion Evaluation DVP-HTR-00001A/B Process Ventilation Preheaters*

Appendix A Test Objectives, Conditions, and Acceptance Criteria

Note: The testing activities included in this Appendix are limited to those identified as needing to be performed by Startup or Commissioning to support the verification of requirements in Section 3. This Appendix does not restrict Startup or Commissioning from performing other routine system functional testing or grooming.

Table A-1 EMF Facility Test Objectives, Conditions, and Acceptance Criteria

Requirement Section Number	Plan (including SSCs)	Acceptance Criteria* (TAC or GTC)	Notes/Comments	Test Conditions
3.4.1.1.1	Perform a test to verify the capability to support the LAW Facility cold commissioning capacity testing criteria.	**(GTC)** The EMF supports the LAW Facility's minimum production rate in accordance with Table C.6-5.1 of the WTP Contract.	This test is expected to be met along with the LAW production requirement in the LAW FDD. The test will average two 5-day periods, with an additional 5 days if necessary to achieve the capacity defined in the WTP Contract. **Reference**: • 24590-LAW-3ZD-20-00002, App. A • WTP Contract Section C C.6 Standard 5(e)(3)(ii)	The EMF is operated continuously for two 5-day tests. All internal systems supporting effluent treatment are operational.
3.4.3.3.8	Perform a test to verify the leak detection capability of secondary containment equipment for the tank systems. **CTNs:** DEP-SUMP-00001, DEP-LT-8112 DEP-SUMP-00002A/B, DEP-LT-8626/8629 DEP-SUMP-00003A/B, DEP-LT-8646/8647 DEP-SUMP-00004A/B, DEP-LT-8632/8656 DEP-SUMP-00005A/B, DEP-LT-8638/8641 DEP-LDB-00001, DEP-LSH-8701 DEP-LDB-00002, DEP-LSH-8702 DEP-LDB-00003, DEP-LSH-8703 DEP-LDB-00004, DEP-LSH-8706 DEP-LDB-00005, DEP-LSH-8705 DEP-LDB-00006, DEP-LSH-8704 RLD-LDB-00012, RLD-LSH-1001 RLD-LDB-00013, RLD-LSH-1002	**(GTC)** Leak detection instrumentation successfully detects and announces leak of at least 0.1 gal/hour within 24 hours.	Leak detection equipment and instrumentation in the EMF is specified in Table 4G-4 of the DWP. This test is extended to RLD-LDB-00012/00013 on the LERF transfer line near the WTP site boundary. Although this equipment is associated with the PT Facility, it is essential for DFLAW operation. Additional allowance may be made for transmitter accuracy. **Reference**: • WA7890008967, Chapter 4G.20 • 24590-BOF-M6-DEP-00001002 • 24590-BOF-M6-DEP-00009001 • 24590-BOF-M6-DEP-00009002 • 24590-BOF-M6-DEP-00009004 • 24590-BOF-M6-DEP-00009005 • 24590-BOF-M6-DEP-00011001 • 24590-PTF-M6-PWD-00058002	PCJ system operating Fill each sump with a maximum 2.4 gallons of water. LERF transfer line leak detection boxes installed and operational.
3.4.5.5.10	Perform testing to verify that hoist brakes engage with a loss of power. **CTNs:** 25-HST-00001 25-HST-00002 25-HST-00003 25-HST-00004 25-HST-00005 25-HST-00006	**(GTC)** The hoist brakes engage for all degrees of motion when the power is isolated, as follows: • While the trolley is moving along the rail, disconnect or shut down power to the hoist and verify the brakes on all hoist functions engage. • While raising or lowering the hook on the hoist, disconnect or shut down power to the hoist and verify the brakes on all hoist functions engage.	Startup to determine method of power isolation for this testing.	LVE system operating The power isolation occurs in such a manner that the trolley/hoist is in motion at the time the isolation is performed.

Requirement Section Number	Plan (including SSCs)	Acceptance Criteria* (TAC or GTC)	Notes/Comments	Test Conditions
3.4.5.5.16	Perform a test to verify the emergency stop capability to (a) report status to the appropriate control system, (b) stop equipment, and (c) remain in a shutdown state until the circuit is physically reset to prevent equipment restart while the dangerous condition exists. **CTNs:** TBD	**(GTC)** Upon engaging each emergency stop button, the equipment de-energizes and remains shut down until the circuit is reset. The emergency stop(s) report their status back to their respective control system.		LVE system operating. Each emergency stop is tested individually.
3.4.5.5.21	Perform noise level measurements to verify normal operating noise levels are minimized within EMF occupied plant spaces.	**(GTC)** Noise exposure levels are less than 109 dBA when all equipment is in operation.	Noise measurements are made by ES&H using M&TE. 109dBA is the American Conference of Governmental Industrial Hygienists limit for continuous occupancy with personal protective equipment (double hearing protection).	All equipment in the EMF operating in its normal configuration.
3.4.5.6.4	Perform a test to verify that the removal and replacement capabilities support replacement of necessary equipment in high radiation areas of the EMF. **CTNs**: 25-HST-00001 DEP-AGT-00001 DEP-PMP-00001A/B	**(GTC)** Equipment located in high radiation areas can be removed and replaced using provided lifting and handling capabilities.	Although the drain tank cell (ED-B001) is normally a R3 area, there are several scenarios where the area could reach R5 levels. The equipment associated with DEP-VSL-00001 that has the potential to fail during normal operations can be removed to a lower radiation area for contact maintenance.	

Notes:
* Test acceptance criteria (TAC) are associated with nuclear safety required testing (i.e., as required by a DSA for SS or SC SSCs), IHLW required testing, or radiological air permit testing required to be reported to and accepted by Ecology. General test criteria (GTC) are associated with requirements from other sources. Applicable to Tables A-1, A-2 and A-3.

Table A-2 DEP System Test Objectives, Conditions, and Acceptance Criteria

Requirement Section Number	Plan (including SSCs)	Acceptance Criteria* (TAC or GTC)	Notes/Comments	Test Conditions
3.5.1.1.1	Perform a test to verify the capability to support the LAW Facility cold commissioning capacity testing criteria.	**(GTC)** The DEP system supports the LAW Facility's minimum production rate in accordance with Table C.6-5.1 of the WTP Contract.	This test is expected to be met along with the LAW production requirement in the LAW FDD. This is a DFLAW production test, not a DEP system test. The test will average two 5-day periods, with an additional 5 days if necessary to achieve the capacity defined in the WTP Contract. **Reference**: • 24590-LAW-3ZD-20-00002, App. A • WTP Contract Section C C.6 Standard 5(e)(3)(ii)	The DEP system is operated continuously for two 5-day tests. All DEP system equipment operating.
3.6.4.1.1	Perform a test to verify EMF sump pumps in DWP areas meet the minimum flow rates. **CTNs:** DEP-SUMP-00002A/B, DEP-PMP-00032A/B DEP-SUMP-00003A/B, DEP-PMP-00033A/B DEP-SUMP-00005A/B, DEP-PMP-00035A/B	. **(GTC)** The DEP system sump pumps in DWP areas meet the following minimum transfer rates: • DEP-PMP-00032A/B: 112.7gpm • DEP-PMP-00033A/B: 112.7gpm • DEP-PMP-00035A/B: 91.0gpm	The determination of the flow rate may be direct measurement using installed or temporary instruments, or by the time to reduce the sump volume by a known or measured quantity. **Reference**: • 24590-BOF-M6-DEP-00001002 • 24590-BOF-M6-DEP-00009001 • 24590-BOF-M6-DEP-00009002 • 24590-BOF-M6-DEP-00009004 • 24590-BOF-M6-DEP-00009005 • 24590-BOF-M6C-DEP-00001 • WA7890008967, Table 4G-4	The DEP system vessel levels are sufficiently below the high level setpoints to allow for sump transfers.
3.6.4.1.2	Perform a test to verify the ability to achieve the minimum volumetric flow rate necessary to achieve a transfer velocity greater than 4 ft/sec. **CTNs**: DEP-PMP-00003A/B DEP-PMP-00012A/B/C DEP-FI-8404	**(GTC)** The DEP system pumps meet the minimum flow rate necessary to achieve a transfer velocity greater than 4 ft/sec.	If the DFLAW conditioned effluent contains solids, the transfer velocity must be greater than 4 ft/sec. If the effluent does not contain solids and the specific gravity is less than 1.35 kg/L, the transfer does not have a minimum velocity to satisfy the ICD-31 requirements for waste transfers and this test is not required. **Reference**: • Section 2.7, 24590-WTP-ICD-MG-01-031 • 24590-BOF-M6-DEP-00002002 • 24590-BOF-M6-DEP-00002006 • 24590-BOF-M6-DEP-00005004	PCJ system operating normally.

Requirement Section Number	Plan (including SSCs)	Acceptance Criteria* (TAC or GTC)	Notes/Comments	Test Conditions
3.15.1.2.1	Perform a test to verify that a permissive/shutdown signal is sent to the Tank Farms Monitoring and Control System to shutdown the transfer, and establish a fail-safe state in the event of an upset condition (such as a transfer line leak, high radiation, high flow rate, high tank level, or valve alignment) is detected. **CTNs**: DEP-LAH-8702	**(GTC)** Permissive/shutdown signal is sent to the Tank Farms Monitoring and Control System at the WTP site interface Node 13 to shutdown the transfer, and establish a fail-safe state, in the event of an upset condition as defined by the control logic diagrams.	Leak detection is the minimum required interlock for interface with Tank Farms. However, other interlock inputs could include vessel levels, valve alignments, flow rates, and high radiation. **Reference**: • 24590-BOF-M6-DEP-00011001 • 24590-WTP-ICD-MG-01-030	PCJ system operating normally.
3.15.1.2.3	Perform a test to verify Treated LAW feed transfer data is provided to the Tank Farms Monitoring and Control System.	**(GTC)** Treated LAW feed transfer data is provided to the Tank Farms Monitoring and Control System at the WTP site interface Node 13.	**Reference**: • 24590-WTP-ICD-MG-01-030	PCJ system operating normally.
3.15.1.2.6	Perform a test to verify that batch transfers of the Treated LAW feed are stopped upon detection of radiation levels that exceed the limits for the LAW Facility. **CTNs**: DEP-RI-8676	**(GTC)** Verify interlock terminates Treated LAW feed upon detection of high radiation levels by DEP-RI-8676.	**Reference**: • 24590-BOF-M6-DEP-00010001 • 24590-WTP-ICD-MG-01-030	PCJ system operating normally.
3.15.1.3.2	Perform a test to verify that a DEP system permissive/shutdown signal shuts down transfer of evaporator concentrate/feed to Tank Farms in the event of leak detection, and that the transfer process is shutdown to a fail-safe state when the permissive/shutdown signal is lost from WTP or from Tank Farms during the transfer of evaporator concentrate/feed to Tank Farms. **CTNs**: TBD	**(GTC)** Transfer is shut down upon detection of a leak in the transfer line by WTP or Tank Farms. Transfer is shut down to a fail-safe state upon loss of permissive/shutdown signal from WTP or Tank Farms, interlock condition, or loss of watchdog signals during transfer.	**Reference**: • 24590-WTP-ICD-MG-01-031	PCJ system operating normally.
3.15.1.3.3	Perform a test to verify that monitoring information for the evaporator concentrate/feed return line to Tank Farms is provided to the Tank Farms Monitoring and Control System.	**(GTC)** Relevant evaporator concentrate/feed return transfer monitoring information is provided to the Tank Farms Monitoring and Control System.	**Reference**: • 24590-WTP-ICD-MG-01-031	PCJ system operating normally.
3.15.1.4.1	Perform a test to verify the stop control function as intended upon an alarm of either the leak detection system on the WTP portion of the LERF/ETF transfer line or an alarm on the LERF/ETF leak detection or control system. **CTNs:** RLD-LSH-1001 RLD-LSH-1002	**(GTC)** The transfer of dilute effluent to LERF/ETF is terminated upon detection of a leak in the WTP portion of the LERF/ETF transfer line by RLD-LSH-1001/1002 or an alarm on the LERF/ETF leak detection or control system.	This test is extended to RLD-LDB-00012/00013 on the LERF transfer line near the WTP site boundary. Although this equipment is associated with the PT Facility, it is essential for DFLAW operation. **Reference**: • 24590-PTF-M6-PWD-00058002 • 24590-WTP-ICD-MG-01-006	PCJ system operating normally.
3.15.1.4.2	Perform a test to verify that relevant, real-time effluent monitoring information (including dilute effluent flow rate, radiation, pH, and conductivity) is provided at the required frequency over a dedicated line to the LERF Instrument Building (242AL-71). **CTNs:** DEP-FI-8475 DEP-RI-8476 DEP-CI-8477 DEP-AI-8478	**(GTC)** Relevant dilute effluent transfer monitoring information is provided over a dedicated line to the LERF Instrument Building at the required frequency.	**Reference**: • 24590-BOF-M6-DEP-00006003 • 24590-WTP-ICD-MG-01-006	PCJ system operating normally.

Requirement Section Number	Plan (including SSCs)	Acceptance Criteria* (TAC or GTC)	Notes/Comments	Test Conditions
3.15.1.4.3	Perform a test to verify that secure data signals from the EMF are received at the interface point for LERF/ETF-related transfers.	**(GTC)** Secure data signals from the EMF are received at interface Node 18 of the WTP site.	**Reference**: • 24590-WTP-ICD-MG-01-006	PCJ system operating normally.

Table A-3 HVAC (ACV, DVP) System Test Objectives, Conditions, and Acceptance Criteria

Requirement Section Number	Plan (including SSCs)	Acceptance Criteria* (TAC or GTC)	Notes/Comments	Test Conditions
3.8.1.1.1	Perform differential pressure measurements to verify airflow direction at the following contamination zone boundaries: • ED-0101 (C2) to ED-0102 (C3) at door TBD • ED-0102 (C3) to ED-B001 (C5) at door ED-0102-4 • E-0101 (C2) to E-0102 (C3) at door E-0101-1 • E-0101 (C2) to E-0102 (C3) at door E-0101-3 • E-0101 (C2) to E-0102 (C3) at door E-0101-4 • E-0102 (C3) to E-0103 (C5) at door E-0102-2 • E-0102 (C3) to E-0103 (C5) at door E-0102-3 • E-0104 (C2/C3) to E-0103 (C5) at door E-0104-2 • EU-0101 (C1) to EU-0102 (C2) at door EU-0102-1 • EU-0101 (C1) to EU-0102 (C2) at door EU-0102-2	**(GTC)** Airflow direction is from areas of low or no potential for contamination to areas of higher potential for contamination, as follows: • C2 areas are at a negative pressure with respect to C1 areas • C3 areas are at a negative pressure with respect to C2 or C2/C3 areas • C5 areas are at a negative pressure with respect to C2/C3 and C3 areas	Testing to be performed as part of the overall EMF HVAC system test. **Reference**: • 24590-BOF-A1-25-01201001 • 24590-BOF-A1-25-01201002 • 24590-BOF-A1-25-01201003 • 24590-BOF-A1-26-00001	Initial building balance complete. All ventilation systems running normally. Doors in airflow path are closed.
3.11.1.5.2	Perform a discharge stack traverse with a pitot tube to verify that the velocity profile of the ACV system exhaust duct meets the acceptance criteria.	**(GTC)** The average cross-sectional air velocity of the stack, as determined by the traverse measurements, is at least 2,000 fpm. .	Notify results to the WDOH in accordance with air permit requirements. The test ports are shown on 24590-BOF-M8-SDJ-00001.	Final building balance complete. All ventilation systems running normally with active controls, at the design airflow rate ±10%.
3.13.1.4	Perform a test to verify that the sequence to start and stop ACV fan systems functions as designed to maintain cascade airflow during startup/shutdown. • While ACV-FAN-00001A/B and ACV-AHU-00001A/B not running, attempt to start ACV-AHU-00001A and ACV-AHU-00001B and verify that the units are unable to start due to a lack of the start permissive. • While ACV-FAN-00001A/B and ACV-AHU-00001A/B are running, stop both ACV-FAN-00001A and ACV-FAN-00001B and verify that both ACV-AHU-00001A and ACV-AHU-00001B shut down. **CTNs:** ACV-AHU-00001A/B ACV-FAN-00001A/B	**(GTC)** • The AHUs do not start without an operating exhaust fan • The AHUs shut down instantaneously and in sequence upon simulated loss of the exhaust fans.	**Reference**: • 24590-BOF-M8-ACV-00001007, Note 5	Final building balance complete. All ventilation systems operating normally.
3.13.4.2	Perform a test to verify that the fan auto-changeover interlock functions correctly. • Select ACV-AHU-00001A as the running unit using ACV-HS-8112 and start the AHU. Trip ACV-AHU-00001A and verify that ACV-AHU-00001B automatically starts. Repeat the test with ACV-AHU-00001B selected as the running unit. • Select ACV-FAN-00001A as the running unit using ACV-HS-8161 and start the exhaust fan. Trip ACV-FAN-00001A and verify that ACV-FAN-00001B automatically starts. Repeat the test with ACV-FAN-00001B selected as the running unit. • Select DVP-EXHR-00001A as the running unit using DVP-HS-8105 and start the exhauster. Trip DVP-EXHR-00001A and verify that DVP-EXHR-00001B automatically starts. Repeat the test with DVP-EXHR-00001B selected as the running unit. **CTNs:** ACV-AHU-00001A/B, ACV-HS-8112 ACV-FAN-00001A/B, ACV-HS-8161 DVP-EXHR-00001A/B, DVP-HS-8105	**(GTC)** Upon failure of an operational fan, the standby fan unit automatically starts. The cascade trip interlock is not initiated during the switchover	Reference: • 24590-BOF-M8-ACV-00001001 • 24590-BOF-M8-ACV-00001007, Note 4 • 24590-BOF-M6-DVP-00001001, Note 5	Initial building balance complete. All ventilation systems operating normally.

Appendix B Descriptions of Functional Flow and Interactions

B.1 Descriptions of the DEP System Functional Flow and Interactions

Function: A.1	**Convey Treated Low-Activity Waste Feed to LAW Facility**
Detailed description: Treated low-activity waste feed is conveyed to LAW Facility via an underground transfer line that is within the DEP system scope (ICD-30). After the feed transfer, a forward flush of the waste feed transfer line from the TOC to LAW is performed. The DEP system includes instrumentation to detect the end of the feed transfer and beginning of the flush sequence. Upon detection, the LAW Facility transfer valves are closed and the TOC stream is diverted to the low point drain vessel. After flushing, the waste transfer line is drained to the low-point drain vessel.	
Initiation: This function is initiated by the TOC control room operator when a source of primary effluent is ready to transfer, and a receiving vessel is available. Effluent is directed to the receiving vessel through DEP underground piping.	
Termination: This function terminates when indication is provided that the batch transfer volume is complete or the receiving vessel is at high operating volume.	
Parallel or sequential functions: N/A	
Applicable Modes: Normal and abnormal operations.	

Function: A.2	**Sequence LAW Facility Feed**
Detailed description: The sequenced LAW Facility feed transfer system is designed to first transfer treated low activity waste from the TOC, followed by evaporator concentrate from the DEP system, with the feed pushed into the LCP system receipt vessels by flush water from the TOC.	
Initiation: This function is initiated by the TOC control room operator when a source of primary effluent is ready to transfer, and a receiving vessel is available. Effluent is directed to the receiving vessel through DEP underground piping.	
Termination: This function terminates when indication is provided that the batch transfer volume is complete or the receiving vessel is at high operating volume.	
Parallel or sequential functions: N/A	
Applicable Modes: Normal and abnormal operations.	

Function: A.3	**Receive and Filter Liquid Effluent**
Detailed description: The DEP system receives and filters batch RLD effluent from LAW and Lab and any miscellaneous liquid, leaks, spills, or washdown collected within the DEP system. Effluent passes through DEP-FILT-00003 before collecting in DEP-VSL-00002.	
Initiation: This transfer function is initiated by the LAW Facility or Lab operator for transfer of RLD effluent. This transfer function initiates upon collection of any miscellaneous liquids or leaks/spills within the DEP system.	
Termination: This transfer function is terminated by the operator when the batch is complete and has passed through the prefilter into the receiving vessel, or there is a low operating volume in the sending vessel or there is a high operating volume in the receiving vessel. This function terminates upon receipt of any miscellaneous liquids or leaks/spills within the DEP system.	
Parallel or sequential functions: N/A	
Applicable Modes: Normal and abnormal operations.	

Function: A.4	**Concentrate Effluent**
Detailed description: Effluent is continuously fed to the DEP system evaporator system from DEP-VSL-00002 using DEP-PMP-00002A/B to concentrate the waste received from the LAW and Lab RLD systems. The evaporator operates under vacuum conditions to reduce boiling temperatures, in order to minimize fouling. The feed is introduced to the recirculation loop of the evaporator which includes a reboiler unit that functions to heat the effluent using steam from the HPS system. Heated liquor from the reboiler enters the evaporator below the liquid surface and flashes as it rises, due to the temperature gradient in the liquid, and becomes vapor.	
Initiation: This transfer function is initiated by the operator when feed is available.	
Termination: This transfer function is terminated by the control logic when feed is depleted.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: A.5.1	**Accumulate Concentrated Effluent**
Detailed description: The concentrate in the bottom of the evaporator is recirculated through DEP-PMP-00007A/B and monitored at DEP-SKID-00005 to determine whether it meets the LAW Facility feed acceptance criteria. Once the specific gravity meets the pre-established target for the feed type, a small portion of the concentrate is bled off of the recirculation loop and collects in DEP-VSL-00003A/B/C. The rate of transfer to the collection vessels is modulated to maintain the specific gravity of the evaporator effluent.	
Initiation: This transfer function is initiated by the operator.	
Termination: This transfer function is terminated by the operator.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: A.5.2	**Accumulate Dilute Effluent**
Detailed description: The vapor produced in the evaporator passes through a bubble cap tray and mesh pads to return condensable vapors back to the process and remove any remaining aerosols and particulates. The vapor then enters DEP-COND-00001 to condense the process vapors using cooling water from the PCW system. The condensate is transferred to DEP-VSL-00004A/B via DEP-PMP-00006A/B for collection. Caustic scrubber effluent transferred from the LVP system also collects in these vessels.	
Initiation: This transfer function is initiated by the operator.	
Termination: This transfer function is terminated by the operator.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: A.6.1	**Mix and Sample Concentrated Effluent**
Detailed description: Concentrated effluent is mixed using the DEP-VSL-00003A/B/C recirculation loop and eductors and sampled at DEP-HOOD-00001. The sample provides confirmation that the concentrate meets the Tank Farms' DST EAC or is used as input to the LAW Facility glass former addition.	
Initiation: This transfer function is initiated by the operator.	
Termination: This transfer function is terminated by the operator.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: A.6.2	**Mix and Sample Dilute Effluent**
Detailed description: Dilute effluent is mixed using the DEP-VSL-00004A/B recirculation loop and eductors and sampled at DEP-HOOD-00001. The sample provides confirmation that the diluted effluent meets the LERF/ETF EAC.	
Initiation: This transfer function is initiated by the operator.	
Termination: This transfer function is terminated by the operator.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: A.7.1	**Store Concentrated Effluent**
Detailed description: The DEP system provides a minimum of 48 hours of storage capacity for evaporator concentrate in DEP-VSL-00003A/B/C prior to transfer to the LAW Facility.	
Initiation: This transfer function is initiated by the operator.	
Termination: This transfer function is terminated by the operator.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: A.7.2	**Store Dilute Effluent**
Detailed description: The DEP system provides a minimum of 48 hours of storage capacity for evaporator condensate in DEP-VSL-00005A/B prior to transfer to LERF/ETF.	
Initiation: This transfer function is initiated by the operator.	
Termination: This transfer function is terminated by the operator.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: A.8.1	**Transfer Concentrated Effluent**
Detailed description: The DEP system includes the ability to transfer concentrate effluent to the LAW LCP system during normal operations, to Tank Farms' DSTs when the LAW Facility is unavailable for transfers, or to a tanker truck (following an ALARA, viability, and safety study). DEP-PMP-00003A/B provide the motive force to transfer the concentrate.	
Initiation: This transfer function is initiated by the operator.	
Termination: This transfer function can be terminated manually by the operator or automatically by the flow measurement equipment.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: A.8.2	**Transfer Dilute Effluent**
Detailed description: The DEP system includes the ability transfer dilute effluent to LERF/ETF using DEP-PMP-00005A/B.	
Initiation: This transfer function is initiated by the operator.	
Termination: This transfer function filters dilute effluent prior to receipt at LERF/ETF and can be terminated manually by the operator or automatically by the flow measurement equipment.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: B.1	**Chemically Adjust Effluent**
Detailed description: Sodium hydroxide and sodium nitrite are used to adjust the feed and concentrated effluent to allow for transfers to Tank Farms or the LAW LCP system.	
Initiation: This function is initiated by the operator using manual handswitches in conjunction with the SHR and SNR systems.	
Termination: This function terminates when the chemical reagent transfer setpoints are met or the effluent transfer ends.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: B.2	**Add Antifoam Reagent**
Detailed description: Antifoam reagent is transferred to the evaporator separator vessel to reduce foam generation while operating.	
Initiation: This transfer function is initiated by the operator.	
Termination: This transfer function can be terminated manually by the operator or automatically by the flow measurement equipment.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: B.3	**Bypass Evaporator**
Detailed description: The DEP system includes a flow path to bypass the evaporator and transfer feed back to Tank Farms. DEP-VSL-00002 effluent is transferred to mixing tees using DEP-PMP-000012A/B/C where the effluent is chemically adjusted to meet the acceptance criteria of ICD-31.	
Initiation: This transfer function is initiated by the operator.	
Termination: This transfer function is terminated by the operator.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: C.1	**Provide Low Point Drain Collection**
Detailed description: A collection vessel is provided to collect liquid from transfer line flushes and overflow collection. This collects the drains and flushes from within the DEP system, handles the TOC transfer line drains, and ensures any overflows/leaks to sumps are not transferred to a leaking vessel.	
Initiation: This function is always active.	
Termination: This function is should never terminate.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: C.2	**Return Overflows to the Process**
Detailed description: Overflows, spills, leaks, and drains that have collected in DEP-VSL-00001 and various sumps serving a secondary containment function are sampled and returned to the evaporator for processing.	
Initiation: This function is always active.	
Termination: This function is should never terminate.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: C.3.1	**Provide Leak Detection**
Detail description: DWP units serving a secondary containment function are provided with level sensors and switches used to detect leaks and notify the operator.	
Initiation: This function is always active.	
Termination: This function is should never terminate.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: C.3.2	**Transfer Sump Contents**
Detailed description: Sumps serving a secondary containment function have provisions to empty the sump contents within 24 hours or in as timely a manner as possible, as required by the DWP.	
Initiation: This function is always active.	
Termination: This function is should never terminate.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: D.1	**Flush System Equipment**
Detailed description: The DEP system has the capability to flush all transfer lines, including pumps, to limit the buildup of solids that could lead to plugging. The system also includes the capability to wash and flush vessels to support maintenance and decommissioning. Water is provided from the DIW and PSW systems, depending on the application.	
Initiation: This function is initiated by the LAW/DEP operator.	
Termination: This function can be terminated manually by the LAW/DEP operator or automatically by the flow measurement equipment.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: D.2	**Ventilate Vessel Headspace**
Detailed description: The DEP system interfaces with the DVP system to purge hydrogen from the headspace of the process vessels.	
Initiation: This function is always active.	
Termination: This function is should never terminate.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: D.3	**Ventilate Fume Hood**
Detailed description: The DEP system interfaces with the ACV system to provide an exhaust path for the air contained within the fume hood space of DEP-HOOD-00001.	
Initiation: This function is always active.	
Termination: This function is should never terminate.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: E.1	**Monitor and Control Waste Transfers**
Detailed description: The DEP system interfaces with the PCJ system and the Tank Farms Monitoring and Control system to regulate the transfers of feed, concentrate, and dilute effluent exchanged between WTP and Tank Farms, in accordance with the requirements of ICD-06, ICD-30, and ICD-31.	
Initiation: This function is automatically initiated.	
Termination: This function is automatically terminated.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: E.1.1	**Align DFLAW Configuration**
Detailed description: Provide the capability to allow the LAW Facility to receive treated feed directly from the TOC or from the PTF, and to disposition LAW and Lab effluents in the DEP system or return to the PTF for treatment and recycle.	
Initiation: N/A	
Termination: N/A	
Parallel or sequential functions: N/A	
Applicable Modes: N/A	

Function: E.2	**Provide Non-safety Monitoring and Control Functions**
Detailed description: Monitoring and control functions for DEP system process equipment at the EMF is accomplished through the PCJ system.	
Initiation: This function is automatically initiated.	
Termination: This function is automatically terminated.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: F.1	**Receive Low-Voltage Power**
Detailed description: Low-voltage power for all DEP system equipment is provided by the LVE system.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: F.2	**Receive Uninterruptible Power**
Detailed description: Uninterruptible power for DEP-SKID-00005 monitoring and control equipment is provided by the UPE system.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: F.3	**Receive Instrument Air**
Detailed description: Dry, clean, pressurized air from the ISA system is provided to DEP system pneumatic valves and instruments.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: F.4	**Receive Plant Service Air**
Detailed description: Dry, pressurized air from the PSA system is used for the evaporator feed filter, the low-point drain area sump pump, and stations for hose connections.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: All	
Applicable Modes: Normal and abnormal operations.	

Function: G.1	**Protect Electrical Equipment**
Detailed description: The GRE system provides grounding/lightning control functions for DEP system electrical equipment in the LAW effluent process and drain tank buildings. The GRE system also provides a ground path in the event of an equipment fault or system short circuit.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: This function runs in parallel with all other functions.	
Applicable Modes: Normal and abnormal operations.	

Function: G.2	**Protect Outdoor Piping**
Detailed description: The HTE system provides heat tracing on DEP system outdoor piping to maintain minimum process temperatures. Underground waste transfer lines are buried a minimum 3 ft deep and are insulated for freeze protection.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: This function runs in parallel with all other functions.	
Applicable Modes: Normal and abnormal operations.	

B.2 Descriptions of the C1V System Functional Flow and Interactions

Function: A.1	**Draw Air**
Detailed description: Outdoor air is drawn at a rate to maintain the internal design conditions within the LAW effluent electrical building and other C1 areas of the EMF that are not supplied by the ACV system.	
Initiation: This function initiates when a temperature, pressure, or humidity monitor reaches one of its setpoints.	
Termination: This function terminates when all temperature, pressure, or humidity monitors are within their setpoint ranges.	
Parallel or sequential functions: Air heating, humidifying, and cooling are all performed simultaneously with drawing of the air.	
Applicable Modes: Normal and abnormal operations.	

Function: B.1	**Heat Air**
Detailed description: Outdoor air is heated as necessary to maintain required temperatures in C1 areas of the EMF that are served by the C1V system.	
Initiation: This function initiates when a temperature monitor is below its setpoint limit.	
Termination: This function terminates when all temperature monitors are above their minimum setpoints.	
Parallel or sequential functions: Air heating, humidifying, and cooling are all performed simultaneously with drawing of the air.	
Applicable Modes: Normal and abnormal operations.	

Function: B.2	**Humidify Air**
Detailed description: Outdoor air is humidified as necessary to maintain humidity requirements in C1 areas of the EMF that are served by the C1V system.	
Initiation: This function initiates when a humidity monitor is below its setpoint limit.	
Termination: This function terminates when all humidity monitors are above their minimum setpoints.	
Parallel or sequential functions: Air heating, humidifying, and cooling are all performed simultaneously with drawing of the air.	
Applicable Modes: Normal and abnormal operations.	

Function: B.3	**Cool Air**
Detailed description: Outdoor air is cooled as necessary to maintain required temperatures in C1 areas of the EMF that are served by the C1V system.	
Initiation: This function initiates when a temperature monitor is above its setpoint limit.	
Termination: This function terminates when all temperature monitors are below their setpoints.	
Parallel or sequential functions: Air heating, humidifying, and cooling are all performed simultaneously with drawing of the air.	
Applicable Modes: Normal and abnormal operations.	

Function: C.1	**Distribute to Electrical Area**
Detailed description: Conditioned air is provided to the electrical areas within the LAW effluent electrical building by the C1V system.	
Initiation: This function initiates upon drawing and conditioning air.	
Termination: This function terminates upon termination of drawing and conditioning air.	
Parallel or sequential functions: This function happens sequentially between conditioning of air and exhausting air.	
Applicable Modes: Normal and abnormal operations.	

Function: C.2	**Distribute to Control and Battery Areas**
Detailed description: Conditioned air is provided to the control and battery areas within the LAW effluent electrical building by the C1V system.	
Initiation: This function initiates upon drawing and conditioning air.	
Termination: This function terminates upon termination of drawing and conditioning air.	
Parallel or sequential functions: This function happens sequentially between conditioning of air and exhausting air.	
Applicable Modes: Normal and abnormal operations.	

Function: C.3	**Distribute to Other C1 Areas**
Detailed description: Conditioned air is provided to the AFR skid room, C&I room, drain tank chase, and the various fire riser rooms by the C1V system.	
Initiation: This function initiates upon drawing and conditioning air.	
Termination: This function terminates upon termination of drawing and conditioning air.	
Parallel or sequential functions: This function happens after the conditioning of air.	
Applicable Modes: Normal and abnormal operations.	

Function: D.1	**Exhaust Battery Room Air**
Detailed description: Air is exhausted to the atmosphere from the battery room by a C1V exhaust fan to prevent hydrogen accumulation. UPE system power is available upon a loss of normal power.	
Initiation: This function initiates after air has passed through the respective confinement areas.	
Termination: This function terminates whenever the confinement areas do not require any additional conditioning or ventilation.	
Parallel or sequential functions: This is the final function of the C1V system within the LAW effluent electrical building.	
Applicable Modes: Normal and abnormal operations.	

Function: E.1	**Receive Low-Voltage Power**
Detailed description: Low voltage power is provided by the LVE system to support the electricity needs of all functions within the C1V system.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: This function runs in parallel with all other functions.	
Applicable Modes: Normal and abnormal operations.	

Function: F.1	**Protect Equipment**
Detailed description: The GRE provides grounding/lightning control functions for C1V system equipment. The GRE system also provides a ground path in the event of an equipment fault or system short circuit.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: This function runs in parallel with all other functions.	
Applicable Modes: Normal and abnormal operations.	

B.3 Descriptions of the ACV and DVP System Functional Flow and Interactions

Function: A.1	**Draw Air**
Detailed description: Outdoor (atmospheric) air is drawn into ACV-AHU-00001A/B to maintain the internal design conditions within the process and utility areas of the LAW effluent process building, LAW effluent drain tank building, and LAW effluent utility building.	
Initiation: This function initiates when a temperature, pressure, or humidity monitor reaches one of its setpoints.	
Termination: This function terminates when all temperature, pressure, or humidity monitors are within their setpoint ranges.	
Parallel or sequential functions: Air heating, humidifying, and cooling are all performed simultaneously with drawing of the air into the ACV supply system.	
Applicable Modes: Normal and abnormal operations.	

Function: B.1	**Heat Air**
Detailed description: Air is heated in the ACV-AHU-00001A/B preheat and reheat steam coils using low pressure steam from the LPS system to maintain minimum temperature requirements. Condensate is collected and returned to the BOF-SCW system. Unit heaters are provided in areas where the AHU outlet temperature does not meet the minimum required temperature of the room.	
Initiation: This function initiates when a temperature monitor is below its setpoint limit.	
Termination: This function terminates when all temperature monitors are above their minimum setpoints.	
Parallel or sequential functions: Air heating, humidifying, and cooling are all performed simultaneously with drawing of the air into the ACV supply system.	
Applicable Modes: Normal and abnormal operations.	

Function: B.2	**Humidify Air**
Detailed description: Water is provided by the DOW system to the evaporative cooling portion of ACV-AHU-00001A/B to maintain minimum humidity requirements.	
Initiation: This function initiates when a humidity monitor is below its setpoint limit.	
Termination: This function terminates when all humidity monitors are above their minimum setpoints.	
Parallel or sequential functions: Air heating, humidifying, and cooling are all performed simultaneously with drawing of the air into the ACV supply system.	
Applicable Modes: Normal and abnormal operations.	

Function: B.3	**Cool Air**
Detailed description: Water from the DOW system is provided to the evaporative cooling portion of ACV-AHU-00001A/B to cool air within the ACV supply system whenever necessary to maintain temperatures below maximum limits. Condensate is discharged to the ground.	
Initiation: This function initiates when a temperature monitor is above its setpoint limit.	
Termination: This function terminates when all temperature monitors are below their setpoints.	
Parallel or sequential functions: Air heating, humidifying, and cooling are all performed simultaneously with drawing of the air into the ACV supply system.	
Applicable Modes: Normal and abnormal operations.	

Function: C.1	**Distribute Air**
Detailed description: Air is distributed directly to select C1, C2, and C3 areas within the LAW Effluent Process, Drain Tank and Utility Buildings. Air is cascaded from areas with lower potential for contamination to areas with higher potential for contamination before being exhausted by the ACV exhaust system.	
Initiation: This function initiates upon drawing and conditioning air.	
Termination: This function terminates upon termination of drawing and conditioning air.	
Parallel or sequential functions: This function happens sequentially between conditioning of air and exhausting air.	
Applicable Modes: Normal and abnormal operations.	

Function: C.2	**Ventilate Process Vessels**
Detailed description: The DEP system process vessels are ventilated by the DVP system to prevent the accumulation of hydrogen gas in the vessel headspace. Vessel vent off-gas is vented to the vessel vent header in the DVP system.	
Initiation: This function is initiated upon initiation of DVP exhaust fan operation.	
Termination: This function terminates upon termination of DVP exhaust fan operation.	
Parallel or sequential functions: This function happens sequentially between the drawing of purge air and exhausting vessel off-gas.	
Applicable Modes: Normal and abnormal operations.	

Function: D.1	**Filter Building Air**
Detailed description: In order to minimize contamination release, ACV system exhaust air is passed through vendor-packaged HEPA filter banks. The ACV system is provided with a standby filter bank to allow for filter changing without interrupting the system process.	
Initiation: This function initiates upon initiation of ACV exhaust fan operation.	
Termination: This function terminates upon termination of ACV exhaust fan operation.	
Parallel or sequential functions: This function happens sequentially between providing conditioned air to the LAW Effluent Process Drain Tank, and Utility Buildings and exhausting the air via the ACV exhaust system.	
Applicable Modes: Normal and abnormal operations.	

Function: D.2	**Filter Vessel Off-Gas**
Detailed description: DVP system vessel vent off-gas is collected, passed through preheaters, and then filtered through vendor-packaged HEPA filter banks independent of the ACV exhaust system.	
Initiation: This function initiates after air has passed through the DEP system vessels.	
Termination: This function terminates whenever the vessels do not require any additional ventilation.	
Parallel or sequential functions: This function occurs after ventilating the process vessels.	
Applicable Modes: Normal and abnormal operations.	

Function: E.1	**Exhaust Air**
Detailed description: After the exhaust air passes through the ACV and DVP HEPA filters, it is exhausted through a combined EMF stack using ACV-FAN-00001A/B and DVP-EXHR-00001A/B.	
Initiation: This function initiates after air has passed through the respective confinement areas.	
Termination: This function terminates whenever the confinement areas do not require any additional ventilation.	
Parallel or sequential functions: This is the final function of the ACV and DVP system.	
Applicable Modes: Normal and abnormal operations.	

Function: F.1	**Provide Non-Safety Monitoring & Control**
Detailed description: PCJ provides non-safety monitoring and control functions for ACV and DVP system equipment. Temperatures, pressures, and humidity for the ACV system are monitored and controlled. Temperatures, pressure, and flow for the DVP system are monitored and controlled.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: This function runs in parallel with all other functions.	
Applicable Modes: Normal and abnormal operations.	

Function: F.2	**Monitor Emissions**
Detailed description: The ACV and DVP systems interface with the SDJ system to monitor the stack emissions. This interface has no active function, that is, it does not automatically actuate or cause actuation of other devices to place facility equipment in a predetermined state.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: This function runs in parallel with all other functions.	
Applicable Modes: Normal and abnormal operations.	

Function: G.1	**Receive Non-safety Power**
Detailed description: Low voltage power is provided by the LVE system to support the electricity needs of all functions within the ACV and DVP systems.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: This function runs in parallel with all other functions.	
Applicable Modes: Normal and abnormal operations.	

Function: G.2	**Receive Uninterruptible Power**
Detailed description: Uninterruptible power (UPE) provides power for monitoring and limited control of select SSCs in the event of loss of offsite power.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: This function runs in parallel with all other functions.	
Applicable Modes: Normal and abnormal operations.	

Function: G.3	**Receive Instrument Air**
Detailed description: The ACV and DVP systems receive instrument air from the ISA system for the remote operation of pneumatic valves and dampers.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: This function runs in parallel with all other functions.	
Applicable Modes: Normal and abnormal operations.	

Function: G.4	**Flush System Equipment**
Detailed description: The DVP system receives water from the DIW system to support maintenance activities. A flush connection is included on the vessel vent header at DVP-V-00058.	
Initiation: This function initiates when system flushing is required.	
Termination: This function terminates when the DIW system utility hose is decoupled.	
Parallel or sequential functions: This function occurs sequentially with all other DVP system functions.	
Applicable Modes: Maintenance mode.	

Function: H.1	**Protect Equipment**
Detailed description: The GRE system provides grounding/lightning control functions for ACV and DVP electrical equipment in the LAW effluent process and utility buildings. The GRE system also provides a ground path in the event of an equipment fault or system short circuit.	
Initiation: This function is always active.	
Termination: This function should never terminate.	
Parallel or sequential functions: This function runs in parallel with all other functions.	
Applicable Modes: Normal and abnormal operations.	

Appendix C Active Safety Instruments and Functions

There are currently no active safety items to identify.

Appendix D System Procedures

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Appendix E System History

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Document for Signature

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