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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
*3100 Port of Benton Blvd • Richland, WA 99354 • (509) 3[illegible]*

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EDMC

September 21, 2010

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Re: Proposed Permit Modification of the *Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste,* Part III, Operating Unit 10, Waste Treatment and Immobilization Plant, WA7890008967

Dear Gentlemen:

This letter transmits the proposed permit modification to Part III, Operating Unit 10, Waste Treatment and Immobilization Plant (WTP) of the *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste,* hereafter called the "WTP Permit."

Washington Administrative Code (WAC) 173-303-840(3) requires a 45-day public review of the permit modification. The public review begins September 27, 2010, and ends November 12, 2010.

Copies of the permit modification are located at the Hanford Public Information Repositories in Richland, Spokane, and Seattle, Washington and in Portland, Oregon. It will be available on-line starting September 27, at: http://www.ecy.wa.gov/programs/nwp/index.html. DVD copies are available upon request.

This modification to the WTP Permit consists of the following secondary containment design packages:

- **Low-Activity Waste (LAW) Design Package LAW-034, Revision 0, *Tank System Secondary Containment for LAW ASX Samplers*** includes:
  - General Arrangement Plan at +48-foot elevation.
  - Secondary Containment Design.
  - Leak Detection in Secondary Containment Systems.
  - Dangerous Waste Permit (DWP) Liner Heights in the LAW Facility.
  - Independent Qualified Registered Professional Engineers (IQRPE) Integrity Assessment Report for the LAW Autosampling System (ASX).
- **Pretreatment Facility (PTF) Design Package PTF-099, Revision 0, *Tank System Secondary Containment for PTF ASX Samplers*** includes the IQRPE Integrity Assessment Report for the ASX secondary containment.

The following items are also included in this modification:

- **24590-WTP-PER-M-08-001** focuses on the Integrity Assessment Program and Schedule for DWP-regulated equipment in the Analytical Laboratory and the LAW Facility.
- **24590-WTP-PER-M-08-002** describes the Integrity Assessment Program and Schedule for DWP-regulated equipment in the PTF and the High-Level Waste Facility.
- **CCN 169564** describes the IQRPE Structural Integrity Assessment Report for LAW Secondary Containment.
- **24590-PTF-PER-M-04-0010** addresses the leak detection capability in the PTF.
- **24590-PTF-PER-M-04-0011** addresses the waste removal capability for the PTF.
- **24590-WTP-PCN-ENV-10-002** revises the permit condition for notification to Ecology of minor nonconformance or construction deficiencies. These deficiencies are from approved designs, plans, and specifications in the construction of critical systems as defined in the Hanford Site-wide permit. The reporting period is changed from five calendar days to seven calendar days.

The modification also contains a revision to Permit Conditions III.10.C.9.d and III.10.C.9.h. Pursuant to WAC 173-303-830(3), only the conditions that are subject to this modification are opened for comment. All other aspects of the existing WTP Permit remain in effect for the duration of the modification.

If there are any questions, contact Annette Carlson at 509-372-7897.

Sincerely,

Jane A. Hedges
Program Manager
Nuclear Waste Program

ac:lkd
Enclosures

cc electronic w/o enc:
RJ Corey, USDOE
Lori Huffman, USDOE
Dale Knutson, USDOE
Tony McKarns, USDOE
Gae Neath, USDOE
Delmar Noyes, USDOE
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Julie Colby, BNI
Barry Curn, BNI
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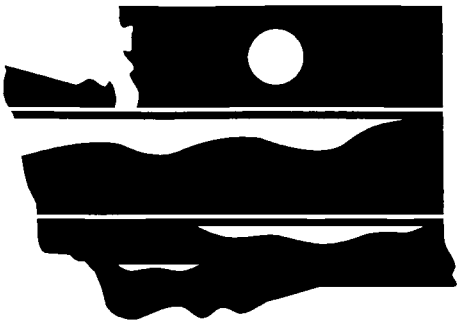
Peggy Fisher, BNI
Dennis Klein, BNI
Dan Robertson, BNI
Sandi Murdock, BNI

cc w/enc, CD-ROM:
Dave Bartus, EPA
Barry Curn, BNI
Suzette Thompson, MSA
(Hanford Operating Record General File)
Stuart Harris, CTUIR
Gabriel Bohnee, NPT
Russell Jim, YN
Susan Leckband, HAB
Ken Niles, ODOE
Administrative Record:
Waste Treatment Plant (TSD #H-0-8)
Environmental Portal
USDOE Correspondence Control
USDOE-ORP Correspondence Control

cc w/enc, hard copy:
Administrative Record: Waste Treatment Plant (TSD #H-0-8)
BNI Correspondence Control
EPA Region 10 Correspondence Control
USDOE Reading Room
WRPS Correspondence Control



DEPARTMENT OF
ECOLOGY
State of Washington

# Statement of Basis

**For Modification of
The Dangerous Waste Portion, Revision 8C, of the
Resource Conservation and Recovery Act Permit
For the Treatment, Storage, and Disposal of Dangerous Waste, Part III,
Operating Unit 10 (WA7890008967),
Waste Treatment and Immobilization Plant**

September 2010

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# Statement of Basis
# For Modification of the Dangerous Waste Portion, Revision 8C, of the Resource Conservation and Recovery Act Permit For the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit 10 (WA7890008967), Waste Treatment and Immobilization Plant

## Permittees

United States Department of Energy
(Owner/Operator)
Office of River Protection
P.O. Box 550
Richland, Washington 99352

Bechtel National, Inc.
(Co-Operator)
2535 Stevens Center Place
Richland, Washington 99354

The Washington State Department of Ecology (Ecology) has developed this Statement of Basis in accordance with the requirements of Washington Administrative Code (WAC) 173-303-840(2)(f)(iv). Its purpose is to present information on Ecology's tentative decision to modify Part III, Operating Unit 10, Waste Treatment and Immobilization Plant (WTP) of the Hanford Facility's Dangerous Waste Portion, Revision 8C, of the Resource Conservation and Recovery Act (RCRA) Permit for the Treatment, Storage, and Disposal (TSD) of Dangerous Waste, hereafter called the "WTP Permit."

This modification includes supporting technical information and engineering drawings for construction on the regulated portions of the WTP Pretreatment Facility (PTF), Low-Activity Waste (LAW) Facility, and High-Level Waste (HLW) Facility. In addition, this modification incorporates format changes to the WTP Permit appendices and changes to supporting information. It also contains a revision to the Permit Conditions III.10.C.9.d and III.10.C.9.h. Pursuant to WAC 173-303-830(3), only the conditions that are subject to this modification are reopened for comment.

Ecology has elected to prepare a Statement of Basis pursuant to WAC 173-303-840(2)(f)(iv) rather than a Fact Sheet. A Statement of Basis was prepared for previous major WTP Permit modifications. This process is being followed for permit modifications initiated by Ecology to incorporate similar design package information and other changes to the WTP Permit conditions.

This Statement of Basis is divided into four sections:

1.0 Hanford Facility Permit Background

2.0 The WTP Permitting Process

3.0 Procedures for Reaching a Final Decision on the Draft Permit Modification

4.0 Proposed Modification to the Hanford Facility Permit, Part III, Operating Unit 10, WTP

Tables submitted by the Permittees for incorporation into the WTP Permit are at the end of this document.

## 1.0 Hanford Facility Permit Background

Ecology initially issued the WTP Permit for the Hanford facility in 1994. The WTP Permit provides standard and general facility conditions, as well as unit-specific conditions for the operation, closure, and post-closure care of mixed and dangerous waste TSD units at Hanford.

The WTP Permit is normally modified annually to incorporate newly permitted units; reflect Class 1, 2, and 3 modifications; and include minor changes in grammar, consistency, and presentation. The Washington State Dangerous Waste Regulations in WAC 173-303-830 describe the types of changes or modifications that may be made to a Dangerous Waste Permit (DWP) issued by Ecology.

Approximately 50 TSD units at Hanford are operating or closing under RCRA final status standards.

Conditions of the WTP Permit are presented in six parts:

- Standard Conditions (Part I)
- General Facility Conditions (Part II)
- Unit-Specific Conditions for Final Status Operating Units (Part III)
- Corrective Action for Past Practice Units (Part IV)
- Unit-Specific Conditions for Units Undergoing Closure (Part V)
- Unit-Specific Conditions for Units in Post-Closure (Part VI)

The WTP TSD Unit was added to the Unit-Specific Conditions for Final Status Operations (Part III) portion of the WTP Permit on September 25, 2002. The WTP Permit modification was effective on October 25, 2002. The WTP TSD Unit is currently being constructed under final status standards.

## 2.0 The WTP Permitting Process

The permitting of the WTP TSD Unit is using a phased (or stepped) approach. The first phase was completed on September 25, 2002, with issuance of a final permit allowing construction of the WTP LAW, PTF, and HLW facilities to commence and a compliance schedule to provide additional detailed information to Ecology. The compliance schedule addresses submittal of information necessary for construction of the rest of the WTP TSD Unit and eventual operation.

The second phase of permitting is implementation of the compliance schedule, which requires design and other information to be submitted for Ecology approval before regulated portions of the WTP TSD Unit are constructed. The third phase of permitting is implementation of the last portion of the compliance schedule, which requires updating portions of the DWP Application prior to facility start of operations. These portions of the WTP Permit are operational in nature and cannot be completed before the design is nearly complete (Contingency Plan, Closure Plan, and Training Plan). At completion of the three phases, the WTP TSD Unit will comply with all the applicable requirements of WAC 173-303 and, after receiving written permission from Ecology, can begin treatment and storage of dangerous and mixed waste.

The design submittals (second phase described above) were structured to allow the Permittees to provide design information in roughly the same order as the WTP facilities are constructed. The design "packages" start at the lowest level of the facilities (below-grade levels) and are submitted for regulated areas of each level of the facility before construction begins. This process was adjusted for some design packages. If the process system in the design package is located on more than one level in a WTP facility, the design package can address components on more than one level. This will prevent the confusion caused by one process system description being segmented into multiple design packages.

The WTP Permit breaks out design packages into three general groups by the type of regulated equipment:

1. Secondary containment.
2. Primary containment (for example tanks, miscellaneous units [evaporators and melters], and containment buildings).
3. Other associated, regulated equipment (for example ancillary equipment, equipment associated with miscellaneous units, instrumentation).

Using tank systems as an example, secondary containment packages include details of the design of secondary containment that must be in place in regulated areas when the floors and walls are built for that level of each facility (floor slope, sump location). The installation of tanks and other large equipment usually follows construction of the floors and walls. Therefore, a tank package on that level will be included in the WTP Permit before installation (for example structural details for those tanks or miscellaneous units showing nozzle locations, unit volumes, and tank shell thickness). The last equipment usually installed on a level for a tank system is the ancillary equipment (for example piping, pumps, process instrumentation, and electrical equipment). Therefore, the ancillary equipment package that provides details for equipment on that level will be included in the WTP Permit before installation (for example materials of construction, pipe support details, pump types and their operating limits).

With each WTP facility consisting of multiple levels, the total number of design packages is large. Of the estimated 160 total design packages, approximately 30 remain to be incorporated into the WTP Permit. Ecology intends to group packages, where possible, to reduce the number of public comment periods.

The secondary containment, primary containment, and other associated, regulated equipment packages for different levels require repetitive information submittals in each package. Again, using tank systems as an example, most tanks will use the same construction specifications. The WTP Permit allows the Permittees to reference the previously submitted design information. Therefore, some design packages may consist mostly of references to information already provided.

Ecology is authorized, pursuant to WAC 173-303-830(4)(e), to grant Temporary Authorizations (TA) for the Permittees to start construction on a design package after Ecology approval, but before the draft permit modification process is complete. A Permittee is allowed to request a TA to implement a modification prior to public notice and comment, pursuant to WAC 173-303-830(4)(e)(ii)(A). To issue a TA, Ecology must find it meets the criteria as described in WAC 173-303-830(4)(e)(ii)(A) and -830(4)(e)(iii). The term of a TA is limited to 180 days with the potential for Ecology approval of two terms, with a maximum combined duration of 360 days, provided that the modification could be

classified as a Class 2 or 3 modification for the activity covered in the TA (WAC 173-303-830(4)(e)(iv)).

The purpose of a TA is to allow the timely implementation of a permit modification. Construction that takes place under a TA is at the Permittees' risk because public comment may require the Permittees to modify something that is already built. The submittal schedule developed by the Permittees will allow most design packages to undergo public comment and be incorporated into the WTP Permit prior to construction of those areas.

## 3.0 Procedures for Reaching a Final Decision on the Draft WTP Permit Modification

The Washington State Hazardous Waste Management Act, Chapter 70.105 Revised Code of Washington, and the rules promulgated in Chapter 173-303 of the WAC, regulate the management of dangerous waste in Washington State. In accordance with WAC 173-303-800, facilities that treat, store, and/or dispose of dangerous waste must obtain a permit for these activities.

As required by WAC 173-303-840(3)(d) draft permit modifications to the WTP Permit will have a 45-day public comment period. The public comment period for this proposed permit modification begins on September 27, 2010, and ends on November 12, 2010. All comments received during the public comment period will be considered and responded to before final decisions are made on the proposed modifications. Regulatory requirements for public notice and involvement (for this proposed permit modification) are described in WAC 173-303-840(3) and (4).

Comments must be post-marked or received by e-mail no later than close of business (5:00 p.m. PST) November 12. Comments will be accepted if they are hand-delivered by close of business (5:00 p.m. PST) November 12 to the address below. Direct all written comments to:

Ms. Erika Holmes
Washington State Department of Ecology
3100 Port of Benton Blvd.
Richland, Washington 99354
E-mail address: ehol461@ecy.wa.gov

Ecology will consider and respond to all written comments submitted by the deadline. Ecology will then make a final permit decision, which will become effective 30 days after Ecology provides notice of the decision to the Permittees and all who commented. If Ecology's decision includes substantial changes to the WTP Permit because of public comment, Ecology will initiate a new public comment period.

All commenters and the Permittees will receive a copy of the Responsiveness Summary and a notification of the final permit decision. Ecology's final permit decision may be appealed within 30 days after issuance of the final permit decision.

Copies of the WTP Permit for the Hanford facility, including the proposed permit modifications are available for review at the Hanford Public Information Repositories listed below. For additional information, call the Hanford Cleanup Hotline toll-free at 800-321-2008.

### Hanford Public Information Repositories

**Portland**
Portland State University
Branford Price Millar Library
1875 SW Park Ave
Portland, Oregon 97201-3220
(503) 725-4552
Attn: Claudia Weston

**Richland**
Public Reading Room
2770 University Drive
Consolidated Information Center, Rm. 101L
Richland, Washington 99352
(509) 372-7443
Attn: Janice Pathree

**Spokane**
Gonzaga University
Foley Center
East 502 Boone
Spokane, Washington 99258-0001
(509) 313-3834
Attn: Linda Pierce

**Seattle**
University of Washington Suzzallo Library
Government Publication Division
Seattle, Washington 98195
(206) 543-9157
Attn: David Maack
Public Service: (206) 543-4664

This Statement of Basis for the proposed permit modification is also available online at www.ecy.wa.gov/programs/nwp/. If special accommodations are needed for public comment, please contact Erika Holmes, Department of Ecology, Nuclear Waste Program, at (509) 372-7880, or (360) 407-6006 (TDD).

## 4.0 Proposed Modifications to the WTP Permit

This proposed permit modification contains the following secondary containment design packages. New or revised documents submitted with the package are listed below. See Tables 1 and 2 for the entire list of documents:

- **Package LAW-034, Revision 0, *Tank System Secondary Containment for LAW ASX Samplers.*** LAW Design Package LAW-034 includes the General Arrangement Plan at +48 foot elevation, Secondary Containment Design, Leak Detection in Secondary Containment Systems, DWP Liner Heights in the LAW Facility, and the Independent Qualified Registered Professional Engineers (IQRPE) Integrity Assessment Report for the LAW Autosampling System (ASX).

- **Package PTF-099, Revision 0, *Tank System Secondary Containment for PTF ASX Samplers.*** The PTF Design Package PTF-099 includes the IQRPE Integrity Assessment Report for the ASX secondary containment.

The following additional items are also included in this draft modification (see Table 3 for the entire list of documents):

- 24590-WTP-PER-M-08-001 focuses on the Integrity Assessment Program and Schedule for DWP regulated equipment in the Analytical Laboratory and LAW Facility.

- 24590-WTP-PER-M-08-002 describes the Integrity Assessment Program and Schedule for DWP-regulated equipment in the PTF and HLW Facility.

- Correspondence Control Number (CCN) 169564 describes the IQRPE Structural Integrity Assessment Report for LAW Secondary Containment.

- 24590-PTF-PER-M-04-0010 addresses the leak detection capability in the PTF.

- 24590-PTF-PER-M-04-0011 addresses the waste removal capability for the PTF.

- 24590-WTP-PCN-ENV-10-002 revises the permit condition for notification to Ecology of minor nonconformance or construction deficiencies. These deficiencies are from approved designs, plans, and specifications in the construction of critical systems as defined in the Hanford Site-wide permit. The reporting period is changed from five calendar days to seven calendar days.

### 4.1 Incorporation of Several Class 1 and Class 1 Permit Modifications

This proposed permit modification incorporates the Class 1 and Class 1 Permit modifications shown below. These were previously approved by Ecology in accordance with WAC 173-303-830(4)(a) and are listed here as a courtesy.

- 24590-HLW-PCN-ENV-07-005, Class 1 Modification: Submits the IQRPE Structural Integrity Assessment Report for the HLW Facility Melter Cave Support Handling System Decontamination Tanks (HSH-TK-00001 and HSH-TK-00002) in Appendix 10.11.

- 24590-HLW-PCN-ENV-08-005, Class 1 Modification: Submits the Integrity Assessment for the Silver Mordenite Columns (HOP-ABS-00002 and HOP-ABS-00003) that are components of the HLW Melter Offgas Treatment Process System currently in Appendix 10.11.

- 24590-HLW-PCN-ENV-08-008, Class 1 Modification: Provides the updated Radioactive Liquid Waste Disposal Mechanical System Data Sheets. These replace the corresponding permit Mechanical Systems Data Sheets in Appendix 10.6.

- 24590-HLW-PCN-ENV-09-001, Class 1 Modification: Submits the updated HLW Facility Process Flow Diagram for the HLW Canister Decontamination Handling System. This replaces the permitted drawing currently in Appendix 10.1.

- 24590-HLW-PCN-ENV-09-003, Class 1 Modification: Submits the General Arrangement drawings for the HLW Facility elevations at -21'-0", 0'-0", 14'-0", 37'-0" and 58'-0" currently in Appendix 10.4.

- 24590-HLW-PCN-ENV-10-001, Class 1 Modification: Submits updated System Logic Description for the HLW Facility—Melter Process System (24590-HLW-PER-J-04-00004, Revision 1) to replace the document in Appendix 10.13.

- 24590-LAB-PCN-ENV-08-001, Class 1 Modification: Submits the IQRPE Report IA-3001891-001 for the Analytical Laboratory Building Radioactive Liquid Waste Disposal System Ancillary Equipment. This replaces the corresponding design intent IQRPE report in Operating Unit 10, Appendix 11.11.

- 24590-LAW-PCN-ENV-07-008, Class 1 Modification: Submits the final design IQRPE report for the ancillary equipment associated with the LAW Concentrate Receipt Process System vessels, replacing the design intent IQRPE report currently in Appendix 9.11.

- 24590-LAW-PCN-ENV-07-011, Class 1 Modification: Submits the final design IQRPE report for ancillary equipment associated with the LAW Radioactive Liquid Waste Disposal System vessels, replacing the design intent IQRPE reports currently in Appendix 9.11.

- 24590-LAW-PCN-ENV-08-002, Class 1 Modification: Submits the Equipment Assembly Drawing for the LAW Caustic Collection Tank to replace the permit drawing currently in Appendix 9.6.

- 24590-LAW-PCN-ENV-08-003, Class 1 Modification: Submits the updated LAW Facility General Arrangement Plan at Elevation -21 feet-0' to replace the permit drawing currently in Appendix 9.4.

- 24590-LAW-PCN-ENV-09-001, Class 1 Modification: Submits the IQRPE Structural Integrity Assessment Report for the LAW Waste Primary Offgas system (LOP) ancillary equipment and miscellaneous unit sub-system equipment associated with plant items in the LAW LOP system in Appendix 9.11.

- 24590-LAW-PCN-ENV-09-005, Class 1 Modification: Submits Corrosion Evaluations for the LAW Facility to replace the permitted Material Selection Data sheets in Appendix 9.9.

- 24590-PTF-PCN-ENV-05-028, Class 1 Modification: Submits updated Equipment Assembly Drawings for HLW Feed Receipt Vessel HLP-VSL-00022, HLW Lag Storage Vessels HLP-VSL-00027A and 00027B, and HLW Feed Blend Vessel HLP-VSL-00028 in Appendix 8.6.

- 24590-PTF-PCN-ENV-06-020 Class 1 Modification: Replaces Material Selection Data Sheets currently in Appendix 8.9. This also includes a Corrosion Evaluation for the PTF HLW Lag Storage and Feed Blending Process System Cesium Concentrate Receipt Breakpots.

- 24590-PTF-PCN-ENV-08-005, Class 1 Modification: Submits the Mechanical Data Sheet for the PTF Ultrafiltration Feed Preparation (UFP) Vessel UFP-VSL-00001A. The datasheet is being submitted to replace the datasheet currently in Appendix 8.6.

- 24590-PTF-PCN-ENV-08-024, Class 1 Modification: Submits Piping and Instrumentation Diagrams (P&IDs) for the PTF Cesium Ion Exchange Process System to replace the permitted P&IDs currently in Appendix 8.2.

- 24590-PTF-PCN-ENV-08-028, Class 1 Modification: Submits updated P&IDs for the PTF Vessel Vent Process System Caustic Scrubber, PVP-SCB-00002, and associated Bulge; and Cesium Nitric Acid Recovery Process System Evaporator Vessel, CNP-EVAP-00001, in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-002 Class 1 Modification: Submits the new P&ID for the PTF Spent Resin Collection and Dewatering Process System Resin Collection. The diagram shows the Spent Resin Dewatering Disposal Transfer Cask design details (RDP-CASK-00001) and it will be added in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-003, Class 1 Modification: Submits P&IDs for the PTF Cesium Nitric Acid Recovery System. These replace the permitting P&IDs currently in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-004, Class 1 Modification: Submits P&IDs for the PTF Ultrafiltration Process System to replace the permitted P&IDs currently in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-005, Class 1 Modification: Submits the P&IDs for the PTF Ultrafiltration Process System to replace the permitted versions in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-006, Class 1 Modification: Updates the PTF General Arrangement Plan for the 56' elevation in Appendix 8.4.

- 24590-PTF-PCN-ENV-09-007 Class 1 Modification: Submits the updated PTF P&ID for the Pulse Jet Ventilation System Inlet Header to Demister Outlet to replace the permitted diagram currently in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-008, Class 1 Modification: Submits updated PTF Process Flow Diagrams in Appendix 8.1.

- 24590-PTF-PCN-ENV-09-009, Class 1 Modification: Submits the updated P&IDs for the PTF Cesium Nitric Acid Recovery Process System (CNP) for the Plant Service Air Rack, Plant Wash Rack, and the CNP Rectifier and Condensers in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-010, Class 1 Modification: Submits the PTF Waste Feed Receipt Vessels, Waste Feed Receipt Utility Services—Plant Service Air Rack P&ID drawings to provide additional detail to documents currently in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-011, Class 1 Modification: Submits updated P&IDs for the PTF HLW Lag Storage and Feed Blending Process Systems in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-012, Class 1 Modification: Replaces updated P&IDs for the PTF Pulse Jet Ventilation System and Vessel Vent Process System in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-013, Class 1 Modification: Submits updated P&IDs for the PTF Plant Wash and Disposal System to replace the permitted documents in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-014, Class 1 Modification: Submits updated P&IDs for the PTF Treated LAW Evaporation Process System to replace the permit versions currently in Appendix 8.2.

- 24590-PTF-PCN-ENV-09-016, Class 1 Modification: Submits Corrosion Evaluations for the PTF to replace the permitted Material Selection Datasheets currently in Appendix 8.9.

- 24590-WTP-PCN-ENV-09-001, Class 1 Modification: Submits document 24590-WTP-PER-CON-02-001, Installation of Tank Systems and Miscellaneous Unit Systems to replace the document currently in Appendix 7.12.

### 4.2 Supplemental Design Information

Tables 1, 2, and 3 list the design information included in this proposed permit modification and the proposed location in the WTP Permit. At issuance of the final WTP permit decision, Ecology will specify where each drawing or report resides in the WTP Permit. Paper copies of the page changes to the WTP Permit as a result of this modification will be placed in the Administrative Record. Duplicate sets of drawings will not be issued to the Permittees at issuance of the final permit decision in order to minimize the amount of duplicate paperwork, unless drawing changes are made as a result of public comment.

The letter issuing the final WTP Permit decision to the Permittees will include the current WTP Permit with the modifications on a CD.

### 4.3 Identifying Changes in this Proposed Permit Modification

As the WTP TSD Unit is constructed, Ecology will modify the WTP Permit for many reasons, including to clarify text, add new conditions, delete existing conditions, correct errors, or add additional information. To communicate the changes, the proposed permit modification will include page changes showing all significant proposed changes to the WTP Permit. The text to be deleted will be struck-out with a single line, and the new text will be double-underlined. Only the text being changed in the current modification will be indicated by double-underlines and strikeouts.

Newly added documents and drawings are provided for review in this proposed permit modification. New document and drawing numbers and titles are shown in bold text in the affected appendix drawing lists.

At issuance of the permit modification, "clean" pages incorporating permit modifications will be issued to the Permittees and placed in the Administrative Record. All double-underlines and strikeouts will be removed. Documents and drawings listed in the appendices will not be bolded and will be incorporated by reference only.

In Ecology publication number 07-05-006, *Responsiveness Summary* (September 27, 2007), Ecology explained the reason for replacing permit version documents with source documents to which the WTP is constructed. Source documents are in a state of constant revision as design details are finalized and additional information is added to provide clarity and to correct typographical errors. Changes not yet incorporated into source documents are tracked by the Permittees using Document Change Notices (DCNs). In some cases, DCNs are issued at the time of Ecology's review. These are not provided for public comment, but will appear in the next revision of the document for review. Source documents have been replacing permit version documents since September 2007.

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## Table 1 – Design Information Submitted by Permittees for Incorporation into the Permit

| Permit Design Package LAW-034, Revision 0,<br>Tank System Secondary Containment For LAW ASX Samplers<br>Table of Contents | | | | | |
|---|---|---|---|---|---|
| **Engineering Document Title** | **Document Number** | **Revision** | **Permit Condition** | **Included** | **Remarks** |
| IQRPE Structural Integrity Assessment Report for LAW ASX Secondary Containment (Sampler Cabinets) | CCN: 169565 | 00A | III.10.E.9.b.i | Y | |
| **Permit Design Drawings** | | | | | |
| LAW Facility General Arrangement Plan at Elevation 48' - 0" | 24590-LAW-P1-P01T-00005 | 3 | III.10.E.9.b.ii | Y | Associated DCNs included |
| DWP Liner Heights in the LAW Facility | 24590-LAW-PER-M-02-002 | 7 | III.10.E.9.b.ii | Y | Document renamed. Replaces Revision 6, 24590-LAW-PER-M-02-002, *Flooding Volume for LAW Facility* in Attachment 51, Appendix 9.8 |
| Secondary Containment Design | 24590-WTP-PER-CSA-02-001 | 9 | III.10.E.9.b.ii<br>III.10.E.9.b.iii | Y | Updated to incorporate ASX sampler secondary containment and leak detection and HLW drum transfer tunnel drip pan |
| Underground Pipe Protection | N/A | - | III.10.E.9.b.iv | N/A | Not Applicable for the ASX samplers |
| Material Selections for Building Secondary Containment/Leak Detection | 24590-WTP-PER-M-02-001 | 3 | III.10.E.9.b.v | N | Included in Attachment 51, Appendix 7.9 |
| Installation of Tank Systems and Miscellaneous Unit Systems | 24590-WTP-PER-CON-02-001 | 6 | III.10.E.b.vi | N | Included in Attachment 51, Appendix 7.12 as approved in PCN 24590-WTP-PCN-ENV-09-001 (October 1, 2009) |
| Leak Detection in Secondary Containment Systems | 24590-WTP-PER-J-02-002 | 4 | III.10.E.9.b.ii<br>III.10.E.9.b.v | Y | Consolidated to replace 24590-WTP-PER-J-02-001 and 24590-WTP-PER-J-02-002 in Attachment 51, Appendix 7.5 |

| Permit Design Package LAW-034, Revision 0,<br>Tank System Secondary Containment For LAW ASX Samplers<br>Table of Contents | | | | | |
|---|---|---|---|---|---|
| **Engineering Document Title** | **Document Number** | **Revision** | **Permit Condition** | **Included** | **Remarks** |
| LAW Facility Sump Data | 24590-LAW-PER-M-02-001 | 5 | III.10.E.9.b.vii | N | Included in Attachment 51, Appendix 9.5 |
| Description of Access for Conducting Integrity Assessments | 24590-WTP-PER-M-02-005 | 1 | III.10.E.9.b.ix | N | Included in Attachment 51, Appendix 7.15 |
| Integrity Assessment Program and Schedule for DWP-Regulated Equipment in the Analytical Laboratory and LAW Facility | 24590-WTP-PER-M-08-001 | 0 | III.10.E.9.b. | N | July 7, 2009, letter from Ecology (CCN: 201996) for incorporation into the proposed WTP Permit modification. |
| Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems | 24590-WTP-PER-PR-03-001 | 1 | III.10.E.9.b.viii | N | U.S. Department of Energy Office of River Protection letter 03-ED-130 dated August 26, 2003, transmitting LAW-029 Revision 0 to Ecology |

## Table 2 – Design Information Submitted by Permittees for Inclusion into the Permit

| Permit Design Package No. PTF-099, Revision 0<br>Tank System Secondary Containment For PTF ASX Samplers<br>Table of Contents | | | | | |
|---|---|---|---|---|---|
| **Engineering Document Title** | **Document Number** | **Revision** | **Permit Condition** | **Included** | **Remarks** |
| IQRPE Structural Integrity Assessment Report for PTF ASX Secondary Containment (Sampler Cabinets) | CCN: 169566 | 00A | III.10.E.9.b.i | Y | |
| **Permit Design Drawings** | | | | | |
| PTF General Arrangement Plan at Elevation 56'-0" | 24590-PTF-P1-P01T-00003 | 4 | III.10.E.9.b.ii | N | Provided in 24590-PTF-PCN-ENV-09-006, approved November 24, 2009, CCN: 209892 (Appendix 8.4) |
| Secondary Containment Design | 24590-WTP-PER-CSA-02-001 | 9 | III.10.E.9.b.ii<br>III.10.E.9.b.iii | N | Included in Package LAW-034 |
| Underground Pipe Protection | N/A | - | III.10.E.9.b.iv | N/A | Not Applicable to the ASX samplers |
| Material Selections for Building Secondary Containment/Leak Detection | 24590-WTP-PER-M-02-001 | 3 | III.10.E.9.b.v | N | Included in Attachment 51, Appendix 7.9 |
| Installation of Tank Systems and Miscellaneous Unit Systems | 24590-WTP-PER-CON-02-001 | 6 | III.10.E.b.vi | N | Included in Attachment 51, Appendix 7.12 as approved in Permit Change Notice (PCN) 24590-WTP-PCN-ENV-09-001 (10/01/09) |
| Leak Detection in Secondary Containment Systems | 24590-WTP-PER-J-02-002 | 4 | III.10.E.9.b.ii<br>III.10.E.9.b.v | N | Included in LAW-034 (consolidation of 24590-WTP-PER-J-02-001 and 24590-WTP-PER-J-02-002) |
| Sump Data for PTF | 24590-PTF-PER-M-02-006 | 5 | III.10.E.9.b.vii | N | Included in Attachment 51, Appendix 8.5 |
| Description of Access for Conducting Integrity Assessments | 24590-WTP-PER-M-02-005 | 1 | III.10.E.9.b.ix | N | Included in Attachment 51, Appendix 7.15 |
| Integrity Assessment Program and Schedule for DWP-Regulated Equipment in the PTF and HLW Facility | 24590-WTP-PER-M-08-002 | 0 | III.10.E.9.b | N | April 29, 2010, letter from Ecology (CCN: 217892) for incorporation into the proposed WTP Permit modification |

## Submitted by the Permittee for Incorporation into the Administrative Record

| Engineering Document Title | Document Number | Revision | Permit Condition | Included | Remarks |
|---|---|---|---|---|---|
| Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems | 24590-WTP-PER-PR-03-001 | 1 | III.10.E.9.b.viii | N | ORP Letter 03-ED-130 dated August 26, 2003, transmitting LAW-029, Revision 0 to Ecology |

## Table 3 - Design Information Submitted by Permittees

| Engineering Document Title | Document Number | Revision | Remarks |
|---|---|---|---|
| Integrity Assessment Program and Schedule for DWP-Regulated Equipment in the Analytical Laboratory and LAW Facility | 24590-WTP-PER-M-08-001 | Rev. 0 | CCN: 201996, July 7, 2009, letter from Ecology for incorporation into the proposed WTP Permit modification |
| Integrity Assessment Program and Schedule for DWP-Regulated Equipment in the PTF and HLW Facility | 24590-WTP-PER-M-08-002 | Rev. 0 | CCN: 217892, April 29, 2010, letter from Ecology for incorporation into the proposed WTP Permit modification |
| IQRPE Structural Integrity Assessment Report for LAW Secondary Containment | CCN 169564 | N/A | Consolidate and replace LAW secondary containment IQRPE reports in Appendix 9.11 of the WTP Permit |
| Leak Detection Capability in the PTF | 24590-PTF-PER-M-04-0010 | Rev. 2 | CCN: 219312 transmitted the Leak Detection Capability in the PTF to Ecology for incorporation into the proposed WTP Permit modification. |
| Waste Removal Capability for the PTF | 24590-PTF-PER-M-04-0011 | Rev. 1 | CCN: 216932 transmitted the Waste Removal Capability for the PTF to Ecology for incorporation into the proposed WTP Permit modification |
| Revise permit conditions III.10.C.9.d and III.10.C.9.h to allow documentation identified in the permit conditions to be submitted every 7 calendar days | 24590-WTP-PCN-ENV-10-002 | N/A | PCN-24590-WTP-PCN-ENV-10-002 transmitted to Ecology for incorporation into the proposed WTP Permit modification |

# Public Comment Period

DEPARTMENT OF ECOLOGY
State of Washington

**Nuclear Waste Program** | **September 2010**

## Focus on Waste Sampling, Leak Detection, and Containment Systems in the Waste Treatment Plant

The Washington State Department of Ecology is proposing a permit modification to the *Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste for the Waste Treatment and Immobilization Plant (WTP)*. The proposed changes are located in Part III, Operating Unit 10 for the WTP.

This permit modification affects the Pretreatment Facility (PTF) and the Low-Activity Waste (LAW) Facility, which are part of the WTP. The modification includes the design of leak-containing liners for Autosampling System sampler cabinets in both the PTF and the LAW Facility.

We invite you to comment on this permit modification. The comment period begins September 27, 2010, and ends November 12, 2010.

### What will the new equipment do?

The sampler cabinets will routinely sample the waste stream being processed. This remote sampling method helps ensure worker safety by keeping WTP employees from contacting the waste. The collected samples will be tested to determine whether waste is being treated to the correct specifications.

The sampler cabinets have upper and lower liners to contain any leaks. The stainless steel liners are sloped and divert leaks to collection areas. When liquid is detected in one of the collection areas, a leak detection system will alert WTP employees.

### How do we know this will work?

The sampler cabinets for the PTF and the LAW Facility have passed an Independent Qualified Registered Professional Engineer (IQRPE) Integrity Assessment as required by Washington Administrative Code (WAC) 173-303-604. The following is a summary of the IQRPE report.

#### WHY IT MATTERS

The proposed permit changes affect the Pretreatment Facility and Low-Activity Waste Facility, which are part of the Waste Treatment Plant (WTP). Once constructed, the WTP will process radioactive and chemical waste from the aging tank farms at Hanford and convert it into glass.

If the tank waste is not treated, it could pollute the groundwater beneath Hanford, and possibly reach the Columbia River. So working toward safely immobilizing it in glass is an important goal to help protect human health and the environment.

#### PUBLIC COMMENT PERIOD

September 27 – November 12

**To Submit Comments**

Send comments by e-mail, U.S. mail, or hand-deliver them to:

Erika Holmes
3100 Port of Benton Blvd.
Richland, WA 99354
Erika.Holmes@ecy.wa.gov

**Public Hearing**

A public hearing is not scheduled, but if there is enough interest, we will consider holding one. To request a hearing or for more information, contact:

Erika Holmes
(509) 372-7880
Erika.Holmes@ecy.wa.gov

Or call the Hanford Cleanup line at 1-800-321-2008.

- The design was deemed appropriate for the intended use and meets all applicable code requirements.
- The sampler cabinets will completely contain any leaked waste because the liners are fully welded. The stainless steel containment liners will hold leaked waste without deteriorating, and leaks are to be removed within 24 hours.
- The cabinet structure and foundation will support the full weight of the sampler cabinets and leak containment liners, including leaked waste, at full capacity.
- The foundation under the sampler cabinets and the containment liners is compatible with the support structure and is equipped to withstand earthquakes.

## Other Modifications

The following documents are also available for public comment as part of this permit modification.

- 24590-WTP-PER-M-08-001, *Integrity Assessment Program and Schedule for DWP-Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility*
- 24590-WTP-PER-M-08-002, *Integrity Assessment Program and Schedule for DWP-Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility*
- CCN 169564, *IQRPE Structural Integrity Assessment Report for LAW Secondary Containment*
- 24590-PTF-PER-M-04-0010, *Leak Detection Capability in the Pretreatment Facility*
- 24590-PTF-PER-M-04-0011, *Waste Removal Capability for the Pretreatment Facility*
- 24590-WTP-PCN-ENV-10-002, *Hanford Facility RCRA Permit Modification Form*, revises the permit condition requiring that Ecology be notified of minor nonconformance or construction deficiencies. These deficiencies are approved, code-compliant changes from permitted designs, plans, and specifications in the construction of critical systems as defined in the Hanford Site-wide permit. The reporting period is changed from five calendar days to seven calendar days.

### TERMS TO KNOW

**Dangerous Waste Permit (DWP):** A State-issued permit allowing facilities to store, treat, and/or dispose of dangerous waste onsite.

**Low-Activity Waste (LAW):** Waste that remains after as much radioactivity as is technically and economically practical has been separated from high-level waste. When immobilized in glass, LAW may be disposed of as low-level radioactive waste in a near-surface facility at Hanford.

**Resource Conservation & Recovery Act (RCRA):** Law authorizing the U.S. Environmental Protection Agency to control hazardous waste, including the generation, transportation, treatment, storage, and disposal of hazardous and other solid waste and waste in underground tanks.

**Washington Administrative Code (WAC):** Regulations of the state's executive branch agencies codified and arranged by subject or agency.

**Waste Treatment Plant (WTP):** Facility designed and being built to thermally treat and immobilize tank waste at the U.S. Department of Energy's Hanford Site. The WTP is comprised of four facilities: pretreatment, high-level waste, low-activity waste, and an analytical laboratory.

## View the Full Proposal

This is a brief summary of the proposed changes. The full proposal is available beginning September 27, on Ecology's Nuclear Waste Program website (www.ecy.wa.gov/programs/nwp/commentperiods.htm) or at one of the public information repositories listed below (maps available at http://bit.ly/aIEhHZ).

### Public Information Repositories

Department of Energy Reading Room
2710 University Drive
Richland, WA 99354-1671
(509) 372-7443

University of Washington
Suzallo Library
PO Box 352900
Seattle, WA 98195-2900
(206) 543-9157

Portland State University
Branford Price Millar Library
1875 SW Park Avenue
Portland, OR 97201-3220
(503) 725-4552

Gonzaga University Foley Center
502 E Boone Avenue
Spokane, WA 99258-1774
(509)313-3834

## Special Accommodations

To ask about the availability of this document in a version for the visually impaired, call the Nuclear Waste Program at 509-372-7950.

Persons with hearing loss, call 711 for Washington Relay Service. Persons with a speech disability, call 1-877-833-6341.

DEPARTMENT OF
ECOLOGY
State of Washington

3100 Port of Benton Boulevard
Richland, WA 99354

# Tell us what you think!

## Public Comment Period
## September 27 – November 12, 2010

On a proposed modification to waste sampling, leak detection, and containment systems in the Waste Treatment Plant.

# Permit Design Package
# No. LAW-034, Rev 0

U.S. Department of Energy
Office of River Protection
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

JUL 2 6 2010

10-ESQ-212

Ms. Jane A. Hedges, Program Manager
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton Blvd.
Richland, Washington 99354

Dear Ms. Hedges:

SUBMITTAL OF PERMIT DESIGN PACKAGE NO. LAW-034, REVISION 0, AND PTF-099, REVISION 0, FOR THE WASTE TREATMENT AND IMMOBILIZATION PLANT

Reference: WA7890008967, "Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit 10, 'Waste Treatment and Immobilization Plant.'"

Attached please find the following permit packages for the Low-Activity Waste (LAW) and Pretreatment Facility (PTF) tank system secondary containment design associated with the Autosampling System (ASX):

- LAW-034, Revision 0, "Tank System Secondary Containment for LAW ASX Samplers," (Attachment 1); and

- PTF-099, Revision 0, "Tank System Secondary Containment for PTF ASX Samplers," (Attachment 2).

Descriptions of the LAW-034 and PTF-099 permit packages are provided in Attachments 1 and 2, respectively. The LAW-034 and PTF-099 permit packages provide the information necessary for the Washington State Department of Ecology (Ecology) to confirm that the secondary containment structures described in the permit packages will comply with the above Reference. This information will allow Ecology to permit the installation of the secondary containment associated with the LAW and PTF ASX sampler cabinets.

The Bechtel National, Inc. and U.S. Department of Energy, Office of River Protection certification statements are provided in Attachment 3. Dangerous Waste Permit (DWP) package submittals are certified coincident with issuance of the integrity assessment report contained in the package. Permit affecting design changes not included in, or occurring after issuance of, the final integrity assessment report will be processed in accordance with DWP requirements for permit modifications prior to construction or installation of affected equipment and components. Installation of equipment and components will be done in accordance with permit packages approved and incorporated into the DWP by Ecology.

In addition to the documents included in Packages LAW-034 and PTF-099, please include the following documents in the public comment period for the proposed modification. The following documents were provided to Ecology under separate transmittals:

- 24590-WTP-PER-M-08-001, Revision 0, "Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility;"

- 24590-WTP-PER-M-08-002, Revision 0, "Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility;"

- 24590-PTF-PER-M-04-0010, Revision 2, "Leak Detection Capability in the Pretreatment Facility;" and

- 24590-PTF-PER-M-04-0011, Revision 1, "Waste Removal Capability for the Pretreatment Facility."

Ecology comments resulting from the review of this permit modification and associated information have been resolved.

If you have any questions, please contact me, or your staff may contact Gae M. Neath, Office of Environmental Safety and Quality, (509) 376-7828.

Sincerely,

David A. Brockman, Manager
Office of River Protection

ESQ:GMN

Attachments: (3)

cc: See page 3

cc w/attachs:
J. F. Brown, BNI
J. M. Colby, BNI
B. L. Curn, BNI
B. G. Erlandson, BNI
P. A. Fisher, BNI
S. K. Murdock, BNI
D. C. Robertson, BNI
F. M. Russo, BNI
A. S. Carlson, Ecology (20 Copies)
Administrative Record
BNI Correspondence
Environmental Portal, LMSI

RECEIVED
JUL 27 2010
Department of Ecology
NWP - Richland

COPY FOR YOUR INFORMATION

cc electronic:
R. K. Biyani, Ecology
M. M. Carhart, Ecology
S. L. Dahl, Ecology
T. Z. Gao, Ecology
T. R. Williams, Ecology
S. A. Thompson, MSA
A. C. McKarns, RL
D. J. Sommer, SCS

cc w/o attachs:
D. M. Busche, BNI
J. Cox, CTUIR
S. G. Harris, CTUIR
G. P. Davis, Ecology
D. McDonald, Ecology
G. P. Bohnee, NPT
K. Niles, Oregon Energy
S. R. Weil, RL
R. Jim, YN

Attachment 1
10-ESQ-212
(93 Pages Double-Sided)

Permit Package No. LAW-034, Revision 0
"Tank System Secondary Containment for LAW ASX Samplers"

## Description of Permit Package LAW-034, Rev. 0

LAW-034, Rev. 0, "Tank System Secondary Containment for LAW ASX Samplers"

Permit package LAW-034 addresses the tank system secondary containment design associated with LAW Autosampling System (ASX) samplers ASX-SMPLR-00012 and ASX-SMPLR-00013. Both autosamplers are located in Room L-0301 at Elevation 48'-0" of the LAW facility. The LAW ASX samplers contain both upper and lower secondary containment liners and leak detection systems. The sloped stainless steel upper containment liner is designed to divert a leak from the incoming sample feed and return lines to a sump where the leak is detected. The sloped stainless steel lower containment area is designed to divert liquids to a sloped collection trough. The trough contains a removable weir that allows liquids to collect and activate the thermal level detection switch and alarms to indicate that a leak may have occurred.

Permit Package LAW-034, Rev. 0, includes:

- An assessment report signed by an independent qualified registered professional engineer (IQRPE) certifying certain portions of the permit package
- General Arrangement Plan for the LAW +48 foot elevation
- Dangerous Waste Permit (DWP) Liner Heights in the LAW Facility. This document renames and replaces Revision 6, 24590-LAW-PER-M-02-002, *Flooding Volume for LAW Facility*
- A revised Secondary Containment Design Document
- A revised Leak Detection in Secondary Containment Systems Document. This document updates and consolidates and replaces permit documents 24590-WTP-PER-J-02-001 and 24590-WTP-PER-J-02-002.

The following components of this package are already included in the Dangerous Waste Permit, the Administrative Record, or are provided with other permit packages, as listed in the Table of Contents:

- Material Selection for Building Secondary Containment/Leak Detection
- Installation of Tank Systems and Miscellaneous Unit Systems
- LAW Facility Sump Data
- Description of Access for Conduction Integrity Assessments
- Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility
- Prevention of Hydrogen Accumulation in Tank Systems and Miscellaneous Treatment Unit Systems.

# Permit Design Package No. LAW-034, Rev. 0
# Tank System Secondary Containment for LAW ASX Samplers
# Table of Contents

## For Incorporation into the Permit

| Engineering Document Title | Document Number | Revision | Permit Condition | Included | Remarks |
|---|---|---|---|---|---|
| IQRPE Integrity Assessment Report | CCN 169565 | | III.10.E.9.b.i | Y | |
| Permit Design Drawings | | | | | |
| LAW Vitrification Building General Arrangement Plan at El. 48' - 0" | 24590-LAW-P1-P01T-00005 | 3 | III.10.E.9.b.ii | Y | Associated DCNs included |
| Dangerous Waste Permit (DWP) Liner Heights in the LAW Facility. | 24590-LAW-PER-M-02-002 | 7 | III.10.E.9.b.ii | Y | Document renamed. Replaces Revision 6, 24590-LAW-PER-M-02-002, *Flooding Volume for LAW Facility* in Attachment 51, Appendix 9.8 |
| Secondary Containment Design | 24590-WTP-PER-CSA-02-001 | 9 | III.10.E.9.b.ii<br>III.10.E.9.b.iii | Y | Updated to incorporate ASX sampler secondary containment and leak detection and HLW drum transfer tunnel drip pan. |
| Underground Pipe Protection | N/A | - | III.10.E.9.b.iv | N/A | Not Applicable for the ASX samplers |
| Material Selection for Building Secondary Containment/Leak Detection | 24590-WTP-PER-M-02-001 | 3 | III.10.E.9.b.v | N | Included in Attachment 51, Appendix 7.9 |
| Installation of Tank Systems and Miscellaneous Unit Systems | 24590-WTP-PER-CON-02-001 | 6 | III.10.E.b.vi | N | Included in Attachment 51, Appendix 7.12 as approved in PCN 24590-WTP-PCN-ENV-09-001 (10/01/2009) |
| Leak Detection in Secondary Containment Systems | 24590-WTP-PER-J-02-002 | 4 | III.10.E.9.b.ii<br>III.10.E.9.b.v | Y | Consolidated to replace 24590-WTP-PER-J-02-001 and 24590-WTP-PER-J-02-002 in Attachment 51, Appendix 7.5 |
| LAW Facility Sump Data | 24590-LAW-PER-M-02-001 | 5 | III.10.E.9.b.vii | N | Included in Attachment 51, Appendix 9.5 |
| Description of Access for Conducting Integrity Assessments | 24590-WTP-PER-M-02-005 | 1 | III.10.E.9.b.ix | N | Included in Attachment 51, Appendix 7.15 |
| Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility | 24590-WTP-PER-M-08-001 | 0 | III.10.E.9.b. | N | July 7, 2009 letter from Ecology (CCN 201996) for incorporation into the next WTP permit modification. |

CCN 216663

# Permit Design Package No. LAW-034, Rev. 0
# Tank System Secondary Containment for LAW ASX Samplers
# Table of Contents

## For Incorporation into the Administrative Record

| Engineering Document Title | Document Number | Revision | Permit Condition | Included | Remarks |
|---|---|---|---|---|---|
| Prevention of Hydrogen Accumulation in Tank Systems and Miscellaneous Treatment Unit Systems | 24590-WTP-PER-PR-03-001 | 1 | III.10.E.9.b.viii | N | ORP Letter 03-ED-130 dated 8/26/2003 transmitting LAW-029, Rev. 0 to Ecology |

R11223161

AREVA

ISSUED BY
RPP-WTP PDC

AFS-10-0199

169565

June 3, 2010

RPP-WTP
RECEIVED
JUN 0 3 2010
BY PDC

Ms. Susan Parr
Subcontract Formation Specialist
Bechtel National RPP-WTP Project
2435 Stevens Center Place
Richland, Washington 99354

Dear Ms. Parr:

**BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00211
IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW ASX
SECONDARY CONTAINMENT (SAMPLER CABINETS) – IA-3003444-000**

The structural integrity assessment of the subject secondary containment has been completed per the contract requirements and is enclosed for your use. The assessment found that the design is sufficient to ensure that the secondary containment is adequately designed and has sufficient structural strength, compatibility with the waste(s) to be processed/stored/treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

If you have any questions, please contact Tarlok Hundal at (509) 371-1975, or via email at tarlok.hundal@areva.com.

Sincerely,

Fred R. Renz
Contract Management
AREVA Federal Services LLC
Richland Office

llm

Enclosure (1)

cc: D. C. Pfluger, MS 5-L w/enclosures (2)

**AREVA Federal Services LLC**
2101 Horn Rapids Road, RC-19, Richland, WA 99354, P. O. Box 840, Richland, WA 99352
Tel.: 509 375 8096 - Fax: 509 375 8495 - www.areva.com

IA-3003444-000

# IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW ASX SECONDARY CONTAINMENT (SAMPLER CABINETS)

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

IA-3003444-000

# IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW ASX SECONDARY CONTAINMENT (SAMPLER CABINETS)

"I, Tarlok Hundal have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the LAW ASX Secondary Containment (Sampler Cabinets), as required by the Washington Administrative Code, *Dangerous Waste Regulations*, Section WAC-173-303-640(3) (a) through (g) applicable components."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design fully satisfies the requirements of the WAC.

The attached review is ten (10) pages numbered one (1) through ten (10).

T S Hundal

Signature

6/3/10

Date

| | | |
|---|---|---|
| **Scope** | Scope of this Integrity Assessment | This assessment addresses the structural integrity of LAW ASX Secondary Containment provided by a sampler cabinet housed in each Autosampler Unit (ASX-SMPLR-00012 and -00013). These autosampler units are located in Room L-0301 at Elevation 48'-0" of the LAW facility as shown on General Arrangement Plan drawing 24590-LAW-P1-P01T-00005. |
| **Summary of Assessment** | | For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design requirements and controls to ensure that the design fully satisfies the requirements of Washington Administrative Code (WAC), Chapter 173-303 WAC, *Dangerous Waste Regulations,* WAC-173-303-640, *Tank Systems.* |

| | | |
|---|---|---|
| References | Engineering & Procurement Subcontract Document, Specifications, and Vendor Drawings | Engineering & Procurement Subcontract Document (EP):<br><br>24590-QL-SRA-HAHH-00001, Rev. 13, Autosampling System (ASX), Exhibit D-Scope of Work, Exhibit E-Technical Specifications, and Exhibit F-List of Drawings.<br><br>Specifications:<br>Following specifications along with their respective revision numbers and change notices are included in EP document listed above:<br><br>24590-WTP-3PS-G000-T0001, General Specification for Supplier Quality Assurance Program Requirements;<br>24590-WTP-3PS-G000-T0002, Engineering Specification for Positive Material Identification (PMI);<br>24590-WTP-3PS-G000-T0003, General Specification for Packaging, Shipping, Handling, and Storage Requirements;<br>24590-WTP-3PS-G000-T0014, General Specification for Supplier Design Analysis ;<br>24590-WTP-3PS-MV00-T0003, Engineering Specification for Pressure Vessel Fatigue Analysis;<br>24590-WTP-3PS-G000-T0015, General Specification for Environmental Qualification of Mechanical Equipment;<br>24590-WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III/IV Equip. and Tanks;<br>24590-WTP-3PS-SS00-T0001, Engineering Specification for Welding of Structural Steel Carbon;<br>24590-WTP-3PS-SS00-T0002, Engineering Specification for Welding of Structural Stainless Steel and Welding of Carbon Steel to Stainless Steel;<br>24590-WTP-3PS-AFPS-T0001, Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment;<br>24590-WTP-3PS-MHSS-T0002, Engineering Specification for Autosampling System (ASX).<br><br>Vendor Drawings (Status Code 1 Drawings *):<br><br>24590-QL-HC4-HAHH-00001-06-00057, Rev. 00G, Autosampling System ASX-SMPLR-00012, Outline Dim & Mtg Det Sheet 1 of 2;<br>24590-QL-HC4-HAHH-00001-06-00058, Rev. 00H, Autosampling System ASX-SMPLR-00012, Outline Dim & Mtg Det Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-00059, Rev. 00G, Autosampling System ASX-SMPLR-00013, Outline Dim & Mtg Det Sheet 1 of 2;<br>24590-QL-HC4-HAHH-00001-06-00060, Rev. 00H, Autosampling System ASX-SMPLR-00013, Outline Dim & Mtg Det Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-00834, Rev. 00B, Autosampling System ASX-SMPLR-00012 and 00013, Internal Base Details Sht 1 of 4;<br>24590-QL-HC4-HAHH-00001-06-00835, Rev. 00C, Autosampling System ASX-SMPLR-00012 and 13, Internal Base Table Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-00836, Rev. 00C, Autosampling System ASX-SMPLR-00012 and 13, Internal Base Table Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-00837, Rev. 00B, Autosampling System ASX-SMPLR-00012 and 13, Internal Base Table Sheet 4;<br>24590-QL-HC4-HAHH-00001-06-00844, Rev. 00B, Autosampling System ASX-SMPLR-00012 and 00013, Internal Base Table Assembly Sheet 1 of 3;<br>24590-QL-HC4-HAHH-00001-06-00845, Rev. 00B, Autosampling System ASX-SMPLR-00012/00013, Internal Base Table Assembly Sht 2;<br>24590-QL-HC4-HAHH-00001-06-00846, Rev. 00B, Autosampling System ASX-SMPLR-00012/00013, Internal Base Table Assembly Sht 3;<br>24590-QL-HC4-HAHH-00001-06-00847, Rev. 00B, Autosampling System ASX-SMPLR-00012 and 00013 Trough Shield Plate Sheet 1 of 1;<br>24590-QL-HC4-HAHH-00001-06-00523, Rev. 00E, Autosampling System ASX-SMPLR-00012, Process Pipe & Support Subassy Sht 1 of 3;<br>24590-QL-HC4-HAHH-00001-06-00771, Rev. 00C, Autosampling System ASX-SMPLR-00012, Process Pipe & Support Subassy Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-00772, Rev. 00B, Autosampling System ASX-SMPLR-00012, Process Pipe & Support Subassy Sheet 3; |

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| References (cont'd) | Vendor Drawings, Plant Drawings, Data Sheet, System Description, and Permit Document | Vendor Drawings (Status Code 1 Drawings *) (cont'd):<br><br>24590-QL-HC4-HAHH-00001-06-00224, Rev. 00G, Autosampling System ASX-SMPLR-00013, Shielded Autosampler Assembly Sht 1 of 6;<br>24590-QL-HC4-HAHH-00001-06-00225, Rev. 00F, Autosampling System ASX-SMPLR-00013, Shielded Autosampler Assembly Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-00767, Rev. 00D, Autosampling System ASX-SMPLR-00013, Shielded Autosampler Assembly Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-00768, Rev. 00D, Autosampling System ASX-SMPLR-00013, Shielded Autosampler Assembly Sheet 4;<br>24590-QL-HC4-HAHH-00001-06-00769, Rev. 00C, Autosampling System ASX-SMPLR-00013, Shielded Autosampler Assembly Sheet 5;<br>24590-QL-HC4-HAHH-00001-06-00770, Rev. 00B, Autosampling System ASX-SMPLR-00013, Shielded Autosampler Assembly Sheet 6;<br>24590-QL-HC4-HAHH-00001-06-00959, Rev. 00B, Autosampling System ASX-SMPLR-00012, Glovebox Subassembly Sheet 1 of 3;<br>24590-QL-HC4-HAHH-00001-06-00960, Rev. 00B, Autosampling System ASX-SMPLR-00012, Glovebox Subassembly Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-00961, Rev. 00B, Autosampling System ASX-SMPLR-00012, Glovebox Subassembly Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-01504, Rev. 00B, Autosampling System ASX-SMPLR-00012, Glovebox Shell Detail Sheet 1 of 2;<br>24590-QL-HC4-HAHH-00001-06-01505, Rev. 00B, Autosampling System ASX-SMPLR-00012, Glovebox Shell Detail Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-01506, Rev. 00B, Autosampling System ASX-SMPLR-00013, Glovebox Shell Detail Sheet 1 of 2;<br>24590-QL-HC4-HAHH-00001-06-01507, Rev. 00B, Autosampling System ASX-SMPLR-00013, Glovebox Shell Detail Sheet 2.<br><br>* Status Code 1 Drawing: Bechtel National Inc.'s Code indicating that BNI has "reviewed and approved the drawing for fabrication."<br><br>Plant Drawings:<br>24590-LAW-P1-P01T-00005, Rev. 3, LAW Vitrification Building General Arrangement Plan at El. 48'-0";<br>24590-LAW-P1-P01T-00007, Rev. 8, LAW Vitrification Building General Arrangement Section A-A B-B, C-C, and S-S;<br>24590-LAW-DB-S13T-00131, Rev. 5, LAW Vitrification Building Main Building Partial Conc Forming Plan, Zone 1 @ El. (+) 48'-0";<br>24590-LAW-DB-S13T-00132, Rev. 6, LAW Vitrification Building Main Building Partial Conc Forming Plan, Zone 2 @ El. (+) 48'-0";<br>24590-LAW-M6-ASX-00007001, Rev. 0, P&ID LAW Autosampling System Isolok Details ASX-SMPLR-00013;<br>24590-LAW-M6-ASX-00009001, Rev. 0, P&ID LAW Autosampling System Isolok Details ASX-SMPLR-00012;<br>24590-LAW-M6-ASX-00009002, Rev. 0, P&ID LAW Autosampling System Isolok Details ASX-SMPLR-00012.<br><br>Data Sheet:<br><br>24590-LAW-M2D-ASX-00001, Rev. 3, LAW Autosampling System (ASX) Data Sheet for Autosamplers (ASX-SMPLR-00012 and 00013).<br><br>System Description:<br><br>24590-WTP-3YD-ASX-00001, Rev. 0, System Description for the Autosampling System (ASX).<br><br>Permit Document:<br><br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design. |

| | Information Assessed | Source of Information | Assessment |
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| **Design** | The sampler cabinets secondary containment design standards and codes used are appropriate and adequate for their intended use. | Drawings, Specifications, Engineering & Procurement Subcontract Document, and Data Sheet listed above under References;<br><br>AISC-M016-89 Manual of Steel Construction, Allowable Stress Design, 9th Edition, American Institute of Steel Construction;<br>ANSI/AISC N690-1994, Specification for the Design, Fabrication, and Erection of Safety Related Structures for Nuclear Facilities, American National Standards Institute;<br>UBC 1997, Uniform Building Code;<br>AWS D1.1, Structural Welding Code-Steel, American Welding Society;<br>AWS D1.6, Structural Welding Code-Stainless Steel, American Welding Society;<br>ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers;<br>ASME B13.3, Pressure Piping, American Society of Mechanical Engineers;<br>ASME AG-1-1997 (including AG-1a-2000 Addenda), Code on Nuclear Air and Gas, American Society of Mechanical Engineers;<br>AGS-G001-1998, Guidelines for Gloveboxes, 2nd Edition. | The Specification for Autosampler System and the Engineering & Procurement Subcontract Document require that the sampler cabinets be designed, fabricated, tested, and delivered in accordance with the requirements specified in the codes and standards listed in the Source of Information column in this section. The Data Sheet for Autosampler Units (ASX-SMPLR-00012 and -00013) requires that these units be designed for temperature range of 59° F to 113° F and pressure range of (-) 4 in. w.g. to (+) 22.3 in. w.g. The Data Sheet also provides applicable nozzle and fatigue loads. The drawings show that overall dimensions of each shielded autosampler unit are about 68" wide x 82" long x 88" high. Each autosampler unit houses the upper and lower secondary containment components (liner plates, leak collection trough, leak detector inside the glovebox). The overall dimensions of each glovebox are about 42" wide x 68" long x 37" high. The autosampler glovebox is built with varying thicknesses of 304L or 316L stainless steel plates, 3/16" being the minimum thickness. The codes and standards listed in the Source of Information column are appropriate and adequate to provide secondary containment for the intended use of collecting and transporting samples of LAW process waste. |

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| **Design (cont'd)** | The sampler cabinets component enclosure, supports, and foundation design include full weight of sampler cabinets. | Specifications, Data Sheet, and Drawings listed above under References;<br><br>24590-WTP-DC-ST-01-001, Rev. 12 Structural Design Criteria;<br>24590-WTP-DB-ENG-01-001, Rev. 1O Basis of Design;<br>24590-WTP-DC-ENG-06-001, Rev. 0, Design Criteria for Equipment Seismic and Environmental Qualification;<br>24590-QL-HC4-HAHH-00001-11-00049, Rev. 00B, Structural Analysis of ASX-SMPLR-00012 & -00013. | The Specification for Autosampling System identifies the system to be of commercial grade (CM) quality and the seismic category to be SC-III. The drawings show that the secondary containment enclosure components, the sampler cabinet, are an integral part of or are located within the bounds of a glovebox structure. All secondary containment liners and components within the glovebox are fully welded to confine any waste spillage within the enclosed sampler cabinet which has the leak detection device to alarm any spillage incidents. The glovebox structure is attached to and supported by structural steel framing members. The framing members are enclosed in shielding steel plates around them on three sides except the rear side that faces the concrete wall. The Structural Design Criteria uses appropriate applicable standards to define design loads and load combinations. The Specification for the Autosampling System, the Design Criteria for Equipment Seismic and Environmental Qualification, and the Data Sheet require that along with dead weights of the components, the weight of the glovebox filled with water, and the specified temperature and pressure environmental conditions should be appropriately included in the loads and load combinations. The Structural Analysis document and drawings reviewed show that the secondary containment components of the sampler cabinets have been adequately designed to provide the required containment for any spilled waste fluids. Review of the autosampler units Structural Analysis also shows that the support system for each unit has adequate strength to sustain the aforementioned loads and is in turn anchored (welded) to the steel embed plates in the concrete floor slab. Furthermore, Chapter 14 of the Basis of Design document requires that the foundation underlying the autosampler units supports must be adequate to sustain the full load of the units, which is out of scope of this assessment. The assessment of the adequacy of the underlying foundation slab is part of a separate integrity assessment report for the secondary containment of the plant items on this floor (Elevation 48'-0"). |

| | Information Assessed | Source of Information | Assessment |
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| **Design (cont'd)** | Design calculation approach and design basis of support and foundation with design standard and codes references such as AISC codes are adequate. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>24590-WTP-DC-ENG-06-001, Rev. 0, Design Criteria for Equipment Seismic and Environmental Qualification;<br>AISC-M016-89 Manual of Steel Construction, Allowable Stress Design, 9th Edition, American Institute of Steel Construction;<br>ANSI/AISC N690-1994, Specification for the Design, Fabrication, and Erection of Safety Related Structures for Nuclear Facilities, American National Standards Institute;<br>24590-QL-HC4-HAHH-00001-11-00049, Rev. 00B, Structural Analysis of ASX-SMPLR-00012 & -00013. | The Basis of Design document provides many fundamental general requirements for support and foundation design. The Structural Design Criteria document references adequate detailed design criteria for the design of support steel framing and concrete foundations and footings. AISC-M016-89 and ANSI/AISC N690-1994 codes are referenced for support design of SC-III structural steel components. Structural Analysis and drawings reviewed show that the upper and lower secondary containment components housed in the gloveboxes are adequately designed to meet the applicable code requirements. |
| **Foundation Design** | Foundation material is compatible with the support structure. | Specification and Drawings listed in above under References. | Specification for Autosampling System requires that stainless steel material be used for the ASX sampler cabinet confinement enclosure components including upper and lower liner plates. The drawings show that the ASX Autosampler Units (ASX-SMPLR-00012 and -00013) are located in Room L-0301 at Elevation 48'-0" level of the LAW building. The carbon steel support structure frame base plates of the autosampler units are welded (anchored) to the carbon steel plates embedded in concrete floor slab. The base plates and embed plates are compatible with each other. |

| Information Assessed | | Source of Information | Assessment |
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| **Foundation Design (cont'd)** | Foundation will withstand the effects of frost heave. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria. | The Structural Design Criteria requires all structural foundations for outdoor components to extend below the 30" frost line from the finished grade (Elevation 0'-0"). Room L-0301 housing the ASX autosampler units are inside/interior of the building at Elevation 48'-0", therefore, they are not subjected to the detrimental effects of frost heave. |
| **Seismic** | Seismic considerations have been adequately addressed. | Drawings listed above under References;<br><br>24590-WTP-PER-CSA-02-001, Rev. 9 Secondary Containment Design;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>24590-WTP-DC-ENG-06-001, Rev. 0, Design Criteria for Equipment Seismic and Environmental Qualification;<br>UBC 1997, Uniform Building Code;<br>AISC M016-89, Manual of Steel Construction - Allowable Stress Design, Ninth Edition;<br>ANSI/AISC N690-1994, Specification for the Design, Fabrication, and Erection of Safety Related Structures for Nuclear Facilities, American National Standards Institute;<br>24590-QL-HC4-HAHH-00001-11-00049, Rev. 00B, Structural Analysis of ASX-SMPLR-00012 & -00013. | The Secondary Containment Design, Structural Design Criteria, and Design Criteria for Seismic and Environmental Qualification documents provide detailed information of design methodology, materials, loads, and load combinations applicable for the Sampler Cabinets. The Specification for Autosampling system identifies the Quality Level of the system to be CM and the Seismic Classification as SC-III. The ASX system design loads combinations are taken from UBC 97 code and analysis for SC-III secondary containment enclosure is performed in accordance with the Specification for Structural Design Loads for Seismic Category III/IV Equipment and Tanks document. The ANSI/AISC N460-1994 code is used for the design of SC-III secondary containment enclosure stainless steel material and AISC M016-89 is used for carbon steel support frame structure. The frame structure is designed to sustain all applicable loads including seismic and its bases are adequately welded to the embedded steel plates in concrete floor slab supporting the autosampler units. The Structural Analysis document and drawings reviewed shows that the sound engineering techniques are used for the analysis purposes. |

| | Information Assessed | Source of Information | Assessment |
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| **Compatibility** | The stored waste is compatible with its secondary containment and leak detection hardware based on a detailed chemical and physical analysis of the wastes used and other information sources. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection;<br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design;<br>24590-WTP-PER-J-02-002, Rev. 4, Leak Detection in Secondary Containment Systems;<br>24590-QL-HC4-HAHH-00001-11-00049, Rev. 00B, Structural Analysis of ASX-SMPLR-00012 & -00013. | The Basis of Design document states that the secondary containment components are to be appropriately lined and any leaks or spills will be removed within 24 hours of a leak detection or in as timely a manner as possible. Based on a detailed chemical and physical analysis of the wastes and other process information sources, the Material Selections document identifies appropriate corrosion resistant materials (stainless steel) for the ASX autosampler units secondary containment components and leak detection hardware. The drawings and Structural Analysis reviewed show that the 304L stainless steel or better material as recommended in Material Selections document is used for the fabrication of the ASX sampler cabinets. The Secondary Containment Design document provides adequate typical construction details including attachment details for the leak detection equipment to be used for secondary containment where required. |
| **Strength** | The design shows that the secondary containment has sufficient strength and thickness to prevent failure owing to pressure gradients, static head during a release, physical contact with the waste, climatic conditions, and the stress of daily operations (e.g., vehicular traffic). | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design;<br>24590-QL-HC4-HAHH-00001-11-00049, Rev. 00B, Structural Analysis of ASX-SMPLR-00012 & -00013. | The LAW general arrangement drawings show ASX autosampler units are located inside the building. Pressure gradients, static head during a release, physical contact with the waste, climatic conditions, and the stresses of daily operations are adequately stated as design goals in the Basis of Design document. The Secondary Containment Design document describes and provides references to the design methodology, materials of construction, loads, and load combinations (including seismic loads) for the LAW facility secondary containment components. The secondary containment enclosures being considered are located in the room inside the LAW Vitrification Building rather than being directly buried in ground, therefore, pressure gradients and vehicular traffic are not considered applicable load cases. However, the Structural Analysis document reviewed shows that strength of secondary containment enclosure components is sufficient to sustain applicable loads such as static, fluid, and seismic. |

| | Information Assessed | Source of Information | Assessment |
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| **Strength (cont'd)** | The secondary containment system has sufficient strength in the presence of operational stresses from site-specific conditions (i.e., frost, precipitation etc.). | Drawings listed above under References;<br><br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design;<br>24590-WTP-3PS-NLLR-T0002, Rev. 1, Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates;<br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection;<br>24590-QL-HC4-HAHH-00001-11-00049, Rev. 00B, Structural Analysis of ASX-SMPLR-00012 & -00013. | The LAW facility drawings show that the secondary containment being considered is installed inside the building. Because it is located inside the building, precipitation and frost are not applicable load cases. The Secondary Containment Design document identifies the applicable load cases (operational stresses) from site specific conditions that must be considered in the design. The Engineering Specification for Furnishing Stainless Steel Liner Plates includes specific provisions for protection and repair of completed liners during the construction process. The Material Selections for Building Secondary Containment document addresses the potential effects of operations conditions on metal liner and the associated maintenance requirements. The Structural Analysis document reviewed shows that the secondary containment components are adequately designed and have sufficient strength to sustain the applicable design loads. |
| **Foundation Integrity** | The secondary containment is adequately supported by the enclosure structure and foundation below has adequate strength | Drawings listed above under References;<br><br>24590-QL-HC4-HAHH-00001-11-00049, Rev. 00B, Structural Analysis of ASX-SMPLR-00012 & -00013;<br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design. | Review of the Structural Analysis and drawings shows that the support system for each sampler cabinet has adequate strength to sustain the applicable design loads and is in turn anchored (welded) to the steel embed plates in the concrete floor slab. Chapter 14 of the Basis of Design document requires that the foundation underlying the cabinet support must be adequate to sustain the loads from the weight of the glovebox filled with water, which is out of scope of this assessment. The assessment of the adequacy of the underlying foundation slab is part of a separate integrity assessment report for the secondary containment for the plant items on this floor. |

| | Information Assessed | Source of Information | Assessment |
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| **Infiltration** | The design or operation prevents run-on or infiltration of precipitation into the secondary containment. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design. | The Basis of Design document requires the design to provide adequate measures to prevent run-on or infiltration of precipitation. The secondary containment is located inside the LAW Vitrification Building where it is protected from direct precipitation by the building structure as shown in the general arrangement drawings. Therefore this section is not applicable to the secondary containment components being assessed. |
| | The design includes an external moisture barrier or other means to prevent moisture from entering the room. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design. | The Basis of Design document requires the design include provisions to prevent external moisture intrusion. The ASX Autosampler Units shown on the General Arrangement drawings are inside the LAW Vitrification Building which protects them from precipitation and surface water percolation, therefore, this section is not applicable to them. |
| **Liner System** | The containment area is free of cracks or gaps and the design discusses methods of their minimization. | 24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design;<br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection. | The Basis of Design document requires the liner system to be free of cracks and gaps. The Secondary Containment Design document provides current adequate design requirements, and codes and standards to design leak tight liners. This document includes appropriate details for installation of stainless steel components free of cracks and gaps. The Material Selections document provides adequate requirements for the secondary containment components. |
| | The design has considered the compatibility of the secondary containment elements with the waste and for preventing it from migrating into the concrete slab below. | 24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection;<br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design. | The Material Selections document contains information on the compatibility of secondary containment stainless steel material usage for containing the waste. The Secondary Containment Design document provides standard installation details for the secondary containment components of the sampler cabinets which ensure leak-tight connections that will prevent the migration of the waste onto the concrete slab below. |

# Master Distribution Schedule for
# WTP Project Subcontract Management Group



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| SUBMITTAL TRANSMITTAL: | ☐ First Submittal | ☐ Re-Submittal | ☐ QVRP Package | ☐ RFI |
| ☐ No Review Required | ☐ No Review Required Re-Submittal | ☐ Submittal Supplement | | |
| CORRESPONDENCE: | ☒ With Attachment | ☐ W/O Attachment (letter only) | ☐ RFI | |
| ☐ Fax as Original (Letter Only) | ☐ Fax as Original (With Attachment) | | | |
| ☐ Pre-Award/Award Package | ☐ Executed Change Order Package | | | |
| ☐ Executed Amendment Package | ☐ Back Charge | ☐ Closeout Package | | |

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| **Subcontract Number:** | 24590-CM-HC4-HXYG-00211 |
| **Subcontract Title:** | Tank Integrity Design Assessments |
| **Subcontractor Name:** | AREVA Federal Services LLC |
| **Subcontract Administrator:** | Susan Parr |

| PDC Document Number | Rev | Document Title | Rev |
|---|---|---|---|
| CCN #169565 | | IQRPE Structural Integrity Assessment Report For LAW ASX Secondary Containment (Sampler Cabinets) - IA-3003444-000) | |
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# Master Distribution Schedule for WTP Project Subcontract Management Group



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|---|---|
| **Subcontract Number:** | 24590-CM-HC4-HXYG-00211 |
| **Subcontract Title:** | Tank Integrity Design Assessments |
| **Subcontractor Name:** | AREVA Federal Services LLC |
| **Subcontract Administrator:** | Susan Parr |

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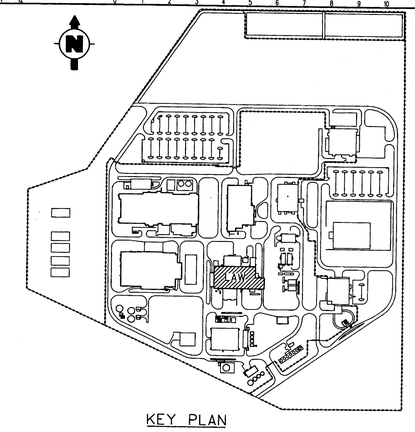
24590-LAW-P1-P01T-00005



KEY PLAN

## NOTES:

1. FOR GENERAL NOTES, SEE 24590-LAW-P1-P01T-00001.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. REVISIONS:
   RENUMBERED ROOMS: L-0301 TO L-0301A, L-0308A TO L-0304H, L-0304B TO L-0304C, L-0309 TO L-0307, L-0304E TO L-0304A, L-0304C TO L-0304D, L-0310 TO L-0309, L-0304D TO L-0304E.
   ADDED ROOMS: L-0301A (CHANGE ROOM), L-0304G (EQUIPMENT AIRLOCK), L-0322 (SPARE ROOM), LC0310 (CORRIDOR).
   ADDED: FAN COIL UNITS, HOLD NOTES FOR C3 HEPA FILTERS, AIR HANDLING UNITS, MELTER OFFGAS HEPA FILTERS, C3 EXHAUST FANS, TEMPERED WATER SYSTEM, PERSONNEL DOORS AT LCH02,LCH03,LCH04, LCH05,LCH06, AND LCH07.
   DELETED: HOLD NOTE 4 AND 6, MISCELLANEOUS REAGENT SYSTEM, AND WALL BETWEEN LCH01 AND LCH02.
   REDESIGNED SODIUM HYDROXIDE SECONDARY OFFGAS SYSTEM, RELOCATED ELECTRICAL EQUIPMENT.
   REDESIGNED ROOMS: L-0312 (SODIUM HYDROXIDE), L-0304 (SUB-CHANGE), L-0306 (SPARE ROOM), L-0304A (EAST MAINTENANCE ROOM), L-0304B (EQUIPMENT AIR LOCK), L-0304C/D/E (SECONDARY OFFGAS EXHAUSTER ROOMS), LC0305 AND LC0306 (CORRIDORS).
   REVISED HATCH SIZE (L-0303).
   DELETED COLUMN GRID J.3 AND ADDED COLUMN GRID J.4.

   INCORPORATED DCNS:
   DCN 24590-LAW-P1N-P01T-00009
   DCN 24590-LAW-P1N-P01T-00021
   DCN 24590-LAW-P1N-P01T-00024
   RELEASED HOLDS 1, 3, 5, 7, 8, 9, 11, AND 13, REVISED FCU LOCATIONS
   REVISED ROOM L-0301 LAYOUT FOR ASX SYSTEM, REVISED TITLE BLOCK, REVISED ELECTRICAL ROOMS L-0309, L-0311, AND L-0313.
   REVISED GFR-TK-00022 AND 23, REVISED LOCATION OF LSH-CRN-00017
   REVISED STAIRS BETWEEN L-0304A AND LP0304E, ADDED HOLD 14, 15, ASX-DISP-00003, ASX-DISP-00004, ASX-HEPA-00025, LVP-SKID-00003, AND MISC. ELECTRICAL EQUIPMENT, MODIFIED LAYOUT OF LVP-EXHR-00001A, B, AND C. ADDED CONTROLLED ACCESS CALL OUTS AT CHASE ACCESSES, REMODELED RWH-CRN-00008, 20-CRN-00005, ASX-SMPLR-00012, AND ASX-SMPLR-00013, DELETED ROOM L-0301A, REVISED ELEVATION OF LP0304E, LSH-CRN-00017.

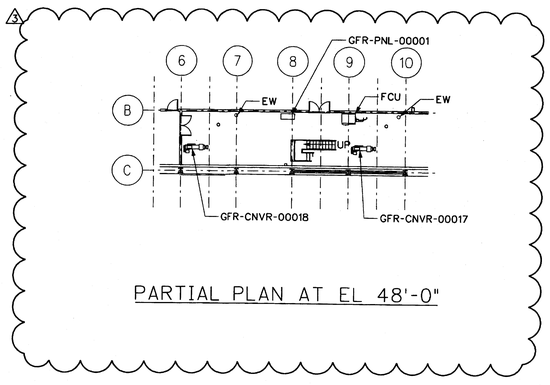
3 REVISED DESCRIPTIONS OF HOLDS 2, 10, AND 16. RELEASED HOLDS ON REMAINING FCU'S. ADDED ISA-SKID-00003 IN ROOM L-0307. ROTATED EW/SS IN ROOM L-0304F. REVISED C3V-FAN-00005A & C3V-FAN-00005B. ADDED PARTIAL PLAN BELOW GFR MIXERS. REVISED SIZE OF LVP-EXHR-00001A/B/C. ADDED LP0304G FOR ACCESS TO RADAR WAVE GUIDE INSTRUMENTATION. ADDED LVE-MCC-20311. RELOCATED DOORS AND WALLS IN ROOM L-0304B. MODIFIED WALL TYPE AND THICKNESS FROM 7¼" TO 8½" FOR L-0304B SOUTH WALL.

## HOLDS:

3 1. DELETED
3 2. LVP HEPA ROOM (L-0304H) FAN COIL UNIT LOCATION PENDING FINAL SECONDARY OFF-GAS PIPING ARRANGEMENT.
3. DELETED
4. DELETED
5. DELETED
6. DELETED
7. DELETED
8. DELETED
3 9. DELETED
3 10. MELTER OFFGAS HEPA FILTERS PENDING VENDOR SELECTION. TO BE PROVIDED BY MECHANICAL SYSTEMS ENGINEERING.
11. DELETED
12. TEMPERED WATER SYSTEM PENDING VENDOR SELECTION. TO BE PROVIDED BY MECHANICAL SYSTEMS.
13. DELETED
14. C2V AIR CONDITIONING UNITS AND AIR CONDENSING UNITS PENDING VENDOR SELECTION TO BE PROVIDED BY HVAC ENGINEERING.
15. ASX HEPA FILTERS PENDING VENDOR INFORMATION TO BE PROVIDED BY MECHANICAL SYSTEMS.
3 16. DELETED.
17. C&I EQUIPMENT PENDING VENDOR SELECTION FROM CONTROL SYSTEMS.
18. C3V AIR CONDITIONING UNITS PENDING VENDOR SELECTION TO BE PROVIDED BY HVAC ENGINEERING.

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by the DOE pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

PLAN AT EL 48'-0"




PARTIAL PLAN AT EL 48'-0"

## LEGEND:

| | |
|---|---|
| CA | CONTROLLED ACCESS |
| EE | EMERGENCY EXIT |
| FCU | FAN COIL UNIT |
| FD | FIRE DOOR |
| L-XXXX | ROOM, CELL, (VAULT) OR TUNNEL |
| LCXXXX | |
| LMXXXX | MEZZANINE |
| LPXXXX | ROOM PLATFORM |
| LPCXXXX | CORRIDOR PLATFORM |
| LCHXX | CHASE |
| LELVXX | ELEVATOR |
| LSTXX | STAIR |
| | EQUIPMENT LAYDOWN AREA |
| | CONCRETE |
| | CHECKERED PLATE |
| | GRATING |
| | EMERGENCY EYEWASH |
| | LADDER |
| | EMERGENCY SHOWER/EYEWASH |
| | FLOOR PENETRATION |

| REV | DESCRIPTION | ORG | CHKD | RVWD | APVD | DATE |
|---|---|---|---|---|---|---|
| 3 | REVISED TO INCORPORATE CHANGES IN NOTE 3 | TH | CMS | PR | JWC | 11/1/06 |
| 2 | REVISED TO INCORPORATE CHANGES IN NOTE 3 | DLL | CMS | PR | DRJ | 12/19/05 |
| 0 | ISSUED FOR DESIGN - SUPERSEDES DWG-W375LV-PL00046, REV 0 | TH | CMS | PR | CJW | 11/25/03 |

REVISION HISTORY

| | | |
|---|---|---|
| ISSUED BY RPP-WTP PDC ISSUE STAMP | PROJECT No. | 24590 |
| | SITE | HANFORD |
| | AREA | 200E |
| | BUILDING No. | 20 |

| | BY | DATE |
|---|---|---|
| ORIGINATOR | TIMOTHY E. HAWKINS | 11/25/03 |
| CHECKER | CRAIG M. SALERNO | 11/25/03 |
| APPROVER | C. J. WINKLER | 11/25/03 |
| REVIEWER | PHIL REICHERT | 11/25/03 |

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-LAW-ADR-PL-03-006 REV: 0
SAFETY SCREEN REQUIRED? [X] YES [ ] NO EMS INITIAL IF YES PSK

SAFETY SCREEN IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-SREQ-002

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

# LAW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN AT EL. 48'-0"

SCALE: 1/16"=1'-0" | 24590-LAW-P1-P01T-00005 | REV 3

"E" SIZE - 44x34
COMPUTER GENERATED - MANUAL CHANGES NOT PERMITTED

R1075464 10/27/2006 09:27:38 AM

EDITED BY: csalerno
E:\Work\cms06392\24590LAWP01T00005.DGN

FORM E_SDN.DGN 02/2003

ISSUED BY
RPP-WTP PDC

R11165624

# Drawing Change Notice



CHANGE DOCUMENT NO.
24590-LAW-A1N-A10T-00029

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | Gypsum Board Partition Wall Modification, Deletion and/or Fire Rating Changes - LAW El 48' and 68' |

| DESIGN DOCUMENT NUMBER | REV | DESIGN DOCUMENT NUMBER | REV |
|---|---|---|---|
| 24590-LAW-A1-A10T-01104001 | 003 | 24590-LAW-A2-A10T-03200003 | 003 |
| 24590-LAW-A1-A10T-01204001 | 005 | 24590-LAW-A2-A10T-03200004 | 003 |
| 24590-LAW-A1-A10T-01204002 | 003 | 24590-LAW-A3-A10T-04700006 | 005 |
| 24590-LAW-A1-A10T-01204003 | 005 | | |
| 24590-LAW-A1-A10T-01204004 | 005 | | |
| 24590-LAW-A1-A10T-01205001 | 005 | 24590-LAW-P1-P01T-00005 | 003 |

PART OF DESIGN CHANGE PACKAGE (DCP)? ☐ Yes ☒ No DCP No.: Rev:

JUSTIFICATION FOR CHANGE

Supersede previous El 48'-0" and 68'-0" DCN. This DCN includes LAW Plant Design General Arrangement drawing and Architectural Floor Plan drawing adjustments reflecting: review of design associated with the deletion of selected gypsum board partition walls, fire rating reductions, modification due to field routed commodities and installed equipment, fireproofing, interferences in the current model, and additional soffiting at roof framing gusset plates. Add General Note 17. Revise design to include Room L-0301 platform enlargement with additional door and stair reflecting General Arrangement. Add south wall at Room L-0322. Add Q partition walls and change affected drawings to Q from CM (on hold).

CAUSE CODE
42

Supersedes Change Document ☒ Yes ☐ No Document # 24590-LAW-A1N-A10T-00021

ECN Needed ☐ Yes ☒ No

## REQUIREMENTS REVIEW

Client Approval Required ☐ Yes ☒ No | Interface Resolution Required * ☐ Yes ☒ No

Address any "yes" answers in the description

DESCRIPTION OF CHANGE

1) Modify General Arrangement drawings to reflect partition wall/door deletion and changes as reflected in the attached Revised Layouts.
2) Delete partition walls including associated doors as indicated in the attached Revised Layouts.
3) Change fire ratings of selected partition walls as indicated in the attached Revised Layouts.
4) Change the locations of walls as noted on the attached Revised Layouts and section drawings.
5) Change wall types or add wall types to indicate wall construction as indicated on the attached Revised Layouts.
6) Add soffits as noted on the drawings to provide a fire rated assembly in areas / locations where steel beams or other interferences prevent construction to approved fire rated construction.
7) Add Room L-0301 door at platform and clarify associated partition wall configuration.
8) Change selected fire barrier partitions from CM to Q to reflect current PDCA and change affected drawings from CM to Q (CCN 211505, Q partition walls placed on hold).
9) Add to GENERAL NOTES on drawing 24590-LAW-A1-A10T-01204001:
   15. Provide soffits as per approved shop drawings in locations where walls connect to steel without fireproofing or metal roof deck with screws that impact fastening of track.
   16. Install mineral wool and fire sealant at walls that fasten to fireproofed beams to provide a continuous fire barrier.
   17. For wall types 0090 and 0100 at non-stair shaft locations: Install 5/8" gypsum board over shaft wall to 7'-6" AFF or platforms/landings, and 40" to any side of platforms/landings or access ways such as ladders/stairs. Gypsum cover board not required in inaccessible locations.

ORIGINATOR Mark Rees

CHECKER Lou LaDouceur

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# Drawing Change Notice

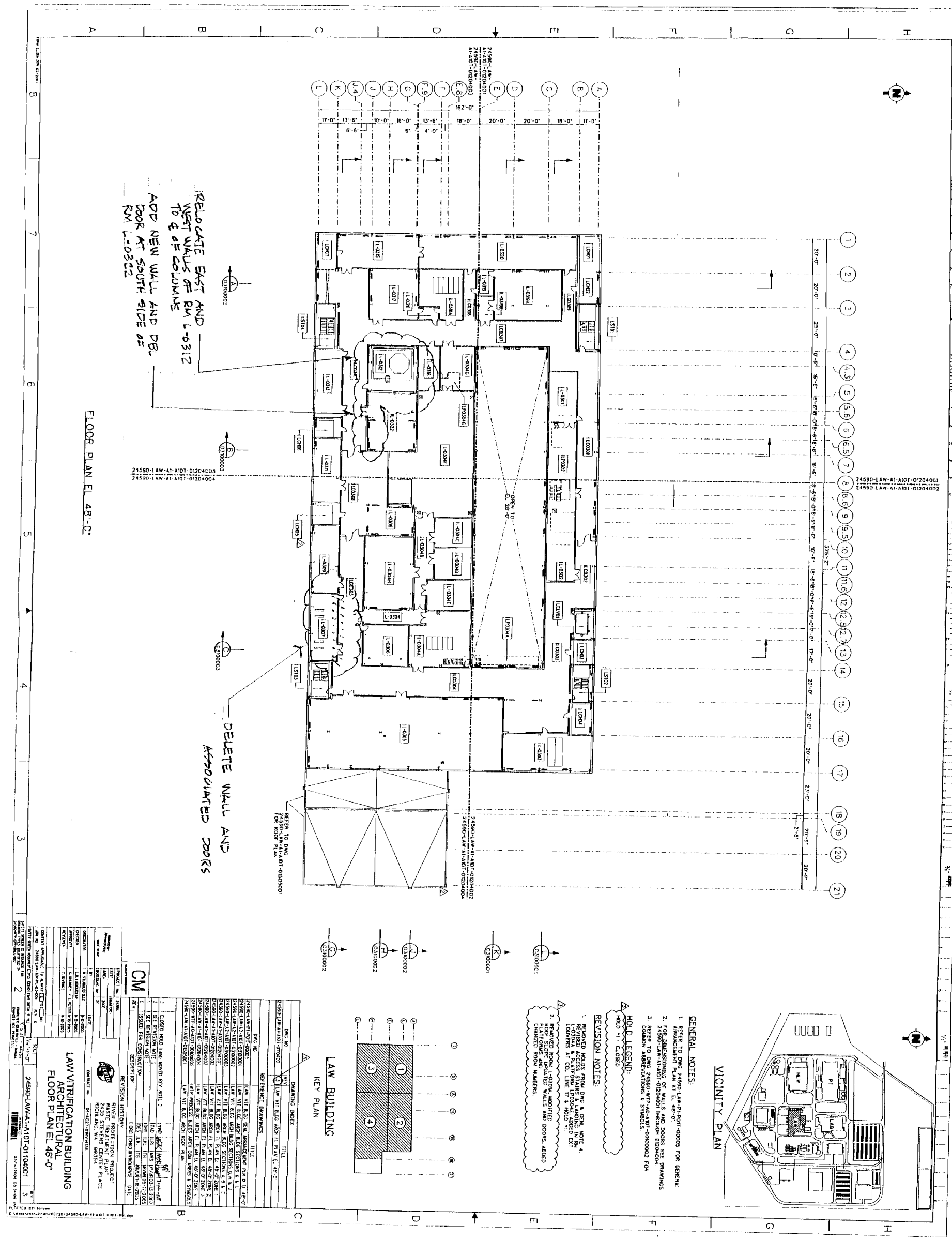
CHANGE DOCUMENT NO.
24590-LAW-A1N-A10T-00029

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | Gypsum Board Partition Wall Modification, Deletion and/or Fire Rating Changes - LAW El 48' and 68' |

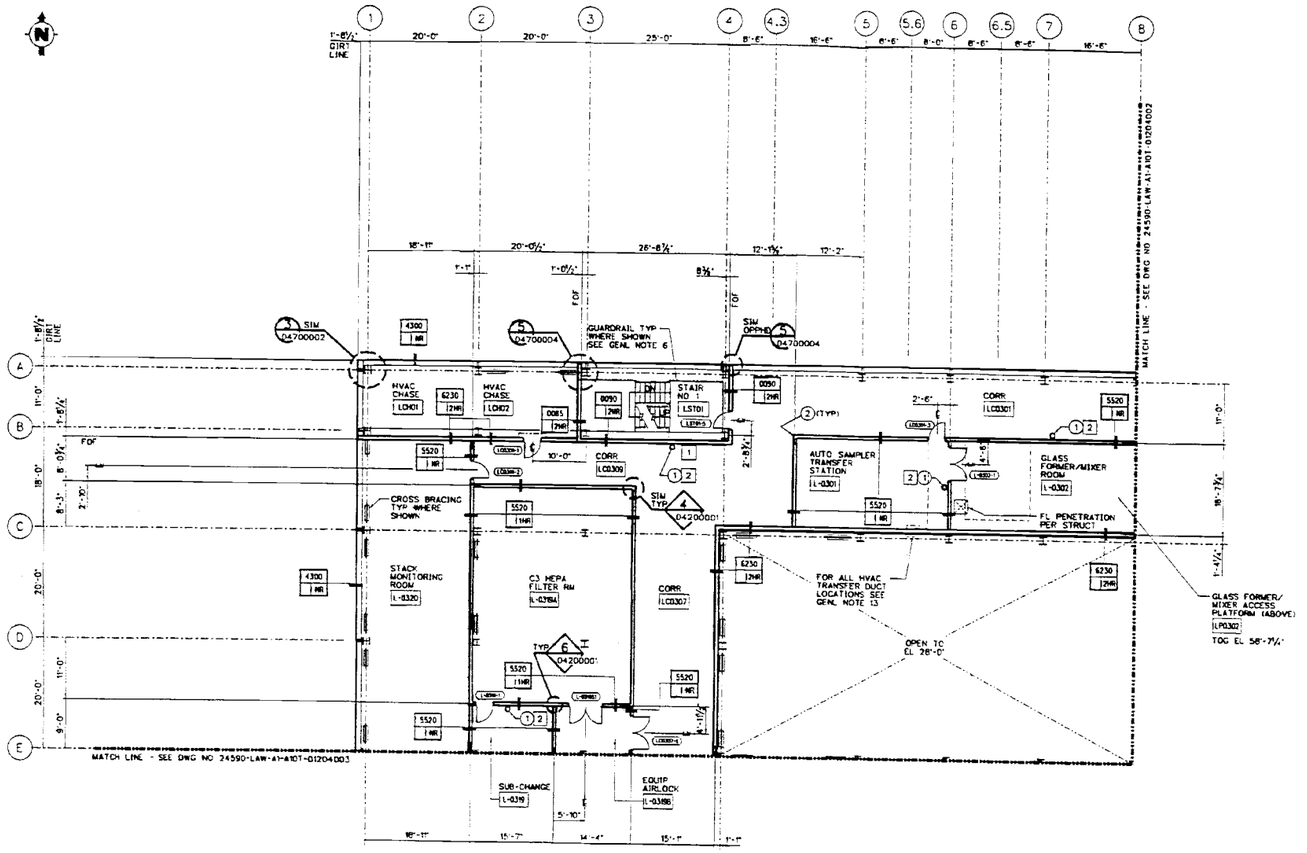
| Reviews | | | |
|---|---|---|---|
| CON - Erik Morrison<br>TRACY DAWIN FOR | E&NS - James Jarvi | CS&A - Marlene Kingman<br>Marlene Kingman | MSR 2/17/10<br>PD - ~~Craig Salerno~~ Roy Slagle<br>Roy L. Slagle |
| FP - Dale Eggen<br>Dale Eggen | HVAC GARY DALTON<br>Gary Dalton | | |

| Approval(s) | | | |
|---|---|---|---|
| APEM-LBL - John Schneider<br>John F. Schneider | CS&A - Mark Braccia | MSR 2/17/10<br>PD - ~~Mark Gober~~ JACK CLINTON<br>Jack Clinton | |

**Date** *(inserted by final approver)*: Feb 17, 2010




24590 - LAW - AIN - A10T - 00029
REVISED LAYOUT
PAGE 3 OF 19




# FLOOR PLAN EL 48'-0" ZONE 1

## GENERAL NOTES:

1. REFER TO DRAWING 24590-LAW-A1-A10T-01104001 FOR OVERALL FLOOR PLAN OF EL 48'-0" LEVEL.
2. REFER TO DWG 24590-WTP-AO-A10T-00100002 FOR COMMON ABBREVIATIONS & SYMBOLS.
3. REFER TO DWG 24590-WTP-AO-A10T-00100003 & 00100004 FOR STANDARD INTERIOR/EXTERIOR WALL TYPES LEGENDS.
4. REFER TO STRUCTURAL DRAWINGS FOR CONCRETE FORMING AND DIMENSIONS.
5. REFER TO STRUCTURAL DRAWINGS FOR STAIR DIMENSIONS AND DETAILS.
6. REFER TO STRUCTURAL DRAWINGS FOR GUARDRAIL/HANDRAIL DIMENSIONS AND DETAILS.
7. REFER TO DRAWING 24590-LAW-AO-A18T-05104001 FOR DOOR SCHEDULE.
8. REFER TO DRAWING 24590-LAW-A5-A19T-05204001 FOR ROOM FINISH SCHEDULE.
9. REFER TO DRAWING 24590-LAW-A5-A10T-05304001 FOR SIGNAGE SCHEDULE.
10. FIRE RATED GYPSUM BOARD AND SHAFT WALL ASSEMBLIES SHALL BE CONTINUOUS FROM FLOOR TO UNDER SIDE OF METAL DECKING. ALL BEAMS ADJACENT TO, INTERSECTING OR WITHIN THE WALL SYSTEM SHALL BE WRAPPED OR FIRE PROOFED TO MATCH THE RATING OF THE WALL SYSTEM PER BNI ACCEPTED DESIGN FROM A NATIONALLY RECOGNIZED TESTING LABORATORY OR OTHER APPROVED SOURCE OR METHOD.
11. INSTALL GYPSUM WALL BOARD CONTROL JOINTS AT 30' MAXIMUM PER SPECIFICATIONS 24590-WTP-3PS-AFGB-T0001 AND 24590-WTP-3PS-AFGW-T0001.
12. GYPSUM BOARD WALL DIMENSIONAL TOLERANCES: WALL INSTALLATION CAN BE ADJUSTED BASED ON DIMENSION SHOWN ±1/2" IN A LATERAL DIRECTION. WALL RELOCATIONS GREATER THAN TOLERANCE REQUIRES BNI APPROVAL PRIOR TO MODIFICATION.
13. TRANSFER DUCT LOCATIONS ARE NOT INDICATED ON THE ARCH DWGS. REFER TO BNI AND VENDOR DRAWINGS LISTED BELOW FOR THE LOCATION, SIZE AND SUPPORT REQUIREMENTS OF ALL WALL TRANSFER DUCTS (GRILLES).

    24590-QL-SRA-MDHM-00001-62-00016 AREA 1
    24590-QL-SRA-MDHM-00001-62-00002 AREA 2
    24590-QL-SRA-MDHM-00001-62-00010 AREA 3
    24590-QL-SRA-MDHM-00001-62-00003 AREA 4
    24590-QL-SRA-MDHM-00001-62-00011 AREA 5
    24590-QL-SRA-MDHM-00001-62-00020 AREA 6
    24590-LAW-MO-20-00011 - WALL PENETRATION SCHEDULE EL 48'
    24590-WTP-S1-S1ST-00046 - STRUCT STL PARTITION WALL LOAD LIMITS
14. REFER TO DRAWING 24590-LAW-AO-A18T-05101002 FOR FLOOR HATCHES.

## KEYED NOTES:

(1) INSTALL A WALL MOUNTED FIRE EXTINGUISHER WHERE SHOWN. RELOCATE AS NEEDED TO AVOID INTERFERENCES WITH SURFACE MOUNTED & WALL MOUNTED PANELS, CONDUITS & PIPING.

(2) FURNISH AND INSTALL CORNER GUARDS ON ALL EXPOSED GYPSUM WALL BOARD CORNERS IN CORRIDORS: LC0301, LC0302, LC0303, LC0304, LC0305, LC0307, AND LC0310 IN ACCORDANCE WITH SPECIFICATION 24590-WTP-3PS-AYWP-T0001 (TYP).

## HOLD LEGEND:

HOLD #1 - CLOSED

## REVISION NOTES:

1. REMOVED.

2. REMOVED

## QUALITY LEVEL EXTERIOR WALL NOTE:

QUALITY LEVEL IS C FOR ARCHITECTURAL EXTERIOR WALL PANELS AND ASSOCIATED FASTENERS. ALL OTHER ITEMS ARE CM.

## LAW BUILDING
KEY PLAN




DRAWING INDEX

| DWG NO | REV | TITLE |
|---|---|---|
| 24590-LAW-A1-A10T-01204001 | 5 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 1 |
| 24590-LAW-A1-A10T-01204002 | 1 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 2 |
| 24590-LAW-A1-A10T-01204003 | 5 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 3 |
| 24590-LAW-A1-A10T-01204004 | 3 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 4 |

REFERENCE DRAWINGS

| DWG NO | TITLE |
|---|---|
| 24590-LAW-A1-A10T-01104001 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" |
| 24590-LAW-A1-A10T-01204002 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 2 |
| 24590-LAW-A1-A10T-01204003 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 3 |
| 24590-WTP-AO-A10T-00100002 | WTP PROCESS BLDGS ARCH COM ABBRS & SYMBOLS |
| 24590-WTP-AO-A10T-00100003 | WTP PROCESS BUILDINGS ARCH STANDARD INTERIOR/EXTERIOR WALL TYPES LEGEND |
| 24590-WTP-AO-A10T-00100004 | WTP PROCESS BUILDINGS ARCH STANDARD INTERIOR/EXTERIOR WALL TYPES LEGEND |
| 24590-LAW-AO-A18T-05104001 | LAW VIT BLDG ARCH DOOR SCHEDULE EL 48'-0" |
| 24590-LAW-A5-A19T-05204001 | LAW VIT BLDG ARCH RM FINISH SCHED EL 48'-0" |
| 24590-LAW-A5-A10T-05304001 | LAW VIT BLDG ARCH SIGNAGE SCHED EL 48'-0" |
| 24590-LAW-A3-A10T-04700002 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |
| 24590-WTP-A3-A10T-04200001 | WTP PROCESS BLDGS ARCH CONCRETE INTR WALL DETS |
| 24590-LAW-A3-A10T-04700004 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |
| 24590-LAW-MO-20-00011 | LAW VIT BLDG WALL PENETRATION SCHEDULE EL 24'-0" |
| 24590-WTP-S1-S1ST-00046 | STRUCT STEEL PARTITION WALL LOAD LIMITS |

| REV | DESCRIPTION | ORG / CHKD | RVWD | APVD | DATE |
|---|---|---|---|---|---|
| 5 | REMOVED QUALITY WALL LEGEND, REVISED SPEC NUMBER IN KEY NOTE 2 | | | | |
| 4 | REMOVED REVISION NOTES 1 AND 2. MODIFIED REVISION NUMBERS, ADDED KEYED NOTE 2 | TAD | ILR | MSR | 7-2-2008 |
| 0 | ISSUED FOR CONSTRUCTION | DRE | ILR | TB | 10/03/05-16-2005 |

REVISION HISTORY

| | |
|---|---|
| PROJECT No. | 24590 |
| SITE | HANFORD |
| AREA | 200 |
| BUILDING No. | 3C |
| SHEET | 8 |
| DATE | |
| DESIGNED | B. STAMBOLIYEV 9-12-2005 |
| CHECKED | I.R. LABOUCEUR 9-12-2005 |
| APPROVED | K. BRAUN / V. L. KESSIS 9-12-2005 |
| REVISED | L. BYRNES 11-01-2005 |

CONTENT APPLICABLE TO ALARA? YES NO
ADR NO. 24590-LAW-ADR-PL-03-XXX REV. 2
ITEMS SCREENING REQUIRED? YES (END ITEMS BELOW 'R' 'C') NO

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

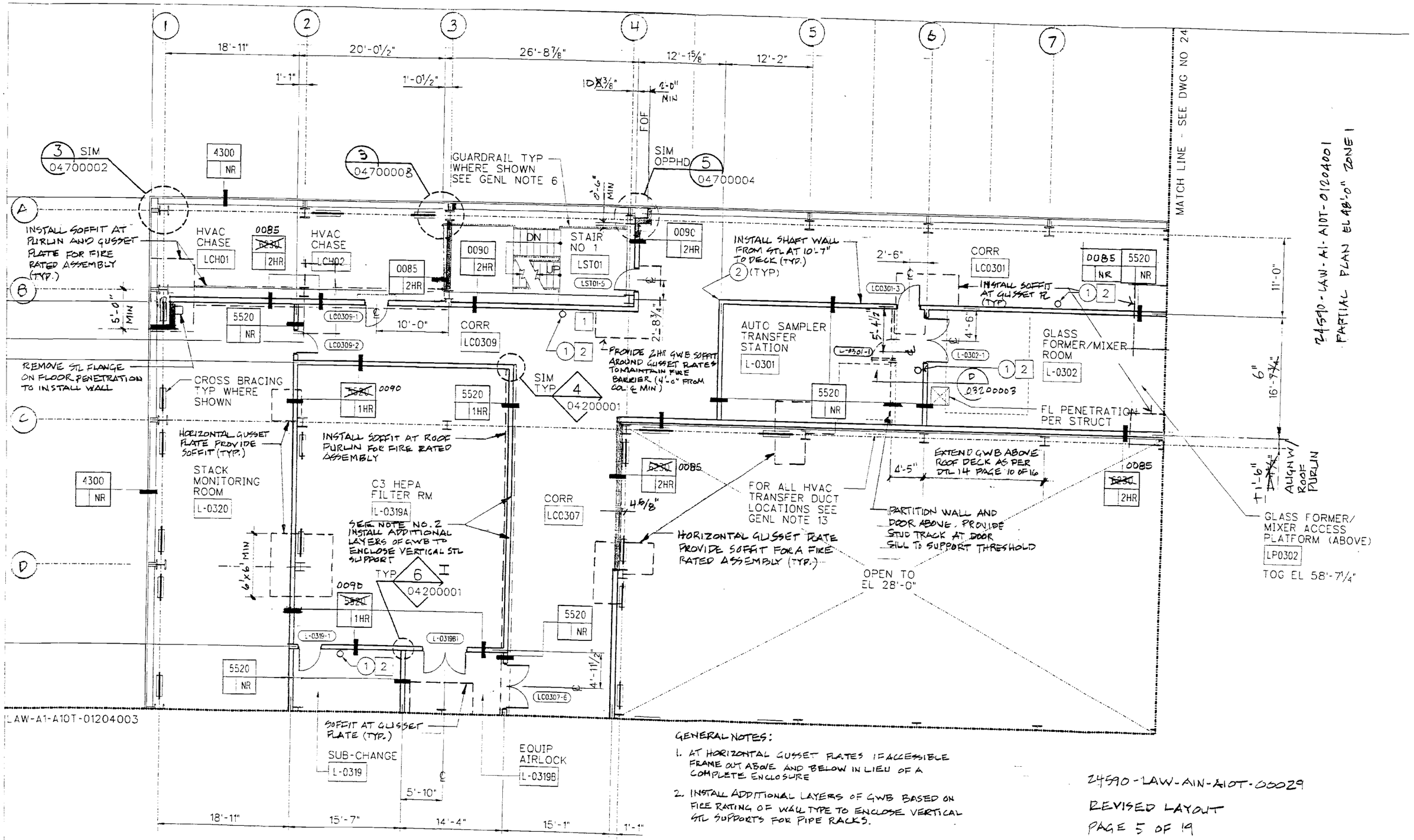
CONTRACT No. DE-AC27-01RV14136

LAW VITRIFICATION BUILDING
ARCHITECTURAL
FLOOR PLAN EL 48'-0"
ZONE 1

SCALE: 1/8"-1'-0" | DWG NO: 24590-LAW-A1-A10T-01204001 | REV: 5

09/29/2009 08:27:13 AM

24590 - LAW - AIN - A10T - 00029
CURRENT REVISION
PAGE 4 OF 19



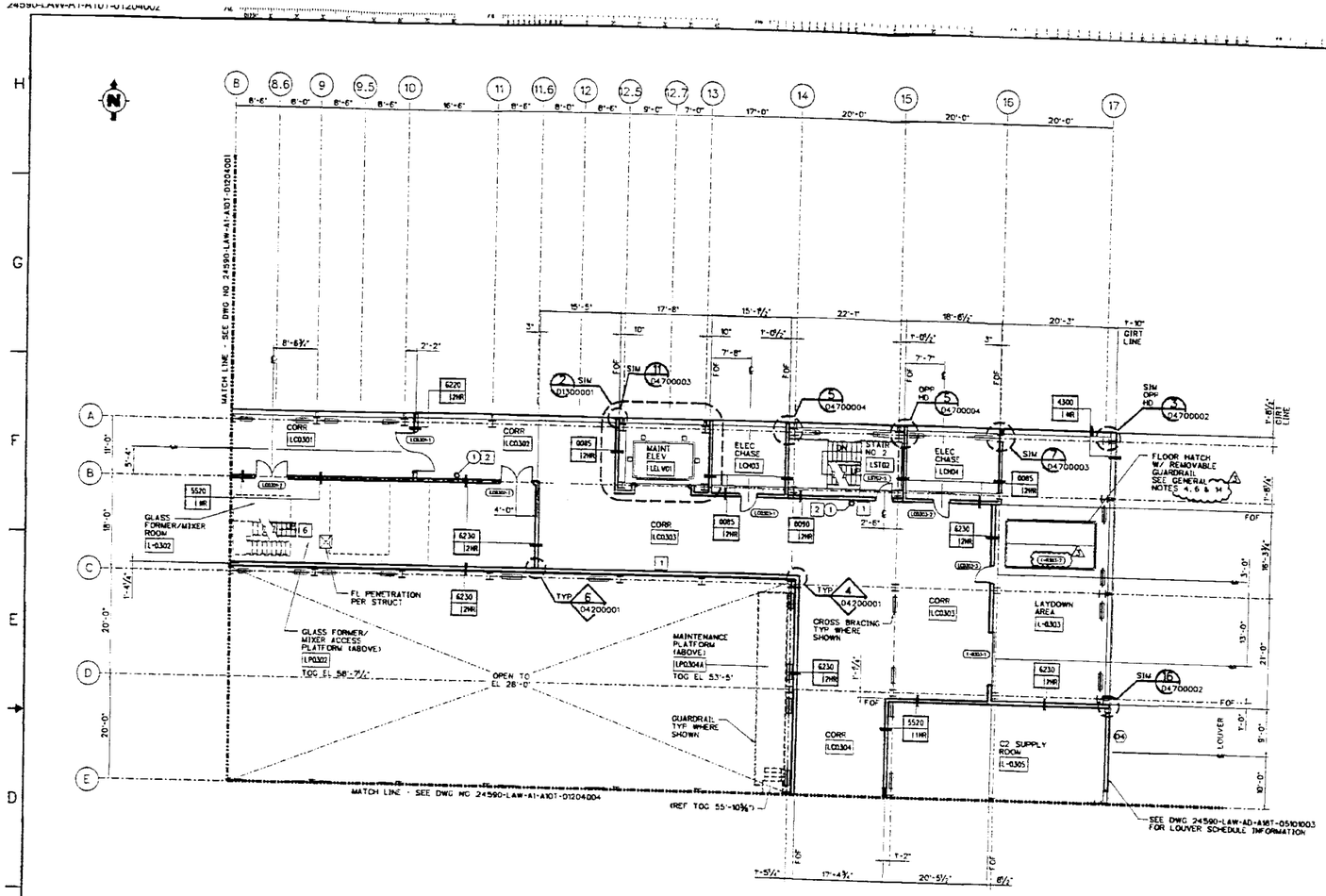

GENERAL NOTES:

1. AT HORIZONTAL GUSSET PLATES IF ACCESSIBLE FRAME OUT ABOVE AND BELOW IN LIEU OF A COMPLETE ENCLOSURE
2. INSTALL ADDITIONAL LAYERS OF GWB BASED ON FIRE RATING OF WALL TYPE TO ENCLOSE VERTICAL STL SUPPORTS FOR PIPE RACKS.

24590-LAW-A1N-A10T-00029

REVISED LAYOUT

PAGE 5 OF 19




FLOOR PLAN EL 48'-0" ZONE 2

## NOTES:

1. REFER TO DRAWING 24590-LAW-A1-A10T-01204001 FOR GENERAL NOTES AND REFERENCES.

## KEYED NOTES:

1. INSTALL A WALL MOUNTED FIRE EXTINGUISHER WHERE SHOWN. RELOCATE AS NEEDED TO AVOID INTERFERENCES WITH SURFACE MOUNTED & WALL MOUNTED PANELS, CONDUITS & PIPING.

## REVISION NOTES:

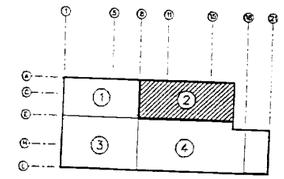
1. REMOVED HOLDS, GEN. NOTE 7 & NORTH WALL @ MAINT ELEV, REVISED PLATF LP0304E, KEYED NOTES, REF DWGS & QUALITY DESIGNATOR, ADDED LOUVER, QL WALL NOTE DET & GUARDRAIL @ DOORS.
2. RELOCATED WALLS AND DOORS, MODIFIED DIMS AND RM NAMES, ADDED REVISION NOTES, MODIFIED QUALITY NOTE, DELETED AND MODIFIED GEN. NOTES, ADDED HOLD #1.

## HOLD LEGEND:

HOLD #1 - CLOSED

## QUALITY LEVEL EXTERIOR WALL NOTE:

QUALITY LEVEL IS Q FOR ARCHITECTURAL EXTERIOR WALL PANELS AND ASSOCIATED FASTENERS. ALL OTHER ITEMS ARE CM.



LAW BUILDING

KEY PLAN

| REFERENCE DRAWINGS | |
|---|---|
| DWG NO | TITLE |
| 24590-LAW-A1-A10T-01204001 | LAW VIT BLDG ARCH FL PLAN EL 28'-0" ZONE 1 |
| 24590-LAW-A1-A10T-01204004 | LAW VIT BLDG ARCH FL PLAN EL 28'-0" ZONE 4 |
| 24590-LAW-A1-A10T-01300001 | LAW VIT BLDG ARCH ELEVATOR PLANS & SECTIONS |
| 24590-LAW-A3-A10T-04700002 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |
| 24590-LAW-A3-A10T-04700004 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |
| 24590-WTP-A3-A10T-04200001 | WTP PROCESS BLDGS ARCH COM INTR WALL DETS |
| 24590-LAW-AD-A18T-05101003 | LAW VIT BLDG ARCH WINDOW/LOUVER SCHEDULE |
| 24590-LAW-A3-A10T-04700003 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |

| REV | DESCRIPTION | DRG | CHKD | RVWD | APVD | DATE |
|---|---|---|---|---|---|---|
| 3 | CLOSED HOLD 1, ADDED HATCH NUMBER, MODIFIED NOTE | | | | | |
| 2 | SEE REVISION NOTE 2 | TAD | LRL | MSR | JP/JR | 03-13-2007 |
| 1 | SEE REVISION NOTE 1 | DBS | LRL | TB | JR/MB | 05-17-2005 |
| 0 | ISSUED FOR CONSTRUCTION | DBS | LRL | TB | HK/LR | 11-18-2005 |

REVISION HISTORY

Q

| | | |
|---|---|---|
| PROJECT No. | 24590 | |
| SITE | HANFORD | |
| AREA | 200E | |
| BUILDING No. | 20 | |
| | BY | DATE |
| ORIGINATOR | B. STAMBLEFIELD | 11-12-2005 |
| CHECKER | L.R. LABOLLEUR | 11-12-2005 |
| APPROVER | K. KIDANET / L. KESSLER | 11-18-2005 |
| REVIEWER | T. BRYNGE | 11-12-2005 |

CONTENT APPLICABLE TO ALARA? YES NO
ADR NO. 24590-LAW-ADR-A1-03-006 REV. 0

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No. DE-AC27-01RV14136

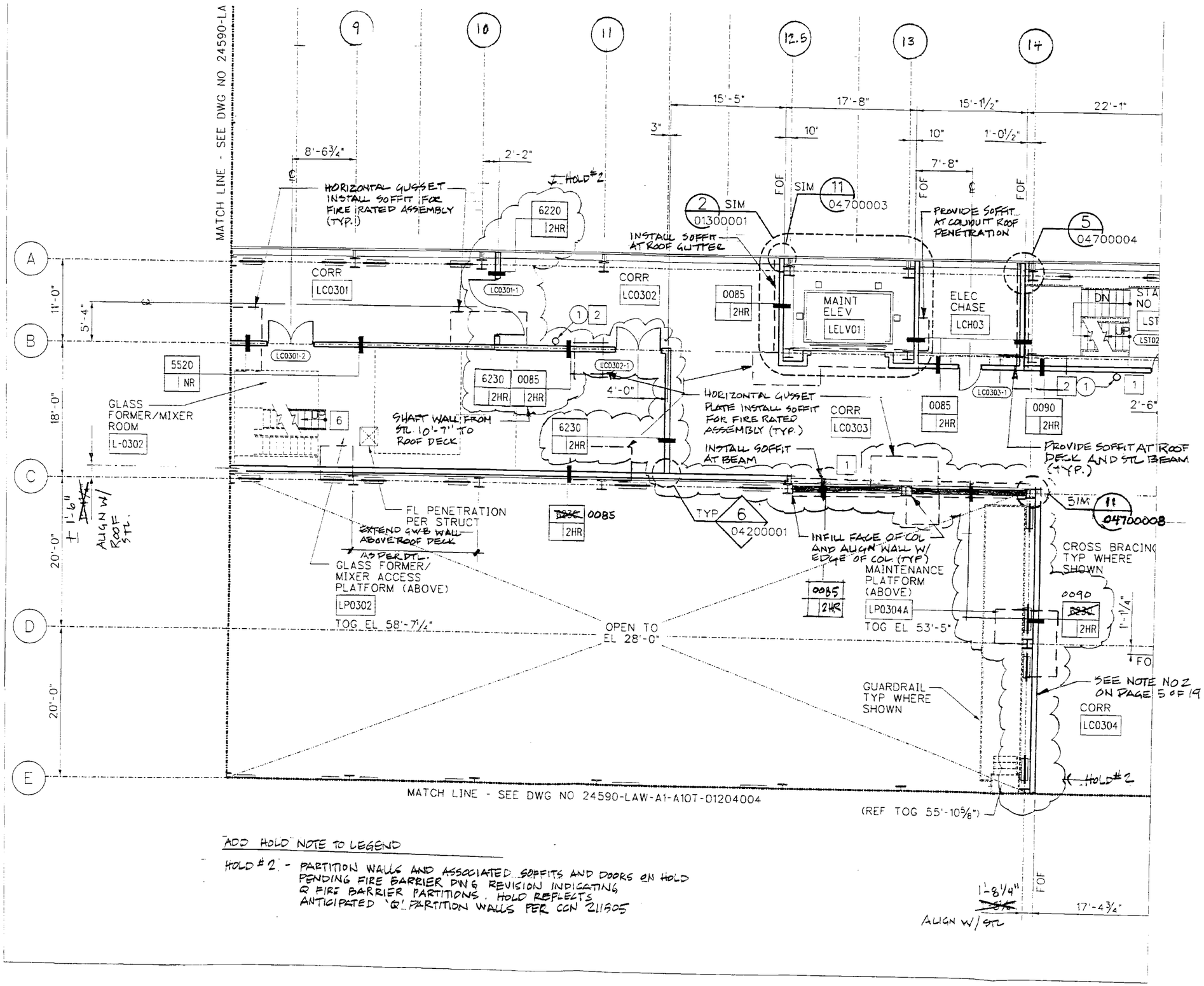
# LAW VITRIFICATION BUILDING ARCHITECTURAL FLOOR PLAN EL 48'-0" ZONE 2

SCALE: 1/8"=1'-0"

24590-LAW-A1-A10T-01204002 REV 3

09/28/2009 08:30:44 AM

24590-LAW-AIN-A10T-00029
CURRENT REVISION
PAGE 6 OF 19

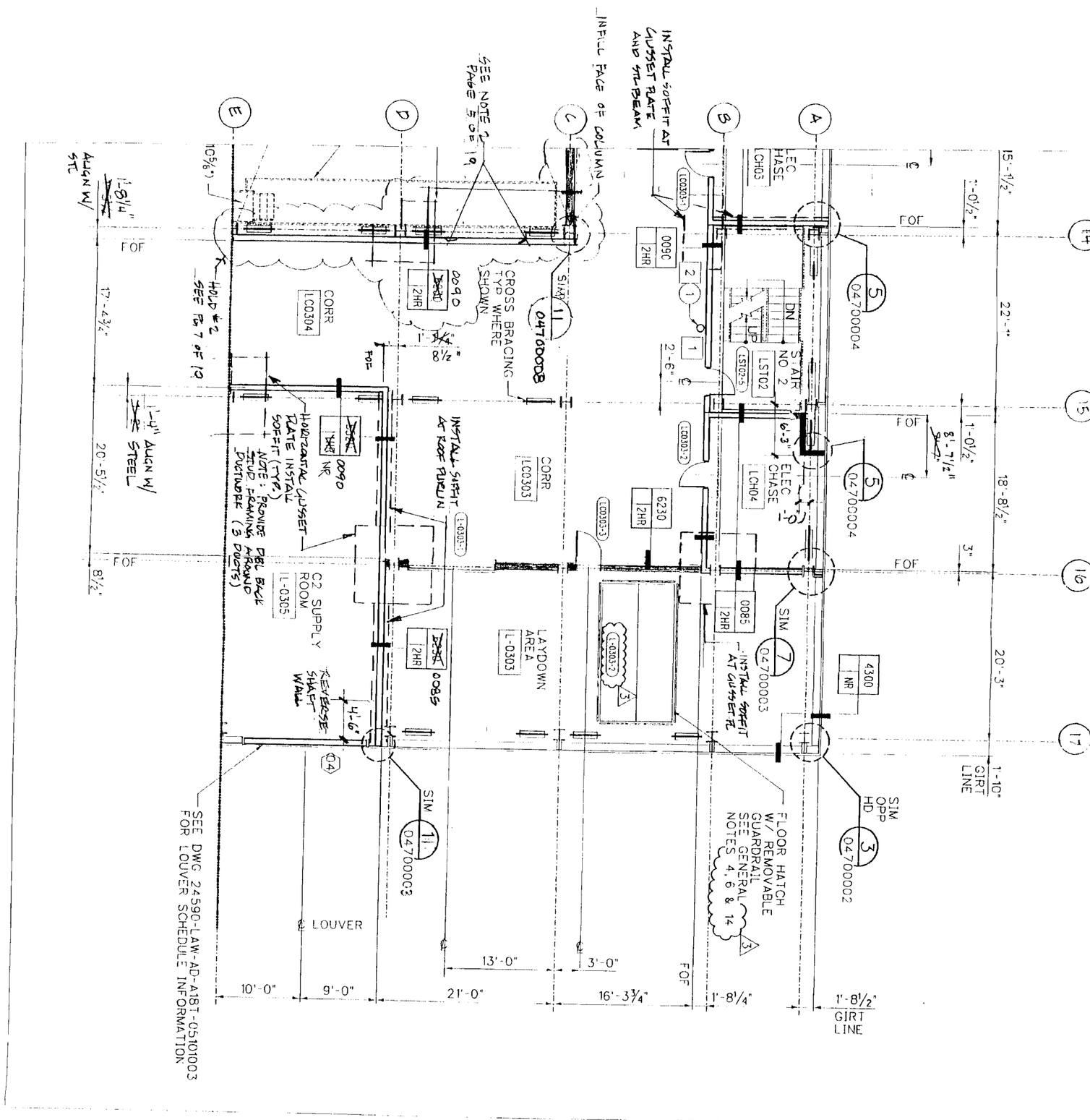



ADD HOLD NOTE TO LEGEND

HOLD # 2 - PARTITION WALLS AND ASSOCIATED SOFFITS AND DOORS ON HOLD PENDING FIRE BARRIER DWG REVISION INDICATING Q FIRE BARRIER PARTITIONS. HOLD REFLECTS ANTICIPATED 'Q' PARTITION WALLS PER CCN 211505

24590-LAW-A1-A10T-01204002
PARTIAL PLAN EL 48'-0" ZONE 2

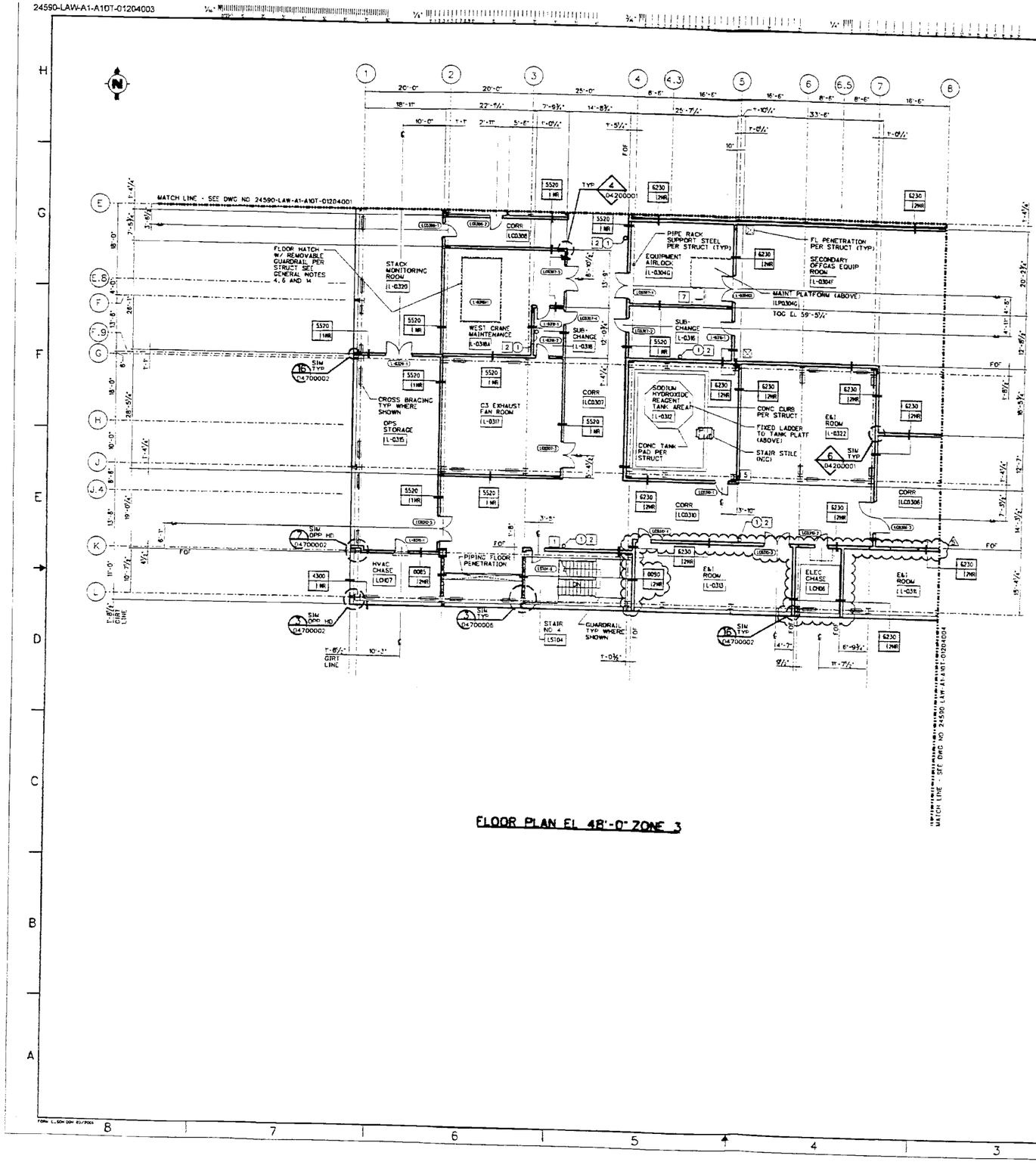
24590-LAW-AN-A10T-00029
REVISED LAYOUT
PAGE 7 OF 19




24590-LAW-A1-A1DT-01204002
PARTIAL PLAN EL 48'-0" ZONE 2

24590-LAW-AIN-A1DT-00029
REVISED LAYOUT
PAGE 8 OF 19

24590-LAW-A1-A10T-01204003




FLOOR PLAN EL 48'-0" ZONE 3

NOTES:

1. REFER TO DRAWING 24590-LAW-A1-A10T-01204001 FOR GENERAL NOTES AND REFERENCES.

KEYED NOTES:

(1) INSTALL A WALL MOUNTED FIRE EXTINGUISHER WHERE SHOWN. RELOCATE AS NEEDED TO AVOID INTERFERENCES WITH SURFACE MOUNTED & WALL MOUNTED PANELS, CONDUITS & PIPING.

REVISION NOTES:

1. REMOVED

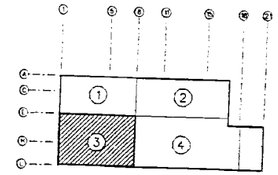
2. REMOVED

HOLD LEGEND:

HOLD #1 - CLOSED

QUALITY LEVEL EXTERIOR WALL NOTE:

QUALITY LEVEL IS Q FOR ARCHITECTURAL EXTERIOR WALL PANELS AND ASSOCIATED FASTENERS. ALL OTHER ITEMS ARE CM.



LAW BUILDING
KEY PLAN

REFERENCE DRAWINGS

| DWG NO | TITLE |
|---|---|
| 24590-LAW-A1-A10T-01204001 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 1 |
| 24590-LAW-A1-A10T-01204004 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 4 |
| 24590-WTP-A3-A10T-04700001 | WTP PROCESS BLDGS ARCH COM INTR WALL DETS |
| 24590-LAW-A3-A10T-04700002 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |
| 24590-LAW-A3-A10T-04700004 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |

REVISION HISTORY

| REV | DESCRIPTION | ORIG (CHK) RVWD (APVD) | DATE |
|---|---|---|---|
| 5 | REMOVED QUALITY WALL LEGEND, REVISED QUALITY LEVEL EXTERIOR WALL NOTE & WALL TYPE | | |
| 4 | REMOVED REVISION NOTES 1 AND 2 ABOVE | TJAD TJR JWSR AJC | 17-2-2008 |
| 0 | ISSUED FOR CONSTRUCTION | JDBS TJR JTE RKW | 11-16-2005 |

Q QUALITY DESIGNATION

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

LAW VITRIFICATION BUILDING
ARCHITECTURAL
FLOOR PLAN EL 48'-0"
ZONE 3

| | |
|---|---|
| PROJECT No. | 24590 |
| SYST | 1WWP DBC |
| ARE | 2WRC |
| BUILDING No. | 2L |
| BY | TJAD |
| DESIGNATOR | R. STUMBLEY KLC 9-12-2005 |
| CHECKER | L.P. LADOUCEUR 9-12-2005 |
| APPROVER | K. KRUMEY / L. KISSLER 9-19-2005 |
| REVIEWER | T. BRYANT 9-12-2005 |

CONTENT APPLICABLE TO NUMBER: YES NO
AOR NO. 24590-LAW-ADR-PL-03-006 REV: 0
TANK SYSTEM(S) AFFECTED: YES NO (SEE LIMS WITH # 11)

SCALE: 1/8"=1'-0"
24590-LAW-A1-A10T-01204003 REV: 5

09/29/2008 06:28:05 AM

24590-LAW-AIN-A10T-00029
CURRENT REVISION
PAGE 9 OF 19

GENERAL NOTE:

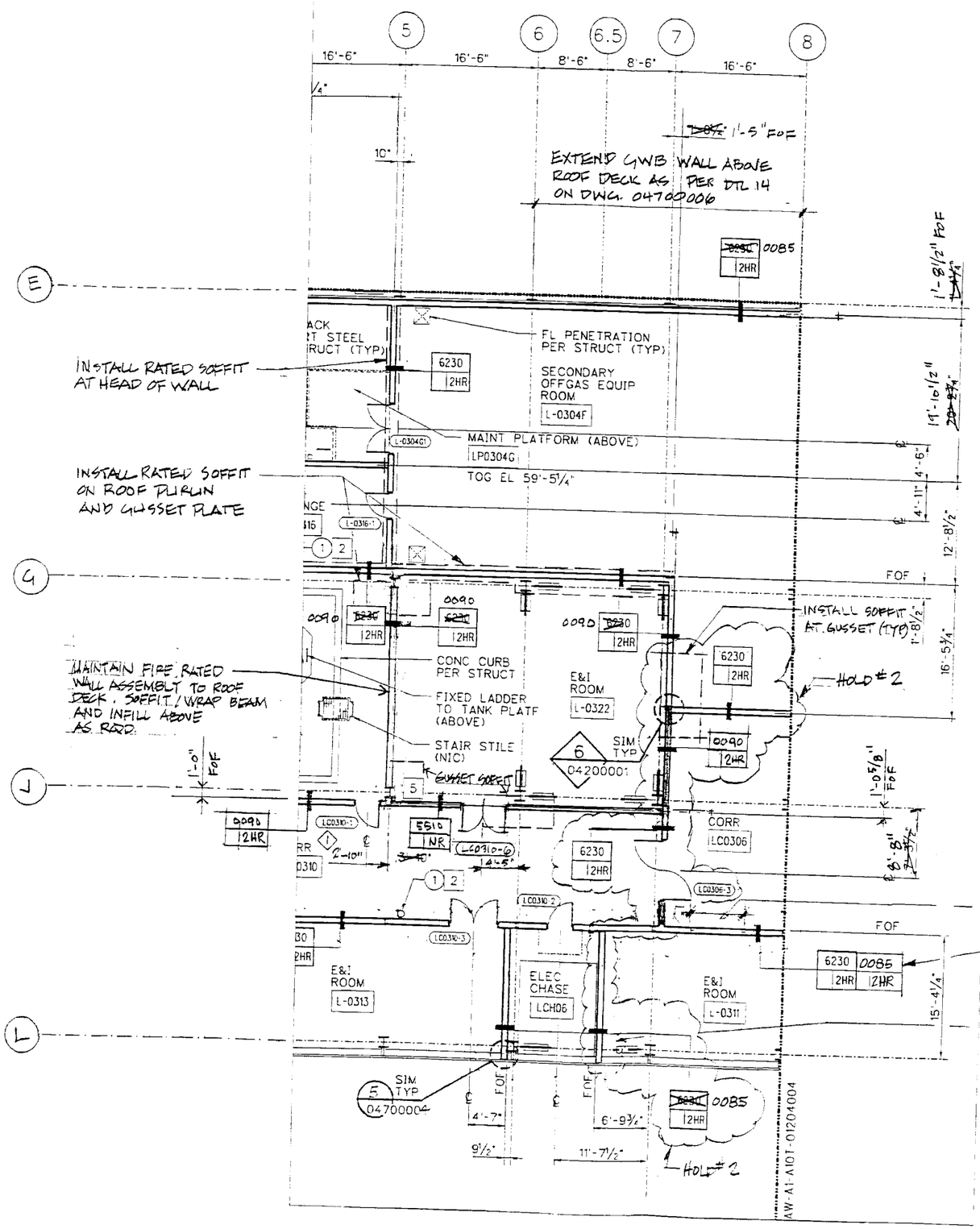
1. PRE DRILL TRACK AS REQ'D TO CLR MISC ROOFING SCREWS (TYP.)
2. INSTALL 0090 SHAFT WALL ONLY WHERE FINISHES ARE REQ'D.

KEY NOTES

1. PROVIDE FRAMING FOR THE MINIMUM REQUIREMENTS NECESSARY TO ALLOW INSTALLATION OF ORIGINAL DOOR FRAME. CORRIDOR SIDE SHALL ~~HAVE~~ NO CHANGE IN PROFILE.

24590-LAW-A1-A10T-01204003
PARTIAL PLAN EL 18'-0" ZONE 2

24590-LAW-AIN-AOT-00029
REVISED LAYOUT
PAGE 10 OF 19




ADD HOLD NOTE TO LEGEND

HOLD # 2 - PARTITION WALLS, SOFFITS AND ASSOCIATED DOORS ON HOLD PENDING FIRE BARRIER DWG REVISION INDICATING 'Q' FIRE BARRIER PARTITIONS. HOLD REFLECTS ANTICIPATED 'Q' PARTITION WALLS PER CCN 211505

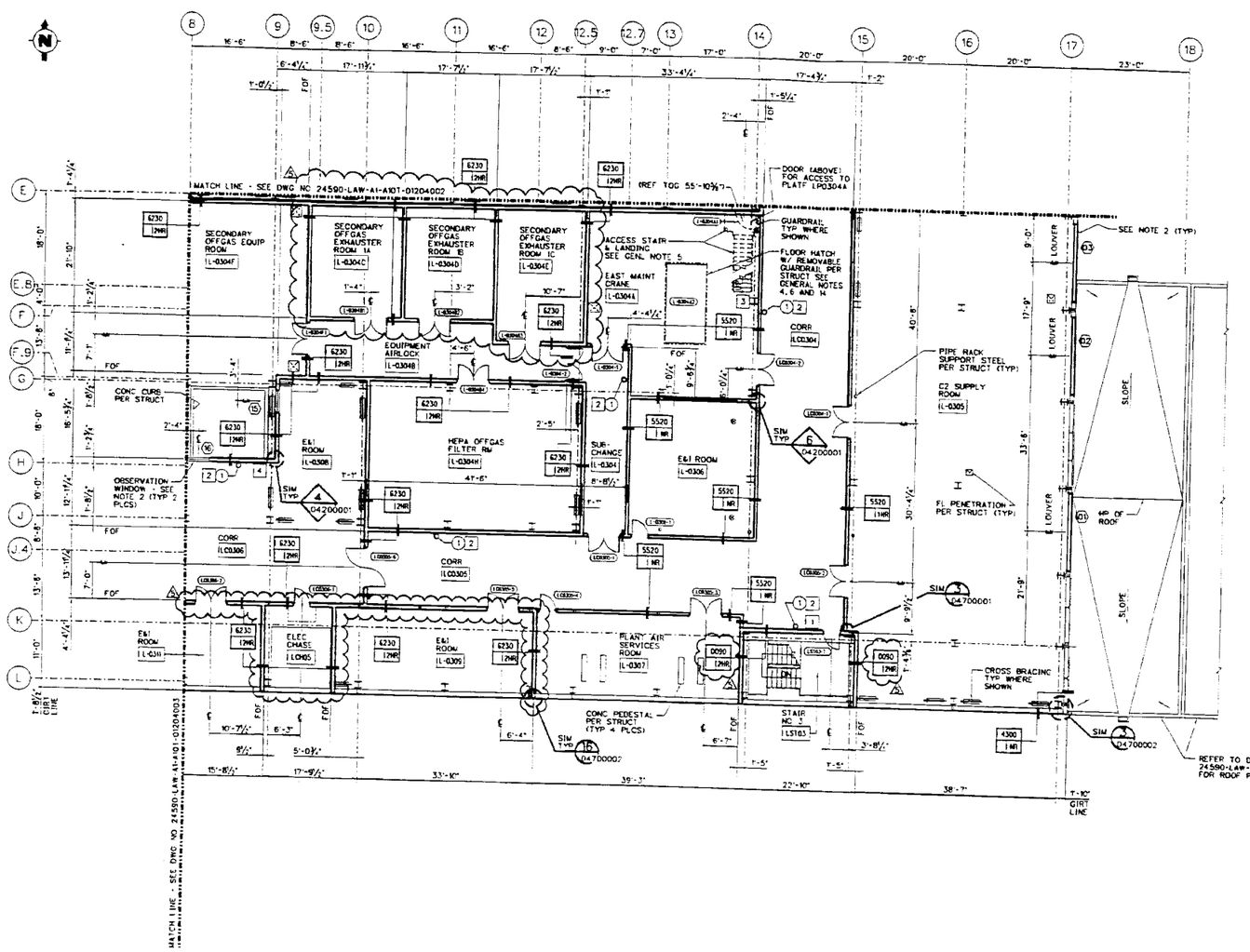
KEY NOTES

SEE Pg 10 OF 19

124590-LAW-A1-A10T-01204003
PARTIAL PLAN EL 48'-0" ZONE 3

124590-LAW-AIN-A10T-00029
REVISED LAYOUT
PAGE 11 OF 19

24590-LAW-A1-A10T-01204004




FLOOR PLAN EL 48'-0" ZONE 4

## NOTES:

1. REFER TO DRAWING 24590-LAW-A1-A10T-01204001 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO DRAWING 24590-LAW-AD-A18T-05101003 FOR WINDOW/LOUVER SCHEDULE.

## KEYED NOTES:

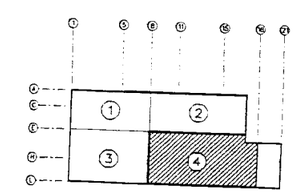
1. INSTALL A WALL MOUNTED FIRE EXTINGUISHER WHERE SHOWN. RELOCATE AS NEEDED TO AVOID INTERFERENCES WITH SURFACE MOUNTED & WALL MOUNTED PANELS, CONDUITS & PIPING.

## REVISION NOTES:

1. REMOVED

## QUALITY LEVEL EXTERIOR WALL NOTE:

QUALITY LEVEL IS 0 FOR ARCHITECTURAL EXTERIOR WALL PANELS AND ASSOCIATED FASTENERS. ALL OTHER ITEMS ARE CM.



## LAW BUILDING

KEY PLAN

| REFERENCE DRAWINGS | |
|---|---|
| DWG NO | TITLE |
| 24590-LAW-A1-A10T-01204001 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 1 |
| 24590-LAW-A1-A10T-01204002 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 2 |
| 24590-LAW-A1-A10T-01204003 | LAW VIT BLDG ARCH FL PLAN EL 48'-0" ZONE 3 |
| 24590-LAW-A1-A10T-01505001 | LAW VIT BLDG ARCH ROOF PLAN |
| 24590-WTP-A3-A10T-04200001 | WTP PROCESS BLDGS ARCH COM INTR WALL DETS |
| 24590-LAW-A3-A10T-04700001 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |
| 24590-LAW-A3-A10T-04700002 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |
| 24590-LAW-AD-A18T-05101003 | LAW VIT BLDG ARCH WINDOW/LOUVER SCHEDULE |
| 24590-LAW-A3-A10T-04700003 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |

| REV | DESCRIPTION | ORG | CHKD | RVWD | APVD | DATE |
|---|---|---|---|---|---|---|
| 5 | REMOVED QUALITY WALL LEGEND, REVISED QUALITY LEVEL EXTERIOR WALL NOTE & WALL TYPE | | | | | |
| 4 | ADDED FLOOR HATCH NUMBER | | | | | |
| 3 | MODIFIED WALL TAG AND NOTE ON PLAN | TAD | LR | MSR | IMS | 17-2-2006 |
| 2 | ISSUED FOR CONSTRUCTION | TAD | LR | MSR | UP/RH | 3-14-2005 |
| 0 | ISSUED FOR CONSTRUCTION | DBS | LR | TB | KK/LK | 1-16-2005 |

REVISION HISTORY

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT NO. DE-AC27-01RV14136

LAW VITRIFICATION BUILDING
ARCHITECTURAL
FLOOR PLAN EL 48'-0"
ZONE 4

SCALE 1/8"=1'-0"

24590-LAW-A1-A10T-01204004 REV 5

08/29/2009 06:29:25 AM

24590-LAW-AIN-A10T-00029
CURRENT REVISION
PAGE 12 OF 19

INSTALL SOFFIT TO ENCLOSE BEAM AT CONC PLATFORM

INSTALL SHAFTWALL FROM RACK STEEL TO ROOF DECK (TYP)

INSTALL SOFFIT TO ENCLOSE STEEL

INSTALL SOFFIT TO ENCLOSE GUSSET PLATE (TYP)

DELETE WALL AND DOORS

HOLD # 1

NOTE

1) INSTALL SOFFIT AT GUSSET PLATE AND STEEL AT ROOF DECK (TYP)

2) INSTALL SHAFT WALL AT COLUMN (TYP 2 PLACES)

3) ADD ADDITIONAL LAYERS OF GWB AT 6" STEEL CHANNEL WINDOW SUPPORT AND FRAME FOR 2HR BARRIER.

HOLD LEGEND

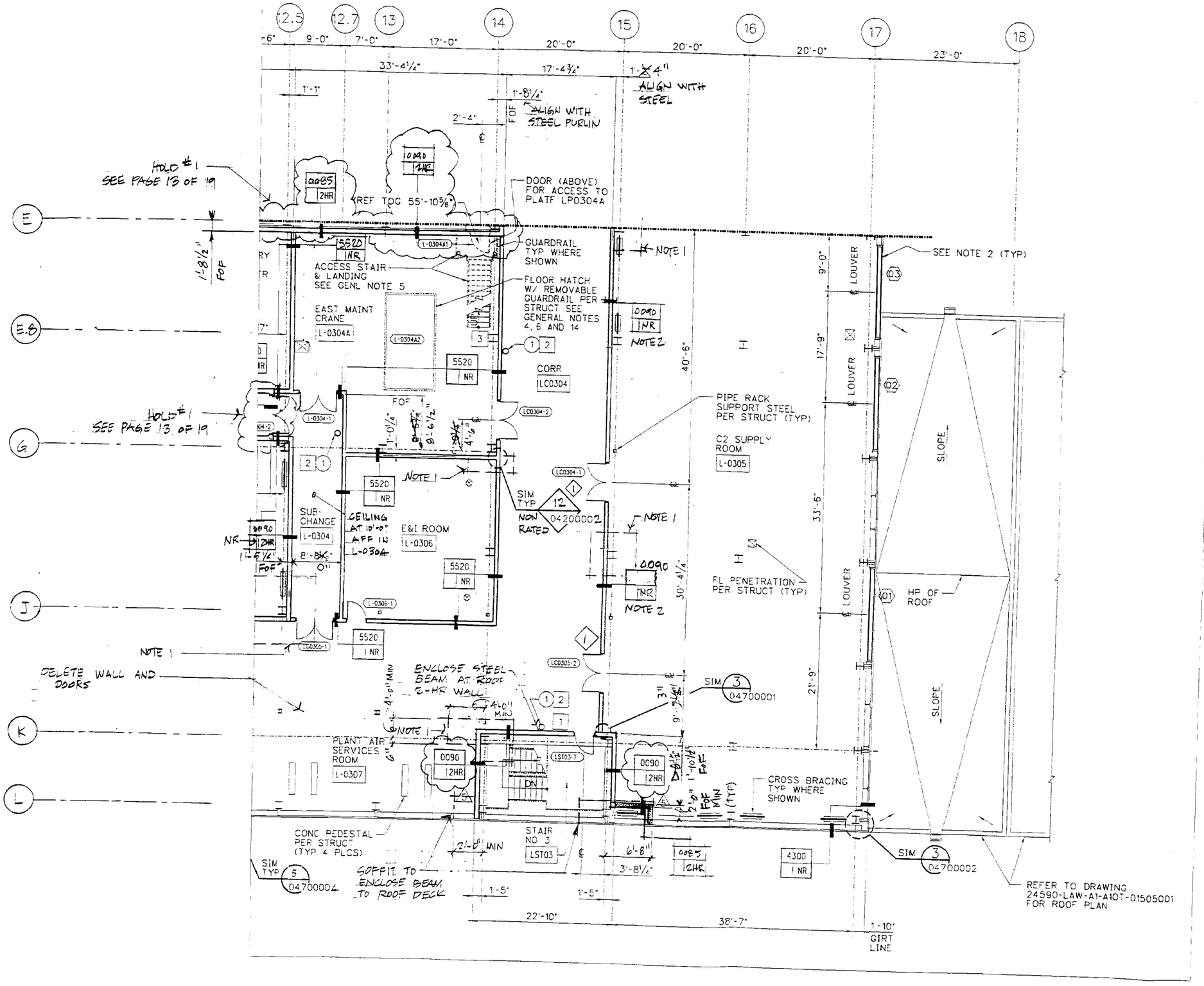
HOLD # 1 - PARTITION WALLS, SOFFITS AND ASSOCIATED DOORS/WINDOWS ON HOLD PENDING FIRE BARRIER DWG REVISION INDICATING 'Q' FIRE BARRIER PARTITIONS. HOLD REFLECTS ANTICIPATED 'Q' PARTITION WALLS PER CCN 211505

KEY NOTES

SEE PG 14 OF 19

24590-LAW-A1-A10T-01204004
PARTIAL PLAN EL 48'-0" ZONE 4

24590-LAW-AIN-A10T-00029
REVISED LAYOUT




NOTE

(1) INSTALL SOFFIT AT GUSSET PLATE FOR CONTINUATION OF FIRE RATED ASSEMBLY (TYP

2) PROVIDE DBL BACK STUD EITHER SIDE OF DUCT OPENING FOR FRAMING (TYP 3 DUCTS)

KEY NOTES

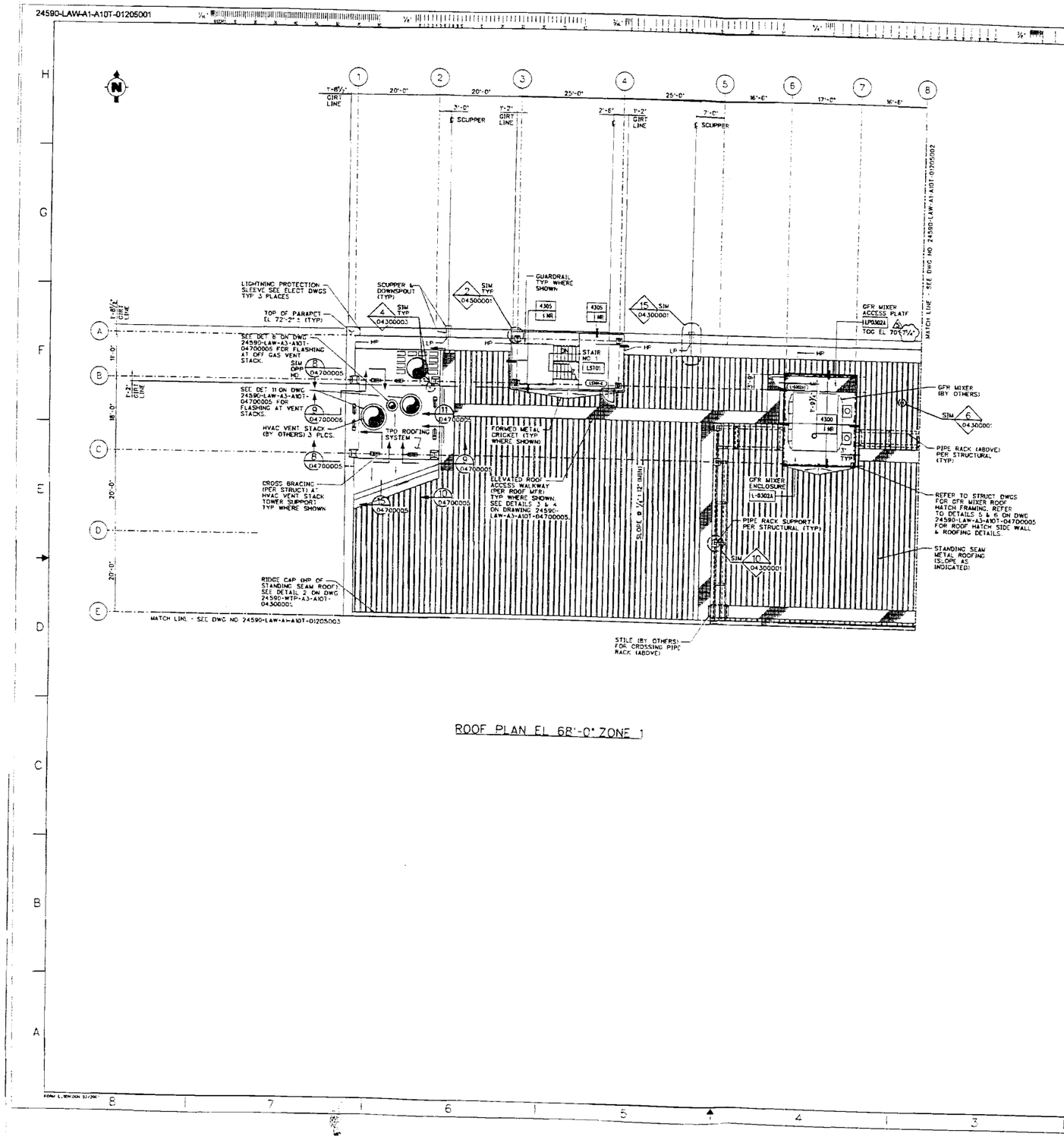
(1) PROVIDE FRAMING FOR THE MINIMUM REQUIREMENTS NECESSARY TO ALLOW INSTALLATION OF ORIGINAL DOOR FRAME. CORRIDOR SIDE SHALL HAVE NO CHANGE IN PROFILE.

24590-LAW-A1-A1OT-01204004
PARTIAL PLAN EL 48'-0" ZONE 4

24590-LAW-AIN-A1OT-00029
REVISED LAYOUT

PAGE 14 OF 19

24590-LAW-A1-A10T-01205001




ROOF PLAN EL 68'-0" ZONE 1

## GENERAL NOTES:

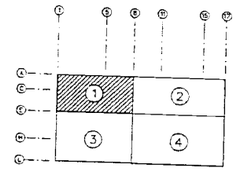
1. REFER TO DRAWING 24590-LAW-A1-A10T-01105001 FOR OVERALL ROOF PLAN OF EL 68'-0" LEVEL.
2. REFER TO DWG 24590-WTP-AD-A10T-00100002 FOR COMMON ABBREVIATIONS & SYMBOLS.
3. REFER TO DWG 24590-WTP-AD-A10T-00100003 & 00100004 FOR STANDARD INTERIOR/EXTERIOR WALL TYPES LEGENDS.
4. REFER TO STRUCTURAL DRAWING 24590-LAW-S5-S15T-00004 FOR STRUCTURAL STEEL FRAMING AND DIMENSIONS.
5. REFER TO STRUCTURAL DRAWING 24590-LAW-S1-S15T-00050 AND -00051 FOR STAIR DIMENSIONS AND DETAILS. (5)
6. REFER TO STRUCTURAL FOR PLATFORM, GUARDRAIL/HANDRAIL, PIPE RACK & PIPE RACK SUPPORT DIMENSIONS AND DETAILS.
7. REFER TO DRAWING 24590-LAW-AD-A18T-05105001 FOR DOOR SCHEDULE.
8. REFER TO DRAWING 24590-LAW-A5-A15T-05205001 FOR ROOM FINISH SCHEDULE.
9. REFER TO DRAWING 24590-LAW-A5-A10T-05305001 FOR SIGNAGE SCHEDULE.
10. REFER TO ELECTRICAL DRAWINGS FOR (GROUNDING/LIGHTNING PROTECTION NOTES & DETAILS.
11. REFER TO DRAWING 24590-LAW-A1-A10T-01505001 FOR OVERALL ROOF PLAN. (5)

## REVISION NOTES:

1. (5) REMOVED

## QUALITY LEVEL EXTERIOR WALL NOTE:

QUALITY LEVEL IS (Q) FOR ARCHITECTURAL EXTERIOR WALL PANELS AND ASSOCIATED FASTENERS. ALL OTHER ITEMS ARE QM.




## LAW BUILDING
KEY PLAN

DRAWING INDEX

| DWG NO | REV | TITLE |
|---|---|---|
| 24590-LAW-A1-A10T-01205001 | 5 | LAW VIT BLDG ARCH ROOF PLAN EL 68'-0" ZONE 1 |
| 24590-LAW-A1-A10T-01205002 | 5 | LAW VIT BLDG ARCH ROOF PLAN EL 68'-0" ZONE 2 |
| 24590-LAW-A1-A10T-01205003 | 5 | LAW VIT BLDG ARCH ROOF PLAN EL 68'-0" ZONE 3 |
| 24590-LAW-A1-A10T-01205004 | 4 | LAW VIT BLDG ARCH ROOF PLAN EL 68'-0" ZONE 4 |

REFERENCE DRAWINGS

| DWG NO | TITLE |
|---|---|
| 24590-LAW-A1-A10T-01105001 | LAW VIT BLDG ARCH ROOF PLAN EL 68'-0" |
| 24590-LAW-A1-A10T-01205002 | LAW VIT BLDG ARCH ROOF PLAN EL 68'-0" ZONE 2 |
| 24590-LAW-A1-A10T-01205003 | LAW VIT BLDG ARCH ROOF PLAN EL 68'-0" ZONE 3 |
| 24590-LAW-A1-A10T-01505001 | LAW VIT BLDG ARCH ROOF PLAN |
| 24590-WTP-AD-A10T-00100002 | WTP PROCESS BLDGS ARCH COM ABBRS & SYMBOLS |
| 24590-WTP-AD-A10T-00100003 | WTP PROCESS BUILDINGS ARCH STANDARD INTERIOR/EXTERIOR WALL TYPES LEGEND |
| 24590-WTP-AD-A10T-00100004 | WTP PROCESS BUILDINGS ARCH STANDARD INTERIOR/EXTERIOR WALL TYPES LEGEND |
| 24590-LAW-AD-A18T-05105001 | LAW VIT BLDG ARCH DOOR SCHEDULE EL 68'-0" |
| 24590-LAW-A5-A15T-05205001 | LAW VIT BLDG ARCH RM FINISH SCHED EL 68'-0" |
| 24590-LAW-A5-A10T-05305001 | LAW VIT BLDG ARCH SIGNAGE SCHED EL 68'-0" |
| 24590-WTP-A3-A10T-04300001 | WTP PROC BLDGS ARCH COM MTL PNL ROOFING DETS |
| 24590-WTP-A3-A10T-04300903 | WTP PROC BLDGS ARCH COM SINGLE PLY ROOFING DETS |
| 24590-LAW-S5-S15T-00004 | LAW VIT BLDG MAIN BLDG STRUCTURAL STEEL KEY PLAN @ ROOF 105 EL VARIES |
| 24590-LAW-S1-S15T-00050 | LAW VIT BLDG MAIN BLDG STAIR NO LS101 STAIR FRAMING PLANS |
| 24590-LAW-A3-A10T-04700905 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |
| 24590-LAW-A3-A10T-04720005 | LAW VIT BLDG ARCH MISCELLANEOUS DETAILS |
| 24590-WTP-A3-A10T-04500001 | WTP PROC BLDGS ARCH COM EXT SIDING DETAILS |

| REV | DESCRIPTION | ORIG | CHK | DRN | APVD | DATE |
|---|---|---|---|---|---|---|
| 5 | CHANGED REVS IN BLOCK, REMOVED REV NOTES | | | | | |
| 4 | CHANGED TOC ELEVATION, MODIFIED NOTE 5 | | | | | |
| 3 | MODIFIED ROOF HATCH SYSTEM UNDER STACK, REMOVED ROOF DRAIN PIPING, MODIFIED GUTTER SLOPE, ADDED (ELEC) SLEEVES IN PARAPET, ADDED DET | TAD | LRL | IMSR | BJM/JAR | 4-24-2006 |
| 2 | | | | | | |
| 1 | ISSUED FOR CONSTRUCTION | TAD | LRL | IMSR | LDK | 11-05-2005 |

Q

REVISION HISTORY

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No. DE-AC27-01RV14136

# LAW VITRIFICATION BUILDING
# ARCHITECTURAL
# ROOF PLAN EL 68'-0"
# ZONE 1

| | |
|---|---|
| PROJECT No. | 24590 |
| UNIT | TRMT/IDC |
| AREA | 200 |
| BUILDING No. | 2C |
| DESIGNATOR | R. STUBBLEFIELD 11-03-2005 |
| CHECKED | L.A. LAGOUDAKIS 11-04-2005 |
| APPROVED | L. ALESSE 11-04-2005 |
| REVISED PER | T. REYNOLDS 11-04-2005 |

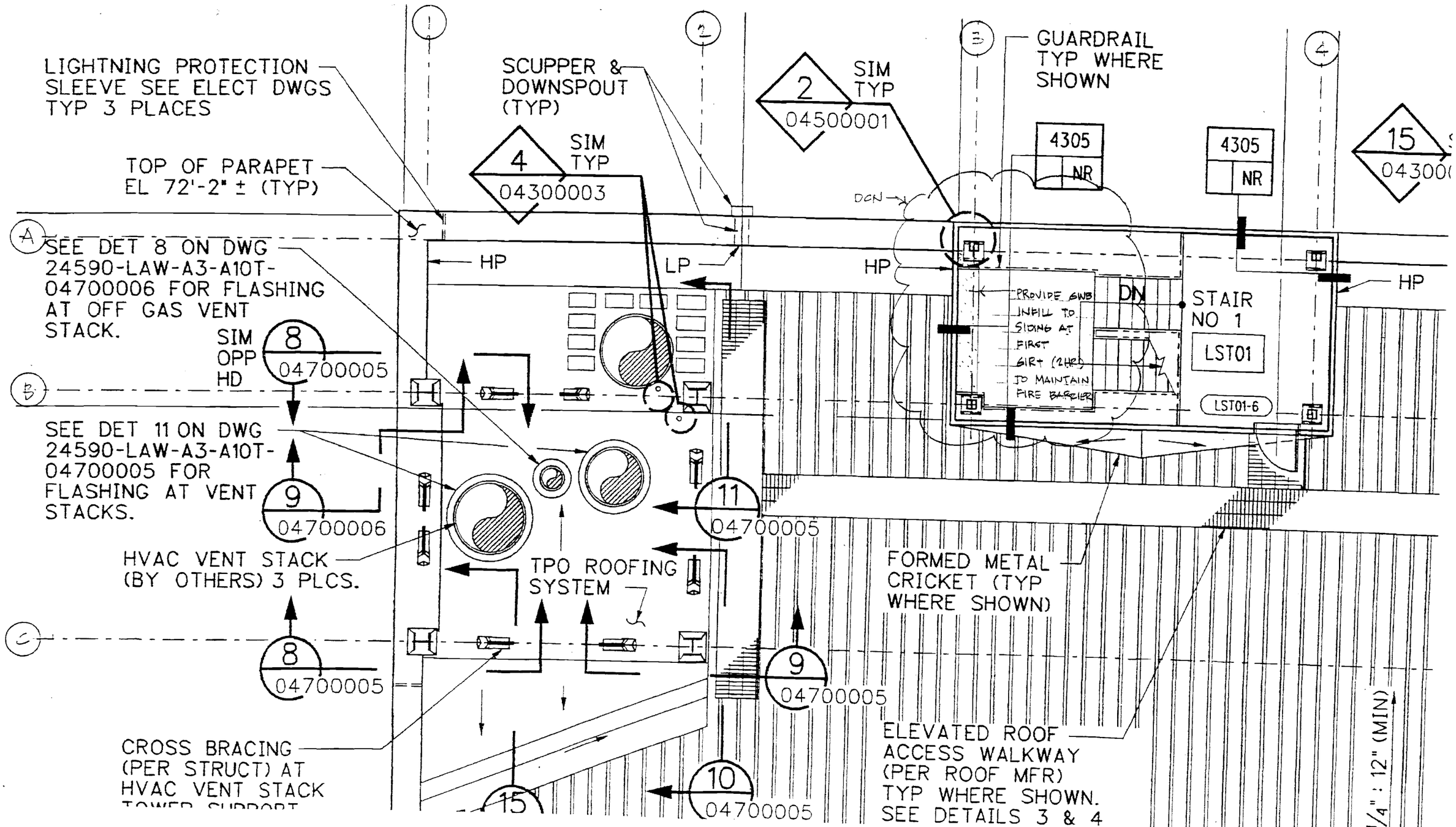
CONTENT APPLICABLE TO NCAW? YES NO
ADR No. 24590-WTP-ADR-PL-03-007 REV. 1
SAFETY SCREEN IS REQUIRED FOR DRAWING THAT IS NOTED IN 24590-WTP-OMA-ORS-00030

SCALE: 1/4"=1'-0" | 24590-LAW-A1-A10T-01205001 | REV 5

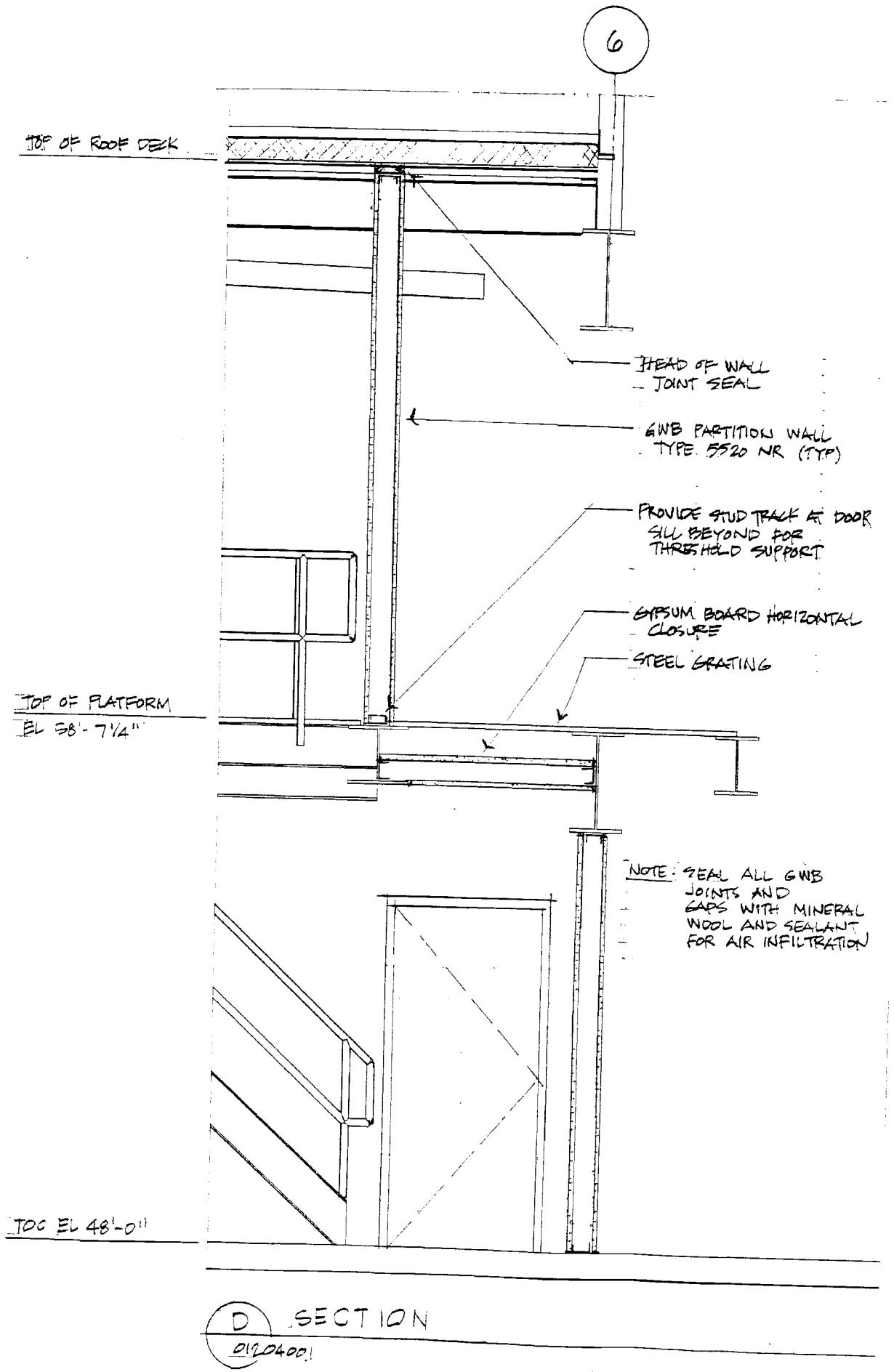
COMPUTER GENERATED - MANUAL CHANGES NOT PERMITTED

05/24/2006 01:25:47 PM

24590-LAW-AIN-A10T-00029
CURRENT REVISION
PAGE 15 OF 19



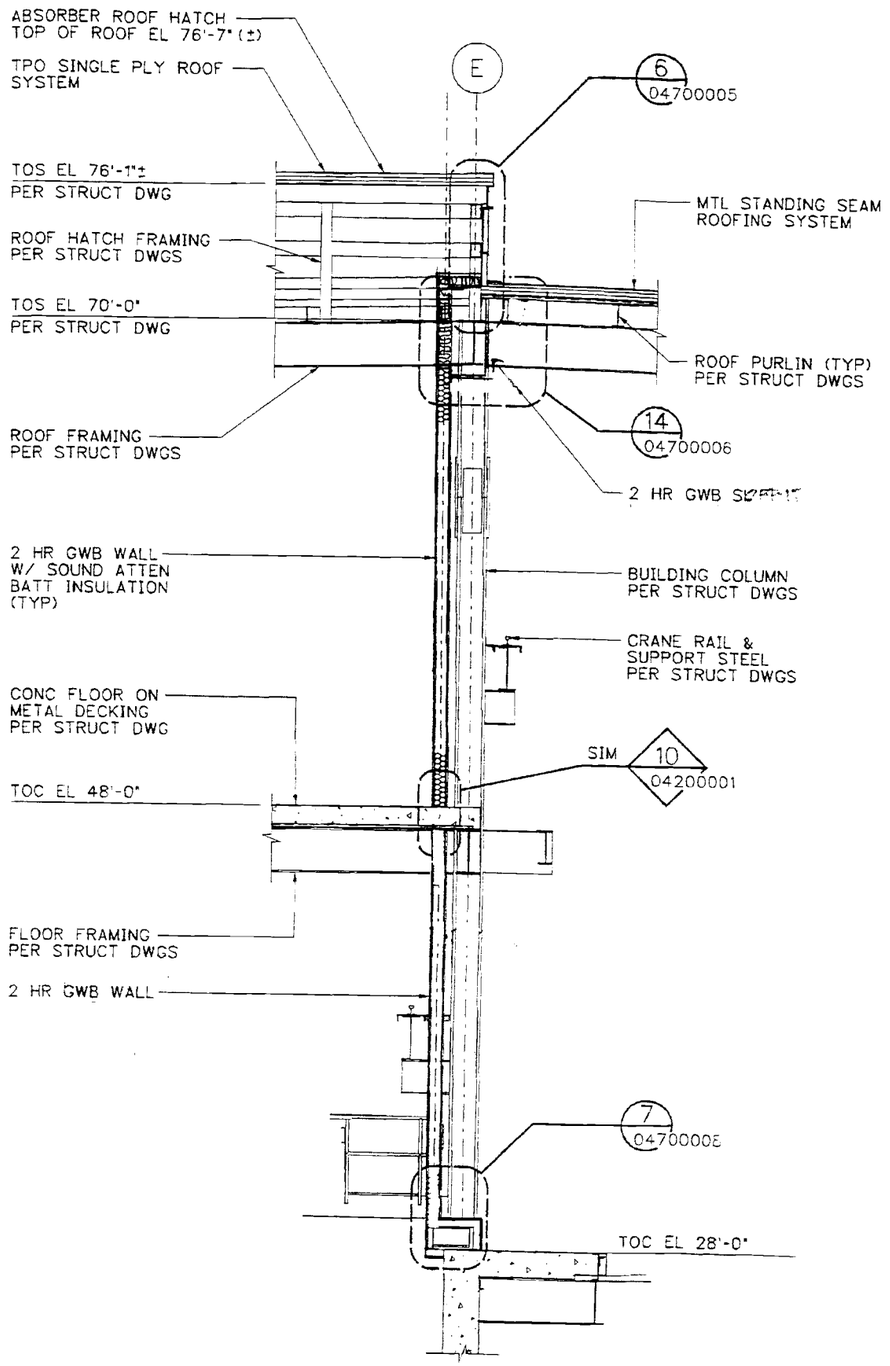

24590 - LAW - A1N - A1OT - 00029
PARTIAL FLOOR PLAN LAW EL +68 ZONE 1
(24590-LAW-A1-A1OT-01205001)
PAGE 16 OF 19




D SECTION
01/2"=1'-0"

24590-LAW-A2-A1DT-03200003
SECTION D

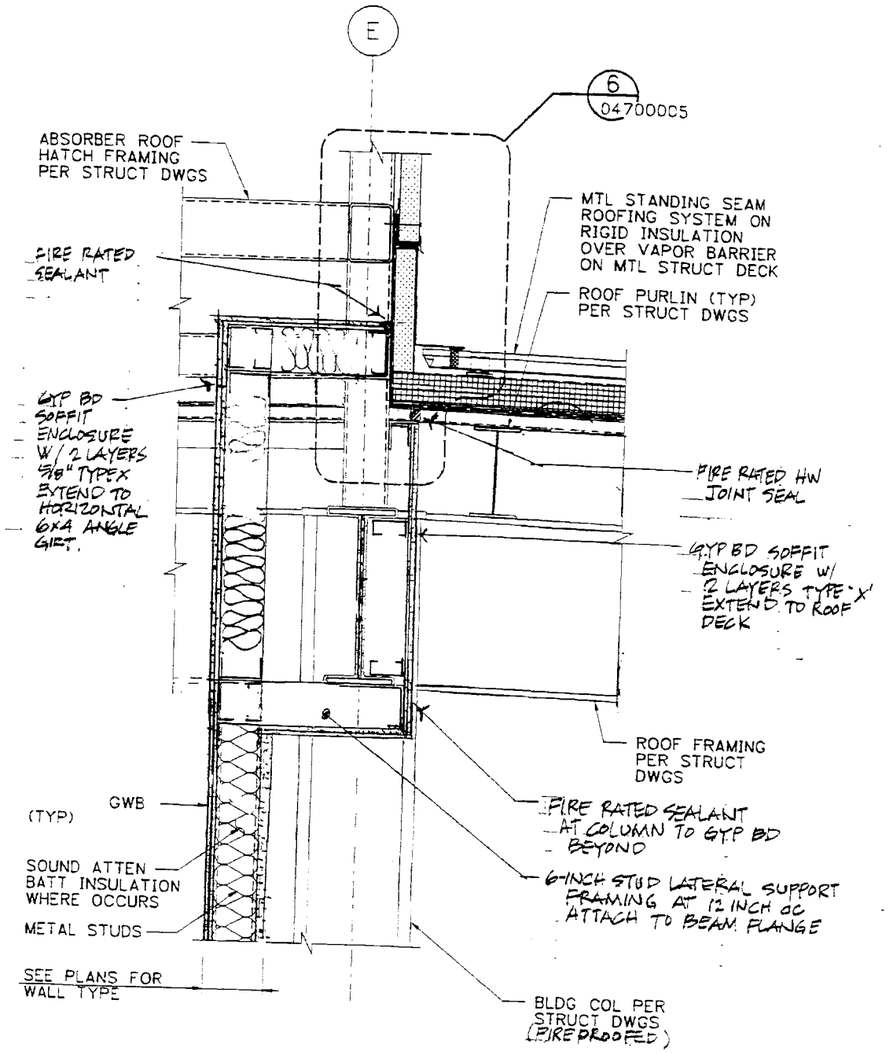
24590-LAW-AIN-A1DT-00029
NEW SECTION
PAGE 17 OF 19




A SECTION
SEE GENERAL NOTE 1

24590-LAW-A2-A1DT-03200004
SECTION A - REVISED

24590-LAW-AIN-A1DT-00029
REVISED SECTION
PAGE 18 OF 19




FIRE-RATED BARRIER AT ABSORBER ROOF HATCH

14 DETAIL

24590 - LAW - A3 - A1OT - 04700006
DETAIL K

24590 - LAW - AIN - A1OT - 00029
REVISED DETAIL
PAGE 19 OF 19

# Drawing Change Notice



R10759374

CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00032

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | REVISE DOOR SWING FOR +48FT GENERAL ARRANGEMENT, ROOM LST01 |

ISSUED BY
RPP-WTP PDC

| DESIGN DOCUMENT NUMBER | REV NO | TITLE OF DESIGN DOCUMENT |
|---|---|---|
| 24590-LAW-P1-P01T-00005 | 3 | LAW VITRIFICATION BUILDING<br>GENERAL ARRANGEMENT<br>PLAN AT EL. 48'-0" |

PART OF DESIGN CHANGE PACKAGE (DCP)? ☒ No ☐ Yes DCP No.: Rev:

| JUSTIFICATION FOR CHANGE | TREND CODE-NUMBER |
|---|---|
| WHEN REVISING DOOR LOCATION DUE TO STRUCTURAL INTERFERENCE, DOOR WAS SHOWN WITH THE SWING IN THE WRONG DIRECTION FOR EGRESS REQUIREMENTS. | N/A |

Supersedes Change Document ☒ No ☐ Yes

## REQUIREMENTS REVIEW

| | | | |
|---|---|---|---|
| Client Approval Required * | ☐ Yes ☒ No | Permit Review by E&NS Required | ☐ Yes ☒ No |
| Interface Resolution Required * | ☐ Yes ☒ No | Safety Screening / Evaluation Required<br>Documents identified in 24590-WTP-GPP-SREG-002 must be checked "Yes" regardless of the change being made, and E&NS signature is required below. | ☒ Yes ☐ No |
| * Address these "yes" answers in the description | | | |

DESCRIPTION OF CHANGE

REVISE DOOR SWING IN LST01

SEE ATTACHMENTS FOR CHANGES REQUIRED.

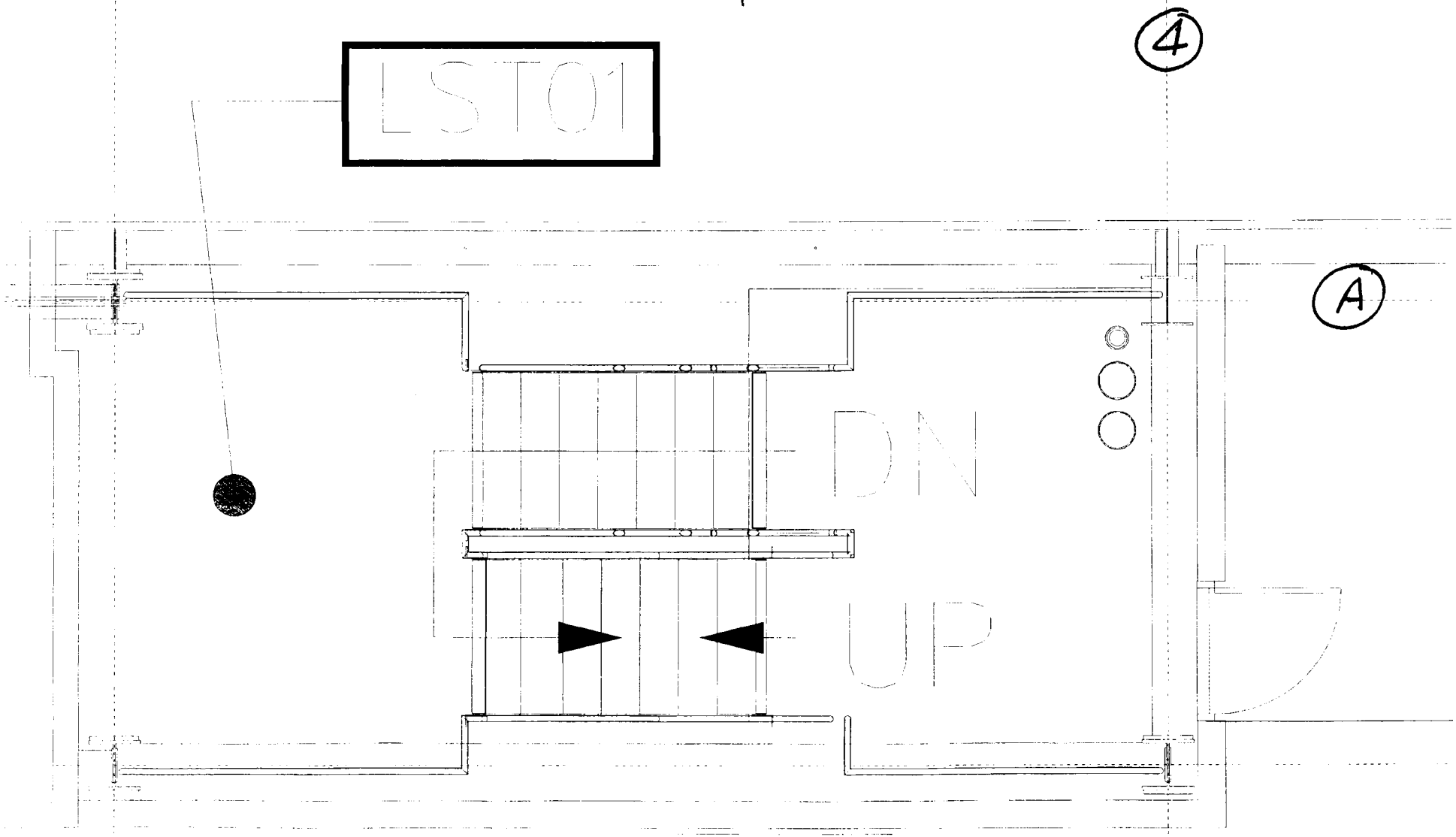
Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

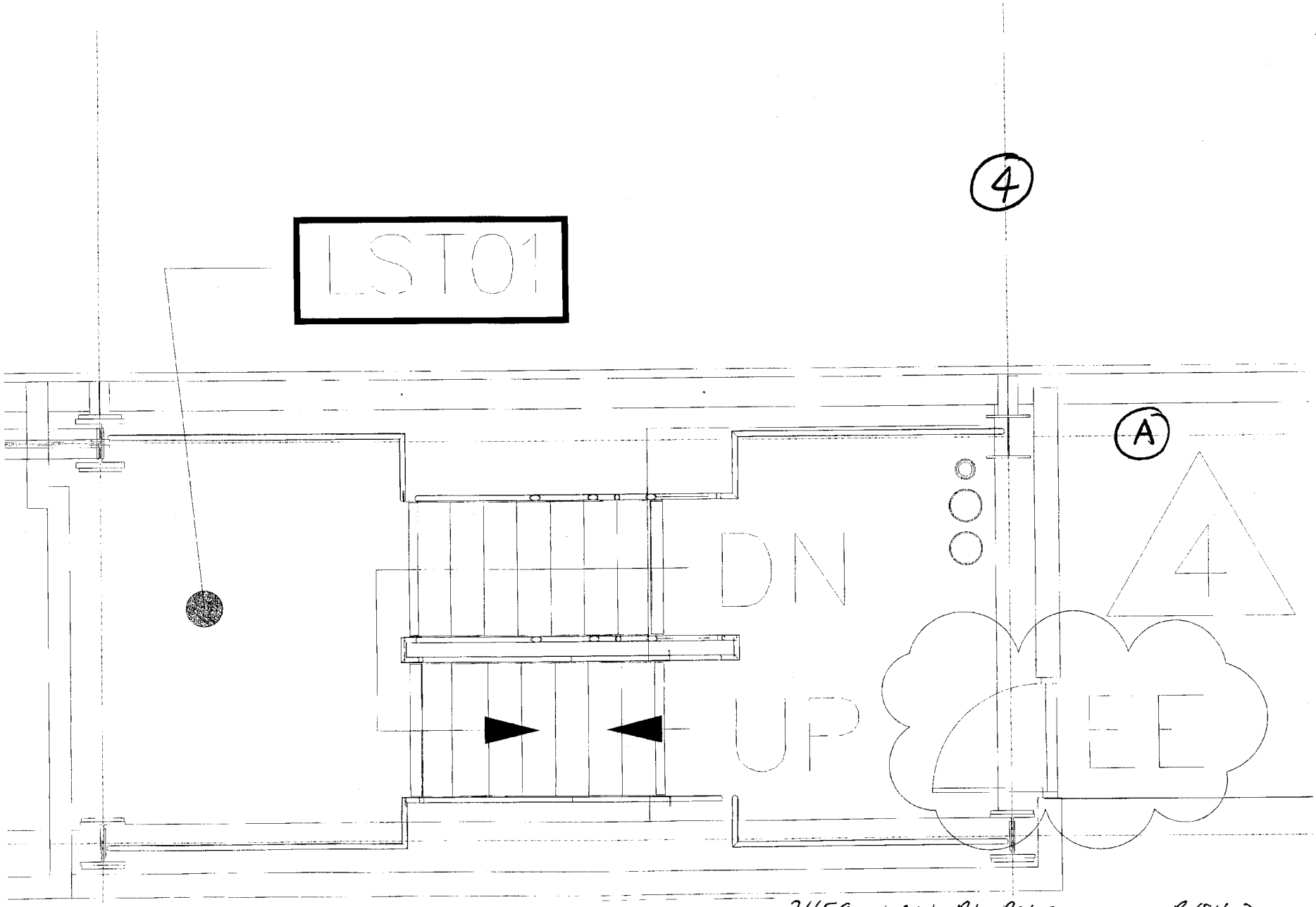
| ORIGINATOR | CHECKER | REVIEWER |
|---|---|---|
| Jim E. Hawkins | K. Eichler | |

| QA (when applicable) | E&NS (when applicable) | APPROVER(S) | APPROVAL DATE |
|---|---|---|---|
| N/A | Dwight Hendrickson | | 03/6/07 |

24590-LAW-PI-POIT-00005 REV.3
24590-LAW-PIN-POIT-00032
Sheet 2 of 3

# Current Layout






NEW LAYOUT

24590-LAW-PI-POIT-00005 REV. 3
24590-LAW-PIN-POIT-00032

# Drawing Change Notice



R10802467

CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00033

| JOB NO. | TITLE FOR CHANGE NOTICE | ISSUED BY |
|---|---|---|
| 24590 | REVISE PLATFORM CALL OUT FOR +48FT GENERAL ARRANGEMENT PLAN | RPP-WTP PDC |

| DESIGN DOCUMENT NUMBER | REV NO | TITLE OF DESIGN DOCUMENT |
|---|---|---|
| 24590-LAW-P1-P01T-00005 | 3 | LAW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN AT EL. 48'-0" |

PART OF DESIGN CHANGE PACKAGE (DCP)? ☒ No ☐ Yes DCP No.: Rev:

| JUSTIFICATION FOR CHANGE | TREND CODE-NUMBER |
|---|---|
| ARCHITECTURAL IDENTIFIED THIS INCORRECT PLATFORM DESIGNATION THAT DID NOT FOLLOW THE ESTABLISHED DESIGN GUIDE FOR ROOM LABELS. | N/A |

Supersedes Change Document ☒ No ☐ Yes

## REQUIREMENTS REVIEW

| | | | |
|---|---|---|---|
| Client Approval Required * | ☐ Yes ☒ No | Permit Review by E&NS Required | ☐ Yes ☒ No |
| Interface Resolution Required * | ☐ Yes ☒ No | Safety Screening / Evaluation Required Documents identified in 24590-WTP-GPP-SREG-002 must be checked "Yes" regardless of the change being made, and E&NS signature is required below. | ☒ Yes ☐ No |
| * Address these "yes" answers in the description | | | |

DESCRIPTION OF CHANGE

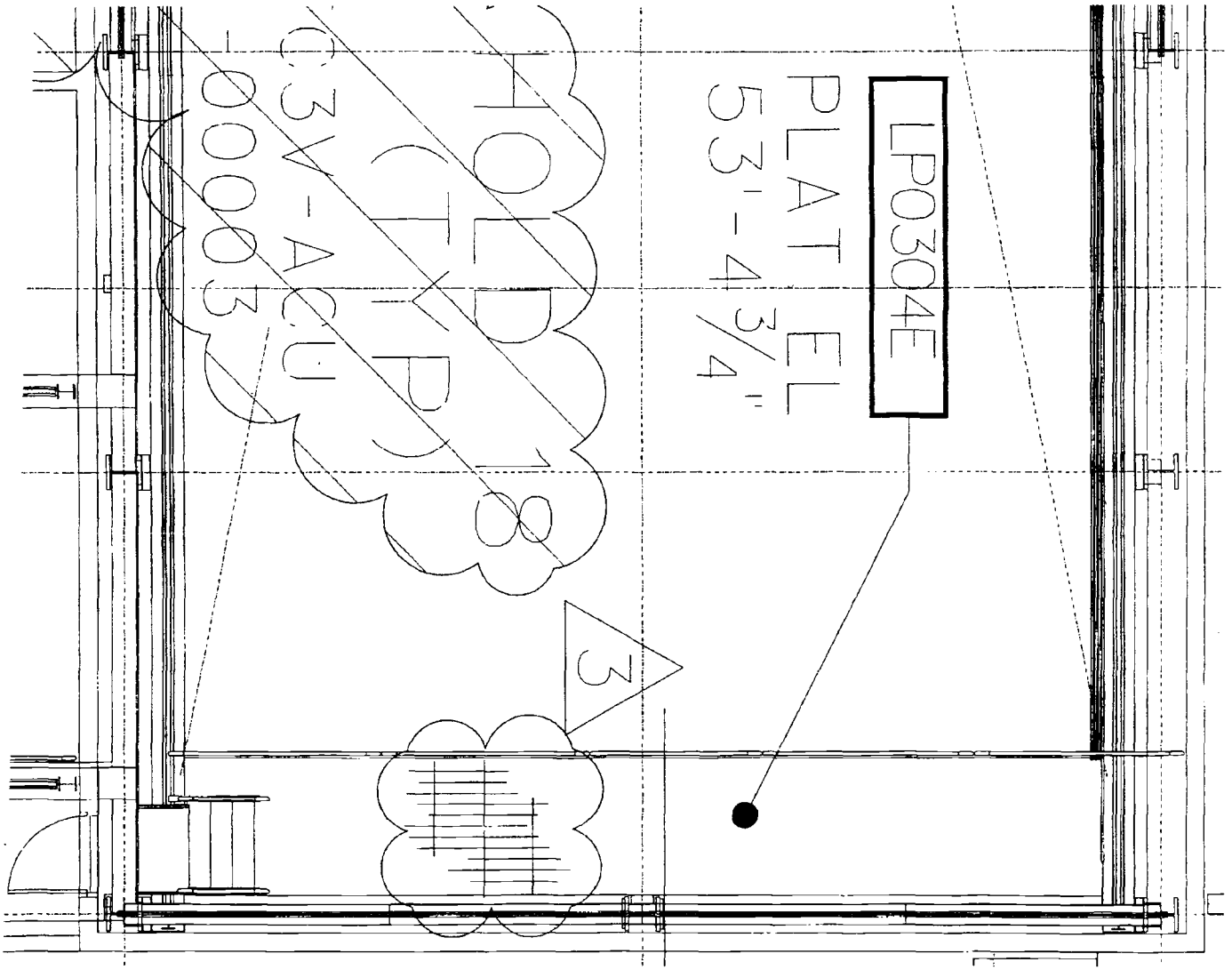
REVISE PLATFORM CALL OUT FROM LP0304E TO LP0304A AND REVISE PLATFORM/HANDRAIL LAYOUT.

SEE ATTACHMENTS FOR CHANGES REQUIRED.

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

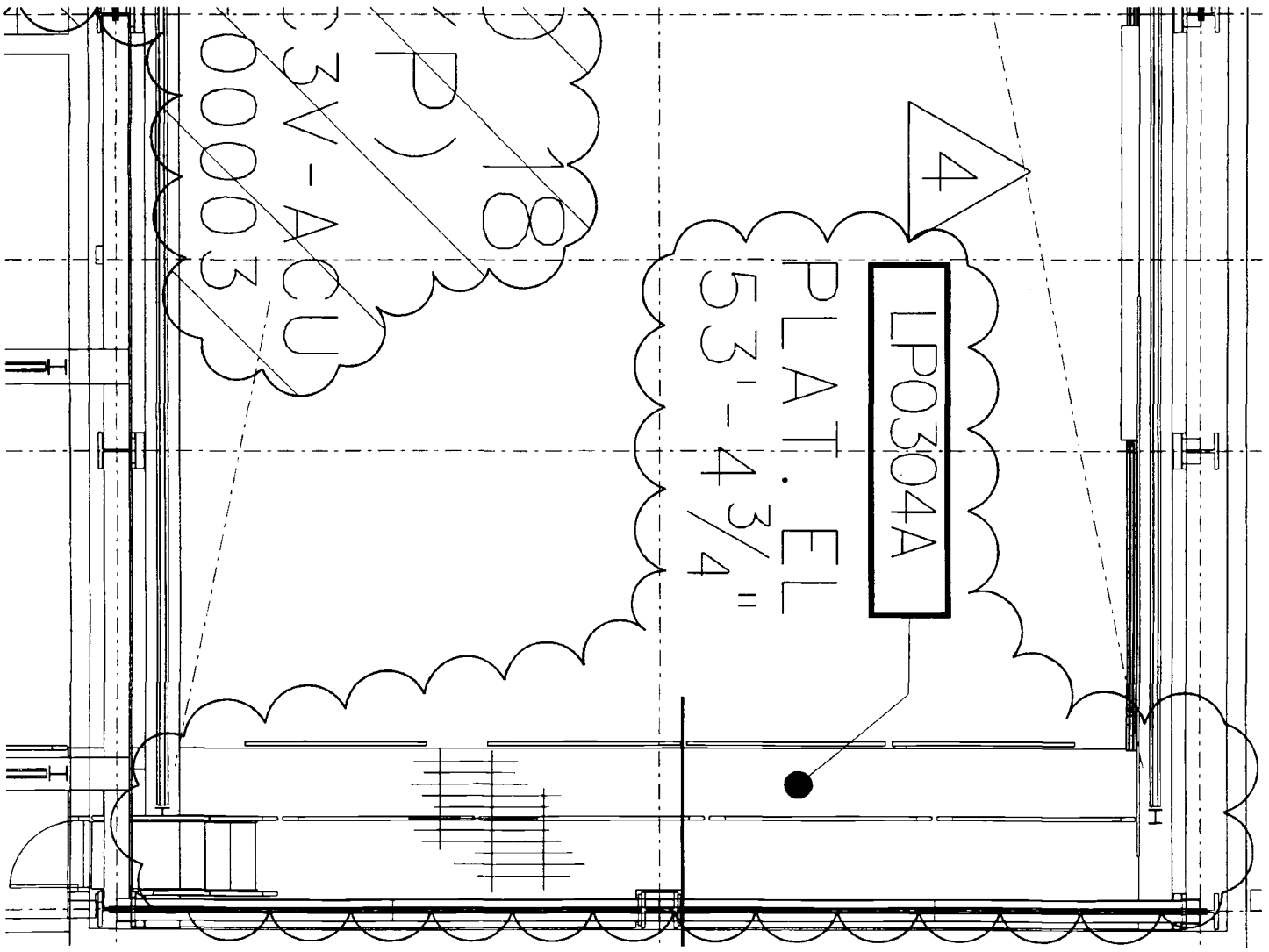
| ORIGINATOR | CHECKER | REVIEWER |
|---|---|---|
| | | |

| QA (when applicable) | E&NS (when applicable) | APPROVER(S) | APPROVAL DATE |
|---|---|---|---|
| N/A | | | 07/03/07 |




Current Layout

24590-LAW-P1-P01T- 00005 Rev3
24590-LAW-PIN-P01T-00033




NEW
LAYOUT

24590-LAW-PI-PO1T-00005 REV.3

24590-LAW-PIN-PO1T-00033

SHEET 3 of 3

R10848053

# Drawing Change Notice

Page 1 of 3

CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00037

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | UPDATE HEPA FILTERS IN ROOM L-0319A |

| DESIGN DOCUMENT NUMBER | REV NO | TITLE OF DESIGN DOCUMENT | |
|---|---|---|---|
| 24590-LAW-P1-P01T-00005 | 3 | LAW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN AT EL. 48'-0" | ISSUED BY RPP-WTP PDC |

PART OF DESIGN CHANGE PACKAGE (DCP)? ☒ No ☐ Yes DCP No.: Rev:

| JUSTIFICATION FOR CHANGE | TREND CODE-NUMBER |
|---|---|
| ADDITIONAL HEPA FILTER ADDED TO ROOM L-0319A TO SUPPORT CURRENT HVAC DESIGN CONDITIONS | TN-24590-06-02606 |

Supersedes Change Document ☒ No ☐ Yes

## REQUIREMENTS REVIEW

| | | | |
|---|---|---|---|
| Client Approval Required * | ☐ Yes ☒ No | Permit Review by E&NS Required | ☒ Yes ☐ No |
| Interface Resolution Required * | ☐ Yes ☒ No | Safety Screening / Evaluation Required Documents identified in 24590-WTP-GPP-SREG-002 must be checked "Yes" regardless of the change being made, and E&NS signature is required below. | ☒ Yes ☐ No |
| * Address these "yes" answers in the description | | | |

DESCRIPTION OF CHANGE

ADDED ADDITIONAL C3V HEPA FILTER C3V-HEPA-00004G (POINT OF SUPPORT AT 48'-1") TO ROOM L-0319A. RELOCATED C3V-HEPA-00004 A THRU F TO MINIMIZE DUCT REWORK AND PROVIDE SPACE NEAR ACCESS DOOR FOR FUTURE FILTER INSTALLATION.

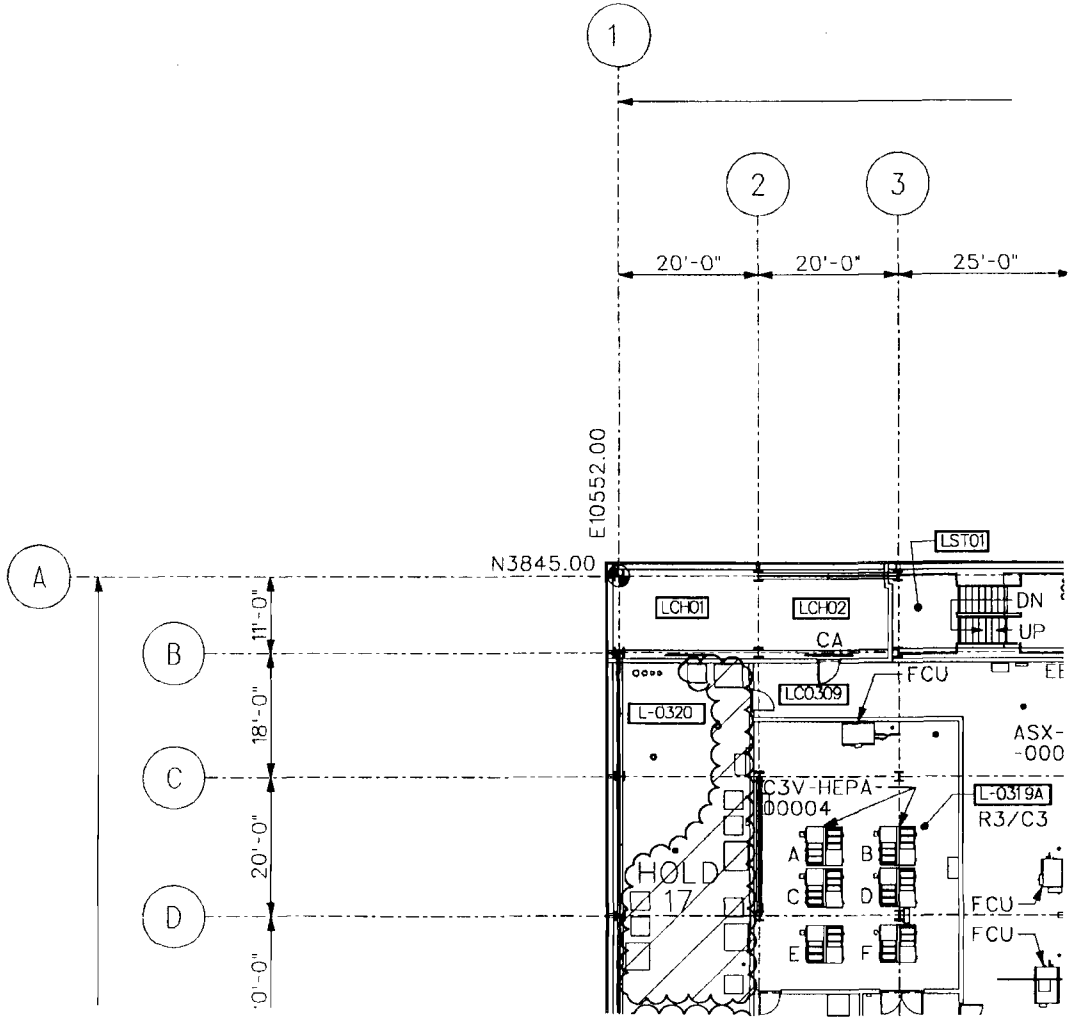
Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

| ORIGINATOR | CHECKER | REVIEWER |
|---|---|---|
| Tim Hawkins | Craig Salerno | Jim McGrath |

| QA (when applicable) | E&NS (when applicable) | APPROVER(S) | APPROVAL DATE |
|---|---|---|---|
| N/A | | | 12/18/07 |

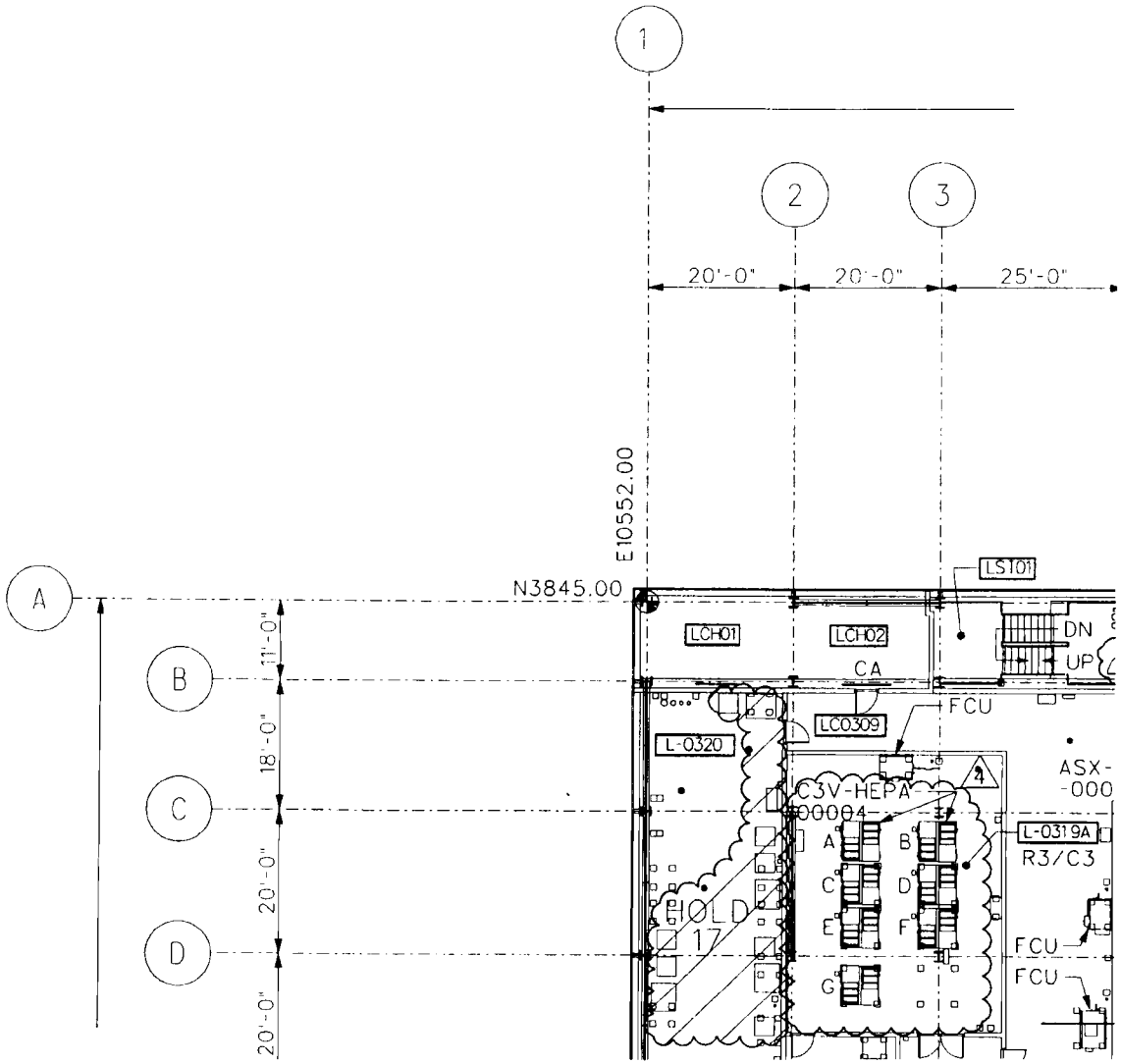
GENERAL ARRANGEMENT
PLAN AT EL. 48'-0"
24590-LAW-P1-P01T-00005 REV 3
CURRENT LAYOUT





GENERAL ARRANGEMENT
PLAN AT EL. 48'-0"
24590-LAW-P1-P01T-00005 REV 3
NEW LAYOUT

24590-LAW-P1N-P01T-00037
SHEET 3 OF 3



# Drawing Change Notice



CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00049

| JOB NO. | TITLE FOR CHANGE NOTICE | ISSUED BY |
|---|---|---|
| 24590 | RELOCATE GYPSUM BOARD WALL ON 48FT | ~~RPP-WTP PDC~~ |

R10923269

| DESIGN DOCUMENT NUMBER | REV NO | TITLE OF DESIGN DOCUMENT |
|---|---|---|
| 24590-LAW-P1-P01T-00005 | 3 | LAW VITRIFICATION BUILDING<br>GENERAL ARRANGEMENT<br>PLAN AT EL. 48'-0" |

PART OF DESIGN CHANGE PACKAGE (DCP)? ☒ No ☐ Yes DCP No.: Rev:

| JUSTIFICATION FOR CHANGE | TREND CODE-NUMBER |
|---|---|
| The gypsum board wall at it present location cannot be constructed - it is located over the shaft area which has no floor system to build from. | |

Supersedes Change Document ☒ No ☐ Yes

## REQUIREMENTS REVIEW

| | | | |
|---|---|---|---|
| Client Approval Required * | ☐ Yes ☒ No | Permit Review by E&NS Required | ☐ Yes ☒ No |
| Interface Resolution Required * | ☐ Yes ☒ No | Safety Screening / Evaluation Required<br>Documents identified in 24590-WTP-GPP-SREG-002 must be checked "Yes" regardless of the change being made, and E&NS signature is required below. | ☒ Yes ☐ No |
| * Address these "yes" answers in the description | | | |

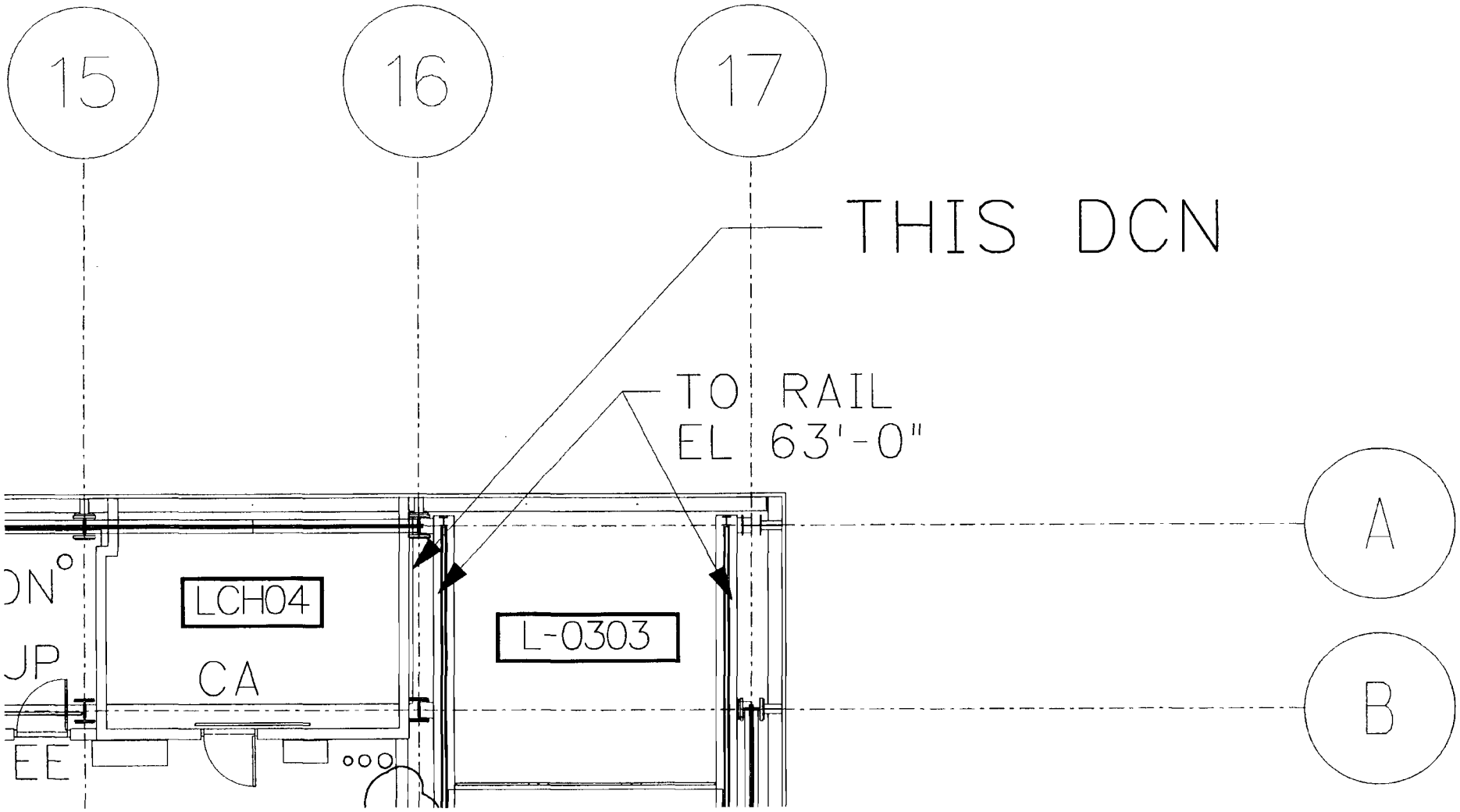
DESCRIPTION OF CHANGE

Relocate existing gypsum board wall west of column line 16 to the new location as indicated in the attached sketches.

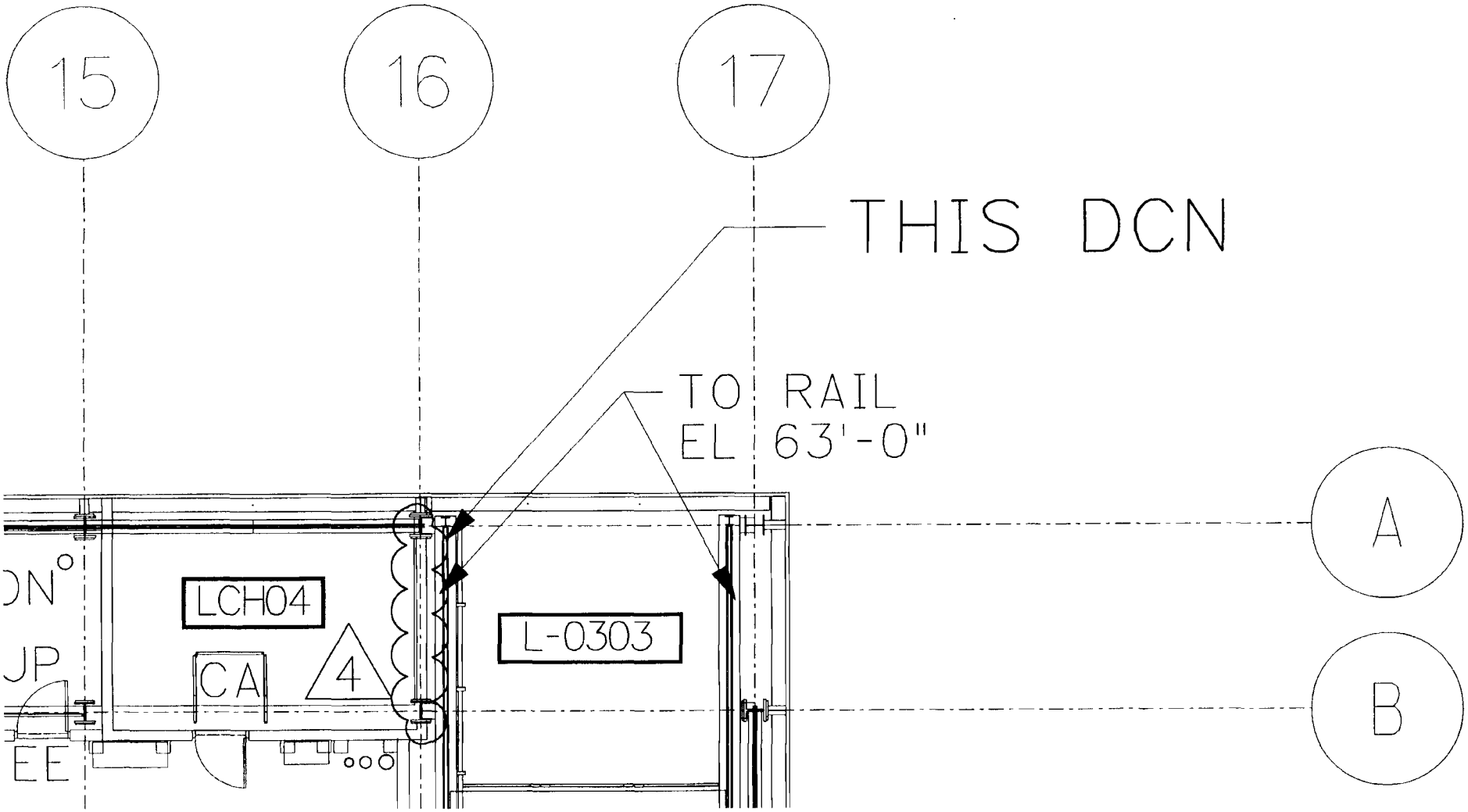
Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

| ORIGINATOR | CHECKER | REVIEWER |
|---|---|---|
| TIM HAWKINS<br>Tim Hawkins | CRAIG SALERNO<br>TH 6/11/08<br>Craig M Salerno | ~~JIM MCGRATH~~ Keith Huber |

| QA (when applicable) | E&NS (when applicable) | APPROVER(S) | APPROVAL DATE |
|---|---|---|---|
| N/A | Dwight Krahn<br>Dwight Krahn | | 6/11/08 |




LAW VITRIFICATION BUILDING
GENERAL ARRANGEMENT
PLAN AT EL. 48'-0"
24590-LAW-P1-P01T-00005 REV 3
CURRENT LAYOUT




LAW VITRIFICATION BUILDING
GENERAL ARRANGEMENT
PLAN AT EL. 48'-0"
24590-LAW-P1-P01T-00005 REV 3
NEW LAYOUT

24590-LAW-P1N-P01T-00049
SHEET 3 OF 3

ISSUED BY
RPP-WTP PDC

# Drawing Change Notice



R10951977

CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00050

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | RADIATION/ CONTAMINATION CLASSIFICATION CHANGES |

| DESIGN DOCUMENT NUMBER | REV NO | TITLE OF DESIGN DOCUMENT |
|---|---|---|
| 24590-LAW-P1-P01T-00001 | 2 | LAW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN @ EL. (-) 21'-0" |
| 24590-LAW-P1-P01T-00002 | 5 | LAW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN @ EL. 3'-0" |
| 24590-LAW-P1-P01T-00004 | 3 | LAW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN @ EL. 28'-0" |
| 24590-LAW-P1-P01T-00005 | 3 | LAW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN @ EL. 48'-0" |

PART OF DESIGN CHANGE PACKAGE (DCP)? ☐ Yes ☒ No DCP No.: Rev:

JUSTIFICATION FOR CHANGE
RECOMMENDATIONS IN MANAGEMENT ASSESMENT 24590-LAW-MAR-ENS-07-0001

TREND CODE-NUMBER
N/A

Supersedes Change Document ☒ Yes ☐ No Document # 24590-LAW-P1N-P01T-00039, 24590-LAW-P1N-P01T-00040, 24590-LAW-P1N-P01T-00041, 24590-LAW-P1N-P01T-00042

ECN Needed ☐ Yes ☒ No

**REQUIREMENTS REVIEW**

| | | | |
|---|---|---|---|
| Client Approval Required * | ☐ Yes ☒ No | Permit Review by E&NS Required | ☐ Yes ☒ No |
| Interface Resolution Required * | ☐ Yes ☒ No | Safety Screening / Evaluation Required Documents identified in 24590-WTP-GPP-SREG-002 must be checked "Yes" regardless of the change being made, and E&NS signature is required below. | ☒ Yes ☐ No |
| * Address these "yes" answers in the description | | | |

DESCRIPTION OF CHANGE

ADD THE FOLLOWING NOTE TO DESIGN DOCUMENTS:

"FOR OPERATIONAL REVISIONS TO RADIATION/ CONTAMINATION CLASSIFICATIONS, REFER TO RECOMMENDATIONS CITED IN MANAGEMENT ASSESSMENT REPORT 24590-LAW-MAR-ENS-07-0001"

ORIGINATOR C. SALERNO Craig M. Salerno

CHECKER T. McGEE T. M. G.

**Reviews**

PD - K. HUBER

**Approval(s) and Date**

| PD - J. CLINTON | APEM-LBL - R. HANSON | | |
|---|---|---|---|
| 7.29.08 | 7/30/08 | | |

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# Drawing Change Notice



ISSUED BY RPP-WTP PDC

CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00053

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | ADDITION OF ASX PLATFORM LP0301 |

R10981383

| DESIGN DOCUMENT NUMBER | REV NO | TITLE OF DESIGN DOCUMENT |
|---|---|---|
| 24590-LAW-P1-P01T-00005 | 3 | LAW VITRIFICATION BUILDING<br>GENERAL ARRANGEMENT<br>PLAN AT EL. 48'-0" |

PART OF DESIGN CHANGE PACKAGE (DCP)? ☐ Yes ☒ No DCP No.: Rev:

| JUSTIFICATION FOR CHANGE | TREND CODE-NUMBER |
|---|---|
| ADD PLATFORM LP0301, DOOR AND MECHANICAL SYSTEMS EQUIPMENT | N/A |

Supersedes Change Document ☐ Yes ☒ No

ECN Needed ☐ Yes ☒ No

**REQUIREMENTS REVIEW**

| | | | |
|---|---|---|---|
| Client Approval Required * | ☐ Yes ☒ No | Permit Review by E&NS Required | ☐ Yes ☒ No |
| Interface Resolution Required * | ☐ Yes ☒ No | Safety Screening / Evaluation Required<br>Documents identified in 24590-WTP-GPP-SREG-002 must be checked "Yes" regardless of the change being made, and E&NS signature is required below. | ☒ Yes ☐ No |
| * Address these "yes" answers in the description | | | |

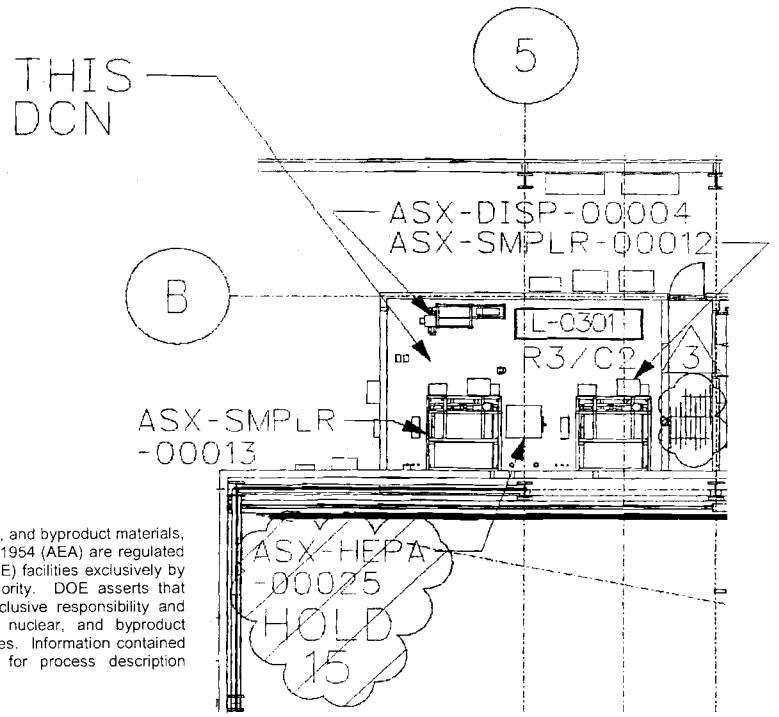
DESCRIPTION OF CHANGE

ADD PLATFORM LP0301, DOOR, ASX-HEPA-00040 AND ASX-PMP-00006/7. REMOVE HOLD 15.

THE FOLLOWING EQUIPMENT ASX-SMPLR-00012, ASX-SMPLR-00013 AND ASX-DISP-00004 WILL BE LOCATED BELOW PLATFORM LP0301 IN ROOM L-0301 AND WILL BE SHOWN ON PARTIAL PLAN. ASX-SMPLR-00012 AND ASX-SMPLR-00013 HAVE BEEN REVISED TO MATCH CURRENT VENDOR DATA.

**BEFORE:**

**24590-LAW-P1-P01T-00005 REV 3**




Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# Drawing Change Notice

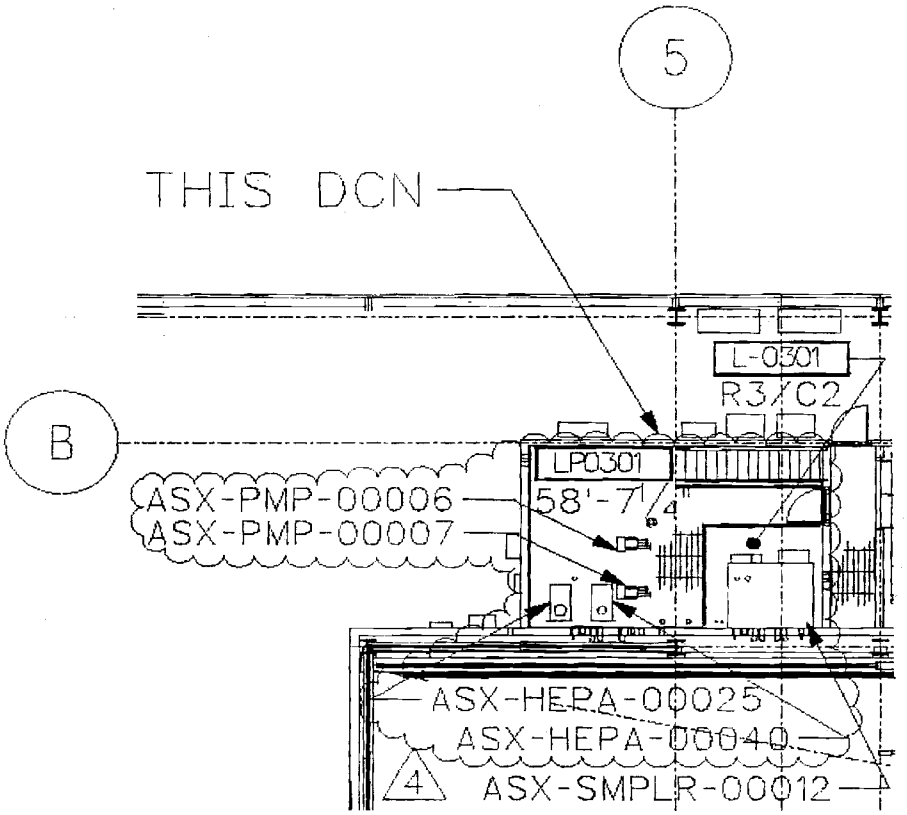
CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00053

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | ADDITION OF ASX PLATFORM LP0301 |

DESCRIPTION OF CHANGE

**AFTER:**

**24590-LAW-P1-P01T-00005 REV 3**



# Drawing Change Notice



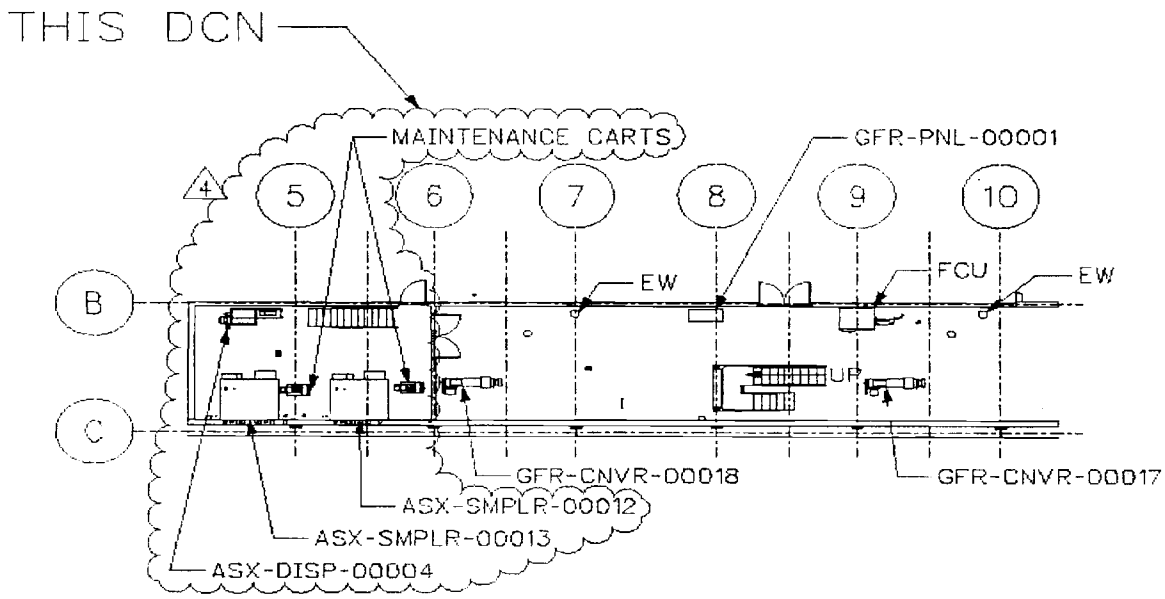
CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00053

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | ADDITION OF ASX PLATFORM LP0301 |

DESCRIPTION OF CHANGE

**AFTER:**

**24590-LAW-P1-P01T-00005 REV 3 (PARTIAL PLAN)**




PARTIAL PLAN AT EL 48'-0"

| ORIGINATOR | CHECKER |
|---|---|
| TIM HAWKINS | CRAIG SALERNO |

**Reviews**

| E&NS - | PD - KEITH HUBER | | | | |
|---|---|---|---|---|---|
| Dwight Krahn | | | | | |

**Approval(s) and Date**

| PD - JACK CLINTON | APEM-LBL - BOB HANSON | | |
|---|---|---|---|
| 10/29/08 | 10/30/08 | | |

# Drawing Change Notice



CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00054

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | ADD ROOM NAME REFERENCE NOTE |

ISSUED BY
GPP-WTP PDC

R10981501

| DESIGN DOCUMENT NUMBER | REV NO | TITLE OF DESIGN DOCUMENT |
|---|---|---|
| 24590-LAW-P1-P01T-00002 | 5 | LAW VITRIFICATION BLDG GENERAL ARRANGEMENT PLAN EL. 3'-0" |
| 24590-LAW-P1-P01T-00003 | 4 | LAW VITRIFICATION BLDG GENERAL ARRANGEMENT PLAN EL. 22'-0" |
| 24590-LAW-P1-P01T-00004 | 3 | LAW VITRIFICATION BLDG GENERAL ARRANGEMENT PLAN EL. 28'-0" |
| 24590-LAW-P1-P01T-00005 | 3 | LAW VITRIFICATION BLDG GENERAL ARRANGEMENT PLAN EL. 48'-0" |
| 24590-LAW-P1-P01T-00006 | 1 | LAW VITRIFICATION BLDG GENERAL ARRANGEMENT PLAN EL. 68'-0" |

PART OF DESIGN CHANGE PACKAGE (DCP)? ☐ Yes ☒ No DCP No.: Rev:

JUSTIFICATION FOR CHANGE
UPDATE THE LAW GAs TO REFERENCE ARCHITECTURAL DRAWINGS FOR ROOM NAMES PER 24590-WTP-PIER-MGT-07-1953-REV 0, ACTION 9

TREND CODE-NUMBER
N/A

Supersedes Change Document ☐ Yes ☒ No

ECN Needed ☐ Yes ☒ No

**REQUIREMENTS REVIEW**

| | | | |
|---|---|---|---|
| Client Approval Required * | ☐ Yes ☒ No | Permit Review by E&NS Required | ☒ Yes ☐ No |
| Interface Resolution Required * | ☐ Yes ☒ No | Safety Screening / Evaluation Required Documents identified in 24590-WTP-GPP-SREG-002 must be checked "Yes" regardless of the change being made, and E&NS signature is required below. | ☒ Yes ☐ No |
| * Address these "yes" answers in the description | | | |

DESCRIPTION OF CHANGE

ADD THE FOLLOWING NOTE TO THE ABOVE LISTED GENERAL ARRANGEMENT DRAWINGS:

"Rooms are officially identified by room numbers only. Room numbers are established and controlled on General Arrangement drawings. Only room numbers are needed to identify rooms on engineering discipline documents. While room numbers are controlled, the most common name of rooms associated with each room number are shown for reference only on Architectural Floor Plans."

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

| ORIGINATOR | CHECKER |
|---|---|
| TIM HAWKINS Tim Hawkins | CRAIG SALERNO Craig H. Salerno |

**Reviews**

| E&NS - Dwight Kath | PD - KEITH HUBER | | |
|---|---|---|---|
| Dwight Kath | | | |

**Approval(s) and Date**

| PD - JACK CLINTON | APEM-LBL - BOB HANSON | | |
|---|---|---|---|
| JR Clinton 10/30/08 | Rick Schuetz FOR BOB HANSON | | |

ISSUED BY
RPP-WTP POC

R11167899

# Drawing Change Notice



CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00057

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | REVISION TO LAW UPS BATTERY ROOM LAYOUT |

| DESIGN DOCUMENT NUMBER | REV | DESIGN DOCUMENT NUMBER | REV |
|---|---|---|---|
| 24590-LAW-P1-P01T-00004 | 4 | | |
| 24590-LAW-P1-P01T-00005 | 3 | | |

PART OF DESIGN CHANGE PACKAGE (DCP)? ☐ Yes ☒ No DCP No.: Rev:

| JUSTIFICATION FOR CHANGE | CAUSE CODE |
|---|---|
| INCORPORATE VENDOR DATA FOR SS ACU TO COMPLETE ACTIONS IN 24590-WTP-RITS-QAIS-06-0792. INCORPORATE UPDATED SELLER DESIGN REQUIREMENTS AND ALIGN DESIGN DOCUMENTS. | 31 |

Supersedes Change Document ☐ Yes ☒ No

ECN Needed ☐ Yes ☒ No

**REQUIREMENTS REVIEW**

Client Approval Required ☐ Yes ☒ No Interface Resolution Required * ☐ Yes ☒ No

*Address any "yes" answers in the description*

DESCRIPTION OF CHANGE

**NOTES**

1. **REFER TO 24590-LAW-P1N-P23T-00058 FOR ADDITIONAL DETAILS AND CALLOUTS**
2. **LABELS FOR MINOR ELECTRICAL AND C&I COMPONENTS (PANELS, TRANSFORMERS, RACKS, AND ENCLOSURES) HAVE BEEN OMITTED FOR CLARITY. REFER TO APPROPRIATE EQUIPMENT LOCATION PLAN FOR LABEL INFORMATION.**

**L-0313 (SEE PAGE 4)**

1. **REMOVED HOLD CLOUD 14 FOR C2V-ACU-00003**
2. **REVISED SIZE OF C2V-ACU-00003**
3. **REVISED SIZES OF UPE-BATT-20301 AND UPE-UPS-20301**
4. **RELOCATED UPE-XFMR-20350, UPE-PNL-20350, LVP-PNL-20322, LVP-XFMR-20322 FROM CORRIDOR LC0310 (NOTE 1)**
5. **ADDED SS HVAC CONTROL PANELS C2V-PNL-00116 AND C3V-PNL-00015 (NOTE 1)**
6. **DELETED SECTION OF UPE-BATT-20301 AT COLUMN 4**
7. **ADDED BATTERY RACK DISCONNECT SWITCH UPE-SW-20301 (NOTE 1)**

**LC0310 (SEE PAGE 4)**

1. **REMOVED HOLD CLOUD 14 FOR C2V-COND-00003**
2. **RELOCATED C2V-COND-00003 TO EXTERIOR PLATFORM. (PAGE 5)**
3. **DELETED LVE-ENCL-000023 TO ALIGN WITH C&I DESIGN DOCUMENTS (NOTE 1)**
4. **RELOCATED UPE-XFMR-20350, UPE-PNL-20350, LVP-PNL-20322, LVP-XFMR-20322 TO L-0313 (NOTE 1)**

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | REVISION TO LAW UPS BATTERY ROOM LAYOUT |

DESCRIPTION OF CHANGE

L-0311 (SEE PAGE 4)

1. REMOVED HOLD CLOUD 14 FOR C2V-ACU-00002
2. REVISED SIZE OF C2V-ACU-00002
3. REVISED SIZES OF UPE-BATT-20302 AND UPE-UPS-20302
4. RELOCATED UPE-XFMR-20351, UPE-PNL-20351 FROM CORRIDOR LC0306 (NOTE 1)
5. ADDED SS HVAC CONTROL PANELS C2V-PNL-00115 AND C3V-PNL-00014 (NOTE 1)
6. DELETED SECTION OF UPE-BATT-20302 AT COLUMN 9
7. ADDED BATTERY RACK DISCONNECT SWITCH UPE-SW-20302 (NOTE 1)

LC0306 (SEE PAGE 4)

1. REMOVED HOLD CLOUD 14 FOR C2V-COND-00002
2. RELOCATED C2V-COND-00002 TO EXTERIOR PLATFORM. (PAGE 5)
3. RELOCATED UPE-XFMR-20351, UPE-PNL-20351 TO L-0311 (NOTE 1)
4. RELOCATED EMJ-ENCL-00008 TO COLUMN K13. (NOT SHOWN ON THIS DCN)
5. ADDED FPW-CAB-00001 (NOTE 1)
6. ADDED LVE-ENCL-00002 (NOTE 1)

L-0309 (SEE PAGE 4)

1. REMOVED HOLD CLOUD 14 FOR C2V-ACU-00001
2. REVISED SIZE OF C2V-ACU-00001
3. REVISED SIZES OF UPE-BATT-20303 AND UPE-UPS-20303
4. RELOCATED LVE-PNL-20323, LVE-XFMR-20323, LTE-PNL-20301, LTE-XFME-20301 FROM CORRIDOR LC0310 (NOTE 1)
5. ADDED SS HVAC CONTROL PANELS C2V-PNL-00114 AND C3V-PNL-00013 (NOTE 1)
6. DELETED SECTION OF UPE-BATT-20303 AT COLUMN 12
7. ADDED BATTERY RACK DISCONNECT SWITCH UPE-SW-20303 (NOTE 1)

LC0305 (SEE PAGE 4)

1. REMOVED HOLD CLOUD 14 FOR C2V-COND-00001
2. RELOCATED C2V-COND-00001 TO EXTERIOR PLATFORM (PAGE 5)
3. RELOCATED LTE-PNL-20301, LTE-XFMR-20301, LVE-PNL-20323, LVE-XFME-20323, LVE-PNL-20324, LVE-XFMR-20324 TO L-0309 (NOTE 1)

EXTERIOR CONDENSER PLATFORM (SEE PAGE 5)

1. REMOVED HOLD CLOUD 16

# Drawing Change Notice

CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00057

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | REVISION TO LAW UPS BATTERY ROOM LAYOUT |

DESCRIPTION OF CHANGE

**ROOM L-0304C (SEE PAGES 6 AND 7)**

1. **REMOVED HOLD 18, REVISED AND RELOCATED C3V-ACU-00001**
2. **RELOCATED LVP-ASD-00001A**
3. **REVISED PRELIMINARY SIZE OF LVP-EXHR-00001A AND ADDED HOLD 19 PENDING RECEIPT OF NEW CODE 2 SUBMITTALS**
4. **CORRECTED LABEL FROM C3V-ACU-00001 TO C3V-ACU-00003**

**ROOM L-0304D (SEE PAGES 6 AND 7)**

1. **REMOVED HOLD 18, REVISED AND RELOCATED C3V-ACU-00002**
2. **RELOCATED LVP-ASD-00001B**
3. **REVISED PRELIMINARY SIZE OF LVP-EXHR-00001B AND ADDED HOLD 19 PENDING RECEIPT OF NEW CODE 2 SUBMITTALS**

**ROOM L-0304E (SEE PAGES 6 AND 7)**

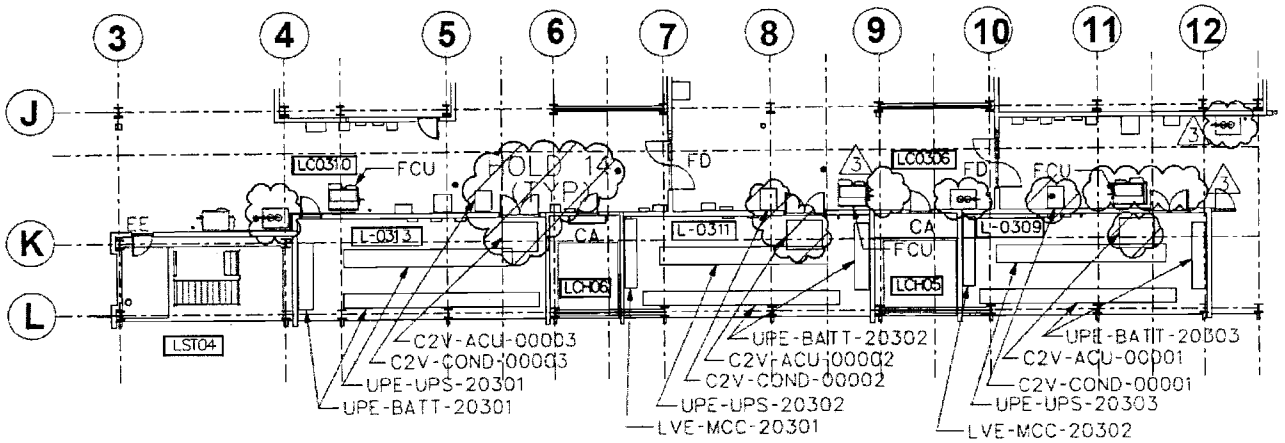
1. **REMOVED HOLD 18, REVISED AND RELOCATED C3V-ACU-00003**
2. **RELOCATED LVP-ASD-00001C**
3. **REVISED PRELIMINARY SIZE OF LVP-EXHR-00001C AND ADDED HOLD 19 PENDING RECEIPT OF NEW CODE 2 SUBMITTALS**
4. **CORRECTED LABEL FROM C3V-ACU-00003 TO C3V-ACU-00001**

# Drawing Change Notice

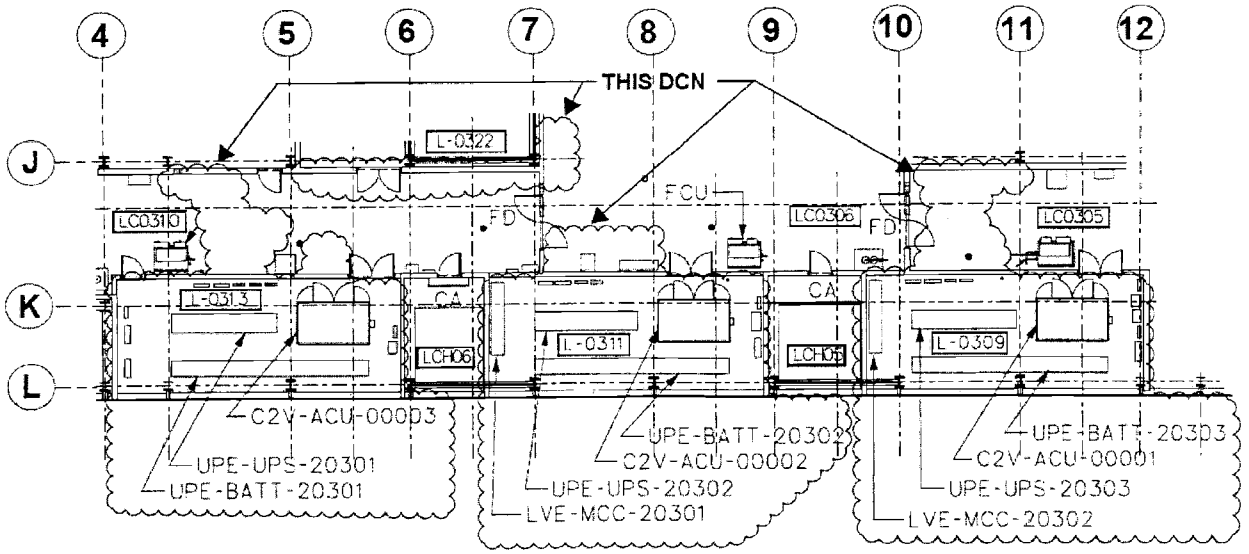
CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00057

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | REVISION TO LAW UPS BATTERY ROOM LAYOUT |

DESCRIPTION OF CHANGE



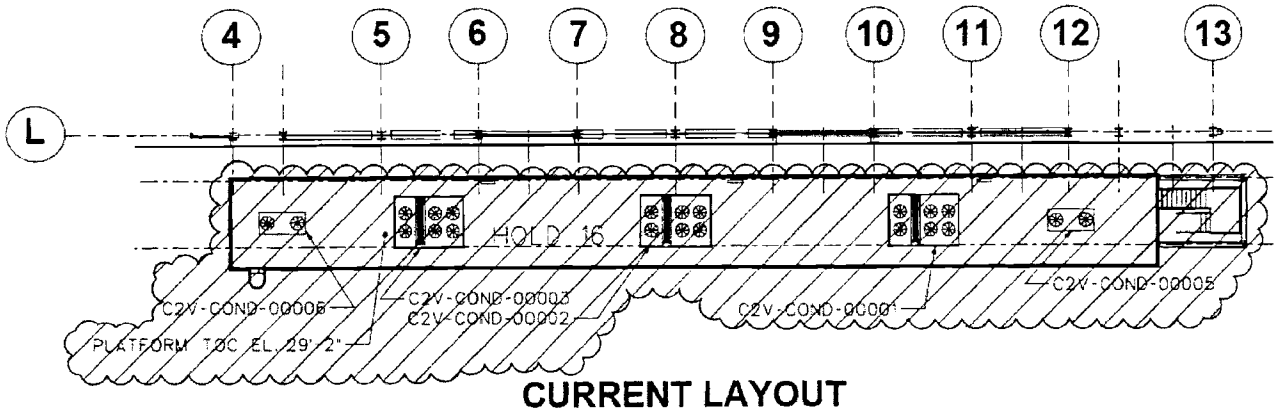

**CURRENT LAYOUT**
**24590-LAW-P1-P01T-00005 REV. 3**
**24590-LAW-P1N-P01T-00057**



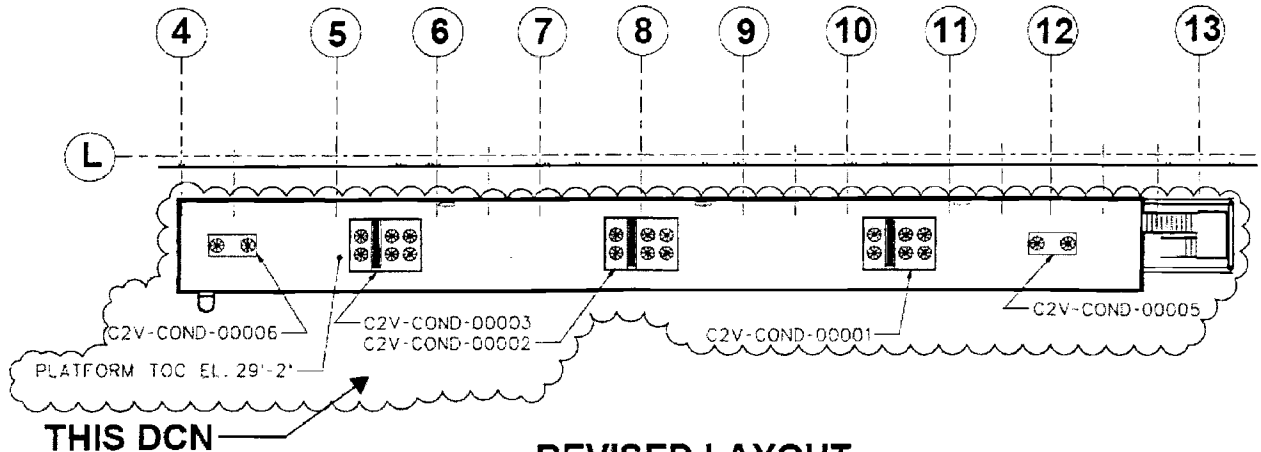

**REVISED LAYOUT**
**24590-LAW-P1-P01T-00005 REV. 3**
**24590-LAW-P1N-P01T-00057**

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | REVISION TO LAW UPS BATTERY ROOM LAYOUT |

DESCRIPTION OF CHANGE



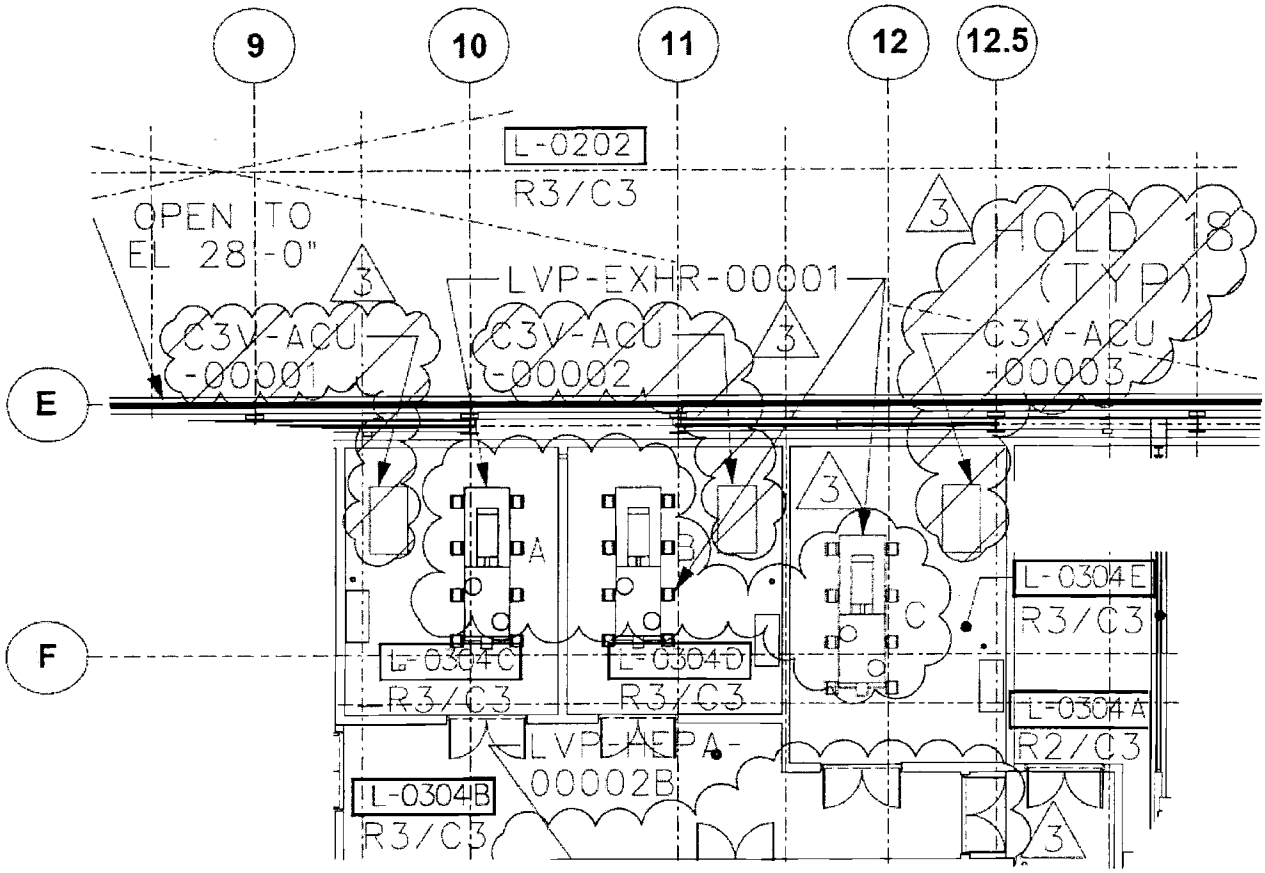

**CURRENT LAYOUT**
**24590-LAW-P1-P01T-00004 REV. 4**
**24590-LAW-P1N-P01T-00057**




**REVISED LAYOUT**
**24590-LAW-P1-P01T-00004 REV. 4**
**24590-LAW-P1N-P01T-00057**

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | REVISION TO LAW UPS BATTERY ROOM LAYOUT |

DESCRIPTION OF CHANGE



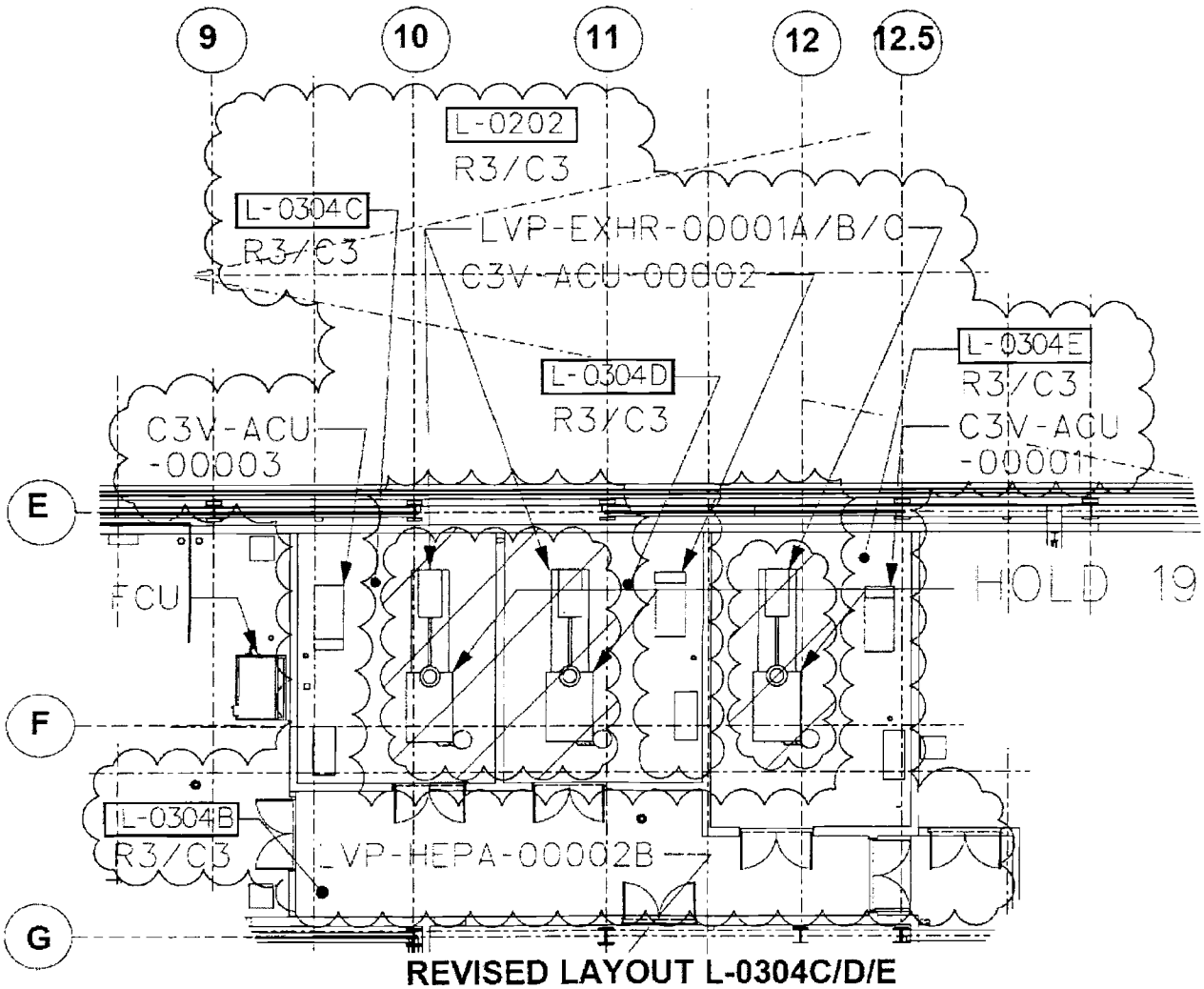

**CURRENT LAYOUT L-0304C/D/E**
**24590-LAW-P1-P01T-00005 REV. 3**
**24590-LAW-P1N-P01T-00057**

# Drawing Change Notice

CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00057

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | REVISION TO LAW UPS BATTERY ROOM LAYOUT |

DESCRIPTION OF CHANGE




**REVISED LAYOUT L-0304C/D/E**
**24590-LAW-P1-P01T-00005 REV. 3**
**24590-LAW-P1N-P01T-00057**

# Drawing Change Notice



CHANGE DOCUMENT NO.
24590-LAW-P1N-P01T-00057

| JOB NO. | TITLE FOR CHANGE NOTICE |
|---|---|
| 24590 | REVISION TO LAW UPS BATTERY ROOM LAYOUT |

| ORIGINATOR | CHECKER |
|---|---|
| CRAIG SALERNO Craig M Salerno | EMMITT PACKER Emmett Packer |

**Reviews**

| E&NS - Dwight Krahn | PD - KEITH HUBER | | |
|---|---|---|---|
| Dwight Krahn | | | |

**Approval(s)**

| APEM-LBL - JOHN SCHNEIDER | PD - JACK CLINTON | | |
|---|---|---|---|
| John F. Schneider | | | |

**Date** *(inserted by final approver)*: 4/5/10

R10905317

| | | |
|---|---|---|
| BECHTEL<br>RPP-WTP JOB No: 24590 | **FIELD CHANGE PART A** | 24590-WTP-FC-E-08-0250<br>TITLE: +48 LAW 20 CRANE 5 CONTROL PANEL<br>FACILITY: LAW AREA: 20 SYSTEM: N/A<br>QUALITY LEVEL: CM Need by date: 7/10/2008<br>Page 1 of 4 |

| *Affected Document Number* | *Rev* | *Remarks* |
|---|---|---|
| 24590-LAW-P1-P01T-00005 | 3 | |
| 24590-LAW-P1-P23T-00050 | 2 | |

**Reason for Change:**

EMBEDDED REBAR PREVENTS ANCHORING OF PANEL SUPPORT BASEPLATES.

**Description of Change:**

☐ Generic Change

MOVE BASEPLATES 8" EAST AND WELD TO IMBEDS.

ISSUED BY

JUL 21 2008

RPP-WTP PDC

Prepared By: STRICKLIN, GREGORY R 7/3/08 Date Prepared: 6/26/2008

**Select Field Change Type:**

☐ "Pre-Approved" FCN

☐ "Case-By-Case" FCN

☑ FCR

Engineering Approval required for "Case-By-Case" FCN's Topic only:

*Signature* *Date*

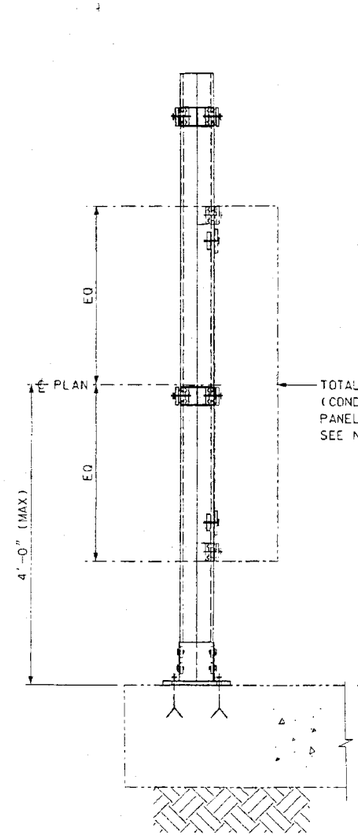
***Lead Discipline Field Engineering Review and Concurrence***

| | Civil | Mechanical | Welding |
|---|---|---|---|
| *Name* | N/A | N/A | N/A |
| *Signature* | | | |
| *Date* | | | |

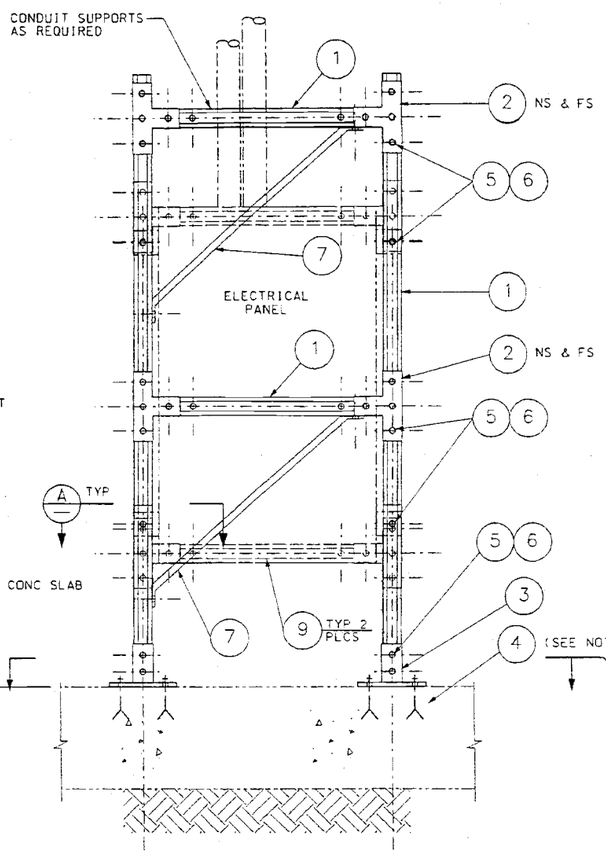
| | Electrical | Piping | C&I |
|---|---|---|---|
| *Name* | Robert Spang | N/A | N/A |
| *Signature* | Robert Spang | | |
| *Date* | 7/3/08 | | |

*Field Engineering Manager Approval:* Steven Polvi STEVEN POLVI *Date:* 7/3/08

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

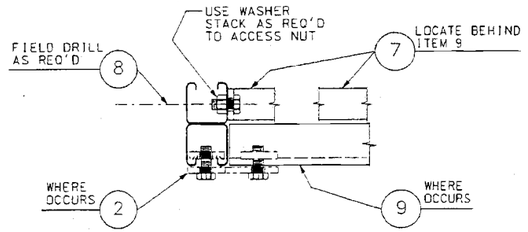



SIDE ELEVATION

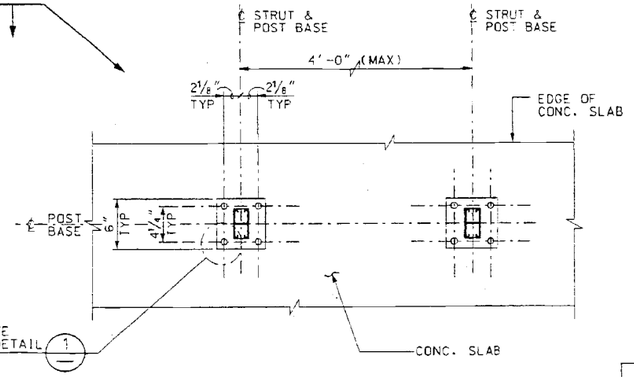



FRONT ELEVATION

| ITEM | DESCRIPTION |
|---|---|
| 1 | B-Line B22A CHANNEL, ZINC FINISH |
| 2 | B-Line B133 FOUR HOLE TEE PLATE, ZINC FINISH |
| 3 | B-Line POST BASE FOR B22A B281SQ, ZINC FINISH |
| 4 | 5/8" ϕ TRU BOLT WEDGE ANCHOR X 2 3/4" MIN EMBED |
| 5 | B-Line NUT WITH SPRING, N225 |
| 6 | 1/2" ϕ X 1 1/4" LG HEX HEAD CAP SCREWS (HHCS), ZINC FINISH |
| 7 | B-Line B631 KNEE BRACE (SEE NOTE 6) |
| 8 | 1/2" ϕ HEX HEAD CAP SCREW (HHCS) W/ 1/2" ϕ HEX NUT (HN), WITH ZINC FINISH |
| 9 | B-Line B22 CHANNEL, ZINC FINISH (SEE NOTE 9) |



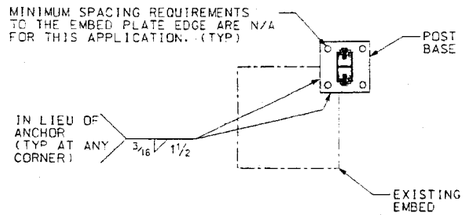

SECTION A



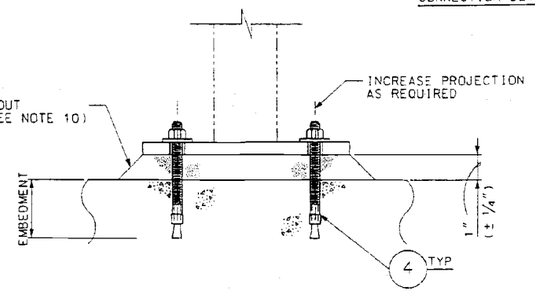

## NOTES:

1. FREE STANDING SUPPORT IS APPLICABLE TO INTERIOR COMMERCIAL GRADE (CM) ELECTRICAL PANEL AND/OR CONDUIT. TOTAL WEIGHT OF PANEL AND/OR CONDUIT SHALL NOT EXCEED 150 LBS.
2. ALL POST-INSTALLED ANCHORS ARE ITW RAMSET/RED HEAD TRUBOLT WEDGE CONCRETE ANCHORS. CONCRETE ANCHORS SHALL BE INSTALLED AND TESTED PER SPECIFICATION 24590-WTP-3PS-FA02-T0004 WITH A MINIMUM EDGE DISTANCE OF 3".
3. SLAB THICKNESS SHALL BE THE MINIMUM ANCHOR EMBEDMENT PLUS 4 INCHES OR GREATER.
4. LOCATION OF PANEL SUPPORTS, LENGTH AND SPACING OF STRUTS SHALL BE AS REQUIRED BY EQUIPMENT SIZE AND EQUIPMENT LOCATION DRAWINGS.
5. INSTALLATION OF B-LINE OR ENGINEERING APPROVED COMPONENTS AND CONNECTIONS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
6. B-LINE B631 ARE MADE IN LENGTHS FROM 18" TO 96". FIELD SHALL USE THE LONGEST BRACE THAT FITS THE CONFIGURATION. THE ORIENTATION MAY BE REVERSED.
7. MATERIAL QUANTITIES AS REQUIRED BY FIELD.
8. DO NOT USE THIS SUPPORT ABOVE OR ADJACENT TO Q EQUIPMENT/COMMODITY UNLESS A SEISMIC INTERACTION EVALUATION HAS BEEN PERFORMED BY DESIGN ENGINEERING.
9. FIELD HAS THE OPTION OF ADDING 2 (9) AS SHOWN TO SUIT EQUIPMENT ATTACHMENT CONDITIONS. USE ONE (2) PER END FOR ATTACHMENT TO FRAME.
10. USE CEMENTITIOUS GROUT PER SPECIFICATION 24590-WTP-3PS-D000-T0001, SECTION 2.2

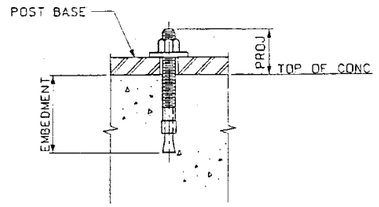
## FREE STANDING PANEL SUPPORT




WELD ATTACHMENT ALTERNATIVE




ALTERNATE DETAIL FOR UNEVEN FLOOR




TYPICAL POST-INSTALLED ANCHOR (SEE NOTE 2)

DETAIL (1)

| REV | DESCRIPTION | ORG | CHKD | RVWD | APVD | DATE |
|---|---|---|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | | | | | 4/4/06 |

REVISION HISTORY

CM — QUALITY DESIGNATOR

ISSUED BY RPP-WTP PDC — ISSUE STAMP

| | | |
|---|---|---|
| PROJECT No. | 24590 | |
| SITE | HANFORD | |
| AREA | 200E | |
| BUILDING No. | | |
| | BY | DATE |
| ORIGINATOR | | 4/4/06 |
| CHECKER | | 4/4/06 |
| APPROVER | | 4/4/06 |
| REVIEWER | | 4-4-06 |

CONTENT APPLICABLE TO ALARA? ☐ YES ☒ NO
ADR NO. REV:
SAFETY SCREEN REQUIRED? ☐ YES ☒ NO | E&MS INITIAL IF YES

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

# CIVIL/STRUCTURAL STANDARDS STRUCTURAL STEEL NON-ITS ELECTRICAL PANEL SUPPORT

| SCALE | | REV |
|---|---|---|
| NONE | 24590-WTP-S1-S15T-00023 | 0 |

3 SAFETY SCREEN IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-SREG-002

"D" SIZE - 34x22
COMPUTER GENERATED - MANUAL CHANGES NOT PERMITTED

R1043834

04/04/2006 01:35:21 PM

PLOTTED BY: kcart
C:\Work\3ms07724\wip\s15t00023.dgn

FORM D_SDN.DGN 02/2003

24590-WTP-FC-E-08-0250 pg 2 of 4

24590-LAW-P1-P23T-00050

NOTES:

1. FOR GENERAL NOTES SEE 24590-LAW-P1-P011-00001
2. FOR EQUIPMENT LOCATION P.O.S./ GENERAL NOTES/ SCHEDULE SEE 24590-LAW-P1-P23T-01009.
3. FOR EQUIPMENT LOCATION ROOM SCHEDULE/ HOLD LIST SEE 24590-LAW-P1-P23T-01010.
4. REVISED TO INCORPORATE THE FOLLOWING: RELEASED HOLDS 6, 13, 18, AND 19, MODIFIED 20-CRN-00005 REVISED ELECTRICAL DIMS FROM CENTER LINE TO EDGE OF UNIT, REVISED FCU LOCATIONS, REVISED TITLE BLOCK, ADDED CONTROLLED ACCESS CALL OUTS AT CHASE ACCESS, REVISED LP0304E ELEVATION, REVISED PARTITION WALLS, ADDED REMOVABLE HANDRAIL.
5. REMOVED HOLD 23, ADDED TOP OF RAIL ELEVATION. RELEASED HOLD 2 AND ADDED DIMENSIONS TO FOUS. ADDED REFERENCE DIMENSIONS. ADDED RAIL SPAN CALLOUT. REVISED PLATFORMS FROM CHECKER PLATE TO GRATING.

AREA LIMIT

MATCHLINE CONT. ON DRAWING 24590-LAW-P1-P23T-00049

MATCHLINE CONT. ON DRAWING 24590-LAW-P1-P23T-00053

RAIL SPAN

T.O.R. EL. 63'-0"

REMOVABLE HANDRAIL (TYP.)

HANDRAIL

FLOOR HATCH

ROLL UP DOOR

LVE-XFMR-20334

LVE-PNL-20334

LTE-XFMR-20304

LTE-PNL-20304

LVE-XFMR-20333

LVE-PNL-20333

RWH-PNL-00001

C2V-ENCL-00002

C2V-RK-00033

C2V-FCU-00037

C2V-FCU-00034

20-CRN-00005

C2V-RK-00024

C2V-HU-00021A

C2V-UH-00042

C2V-AHU-00007A

T.O.RAIL 55'-8"

PLAT. EL. 53'-4½"

OPEN TO EL. 28'-0"

This FC

KEY PLAN AT EL 48'-0"

| REFERENCE DRAWINGS | |
|---|---|
| DWG NO | TITLE |
| 24590-LAW-P1-P011-00005 | LAW GENERAL ARRANGEMENT PLAN AT EL 48'-0" |
| 24590-LAW-P1-P23T-00001 | LAW EQUIPMENT LOCATION PLAN KEY PLAN |
| 24590-LAW-P1-P23T-00048 | LAW EQUIPMENT LOCATION PLAN EL 48'-0"/AREA 1 |
| 24590-LAW-P1-P23T-00049 | LAW EQUIPMENT LOCATION PLAN EL 48'-0"/AREA 2 |
| 24590-LAW-P1-P23T-00051 | LAW EQUIPMENT LOCATION PLAN EL 48'-0"/AREA 4 |
| 24590-LAW-P1-P23T-00052 | LAW EQUIPMENT LOCATION PLAN EL 48'-0"/AREA 5 |
| 24590-LAW-P1-P23T-00053 | LAW EQUIPMENT LOCATION PLAN EL 48'-0"/AREA 6 |
| 24590-LAW-P1-P23T-01009 | LAW EQUIPMENT LOCATION POS/GENERAL NOTES/SCHEDULE |
| 24590-LAW-P1-P23T-01010 | LAW EQUIPMENT LOCATION ROOM SCHEDULE/HOLDS LIST |

| REV | DESCRIPTION | ORG | CHK | DRW | DWG | APVD | DATE |
|---|---|---|---|---|---|---|---|
| 2 | REVISED TO INCORPORATE CHANGES IN NOTE 5 | TJ | CWB | HK | DRK OK | | 10/1/06 |
| 1 | REVISED TO INCORPORATE CHANGES IN NOTE 4 | DL | CWB | HK | OK | | 12/15/05 |
| 0 | ISSUED FOR CONSTRUCTION | CDU | LMS | LMU | TPR | | 12/20/04 |

REVISION HISTORY

| | | |
|---|---|---|
| ISSUED BY RPP-WTP PDC | PROJECT No. | 24590 |
| | SITE | HANFORD |
| | AREA | 2601 |
| TANK FARM | BUILDING No. | 2701 |

| | BY | DATE |
|---|---|---|
| ORIGINATOR | CARL G ULRICH | 12/20/04 |
| CHECKER | WOODIE STAMPLEY | 12/20/04 |
| APPROVER | PHIL REICHERT | 12/20/04 |
| REVIEWER | MARK MCGILL | 12/20/04 |

CONTENT APPLICABLE TO ALARA? YES ___ NO ___
ADR NO. 24590-LAW-ADR-PL-03-006 REV. 0

SAFETY SCREEN DOCUMENTED IN SDD? YES ___ NO ___ IF YES, SAFETY SCREEN IS REQUIRED FOR ORIGINATING ITEM IDENTIFIED IN 24590-WTP-SWD-SCR-06-

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No. DE-AC27-01RV14136

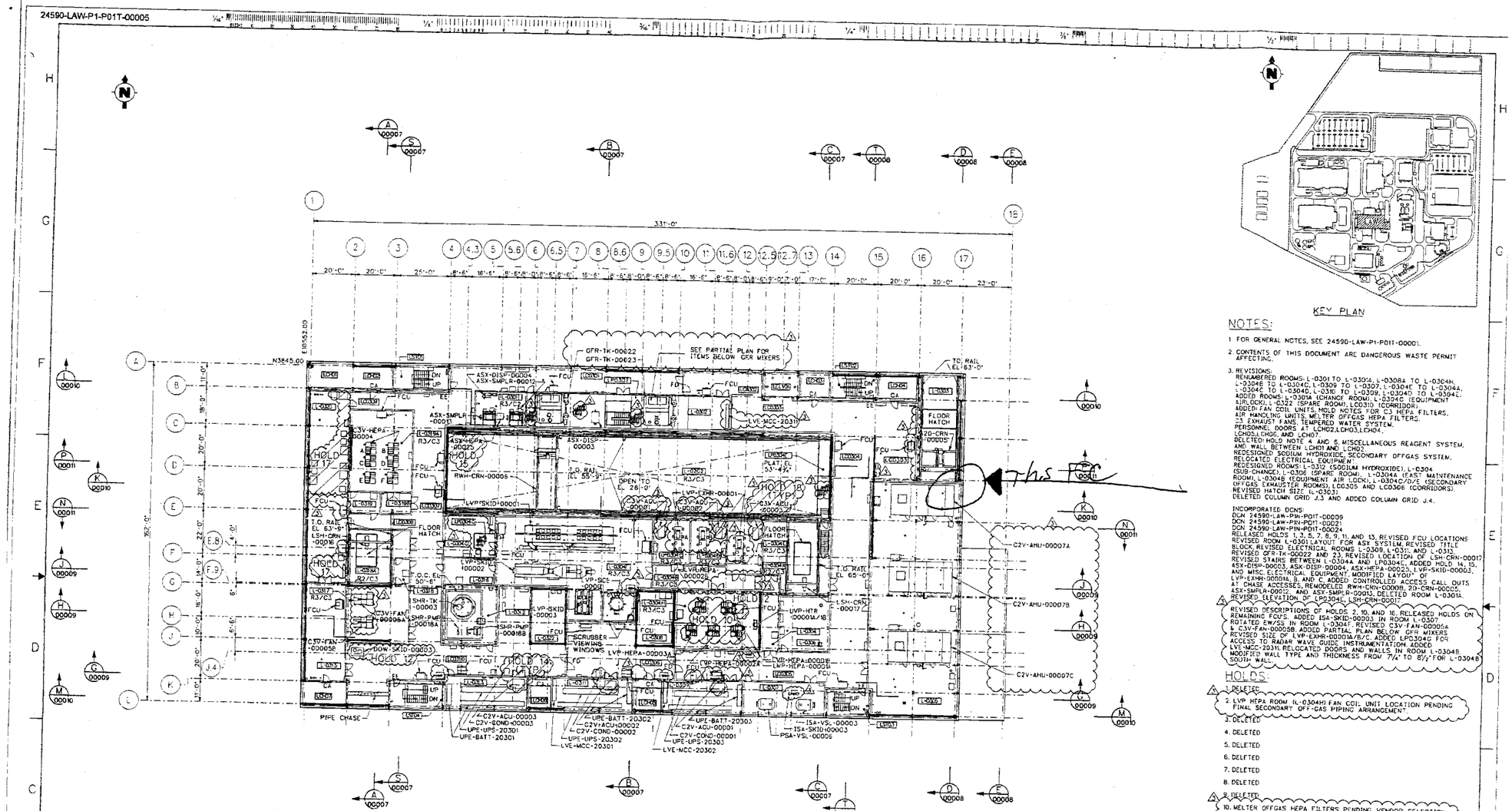
# LAW VITRIFICATION BUILDING EQUIPMENT LOCATION PLAN EL. 48'-0" / AREA 3

SCALE: 1/4"=1'-0" | 24590-LAW-P1-P23T-00050 | REV 2

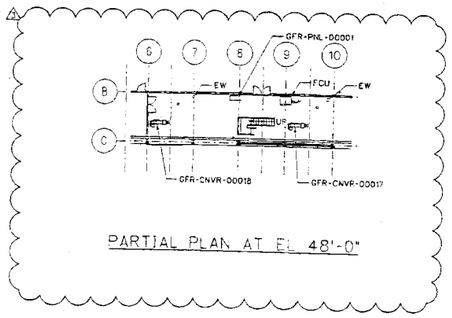
24590-WTP-FC-E-08-0250

PG 3 of 4

24590-LAW-P1-P01T-00005




PLAN AT EL 48'-0"




PARTIAL PLAN AT EL 48'-0"



KEY PLAN

NOTES:

1. FOR GENERAL NOTES, SEE 24590-LAW-P1-P01T-00001.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. REVISIONS:
   RENUMBERED ROOMS: L-0301 TO L-0301A, L-0308A TO L-0304H, L-0304E TO L-0304C, L-0309 TO L-0307, L-0304E TO L-0304A, L-0304C TO L-0304B, L-0316 TO L-0309, L-0304D TO L-0304C.
   ADDED ROOMS: L-0301A (CHANGE ROOM), L-0304C (EQUIPMENT AIRLOCK), L-0322 (SPARE ROOM), L-0310 (CORRIDOR).
   ADDED FAN COIL UNITS, HOLD NOTES FOR C3 HEPA FILTERS, AIR HANDLING UNITS, MELTER OFFGAS HEPA FILTERS, C3 EXHAUST FANS, TEMPERED WATER SYSTEM, PERSONNEL DOORS AT LCH02,LCH03,LCH04, LCH05,LCH06, AND LCH07.
   DELETED: HOLD NOTE 4 AND 5, MISCELLANEOUS REAGENT SYSTEM, AND WALL BETWEEN LCH01 AND LCH02.
   REDESIGNED SODIUM HYDROXIDE SECONDARY OFFGAS SYSTEM, RELOCATED ELECTRICAL EQUIPMENT.
   REDESIGNED ROOMS: L-0312 (SODIUM HYDROXIDE), L-0304 (SUB-CHANGE), L-0306 (SPARE ROOM), L-0304A (EAST MAINTENANCE ROOM), L-0304B (EQUIPMENT AIR LOCK), L-0304C/D/E (SECONDARY OFFGAS EXHAUSTER ROOMS), LC0305 AND LC0306 (CORRIDORS).
   REVISED HATCH SIZE: (L-0303).
   DELETED: COLUMN GRID J.3 AND ADDED COLUMN GRID J.4.

   INCORPORATED DCNS:
   DCN 24590-LAW-PIN-P01T-00009
   DCN 24590-LAW-PIN-P01T-00021
   DCN 24590-LAW-PIN-P01T-00024
   RELEASED HOLDS 1, 3, 5, 7, 8, 9, 11, AND 13, REVISED FCU LOCATIONS REVISED ROOM L-0301 LAYOUT FOR ASX SYSTEM, REVISED TITLE BLOCK, REVISED ELECTRICAL ROOMS L-0309, L-0311, AND L-0313, REVISED GFR-TK-00022 AND 23, REVISED LOCATION OF LSH-CRN-00017, REVISED STAIRS BETWEEN L-0304A AND LP0304E, ADDED HOLD 14,15, ASX-DISP-00003, ASX-DISP-00004, ASX-HEPA-00025, LVP-SKID-00003, AND MISC ELECTRICAL EQUIPMENT, MODIFIED LAYOUT OF LVP-EXHR-00001A, B, AND C, ADDED CONTROLLED ACCESS CALL OUTS AT CHASE ACCESSES, REMODELED RWH-CRN-00008, 20-CRN-00005, ASX-SMPLR-00012, AND ASX-SMPLR-00013, DELETED ROOM L-0301A, REVISED ELEVATION OF LP0304E, LSH-CRN-00017.

4. REVISED DESCRIPTIONS OF HOLDS 2, 10, AND 16, RELEASED HOLDS ON REMAINING FCU'S, ADDED ISA-SKID-00003 IN ROOM L-0307, & C3V-FAN-00005B, ADDED PARTIAL PLAN BELOW GFR MIXERS, REVISED SIZE OF LVP-EXHR-00001A/B/C, ADDED LP0304C FOR ACCESS TO RADAR WAVE GUIDE INSTRUMENTATION, ADDED LVE-MCC-20311, RELOCATED DOORS AND WALLS IN ROOM L-0304B, MODIFIED WALL TYPE AND THICKNESS FROM 7/4 TO 8½ FOR L-0304B SOUTH WALL.

HOLDS:

1. DELETED
2. LVP HEPA ROOM (L-0304H) FAN COIL UNIT LOCATION PENDING FINAL SECONDARY OFF-GAS PIPING ARRANGEMENT.
3. DELETED
4. DELETED
5. DELETED
6. DELETED
7. DELETED
8. DELETED
9. DELETED
10. MELTER OFFGAS HEPA FILTERS PENDING VENDOR SELECTION. TO BE PROVIDED BY MECHANICAL SYSTEMS ENGINEERING.
11. DELETED
12. TEMPERED WATER SYSTEM PENDING VENDOR SELECTION. TO BE PROVIDED BY MECHANICAL SYSTEMS.
13. DELETED
14. C2V AIR CONDITIONING UNITS AND AIR CONDENSING UNITS PENDING VENDOR SELECTION TO BE PROVIDED BY HVAC ENGINEERING.
15. ASX HEPA FILTERS PENDING VENDOR INFORMATION TO BE PROVIDED BY MECHANICAL SYSTEMS.
16. DELETED.
17. C&I EQUIPMENT PENDING VENDOR SELECTION FROM CONTROL SYSTEMS.
18. C3V AIR CONDITIONING UNITS PENDING VENDOR SELECTION TO BE PROVIDED BY HVAC ENGINEERING.

LEGEND:

| | |
|---|---|
| CA | CONTROLLED ACCESS |
| EE | EMERGENCY EXIT |
| FCU | FAN COIL UNIT |
| FD | FIRE DOOR |
| L-XXXX | ROOM, CELL, (VAULT) OR TUNNEL |
| LCXXXX | |
| LMXXXX | MEZZANINE |
| LPXXXX | ROOM PLATFORM |
| LPCXXXX | CORRIDOR PLATFORM |
| LCHXX | CHASE |
| LELVXX | ELEVATOR |
| LSTXX | STAIR |
| | EQUIPMENT LAYDOWN AREA |
| | CONCRETE |
| | CHECKERED PLATE |
| | GRATING |
| | EMERGENCY EYEWASH |
| | LADDER |
| | EMERGENCY SHOWER/EYEWASH |
| | FLOOR PENETRATION |

REVISION HISTORY

| REV | DESCRIPTION | ORG | CHKD | RVWD | APVD | DATE |
|---|---|---|---|---|---|---|
| 3 | REVISED TO INCORPORATE CHANGES IN NOTE 3 | TH | WM | SH | MK | 10/27/06 |
| 2 | REVISED TO INCORPORATE CHANGES IN NOTE 3 | GLL | TCMS | IPR | DRJ | 12/19/05 |
| 1 | ISSUED FOR DESIGN - SUPERSEDES: DRG-W375-P-00045, REV. F | TH | CMS | IPR | CJW | 11/25/03 |

| | |
|---|---|
| ISSUED BY: RPP-WTP-PDC | PROJECT No.: 24590 |
| DRN. TITLE | SITE: HANFORD |
| | AREA: 2307 |
| | BUILDING No.: 22 |
| | BY: (DATE) |
| ORIGINATOR | TIMOTHY L. HANNING 10/25/05 |
| DESIGNER | CRAIG W. SALONEN 10/25/05 |
| APPROVER | C.J. WINKLER 10/25/05 |
| REVIEWER | PHIL REICHERT 10/25/05 |

CONTENT APPLICABLE TO ALARA? (X) YES ( ) NO
ADR NO. 24590-LAW-ADR-PL-03-005 REV. 0
SAFETY SCREEN REQUIRED? (X) YES ( ) NO (EMS, PISA, & ISS Only)
SAFETY SCREEN IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-ENG-001
2

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No.: DE-AC27-01RV14136

# LAW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN AT EL. 48'-0"

SCALE: 1/16"=1'-0" | 24590-LAW-P1-P01T-00005 | REV: 3

10/27/2006 09:27:39 AM

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FORM E.ENGDGN 02/2003

pg 4 of 4

| RPP-WTP JOB No: 24590 | **FIELD CHANGE REQUEST PART B**<br>**Engineering Disposition** | FCR #<br>24590-WTP-FC-E-08-0250<br>Page 1 of 1 |
|---|---|---|

| | | | |
|---|---|---|---|
| **PART OF DESIGN CHANGE PACKAGE?** | ☐ YES ☒ NO | DCP No.: | Rev: |
| **ENGINEERING DISPOSITION:** | ☒ APPROVED | ☐ DISAPPROVED | |

**DESIGN DOCUMENTS AFFECTED**

*The documents that may be listed are limited to specifications, drawings (including datasheets and engineering lists), and material requisitions (changes to Technical Notes only).*

| Document Number | Rev | Remarks | Incorporated By | |
|---|---|---|---|---|
| | | | Design Change | Reference |
| 24590-LAW-P1-P01T-00005 | 3 | | X | |
| 24590-LAW-P1-P23T-00050 | 2 | | X | |
| | | | | |

**REQUIREMENTS REVIEW**

| | | | |
|---|---|---|---|
| Client Approval Required* | ☐ Yes ☒ No | Permit Review by E&NS Required | ☐ Yes ☒ No |
| Interface Resolution Required* | ☐ Yes ☒ No | Safety Screening/Evaluation Required<br>Documents identified in 24590-WTP-GPP-SREG-002 must be checked "Yes" regardless of the change being made, and E&NS signature is required | ☒ Yes ☐ No |
| *Address these "yes" answers in the disposition | | | |

**DISPOSITION:**

Design Engineering concurs with the requested change to relocate the subject panel 8" to the east in order to avoid an interference with rebar.

Basis of Disposition: Relocating the subject panel 8" does not impact its function for the systems its intended for. There are no technical changes with respect to this disposition.

Cause Code: 15

3-D Model Impact: ☒ Yes ☐ No

**APPROVALS**

| | Print/Type Name | Signature | Date |
|---|---|---|---|
| **ORIGINATOR:** | R. W. Mossbrucker | | 7/9/08 |
| **CHECKER:** | CRAIG SALERNO | | 7/9/08 |
| **APPROVER:** | Dave Jackson | | 7/10/08 |
| **APPROVER:** | Tom HUGHES | | 7/10/08 |
| **E&NS:** | | | 7/17/08 |
| **QA:** | N/A | | |

ISSUED BY
RPP-WTP PDC

R11222794

# Dangerous Waste Permit (DWP) Liner Heights in the LAW Facility

Document title:

Document number: 24590-LAW-PER-M-02-002, Rev 7

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Contract number: DE-AC27-01RV14136

Department: Mechanical Systems

Author(s): K. Bhamidipaty

Checked by: Richard D Peters

Issue status: Approved

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Approved by: Stuart Kretzschmar

Approver's position: DEGS, M&PE

Approver's signature: _____ 6/1/10

*Signature* *Date*

This bound document contains a total of 23 sheets

River Protection Project
Waste Treatment Plant
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# Notice

Please note that source, special nuclear, and byproduct materials, as defined in the *Atomic Energy Act of 1954* (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# History Sheet

| Rev | Reason for revision | Revised by |
|---|---|---|
| 0 | Issued for permitting use. | J. Rewari |
| 1 | Revised to include +3 ft elevation and Appendix A | J. Rewari |
| 2 | Revised Appendix A | J. Rewari |
| 3 | Revised Section 3, Appendix A & Issued for permitting use. | J. Rewari |
| 4 | Revised to include +28 ft elevation and remove Melter 3 tankage. Issued for permitting use. | J. Rewari |
| 5 | Revised to include changes to -21 and +28 ft elevations | D.F. Miller |
| 6 | Revised to correct inconsistencies between text and appendix A | R. Hanson |
| 7 | Major Revision of Section 3 and Appendix A to incorporate flooding volumes and associated liner heights to match issued calculations | K. Bhamidipaty |

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# 1 Introduction

The Washington Administrative Code, WAC 173-303-640[4][e][i][A], requires that secondary containment systems be designed or operated to contain one hundred percent of the capacity of the largest tank within its boundary containing dangerous waste. Per Washington State Department of Ecology Publication 95-420, *Guidance for Assessing Dangerous Waste Secondary Containment Systems*, page 3, where automatic fire extinguishing systems are used, the Uniform Fire Code requires secondary containment for hazardous materials to be sized with additional volume to contain the design flow rate for 20 minutes. This report discusses the assessment of flooding volume that is required to be contained for the low-activity waste vitrification (LAW) facility.

# 2 Applicable Documents

- WAC 173-303. *Dangerous Waste Regulations*. Washington Administrative Code.
- Washington State Department of Ecology Publication 95-420, *Guidance for Assessing Dangerous Waste Secondary Containment Systems*
- NFPA 13, Standard for the Installation of Sprinkler Systems, 1999

# 3 Description

## 3.1 Flooding Volume Description for LAW Facility at -21 Ft Elevation

LAW facility has the following vessel containing dangerous waste, in the process cells, and effluent cell rooms, at -21 ft elevation:

| | |
|---|---|
| C3/C5 Drain Collection Cell | Room L-B001B |
| RLD-VSL-00004 | C3/C5 Drains/Sump Collection Vessel |

The only vessel in the LAW facility containing dangerous waste at (-) 21 ft elevation is the C3/C5 drains/sump collection vessel (RLD-VSL-00004). In the event of a line break, vessel failure, or tank overflow, flooding could occur in the cell. The C3/C5 drains/sump collection vessel (RLD-VSL-00004) is in an enclosed C3/C5 cell area, in room L-B001B (C3/C5 drain collection cell). The vessel could also receive firewater from the floor above.

To calculate the minimum height of C3/C5 drain collection cell (Room L-B001B) stainless steel liner, the following 2 scenarios are considered:

Scenario a:

This scenario is based on the design of the LAW facility and assumes leakage and spillage of the C3/C5 drains/sump collection vessel (RLD-VSL-00004) when the total volume of fluid contained in the vessel is discharged into the cell. The flooding volume is the larger of 110 % (used as a conservative criteria) of the maximum operating volume of the largest vessel, or 100 % of the total volume of the largest vessel. The vessel total volume is defined as internal volume of the vessel including the shell and both heads.

The total vessel volume of 1034 $ft^3$ is greater than 110 % of the maximum operating volume. Fire sprinklers are provided in this cell; therefore, 193.5 $ft^3$ of fire water from 20 minutes of sprinkler discharge (includes 10 % margin for overage i.e. safety factor = 1.1) in the cell is added to the flooding volume. The total volume of fluid that must be contained by the liner in the room = 1034 + 193.5 = 1227.5 $ft^3$.

The room has a sump and sloping segments of floor. The volume of fluid accommodated on the sloping floor between top of sump and the high point on the floor is calculated to be 7.9 $ft^3$. Therefore, the volume of fluid that occupies the room space above the high point slope is equal to 1227.5 - 7.9 = 1219.6 $ft^3$.

The liner height is measured from the top of sump. Therefore, the minimum required liner height is calculated as the sum of two parts: (1) height of high point slope above sump, and (2) height of liner top above the high point slope. The high point of floor is 2 in above the top of sump. The available cross-sectional area of the room is calculated to be 387 $ft^2$. The required liner height above the high point slope is equal to the volume 1219.6 $ft^3$ divided by the available cross-sectional area of the room (= 387 $ft^2$), which is equal to 3.16 ft = 3 ft 2 in (rounded to nearest inch).

The liner height from top of sump for scenario a. is equal to 3 ft 2 in + 2 in = 3 ft 4 in.

Scenario b:

This scenario is based on the design of the LAW facility and uses a conservative volume of firewater flow to calculate the minimum liner height. The Vessel RLD-VSL-00004 is full and intact so only firewater runoff from higher elevation floor drains is considered for the flooding volume. As shown in Figure 1, firewater flow into some floor drains, sumps, and overflow lines drain into the C3/C5 Floor Drain Vessel (RLD-VSL-00004). In the event of a fire, the firewater could collect on the higher elevations and drain to the tank causing the tank to overflow. Since the tank is full and not leaking in this scenario, firewater would flow out of the tank and into the cell via the overflow nozzle. The firewater used in this scenario is the largest design requirement for the LAW facility. Volume of 20 minutes of firewater outside of the cell is calculated to be 11,220 gallons (or 1,500 $ft^3$).

Therefore, the required liner height for C3/C5 drain collection cell from top of sump for scenario b. is equal to 4 ft 1 in.

## 3.2 Flooding Volume Description for LAW Facility at +3 Ft Elevation

LAW facility has the following vessels and miscellaneous units, containing dangerous waste, in the process cells, and effluent cell rooms, at +3 ft elevation:

**Process Cell Room L-0123**

| | |
|---|---|
| LCP-VSL-00001 | Melter 1 Concentrate Receipt Vessel |
| LFP-VSL-00001 | Melter 1 Feed Preparation Vessel |
| LFP-VSL-00002 | Melter 1 Feed Vessel |
| LOP-VSL-00001 | Melter 1 SBS Condensate Vessel |
| LOP-WESP-00001 | Melter 1 Wet Electrostatic Precipitator (WESP) |
| LOP-SCB-00001 | Melter 1 Submerged Bed Scrubber (SBS) |

**Process Cell Room L-0124**

| | |
|---|---|
| LCP-VSL-00002 | Melter 2 Concentrate Receipt Vessel |
| LFP-VSL-00003 | Melter 2 Feed Preparation Vessel |
| LFP-VSL-00004 | Melter 2 Feed Vessel |
| LOP-VSL-00002 | Melter 2 SBS Condensate Vessel |
| LOP-WESP-00002 | Melter 2 Wet Electrostatic Precipitator (WESP) |
| LOP-SCB-00002 | Melter 2 Submerged Bed Scrubber (SBS) |

**Effluent Cell Room L-0126**

| | |
|---|---|
| RLD-VSL-00003 | Plant Wash Vessel |
| RLD-VSL-00005 | SBS Condensate Collection Vessel |

### 3.2.1 Process Cells

The process cells have 6 vessels in each cell. Both process cells are identical in size and contain a similar set of vessels.

For calculating the minimum height of stainless steel liners for process cell rooms L-0123, and L-0124, the following scenario is considered:

The total volume of fluid contained in the largest vessel is discharged by leakage or spillage into the cell. To calculate the available area of the cell where the flooding volume could leak, the largest cross-sectional area of each of the vessels (except the leaking vessel) are subtracted from the cross-sectional area of the rectangular cell.

Conservative values for the vessel volume are used in the calculation of the liner height by using the volume of the vessel without subtracting the volume of the internal equipment. The largest cross-sectional area of the vessel is used to conservatively calculate the cross-sectional area of the rectangular cell, even though the cross-sectional area of the vessel at the bottom is much smaller.

The liners are sized to hold 100 % of the total volume of the largest vessel or 110 % of its maximum operating volume, whichever is greater. In all cases, the total volume is used because this is larger than 110 % of the volume up to the overflow nozzle.

The largest vessel in each cell is the concentrate receipt vessel, (LCP-VSL-00001, -00002), and the total volume of each is 2427.6 $ft^3$. These rooms have sumps and sloping segments of floor that accommodate 62.1 $ft^3$ of liquid in each room from the top of sump to the high point slope. Therefore, the volume of fluid that occupies the room space above the high point slope is equal to 2427.6 - 62.1 = 2365.5 $ft^3$.

The liner height is measured from the top of sump. Therefore, the minimum required liner height is calculated as the sum of two parts: (1) height of high point slope above sump, and (2) height of liner top above the high point slope. The high point of floor is 2 ⅞ in (= 0.24 ft) above the top of sump. The available cross-sectional area of the room is calculated to be 1411.5 $ft^2$. The required liner height above the high point slope is equal to the volume 2365.5 $ft^3$ divided by the available cross-sectional area of the room (= 1411.5 $ft^2$), which is equal to 1.676 ft.

Therefore, the required liner height above the top of sump is equal to 1.676 ft + 0.24 ft = 1.916 ft = 1 ft 11 in (rounded to nearest inch).

### 3.2.2 Effluent Cell

Effluent cell room L-0126 has 2 vessels in it. Both vessels are identical in size. Using the same method as for the process cells, the total volume of each of these vessels is 3445 $ft^3$. This room has sumps and sloping segments of floor that accommodate 11.4 $ft^3$ of liquid in each room from the top of sump to the high point slope. Therefore, the volume of fluid that occupies the room space above the high point slope is equal to 3445 $ft^3$ - 11.4 $ft^3$ = 3433.6 $ft^3$.

Conservative values for the vessel volume are used in the calculation of the liner height by using the volume of the vessel without subtracting the volume of the internal equipment. The largest cross-sectional area of the vessel is used to conservatively calculate the cross-sectional area of the rectangular cell, even though the cross-sectional area of the vessel at the bottom is much smaller.

The liner height is measured from the top of sump. Therefore, the minimum required liner height is calculated as the sum of two parts: (i) height of high point slope above sump, and (ii) height of liner top above the high point slope. The high point slope of floor is 2 ⅛ in (= 0.177 ft) above the top of sump. The available cross-sectional area of the room is calculated to be 996.54 $ft^2$. The required liner height above the high point slope is equal to the volume 3433.6 $ft^3$ divided by the available cross-sectional area of the room (= 996.54 $ft^2$), which is equal to 3.446 ft.

Therefore, the required liner height from top of sump is equal to 3.446 ft + 0.177 ft = 3.623 ft = 3 ft 8 in (rounded to nearest inch).

## 3.3 Flooding Volume Description for LAW Facility at +28 Ft Elevation

LAW facility has the following tank, containing dangerous waste, at +28 ft elevation:

**Caustic Scrubber Blowdown Pump Room, Room L-0218**

| | |
|---|---|
| LVP-TK-00001 | Caustic Collection tank |

### 3.3.1 Room L-0218

Caustic Scrubber Blowdown Pump Room, L-0218, at elevation +28 contains the caustic collection tank (LVP-TK-00001). The tank sits on a 6" high octagonal pedestal. The floor in room L-0218 is not sloped, however, the octagonal tank pedestal is provided with grooves that slope from the center of the tank pedestal to divert a potential leak under the tank. Also located in this room are 4 pumps on individual pedestals. The room's concrete vault walls are designed and provided with a special protective coating approved by Ecology in accordance with the *Engineering Specification for Field Applied Special Protective Coatings for Secondary Containment* (24590-WTP-3PS-AFPS-TP006).

For calculating the minimum height of the secondary containment coating on the vault walls, the following scenario is considered:

The total volume of the fluid contained in the tank is discharged by leakage or spillage into the secondary containment. In addition to this, if there is a fire in the area during this event, the automatic fire

protection sprinkler system will activate and add fire protection water to the fluid discharged from the tank. Therefore, the secondary containment wall is sized to handle the volume of the fire protection water from the sprinkler system over the design area for a period of 20 minutes, including a 10 % margin for overage (i.e., safety factor =1.1), in addition to the 100 % capacity of the tank.

To calculate the minimum secondary containment wall coating height, the available volume of the room (this includes the vessel cross-sectional area) and the volume of fire water must also be calculated; altogether, the calculation is done in four steps.

Step 1: Calculate the volume of fluid within the caustic collection tank. This takes into account the entire volume of 1950 $ft^3$.

Step 2: Calculate the volume of available secondary containment coating up to a height of 6". This step excludes the 6" tank pedestal and the 4 pump pedestals to a height of 6", from the available area of the room. This volume = 204.4 $ft^3$.

Step 3: Calculate the additional height of the secondary containment coating after the first 6". This step excludes the area above the 4 pump pedestals to a height of the ceiling (height of pump pedestals is considered to be the height of the room for conservatism) from the total area of the room. The remaining wall height is found by dividing the remaining fluid volume by the area available. The available area of the room above the pump pedestals = 595.17 $ft^2$, and the remaining fluid volume = 1745.6 $ft^3$. The additional height of the secondary containment after the first 6" is equal to 2.933 ft.

Step 4: Calculate the volume of 20 minutes of firewater from the sprinkler system, multiplied by a safety factor of 1.1. Calculate the height of the secondary containment wall for firewater by dividing the volume of firewater by the area of the room minus the area of the 4 pump pedestals. The firewater volume = 319.423 $ft^3$ and the additional height of secondary containment required = 319.423 $ft^3$ / 595.14 $ft^2$ = 0.537 ft.

The secondary containment wall coating height is then: 6" (Step 1) plus additional height of the wall (Step 3) plus height required for firewater (Step 4).

The secondary containment wall coating height required for this room is 0.5 ft + 2.933ft + 0.537 ft = 3.97 ft, rounded to 4 ft.

## 3.4 Curb Height in the Curbed Section of Room L-0304 F (Caustic Scrubber Area) at +48 Ft Elevation)

This report addresses the following miscellaneous unit containing dangerous waste at + 48 ft elevation.

**Secondary Offgas Equipment Room L-0304 F (curbed section only)**

LVP-SCB-00001 Caustic Scrubber (curbed section)

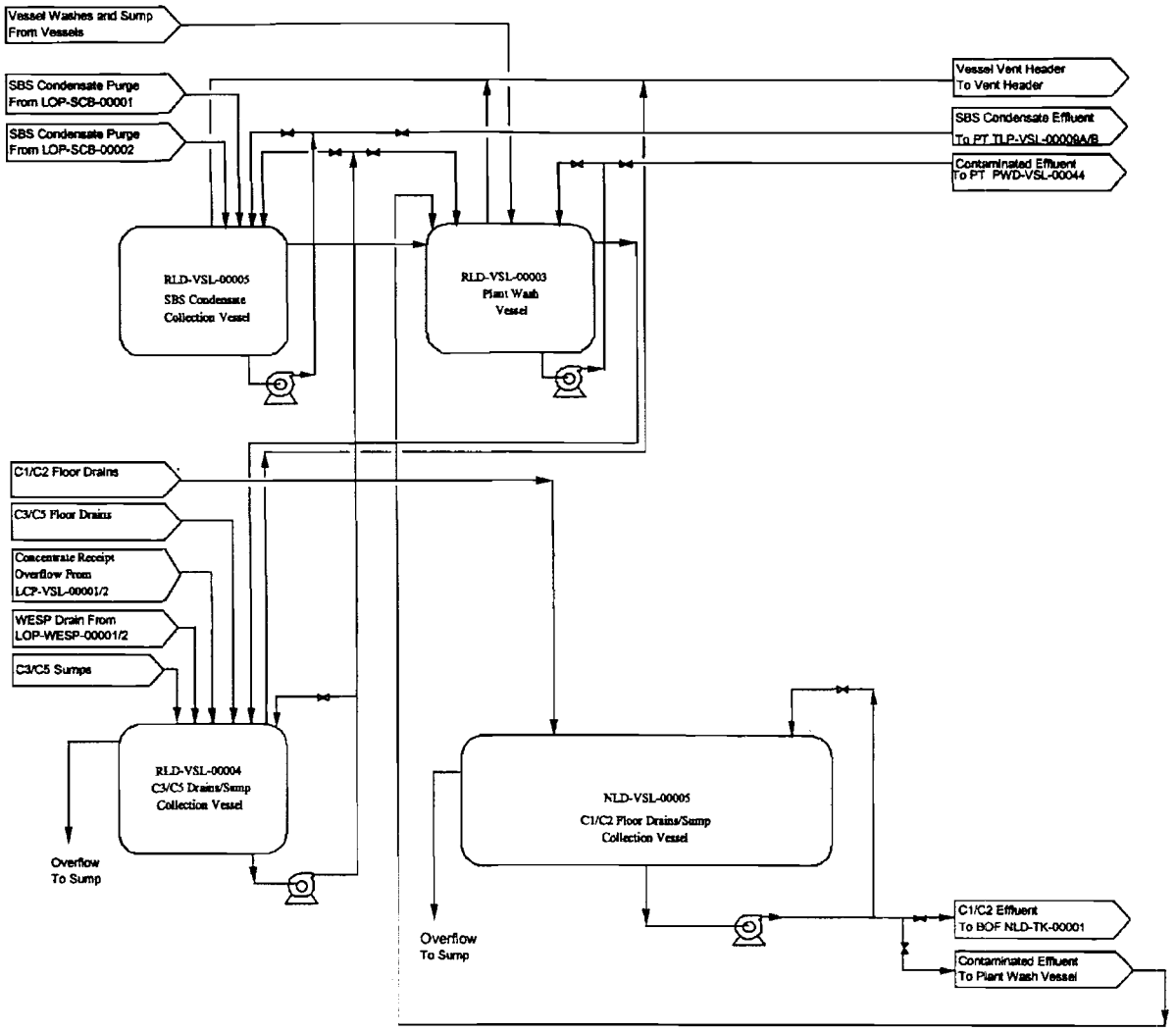
A curbed area with an open floor drain (RLD-FD-00025) has been provided in South-East corner of Room L-0304 F. The LVP Caustic Scrubber is located inside the curbed area that is designed to prevent a potential spill or leak from flowing into the other sections of Secondary Off-gas Equipment Room (L-0304 F). The curbed area is also designed to prevent firewater inflow to the caustic scrubber area due to sprinkler activation in the adjacent part of room L-0304 F. The curbed area is designed

and provided with a special protective coating approved by Ecology in accordance with the *Engineering Specification for Field Applied Special Protective Coatings for Secondary Containment* (24590-WTP-3PS-AFPS-TP006). The floor drain will direct a potential spill or leak from the caustic scrubber LVP-SCB-00001 to RLD-VSL-00004 located at -21 ft. elevation.

The caustic scrubber system continuously recycles scrubber solution between the caustic scrubber and the caustic collection tank (LVP-TK-00001) located directly below the scrubber at the +28 ft. elevation. The caustic scrubber is normally operated under vacuum (-124 in. WC nominal). In the event of any small to moderate leak in the caustic scrubber, room air will be pulled in, which mitigates the out-leakage of scrubber solution. Any large leak in the recirculation piping would trigger a loss of flow interlock that shuts down the recirculation pumps isolating the caustic scrubber from the recirculation piping.

A calculation for the curb height (flood volume) for this area was not completed because the curb height is based principally on the discharge of the fire protection sprinkler system with only minimal contribution from leakage of caustic scrubber and associated ancillary equipment. The floor drains and curbs are sized for 20 minutes of fire sprinkler water flow. The floor and curb area is coated with a special protective coating to the top of the 4 inch curb. This room is shown on drawing 24590-LAW-P1-P01T-00005 (*LAW Vitrification Building General Arrangement Plan at El 48'- 0"*).

**Figure 1 LAW Effluent General Flow Diagram**



# Appendix A

# Calculation of Volume and Liner Height

# Appendix A: Calculation of Volume and Liner Height

## 1 Purpose

The purpose of this calculation is to size the height of the liners in the process cells for LAW vitrification facility at elevation -21 ft and elevation +3 ft. C3/C5 drains/sump collection vessel (RLD-VSL-00004) room L-B001B is shown at elevation -21 ft on drawing 24590-LAW-P1-P01T-P0001 (*LAW Vitrification Building General Arrangement Plan at El. -21'- 0"*). Process cell rooms L-0123 and L-0124 and effluent cell room L-0126 at elevation +3 ft are shown on drawing 24590-LAW-P1-P01T-P0002 (*LAW Vitrification Building General Arrangement Plan at El 3'-0"*).

Additionally, this calculation will size the height of the secondary containment with protective coating required for the caustic scrubber blowdown pump room, Room L-0218 at elevation +28. This room is shown on drawing 24590-LAW-P1-P01T-P0004 (*LAW Vitrification Building General Arrangement Plan at El 28'-0"*).

## 2 Criteria and Design Input

### 2.1 Process and Effluent Cell Liner Height

Per Assumption 3.1.1, the vessels are conservatively assumed to be completely filled (including the top head) and sitting on the floor. The largest vessel total volume is used as the volume in determining the liner height. To allow for the worst case scenario, the volume of the vessel is assumed to leak completely onto the floor.

The liners are sized to hold 100 % of the total volume of the largest tank or 110 % of its maximum operating volume, whichever is larger. In all cases, the total volume is used because this is larger than 110 % of the volume up to the overflow nozzle.

For the process cells and the effluent cells, the largest vessel total volume is used as the volume in determining the liner height. The fire water spray in these cells is at a density of 0.17 gal/min/ft$^2$, for 20 minutes and is multiplied by a safety factor of 1.1.

The following vessels are contained within the process and effluent cells.

| | | | |
|---|---|---|---|
| LCP-VSL-00001 | Melter 1 Concentrate Receipt Vessel | Room L-0123 | El. +3' |
| LCP-VSL-00002 | Melter 2 Concentrate Receipt Vessel | Room L-0124 | El. +3' |
| LFP-VSL-00001 | Melter 1 Feed Preparation Vessel | Room L-0123 | El. +3' |
| LFP-VSL-00002 | Melter 1 Feed Vessel | Room L-0123 | El. 3.3' |
| LFP-VSL-00003 | Melter 2 Feed Preparation Vessel | Room L-0124 | El. +3' |
| LFP-VSL-00004 | Melter 2 Feed Vessel | Room L-0124 | El. +3' |
| RLD-VSL-00003 | Plant Wash Vessel | Room L-0126 | El. +3' |
| RLD-VSL-00005 | SBS Condensate Collection Vessel | Room L-0126 | El. +3' |

| | | | |
|---|---|---|---|
| LOP-VSL-00001 | Melter 1 SBS Condensate Vessel | Room L-0123 | El. +3' |
| LOP-SCB-00001 | Melter 1 SBS Vessel | Room L-0123 | El. +3' |
| LOP-VSL-00002 | Melter 2 SBS Condensate Vessel | Room L-0124 | El. +3' |
| LOP-SCB-00002 | Melter 2 SBS Vessel | Room L-0124 | El. +3' |
| | | | |
| LOP-WESP-00001 | Melter 1 WESP | Room L-0123 | El. +3' |
| LOP-WESP-00002 | Melter 1 WESP | Room L-0124 | El. +3' |

Location and size of the C3/C5 drain collection cell (room L-B001B) is based on drawing 24590-LAW-P1-P01T-P0001 (*LAW Vitrification Building General Arrangement Plan at El. -21' 0"*). Location and size of process rooms L-0123, and L-0124 and effluent room L-0126, at elevation 3 ft are shown on drawing 24590-LAW-P1-P01T-P0002 (*LAW Vitrification Building General Arrangement Plan at El. 3' 0"*).

### 2.2 Secondary Containment Vault Liner Height

The caustic collection tank (LVP-TK-00001) is located in the caustic scrubber blowdown tank room L-0218 at elevation +28'-0". The height of the special protective coating on the containment vault wall is sized to handle the volume of fire-protection water from the fire protection system over the design area for a period of 20 minutes, multiplied by a safety factor of 1.1, in addition to the 100 % capacity (or total volume) of the tank. The fire protection water automatic sprinkler design density is 0.17 gpm/sq. ft. Location and size of room L-0218 at elevation +28 ft is shown on drawing 24590-LAW-P1-P01T-P0004 (*LAW Vitrification Building General Arrangement Plan at El. 28' 0"*).

# 3 Assumptions

### 3.1 Assumptions Not Requiring Verification

**3.1.1** To provide the worst case scenario, the vessels are conservatively assumed to be completely filled (including the top head) and sitting on the floor, and that the largest vessel total volume is used as the volume in determining the liner height. To allow for the worst case scenario, the volume of the vessel is assumed to leak completely onto the floor until it reaches equilibrium with surrounding fluid level.

### 3.2 Assumptions Requiring Verification

None

# 4 Methodology

As stated above in the criteria and design input section, to determine the required liner height for the worst case, the calculation methodology (per Assumption 3.1.1) considers that the vessels are completely filled and sitting on the floor and that the largest tank leaks completely into the room. For the C3/C5 drain collection cell (room L-B001B), the maximum leakage volume to the cell is fire water input from higher elevation floor drains to a filled C3/C5 drains/sump collection vessel (RLD-VSL-00004).

## 4.1 Basic Equations

$\pi = 3.14$

Area of a Rectangle = Length x Width

Inside cross-sectional area of the vessel = $\pi \frac{D_i^2}{4}$, outside cross-sectional area of the vessel = $\pi \frac{D_o^2}{4}$

Volume of Cylinder = $\frac{\pi}{4} \cdot D_i^2 \cdot h$

Volume of Rectangular Room = Length x Width x Height

Area of a Regular Polygon = 1/2 x a x p (where a = apothem and p = perimeter)

## 4.2 Room Dimensions, Equations and Symbology

L = length of room (ft)

W = width of room (ft)

H = height of room (ft)

A = area of room ($ft^2$)

$\Delta$ = height of high point slope above the top of sump (ft), if the room floor has sloping segments (if floor has no slope, $\Delta = 0$)

## 4.3 Volume and Liner Height Calculation

Volume of a vessel or tank is calculated by using the following equations:

$$V_S = \frac{\pi D_i^2}{4} L_{T-T}$$

where:

$V_S$ = volume of the cylindrical portion of the vessel or tank

$D_i$ = inside diameter, $D_o$ = outer diameter

$L_{T-T}$ = tangent to tangent length

Volume ($V_h$) of 1 F&D (flanged and dished) head is calculated using the following equation:

$$V_h = 0.0847 D_i^3$$

$d = 0.162\,D_i$, $d$ = the depth of the F&D head

Refer to *Pressure Vessel Design Manual* (Moss, 1987).

Volume ($V_c$) of conical head is calculated using the following equation:

$V_c = (1/3)(\pi/4)(D_i^2)\,d$, $d$ = the height of the conical head

$V_V$ = total volume of the vessel (tank) = volume of the cylindrical portion + volume of top head + volume of bottom head.

$V_F$ = Volume of Firewater = Area of Room x fire water spray density x 20 minutes x 1.1 safety factor
(this is calculated only if the room has automatic sprinkler system installed)

$V_{SF}$ = volume of fluid in the space above the top of sump up to the high point slope
(This is calculated only if the floor has sloping segments. Otherwise, $V_{SF} = 0$. Calculation involves 3-D geometry, which is not included here)

$H_L$ = required liner height (measured from top of sump)
= height of high point slope above top of sump + liner height above the high point slope

Total volume of fluid to be contained by the liner = $V_V + V_F$

Out of this volume, an amount of volume equal to $V_{SF}$ is contained in the space between top of sump and high point slope. This height is equal to $\Delta$.

The remaining volume of fluid $= V_V + V_F - V_{SF}$, which is contained by the portion of the liner above the high point slope.

This height of liner above the high point slope = $\dfrac{V_V + V_F - V_{SF}}{Available\ Area\ of\ Room}$

$H_L$ = required liner height above top of sump = $\Delta + \dfrac{V_V + V_F - V_{SF}}{Available\ Area\ of\ Room}$

### 4.4 Available Area for Liquid Containment

a) For Cells:

To calculate the possible (available) area that the liquid in the vessel could leak into, the sum of the cross sectional areas of the vessels (except the leaking or failing vessel) is subtracted from the cross sectional area of the room. Thus, the

Available area of the room = area of the room minus sum of the cross sectional areas of the vessels (except the leaking vessel) in the room ($ft^2$).

The height of liner is equal to the volume of the largest vessel divided by the available area of room.

Height of the liner (ft) = volume of the largest vessel / area available

b) For Room L-0218:

Room L-0218 contains 4 pumps and 1 tank. To calculate the possible area that the liquid could leak into, the available volume of the room and the volume of the firewater must be calculated. This is done in four steps, calculating available volume by height.

1. Calculate total (100%) volume of the tank
2. Calculate the volume of available secondary containment coating up to a height of 6"
3. Calculate additional height required to accommodate the remaining tank volume. Volume of the tank minus the volume calculated in step 2 is divided by the available area of the room. The available area of the room in this step is the area of the room above 6" high octagonal pedestal minus the combined cross-sectional area of the four pump pedestals.
4. Calculate the volume of 20 minutes of firewater from the sprinklers multiplied by a safety factor of 1.1. Calculate the height of the containment wall for firewater by dividing the volume of firewater by the available area of the room calculated in Step 3.

The secondary containment wall height required is then: 0.5 ft (= 6", from Step 2) plus additional height of wall (Step 3) plus height required for containment of firewater (Step 4).

# 5 Calculations

Complete calculations for the liner height are as follows for each individual cell:

### 5.1 C3/C5 Drain Collection Cell, Room L-B001B, Elevation -21 ft

| Vessel Number | Diameter ($D_i$) ft | $L_{T-T}$ ft | Head Type (Flange and Dished) | Total Height (including bottom and top head) ft | Remark |
|---|---|---|---|---|---|
| RLD-VSL-00004 | 10 | 11 | F&D (bottom and top) | 14.24 | |

Two scenarios are considered:

a Leakage and spillage of the C3/C5 drains/sump collection vessel RLD-VSL-00004

b Collection of fire water runoff when the vessel is full and intact with a safety factor of 1.1

### 5.1.1 Scenario a

In this scenario, liner height is calculated based on firewater discharge (from the in-cell sprinkler system, for a period of 20 minutes, at a discharge rate of 0.17 gpm / $ft^2$ using the total floor area of the cell i.e. including vessel cross-sectional area) with a safety factor of 1.1 plus 100% of the vessel volume.

$V_V$ = total volume of vessel RLD-VSL-00004 (using formula given in Section 4.3 above)

= Volume of the cylindrical portion + volume of top head + volume of bottom

= $[\pi/4 \times (10)^2 \times 11] + [0.0847 \times (10)^3] + [0.0847 \times (10)^3]$

= 863.94 + 84.7 + 84.7 = 1033.34, rounded to 1034 $ft^3$

Available area of the room = $(16.58 \times 23.33)$ = 387 $ft^2$

$V_F$ = volume of fire water from sprinkler system in the cell

= Area of room x fire water spray density x 20 minutes x 1.1 (= safety factor)

= 387 $ft^2$ x 0.17 gal/min/$ft^2$ x 20 min x 1.1 = 1447 gal = 193.5 $ft^3$

$V_{SF}$ = volume of fluid in the space above the top of sump up to the high point slope = 7.9 $ft^3$

$\Delta$ = height of high point slope above the top of sump = 2 in $\approx$ 0.167 ft

$H_L$ = required liner height above top of sump = 0.167 ft + $\frac{1034 + 193.5 - 7.9}{387}$ ft = 3.318 ft

= 3 ft 4 in (rounded to nearest inch).

### 5.1.2 Scenario b

The firewater runoff volume is conservatively calculated using an area of 3,000 $ft^2$, sprinkler discharge density of 0.17 gpm / $ft^2$, for a duration of 20 minutes, with a safety factor of 1.1. (NFPA 13, Standard for the Installation of Sprinkler Systems, 1999).

$V_{RF}$ = Runoff firewater volume = (3,000 $ft^2$) x (0.17 gpm / $ft^2$) x (20 minutes) x (1.1) = 11,220 gallons

= 1,500 $ft^3$.

Using the values of $\Delta$, $V_{SF}$, and available area of the room from Sec 5.1.1,

$H_L$ = required liner height above top of sump = $\Delta$ (= 0.167 ft) + $\frac{V_{RF} - V_{SF}}{available\ area\ of\ room}$

= 0.167 ft + $\frac{1{,}500 - 7.9}{387}$ ft = 0.167 ft + 3.855 ft = 4.022 ft = 4 ft 1 in (rounded to nearest inch).

The greater of the two values (of required liner height) from Sections 5.1.1 and 5.1.2 is taken as the minimum required liner height in this room.

Therefore, the minimum required liner height in the room L-B001B = 4 ft 1 in.

The installed liner height in room L-B001B = 9 ft 6 in.

## 5.2 Melter 1 and 2 Process Cells, Rooms L-0123 and L-0124, Elevation +3 ft

| Room Number | Vessel Number | Outside Diameter ($D_o$) ft, | Inside Diameter ($D_i$) ft | $L_{T-T}$ ft | Total Height (including bottom and top head) ft | Remark |
|---|---|---|---|---|---|---|
| L-0123 | LCP-VSL-00001 | 14.13 | 14 | 12.75 | 17.29 | Largest vessel in the room |
| | LFP-VSL-00001 | 11.13 | 11 | 10.46 | 14.02 | |
| | LFP-VSL-00002 | 11.13 | 11 | 10.46 | 14.02 | |
| | LOP-VSL-00001 | 12.10 | 12 | 8.12 | 12 | |
| | LOP-WESP-00001 | 8.08 | 8 | 17 | 19 | |
| | LOP-SCB-00001 | 10.10 | 10 | 6.5 | 9.74 | |
| L-0124 | LCP-VSL-00002 | 14.13 | 14 | 12.75 | 17.29 | Largest vessel in the room |
| | LFP-VSL-00003 | 11.13 | 11 | 10.46 | 14.02 | |
| | LFP-VSL-00004 | 11.13 | 11 | 10.46 | 14.02 | |
| | LOP-VSL-00002 | 12.10 | 12 | 8.12 | 12 | |
| | LOP-WESP-00002 | 8.08 | 8 | 17 | 19 | |
| | LOP-SCB-00002 | 10.10 | 10 | 6.5 | 9.74 | |

note: All vessels have F&D type bottom and top heads.

$V_V$ = volume of largest vessel from table above = volume of cylindrical portion + volume of heads
$= [\pi/4 \times (14)^2 \times 12.75] + [0.0847 \times (14)^3] + [0.0847 \times (14)^3]$
$= 1962.71 + 232.41 + 232.41 = 2427.6 \text{ ft}^3$

Available area of the room $= (38.33 \times 48.33) - [\pi/4 \times \{(8.08)^2 + (11.13)^2 + (12.10)^2 + (10.10)^2 + (11.13)^2]$
$= 1411.5 \text{ ft}^2$

$V_F$ = 0 (no sprinklers installed in these rooms)

$V_{SF}$ = volume of fluid in the space above the top of sump up to the high point slope
$= 62.1 \text{ ft}^3$

$\Delta$ = height of high point slope above the top of sump = 2 ⅞ in $\approx$ 0.24 ft

$H_L$ = required liner height above top of sump= $0.24 \text{ ft} + \frac{2427.6 + 0 - 62.1}{1411.5} \text{ ft} = 1.916 \text{ ft}$
= 1 ft 11 in (rounded to nearest inch).

## 5.3 Effluent Cell Calculations, Room L-0126, Elevation +3

| Room Number | Vessel Number | Diameters ($D_o$) ft, ($D_i$) ft | $L_{T-T}$ ft | Head Type | Total Height (including bottom and top head) ft | Remark |
|---|---|---|---|---|---|---|
| L-0126 | RLD-VSL-00003 | 16.13, 16 | 14.66 | Flat top and F&D bottom | 18 | Both vessels in this room |
| | RLD-VSL-00005 | 16.13, 16 | 14.66 | Flat top and F&D bottom | 18 | |

$V_V$ = volume of largest vessel (from the table above)
= volume of the plant wash/SBS condensate collection vessel (RLD-VSL-00003/RLD-VSL-00005)
= volume of cylindrical portion + volume of F&D bottom + volume of flat head (cylindrical) portion
$= [\pi/4 \times (16)^2 \times 14.66] + [0.0847 \times (16)^3] + [\pi/4 \times (16)^2 \times \{18 - 14.66 - (0.162 \times 16)\}]$
$= 2947.57 + 346.93 + 150.39$
$= 3445 \text{ ft}^3$

Available area of the room $= (38.33 \times 31.33) - [(\pi/4)(16.13)^2\}] = 996.54 \text{ ft}^2$

$V_F$ = 0 (no sprinklers installed in these rooms)

$V_{SF}$ = volume of fluid in the space above the top of sump up to the high point slope
= 11.4 $ft^3$

$\Delta$ = height of high point slope above the top of sump = 2 ⅛ in ≈0.177 ft

$H_L$ = required liner height above top of sump= 0.177 ft + $\frac{3445+0-11.4}{996.54}$ ft = 3.622 ft
= 3 ft 8 in (rounded to nearest inch).

## 5.4 Caustic Scrubber Blowdown Pump Room, Room L-0218, Elevation + 28

Caustic Collection Tank, Room L-0218, Elevation +28

| Room Number | Tank Number | Diameter ($D_i$) ft | $L_{T-T}$ ft | Head Type |
|---|---|---|---|---|
| L-0218 | LVP-TK-00001 | 13 | 14.33 | Flat bottom and conical top with 1: 6 slope |

Step 1. Tank volume.

Volume of the tank using the table above
= Volume of the Caustic Collection Tank (LVP-TK-00001)
= Volume of cylindrical portion + Volume of conical head portion
= [(π/4) (13 ft)$^2$ (14.33 ft)] + [(1/3) (π/4) (13 ft)$^2$ (1.083 ft)]
= 1,902.054 $ft^3$ + 47.916 $ft^3$ = 1,950 $ft^3$ (rounded to)

Step 2. Containment volume for 6" high wall.

Containment area has 6-in high octagonal pedestal for tank LVP-TK-00001. The distance between the parallel sides of the tank pedestal is 15ft. Each side of the pedestal is 6 ft 2 9/16 in.

Area of the tank pedestal is = 0.5 x 7.5 x 8 x 6.214 = 186.42 $ft^2$.

Area of the room available for containment up to a height of 6-in is
= Area of the room - Area of the Pump Pedestals - Area of the Tank Pedestal.

Area of the room = (9ft- 2 1/4in) x (21ft- 3in) + (15ft- 3in) x (22ft- 4in) + (5ft- 4 1/4in) x (19ft- 3in)
= (110.25in) x (255in) + (183in) x (268in) + (64.25in) x (231in)
= 638.89 $ft^2$

Area of the Pump Pedestals = 4 x ((2ft- 1in) x (5ft- 3in))
= 4 x (25in x 63in) = 43.75 $ft^2$

Area of the room available for containment up to a height of 6-in is
= 638.89 $ft^2$ - 43.75 $ft^2$ - 186.42 $ft^2$ = 408.72 $ft^2$

Volume of liquid contained by 6" high wall = 408.72 $ft^2$ x 0.5 ft = 204.4 $ft^3$

Step 3. Containment wall height needed for remaining fluid.

(Note: VSL is credited for containing volume up to a height equal to the wall height i.e. vessel area is included in the available area of the room)

Volume of tank = 1,950 $ft^3$

Remaining volume of tank to be contained = Volume tank - Volume contained by 6" high wall (7.2)
= 1,950 $ft^3$ - 204.4 $ft^3$
= 1745.6 $ft^3$

Area of the room available for containment is,
= Area of the room above 6in octagonal pedestal - Cross sectional area of the Pump Pedestals
= 638.89 $ft^2$ - 43.75 $ft^2$
= 595.14 $ft^2$

Height of wall needed to contain remaining volume of fluid from the tank
= 1745.6 $ft^3$ / 595.14 $ft^2$
= 2.933 ft

The wall height required to contain the leaking fluid from the tank to a height where the balance of fluids remain inside the tank, or a massive failure of the vessel where the leaking fluids flow back into the area of the ruptured tank.

Wall height for fluid containment = 0.5 ft + 2.933 ft = 3.433 ft.

Step 4. Additional wall height required for firewater.

In the event of a fire in the area and the sprinklers come on, the volume of water added to the containment will be based on the firewater spray density of 0.17 gal/min/$ft^2$ for a time of 20 minutes multiplied by a safety factor of 1.1.

Volume of firewater = Area of containment in $ft^2$ x 0.17 gal/min/$ft^2$ x 20 minutes x 1.1
= 638.89 $ft^2$ x 0.17 gal/min/$ft^2$ x 20 minutes x 1.1
= 2389.449 gallons
= 319.423 $ft^3$

Therefore, additional height of wall required to accommodate firewater volume
= Volume of firewater / (Area of the room - area of pump pedestals)

$= 319.423\ ft^3 / (638.89\ ft^2 - 43.75\ ft^2)$
$= 319.423\ ft^3 / (595.14\ ft^2)$
$= 0.537$ ft

Wall height required to accommodate for firewater = 0.537 ft

Total wall height for worst-case scenario.
Worst-case scenario includes both a rupture of the tank and the accumulation of 20 minutes of firewater.

Containment wall height required = 0.5 ft + 2.933 ft + 0.537 ft = 3.97 ft ≅ 4 ft.

# 6 Summary

The minimum required liner heights using the method above for the rooms are as follows:

**Table of Liner Height**

| Cell | Room | Required Liner Height above Top of sump (rounded to nearest inch) | Installed Liner Height |
|---|---|---|---|
| C3/C5 Drain Collection Cell | L-B001B | 4 ft 1 in | 9 ft 6 in |
| Melter 1 Process Cell | L-0123 | 1 ft 11 in | 2 ft 2 in |
| Melter 2 Process Cell | L-0124 | 1 ft 11 in | 2 ft 2 in |
| Effluent Cell | L-0126 | 3 ft 8 in | 4 ft 8 in |

**Table of Secondary Containment Wall Height with Special Protective Coating**

| Room | Room Number | Required Liner Height above Top of sump (rounded to nearest inch) | Installed Liner/ Coating Height |
|---|---|---|---|
| Caustic Scrubber Blowdown Pump Room | L-0128 | 4 ft 0 in | 4 ft 0 in |

# 7 References

24590-LAW-P1-P01T-00001, *LAW Vitrification Building General Arrangement Plan at El. -21'0" Rev. 3*

24590-LAW-P1-P01T-00002, *LAW Vitrification Building General Arrangement Plan at El. 3'0" Rev. 5*

24590-LAW-P1-P01T-00004, *LAW Vitrification Building General Arrangement Plan at El. 28'0" Rev. 4*

24590-LAW-P1-P01T-00005, *LAW Vitrification Building General Arrangement Plan at El. 48'0" Rev. 3*

Moss, Dennis R. 1987. *Pressure Vessel Design Manual*, Gulf Publishing Co.

24590-WTP-3PS-AFPS-TP006, Engineering *Specification for Field Applied Special Protective Coatings for Secondary Containment.*

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# Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# History Sheet

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| 8 | 8/25/08 | • Revised Figures 8 and 11 to provide additional sketch notes for Laboratory weir plans and sections<br>• Addition of Figure 13 LAW Melter Encasement Assembly sketch<br>Issued for Permitting Use | Bryson Bogart |
| 9 | 2/8/10 | • Added Figures 14 through 16, revised Figure 13<br>Issued for Permitting Use | Bryson Bogart,<br>Dan Robertson |

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# 1 Introduction

In accordance with Chapter 173-303 Washington Administrative Code (Ref. 2.1.5), facilities that manage liquid dangerous waste must provide secondary containment[1]. At the Waste Treatment and Immobilization Plant, secondary containment systems have been designed to prevent a release of dangerous waste to the environment as required by the Code.

This report describes and provides references to the design criteria, load definitions, load combinations, material of construction, and methodology for the analysis/design of Pretreatment (PT), High-Level Waste (HLW), Low-Activity Waste (LAW) facilities, and Analytical Laboratory (LAB) building with emphasis on secondary containment components. It also includes several representative typical details.

# 2 Applicable Documents

## 2.1 Codes and Standards

2.1.1 ACI 349, Code Requirements for Nuclear Safety-Related Concrete Structures.

2.1.2 ACI 318, Code Requirements for Structural Concrete.

2.1.3 Uniform Building Code (UBC), 1997.

2.1.4 ANSI/AISC N690, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities.

2.1.5 Washington Administrative Code, Chapter 173-303.

2.1.6 AISC M016-89, Manual of Steel Construction -Allowable Stress Design, Ninth Edition.

2.1.7 ASCE 7, Minimum Design Loads for Buildings and Other Structures.

2.1.8 ASCE 4, Seismic Analysis of Safety-Related Nuclear Structures and Commentary.

2.1.9 Safety Requirements Document, Volume 11, 24590-WTP-SRD-ESH-01-001-02.

[1] With the exception of ancillary equipment as provided by 173-303-640(4)(f) and approved by DWP.

# 3 Description

## 3.1 Design Methodology, Material, Loads, and Load Combinations

| | |
|---|---|
| **Methodology** | Codes and specifications:<br>• PT and HLW:<br>General: ASCE 4 (Ref. 2.1.8).<br>Concrete: ACI 349 (Ref. 2.1.1).<br>Steel: ANSI/AISC N690 (Ref. 2.1.4) and AISC (Ref. 2.1.6).<br>• LAW and LAB:<br>General: UBC (Ref. 2.1.3).<br>Concrete: ACI 318 (Ref. 2.1.2).<br>Steel: AISC M016 (Ref. 2.1.6). |
| **Dead Loads and Live loads:** | ASCE 7 (Ref. 2.1.7), UBC (Ref. 2.1.3), and Tables 4-1 and 4-2 of SRD (Ref. 2.1.9). |
| **Seismic Loads** | Site-specific response spectra as specified in SRD (Ref. 2.1.9).<br>• PT and HLW:<br>Peak Ground Horizontal Acceleration = 0.30g.<br>Peak Ground Vertical Acceleration = 0.21g.<br>• LAW and LAB: Seismic Zone 2B (UBC, Ref. 2.1.3).<br>Peak Ground Horizontal Acceleration = 0.24g.<br>Peak Ground Vertical Acceleration = 0.16g. |
| **Material** | |
| Concrete | 28-day compressive strength, f'c = 4,000 psi and 5,000 psi. |
| Reinforcing Bar | ASTM A706, deformed. |
| Steel | W Shape – ASTM A992 or A572 Grade 50; Angles and Channels - ASTM A36 or A529 Grade 50; Plates - ASTM A36; Pipe - ASTM A53; Anchor Rods - ASTM F1554; Welded studs A108; Steel deck-ASTM A653. |
| **Load Combinations** | |
| Concrete | • HLW and PT: Based on ACI 349 (Ref 2.1.1).<br>• LAW and LAB: ACI 318 (Ref. 2.1.2) and UBC (Ref 2.1.3). |
| Steel | • HLW and PT: Based on ANSI/AISC N690 (Ref 2.1.4) and AISC (Ref 2.1.6).<br>• LAW and LAB: AISC M016-89 (Ref. 2.1.6) and UBC (Ref 2.1.3). |
| **Stainless Steel Liners (SS)** | Most commonly used in the process cells. Refer to Figures 2-5 for typical details. Refer to Figures 14 and 15 for ASX liner typical details. |
| **Special Protective Coating** | Material for coatings will be compatible with the dangerous waste. |
| **Yard Transfer Lines Structural Support** | Structural support for yard transfer lines (intra and inter facility waste transfer lines) is described in Ancillary Equipment Pipe Support Design, 24590-WTP-PER-PS-02-001. |

## 3.2 Typical Details

Figures 1 through 16 show several typical details related to secondary containment for PT, HLW, LAW, and LAB buildings.

**Figure 1** **Typical Vessel Embed, Support, and Flat Bottom Tank Details for LAW 3 Building**

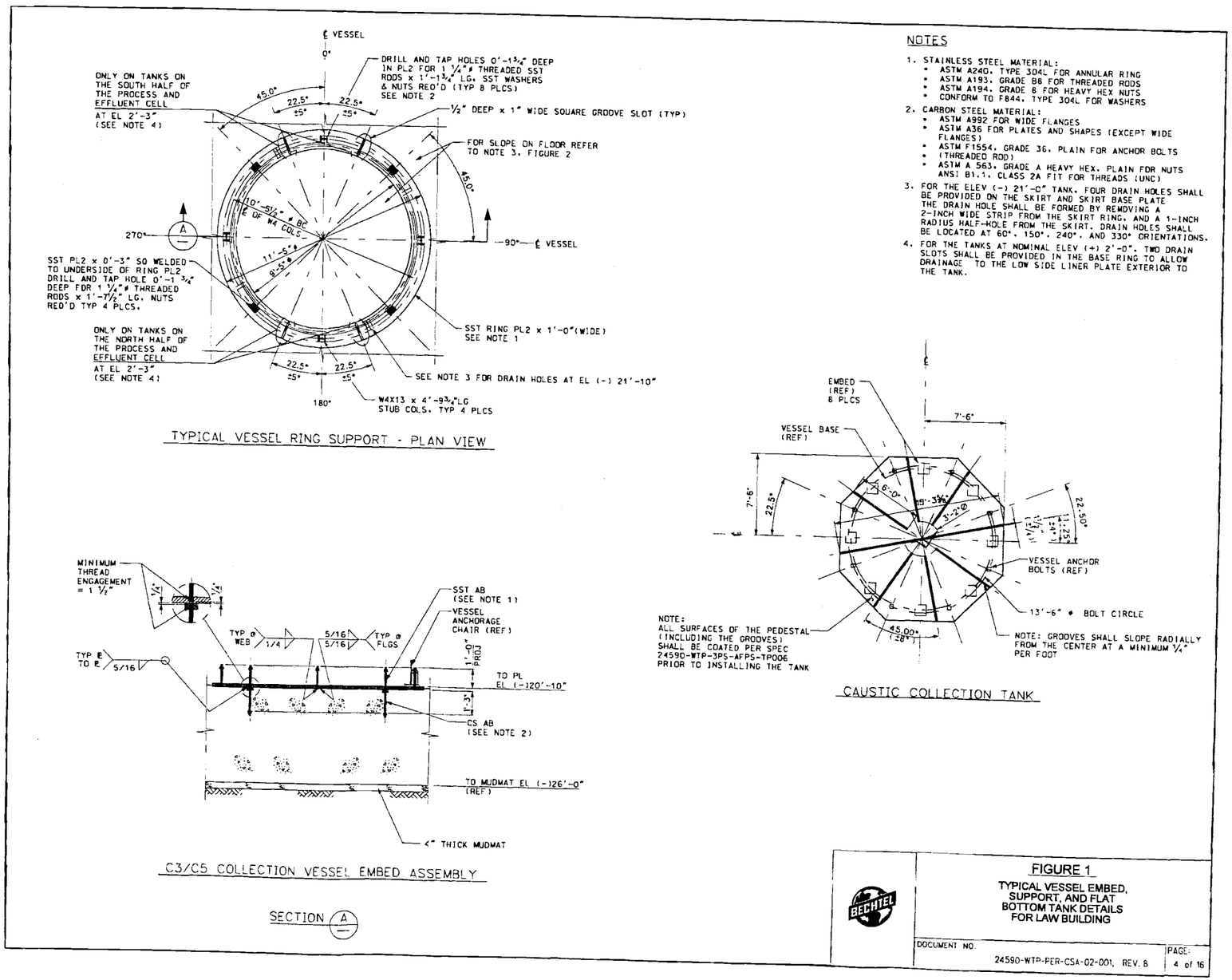


**Figure 2** **Liner Plate and Grillage Support Details for PT, HLW, LAW and LAB Buildings**

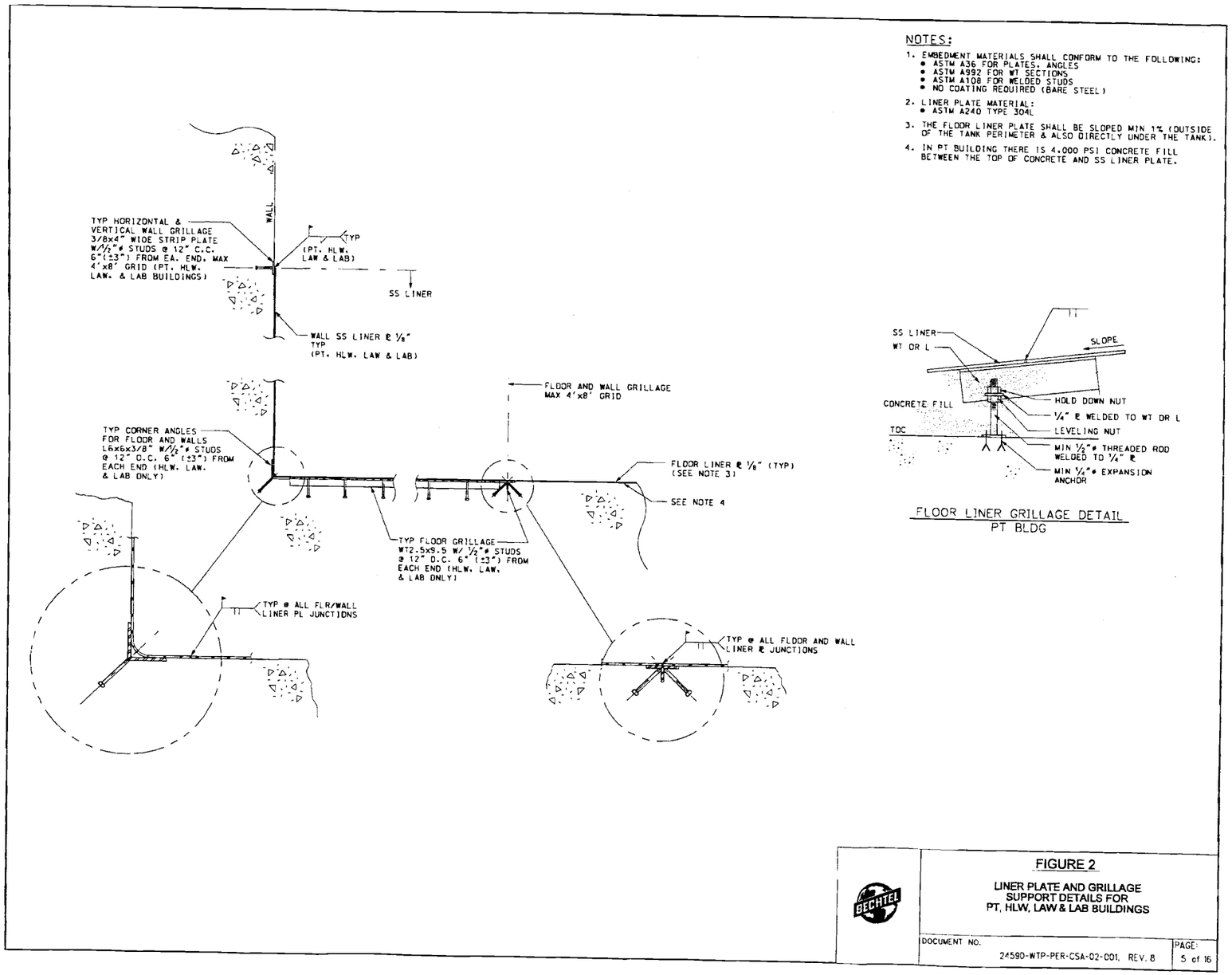


**Figure 3** **Typical Process Vessel Support Details for PT and HLW Buildings**

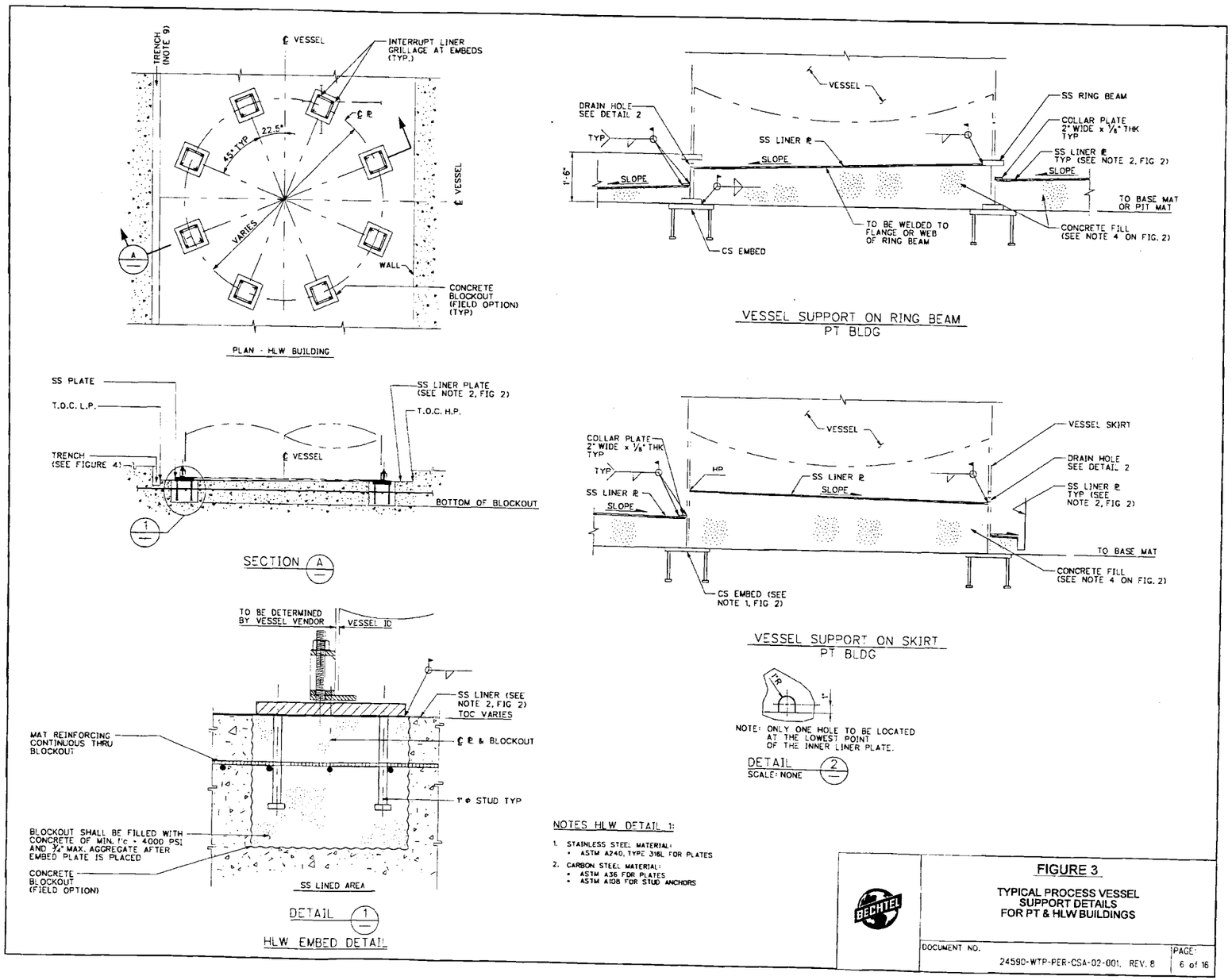
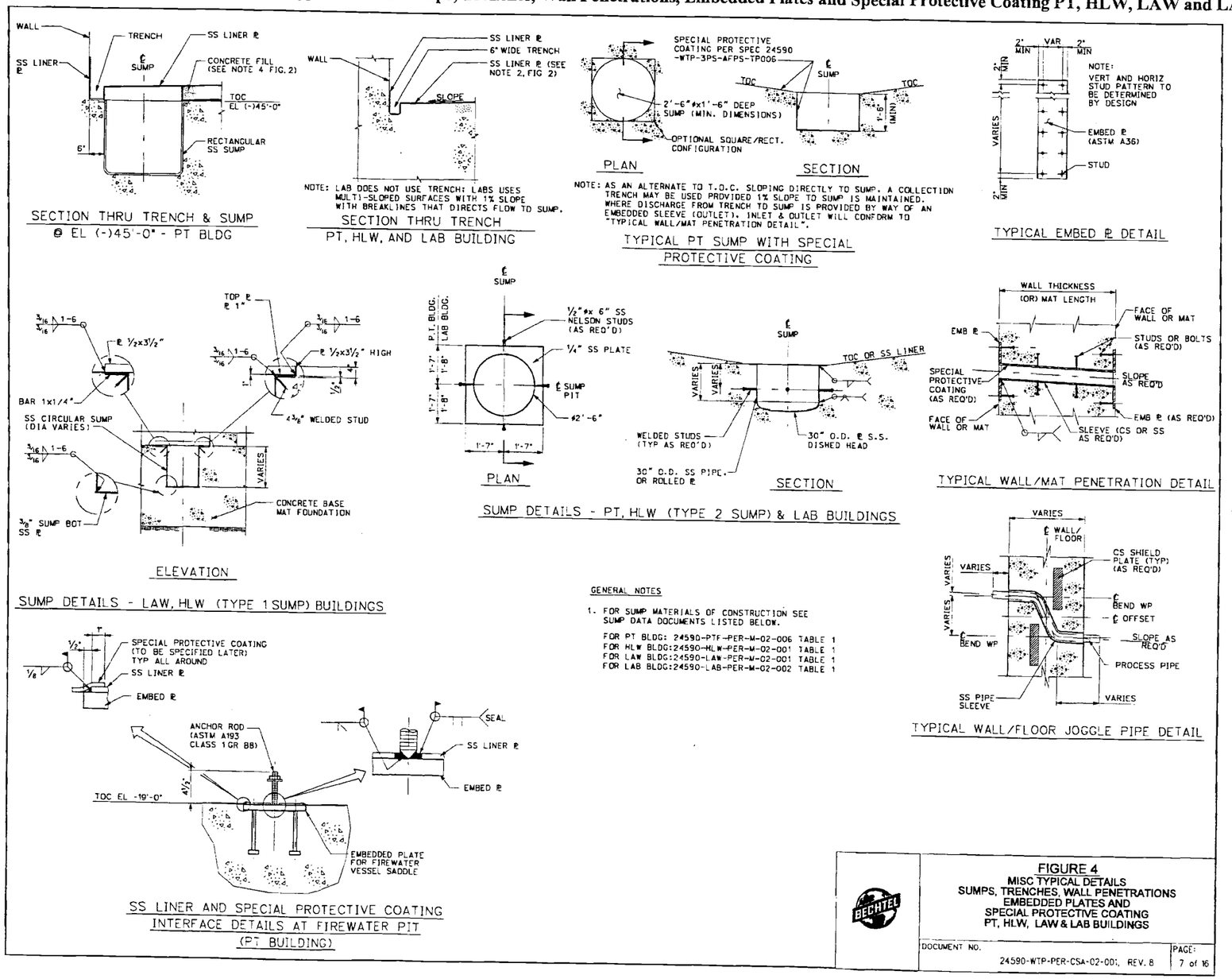


**Figure 4** **Misc. Typical Details Sumps, Trenches, Wall Penetrations, Embedded Plates and Special Protective Coating PT, HLW, LAW and LAB Buildings**




GENERAL NOTES

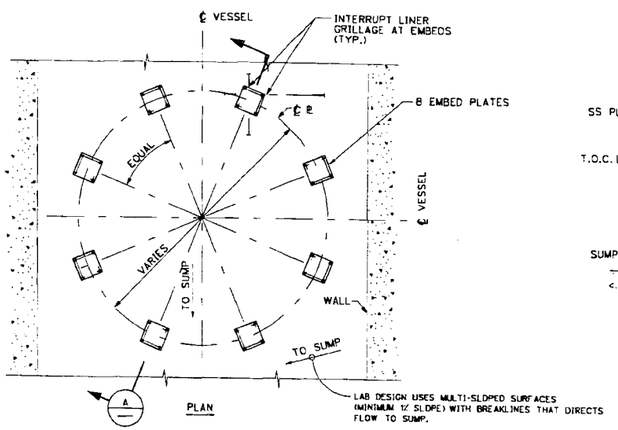
1. FOR SUMP MATERIALS OF CONSTRUCTION SEE SUMP DATA DOCUMENTS LISTED BELOW.

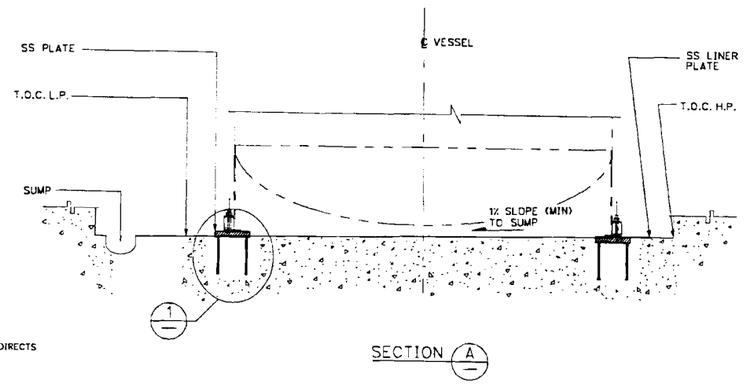
   FOR PT BLDG: 24590-PTF-PER-M-02-006 TABLE 1
   FOR HLW BLDG:24590-HLW-PER-M-02-001 TABLE 1
   FOR LAW BLDG:24590-LAW-PER-M-02-001 TABLE 1
   FOR LAB BLDG:24590-LAB-PER-M-02-002 TABLE 1

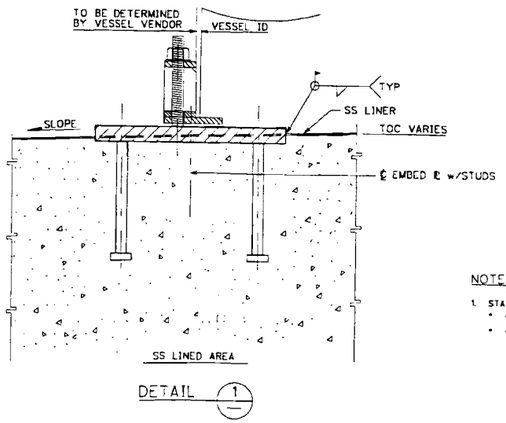
**FIGURE 4**
**MISC TYPICAL DETAILS SUMPS, TRENCHES, WALL PENETRATIONS EMBEDDED PLATES AND SPECIAL PROTECTIVE COATING PT, HLW, LAW & LAB BUILDINGS**

DOCUMENT NO. 24590-WTP-PER-CSA-02-001, REV. 8 | PAGE: 7 of 16

**Figure 5** **Typical Process Vessel Support Details for LAB Building**




NOTES:

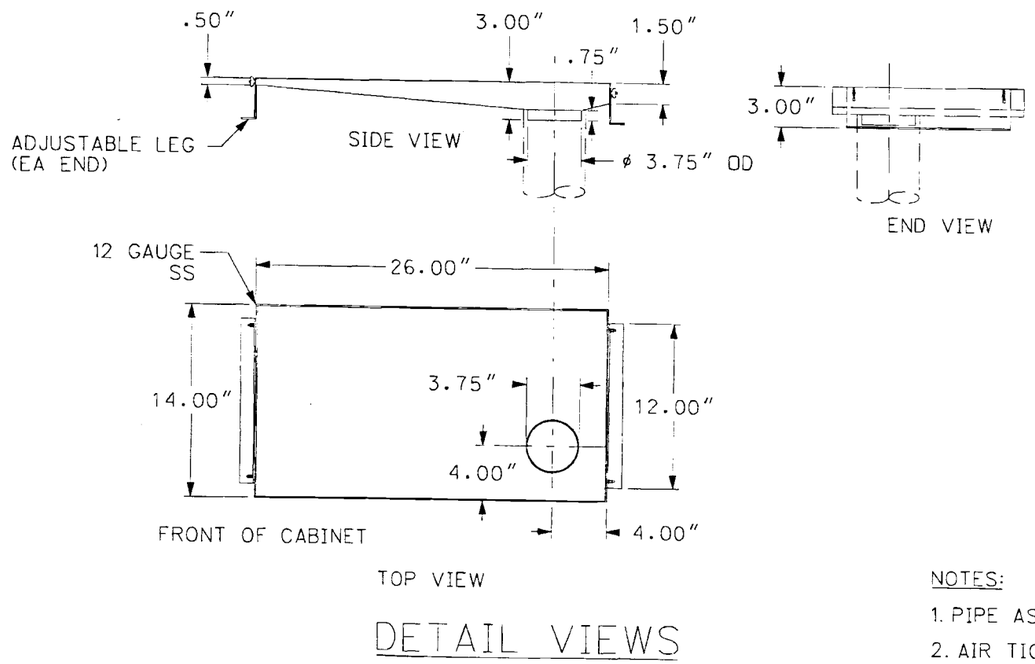
1. STAINLESS STEEL MATERIAL:
   - ASTM A240, TYPE 304L FOR PLATES
   - ASTM A108 GRADE C1010 THRU C1020 FOR STUD ANCHORS

**FIGURE 5**

TYPICAL PROCESS VESSEL SUPPORT DETAILS FOR LAB BUILDING

DOCUMENT NO. 24590-WTP-PER-CSA-02-001, REV. 8 | PAGE: 8 of 16

**Figure 6** **Plan View of Typical Under Sink and Fume Hood Drain for LAB Bldg Secondary Containment Leak Collection Pan**




DETAIL VIEWS

NOTES:

1. PIPE ASSEMBLY SHOP FABRICATED.
2. AIR TIGHT WELDS TO 50 PSIG.
3. LEAK COLLECTION PAN SHOP WELDED IN 12 GAUGE (0.1065"), 304L STAINLESS STEEL.

FIGURE 6

PLAN VIEW OF TYPICAL UNDER SINK
AND FUME HOOD DRAIN FOR LAB BLDG
SECONDARY CONTAINMENT LEAK COLLECTION PAN

DOCUMENT NO. 24590-WTP-PER-CSA-02-001, REV. B | PAGE: 9 of 16

**Figure 7** Section View of Typical Laboratory Under Sink and Fume Hood Drain for LAB Bldg Secondary Containment Leak Collection Pan, Including Leak Test Plug

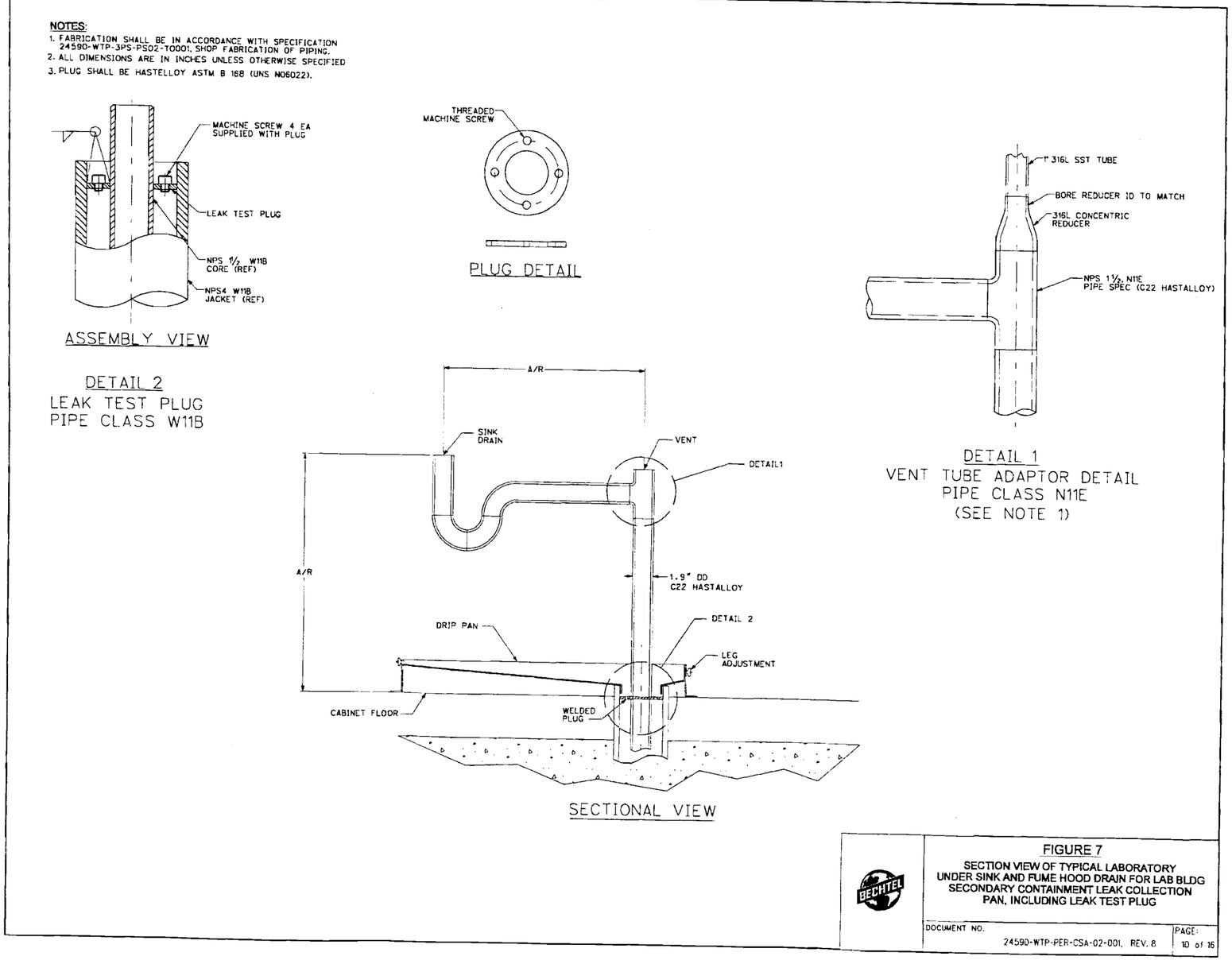
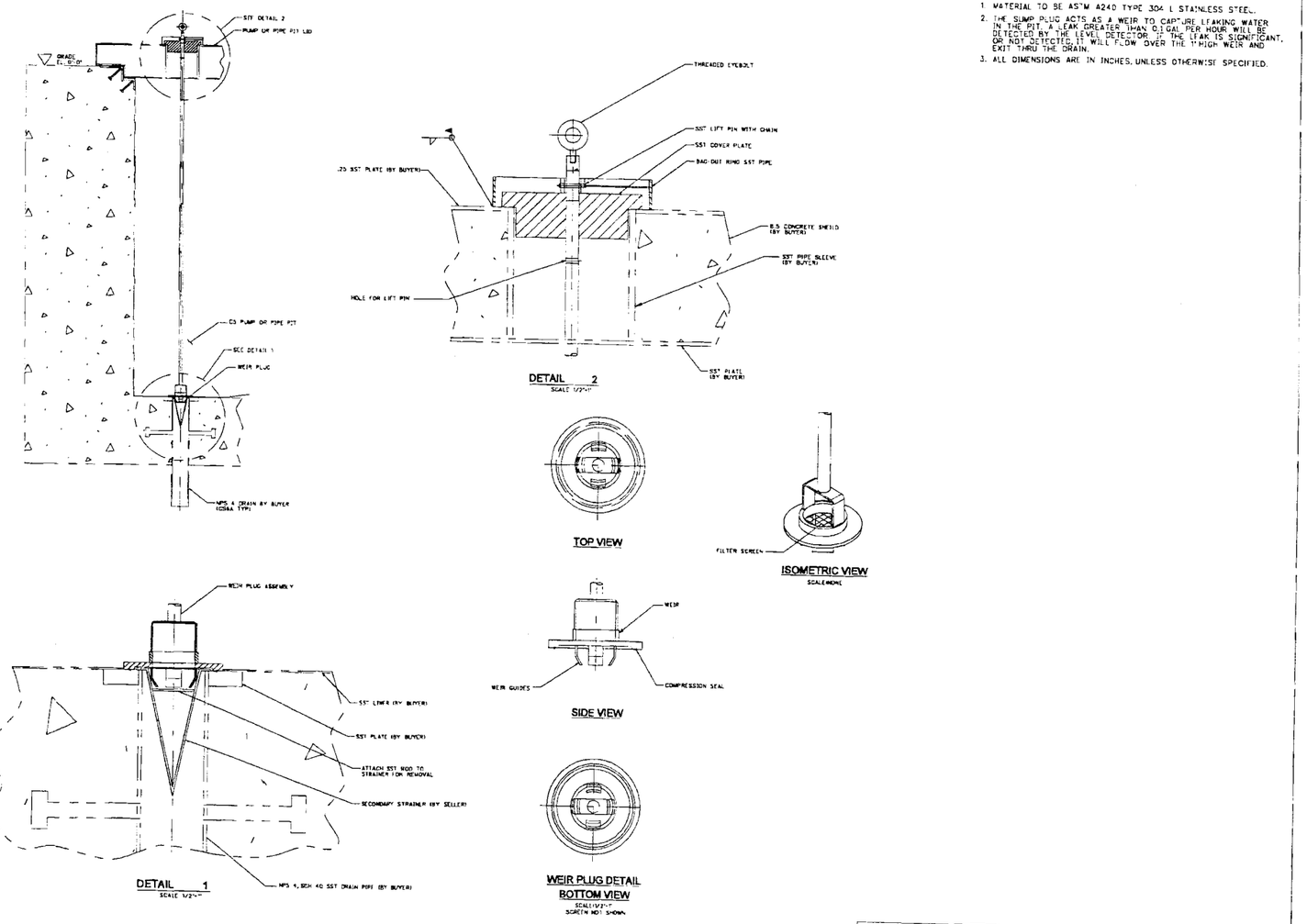


**Figure 8** **Typical Laboratory Piping and Pump Pit Sump and Weir Details for LAB Building**




NOTES:

1. MATERIAL TO BE ASTM A240 TYPE 304 L STAINLESS STEEL.
2. THE SUMP PLUG ACTS AS A WEIR TO CAPTURE LEAKING WATER IN THE PIT. A LEAK GREATER THAN 0.1 GAL PER HOUR WILL BE DETECTED BY THE LEVEL DETECTOR. IF THE LEAK IS SIGNIFICANT, OR NOT DETECTED, IT WILL FLOW OVER THE 1"HIGH WEIR AND EXIT THRU THE DRAIN.
3. ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE SPECIFIED.

FIGURE 8

TYPICAL LABORATORY C5 PIPING AND PUMP PIT SUMP AND WEIR DETAILS FOR LAB BUILDING

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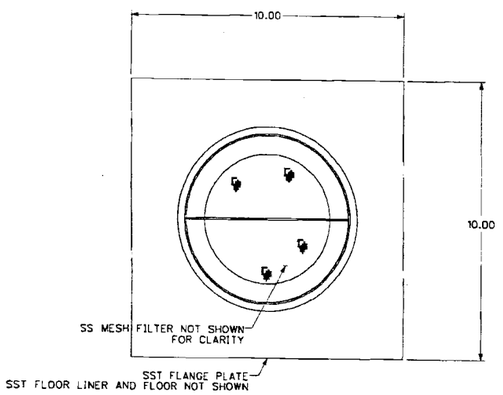
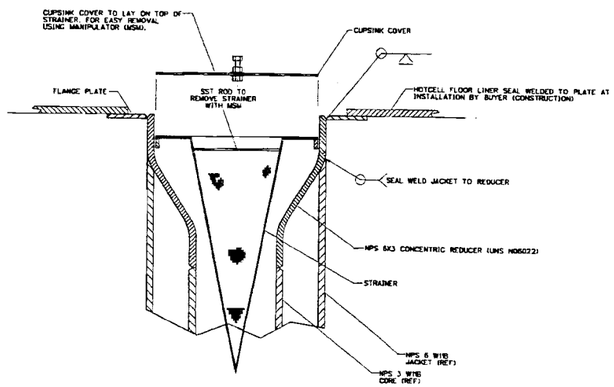
**Figure 9** **Typical Hot Cell Floor Drain Detail and Transfer Port Drain Detail for LAB Building**

NOTES:

1. FABRICATION SHALL BE IN ACCORDANCE WITH SPECIFICATION 24590-WTP-3PS-PS02-T0001, SHOP FABRICATION OF PIPING.
2. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
3. MATERIAL FOR THE FLANGE PLATE SHALL BE ASTM A240 TYPE 316L, STAINLESS STEEL. ALL OTHER STAINLESS STEEL ITEMS TO BE 300 SERIES.
4. MATERIAL: 14 GA., SST, PERFORATED PLATE 1/8" DIA. HOLES ON 3/16" CENTERS (40% OPEN AREA, 33 HOLES/SQ. IN.).
5. CUPSINK COVER - SST REGIMESH SINTERED WOVEN WIRE MESH GRADE 1 FILTER OR EQUIVALENT.

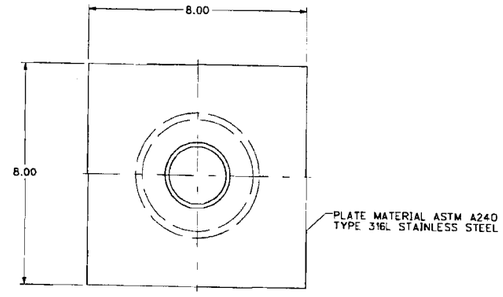


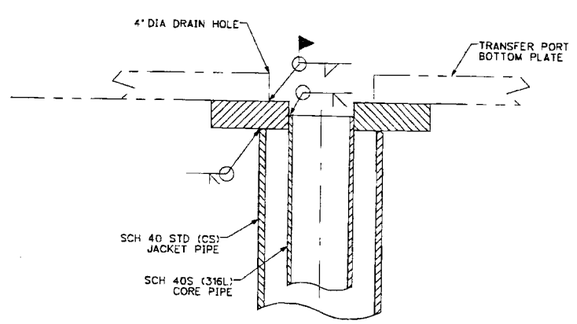

HOTCELL CUPSINK (FLOOR DRAIN) DETAIL
NPS 3 CORE PIPE
PIPE CLASS W16

NOTES:

1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
2. FABRICATION SHALL BE IN ACCORDANCE WITH SPECIFICATION 24590-WTP-3PS-PS02-T0001, SHOP FABRICATION OF PIPING.
3. PIPE CLASS S32B
4. DIMENSION TO SLIP FIT WITH OD OF CORE PIPE.




TOP VIEW




SECTION VIEW

HOT CELL TRANSFER PORT DRAIN

FIGURE 9

TYPICAL HOT CELL FLOOR DRAIN DETAIL AND TRANSFER PORT DRAIN DETAIL FOR LAB BUILDING

| DOCUMENT NO. | PAGE: |
|---|---|
| 24590-WTP-PER-CSA-02-001, REV. 8 | 12 of 16 |

**Figure 10** **Typical HLW Building Sump Details & Typical PT Building SS Liner/CS Embed Detail**

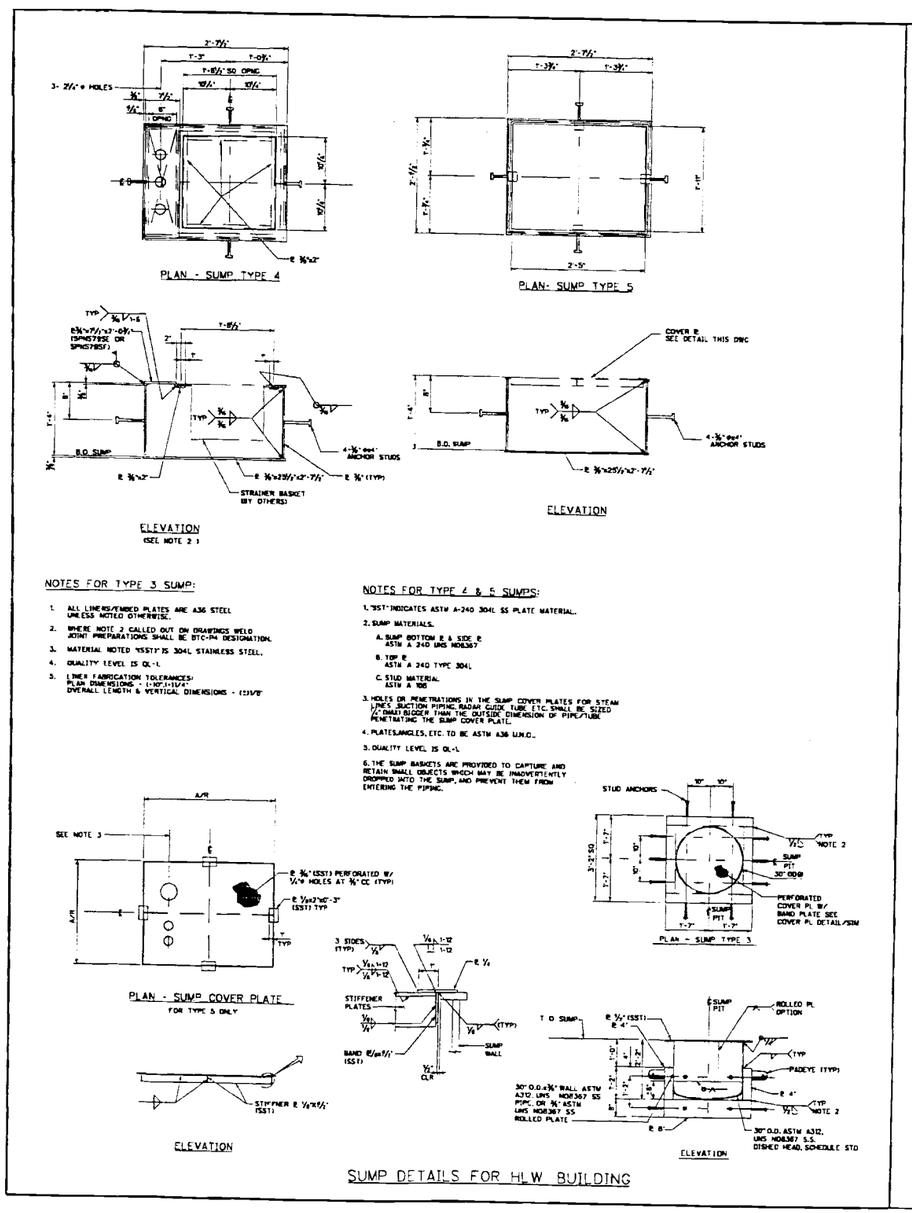



FIGURE 10

TYPICAL HLW BUILDING SUMP DETAILS & TYPICAL PT BUILDING SS LINER/CS EMBED DETAIL

DOCUMENT NO. 24590-WTP-PER-CSA-02-001, REV. 8 | PAGE: 13 of 16

**Figure 11** **Typical Laboratory C3 Piping and Pump Pit Sump and Weir Details for LAB Building**

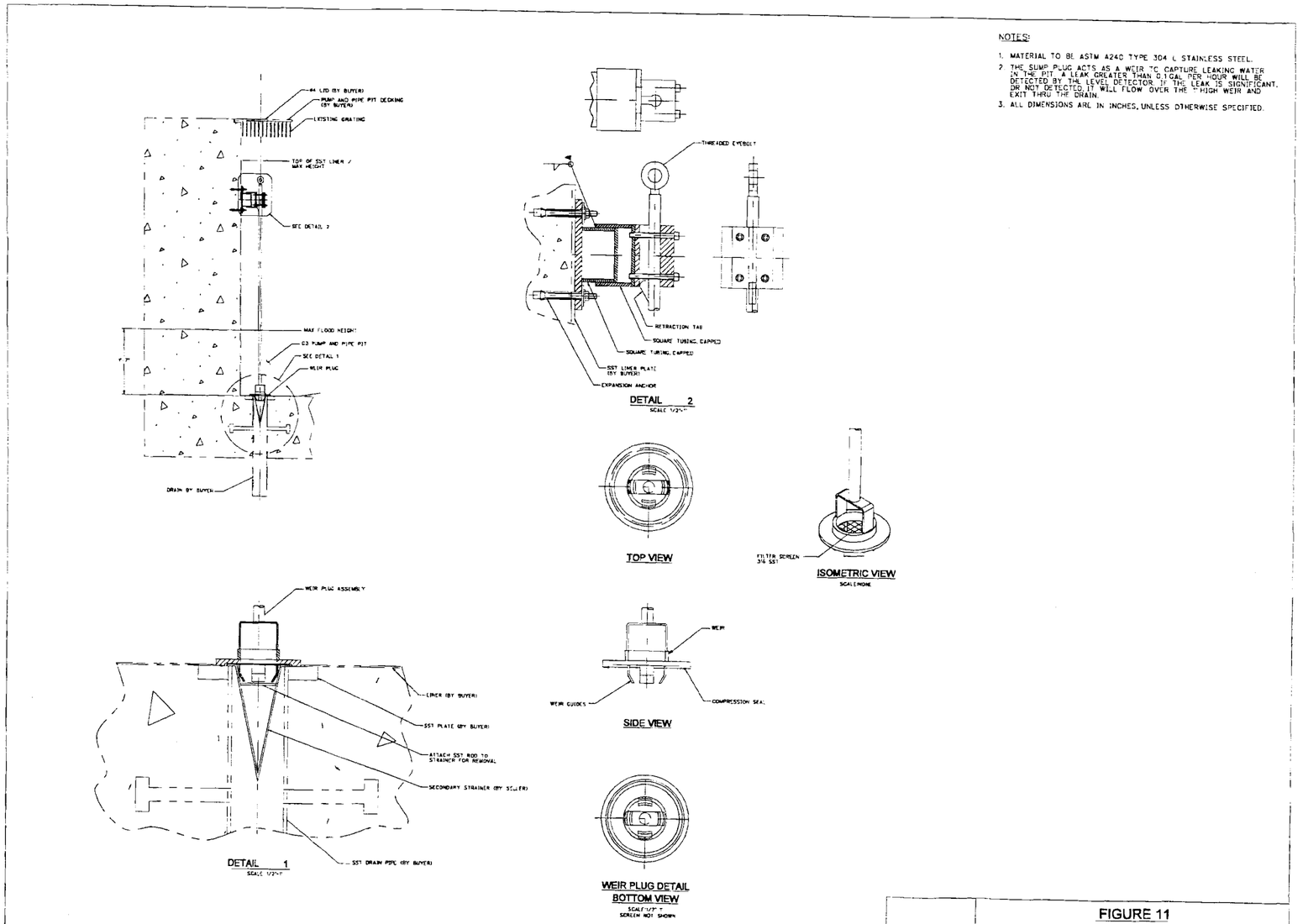
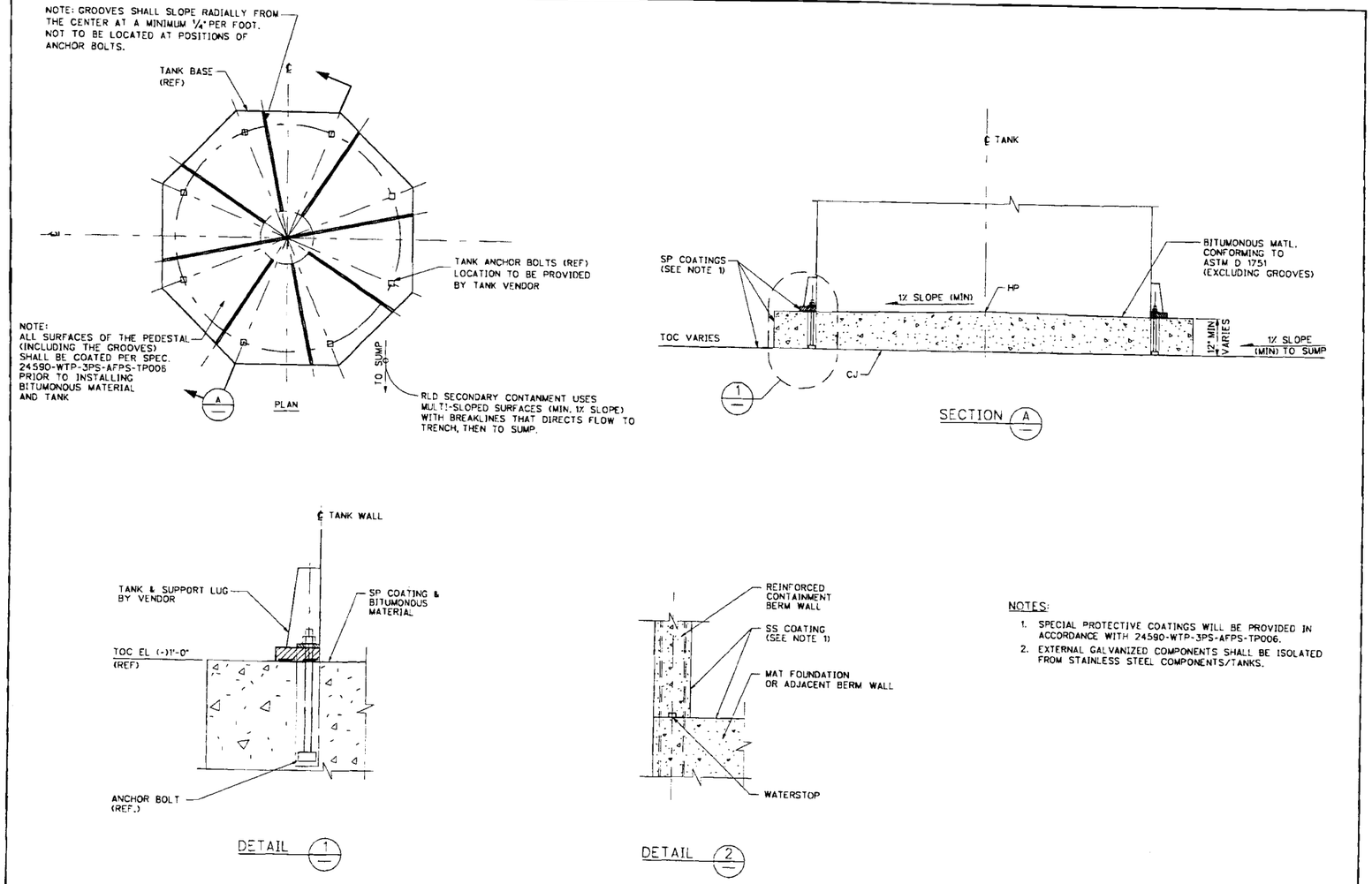


**Figure 12 Typical RLD Condensate Tank Support Details for PT Building (Exterior)**




NOTES:

1. SPECIAL PROTECTIVE COATINGS WILL BE PROVIDED IN ACCORDANCE WITH 24590-WTP-3PS-AFPS-TP006.
2. EXTERNAL GALVANIZED COMPONENTS SHALL BE ISOLATED FROM STAINLESS STEEL COMPONENTS/TANKS.

FIGURE 12
TYPICAL RLD CONDENSATE TANK SUPPORT DETAILS FOR PT BUILDING (EXTERIOR)

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**Figure 13 LAW Melter Encasement Assembly Secondary Containment Details**

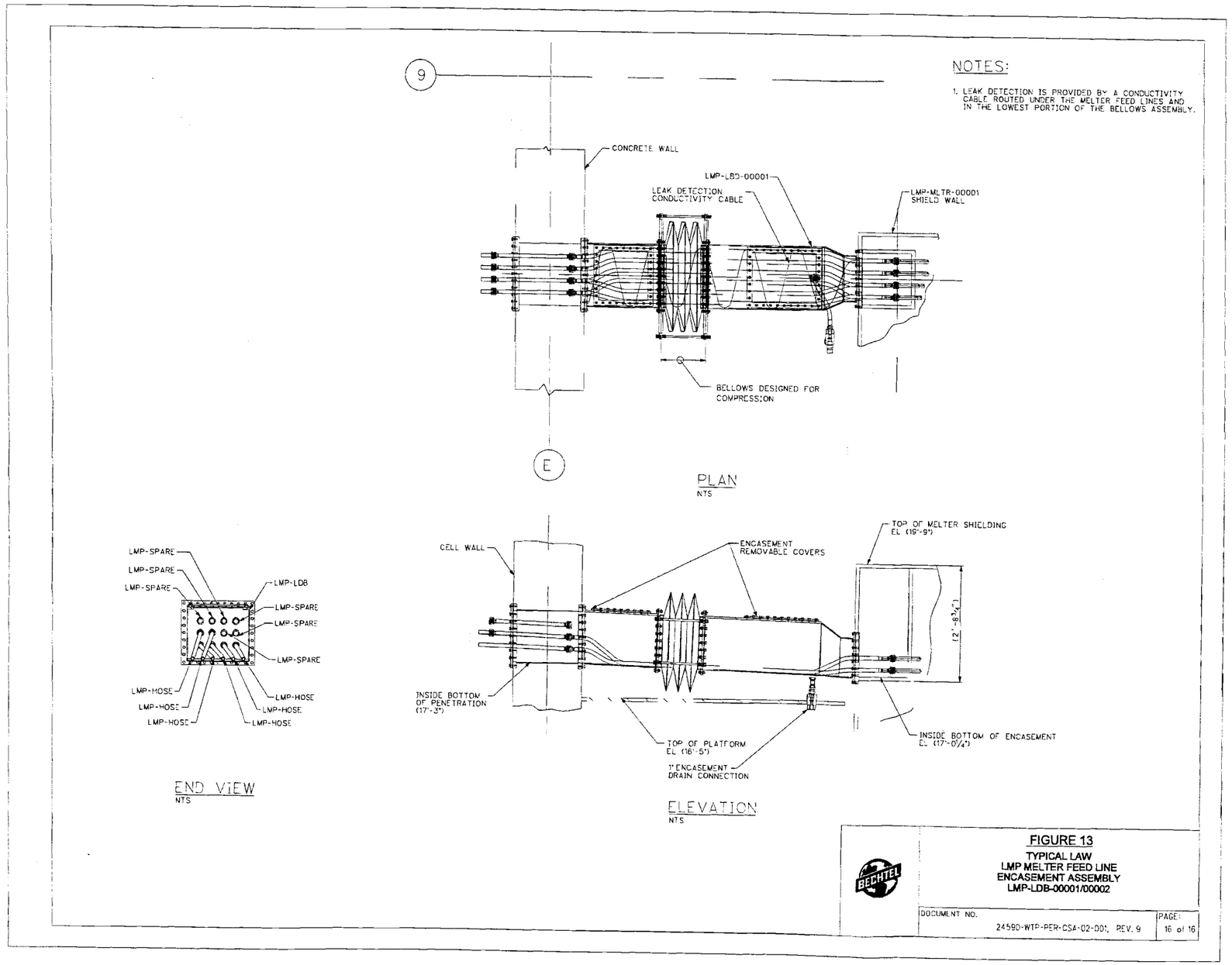


**Figure 14 Typical Autosampling System ASX Sampler Full Half Section**

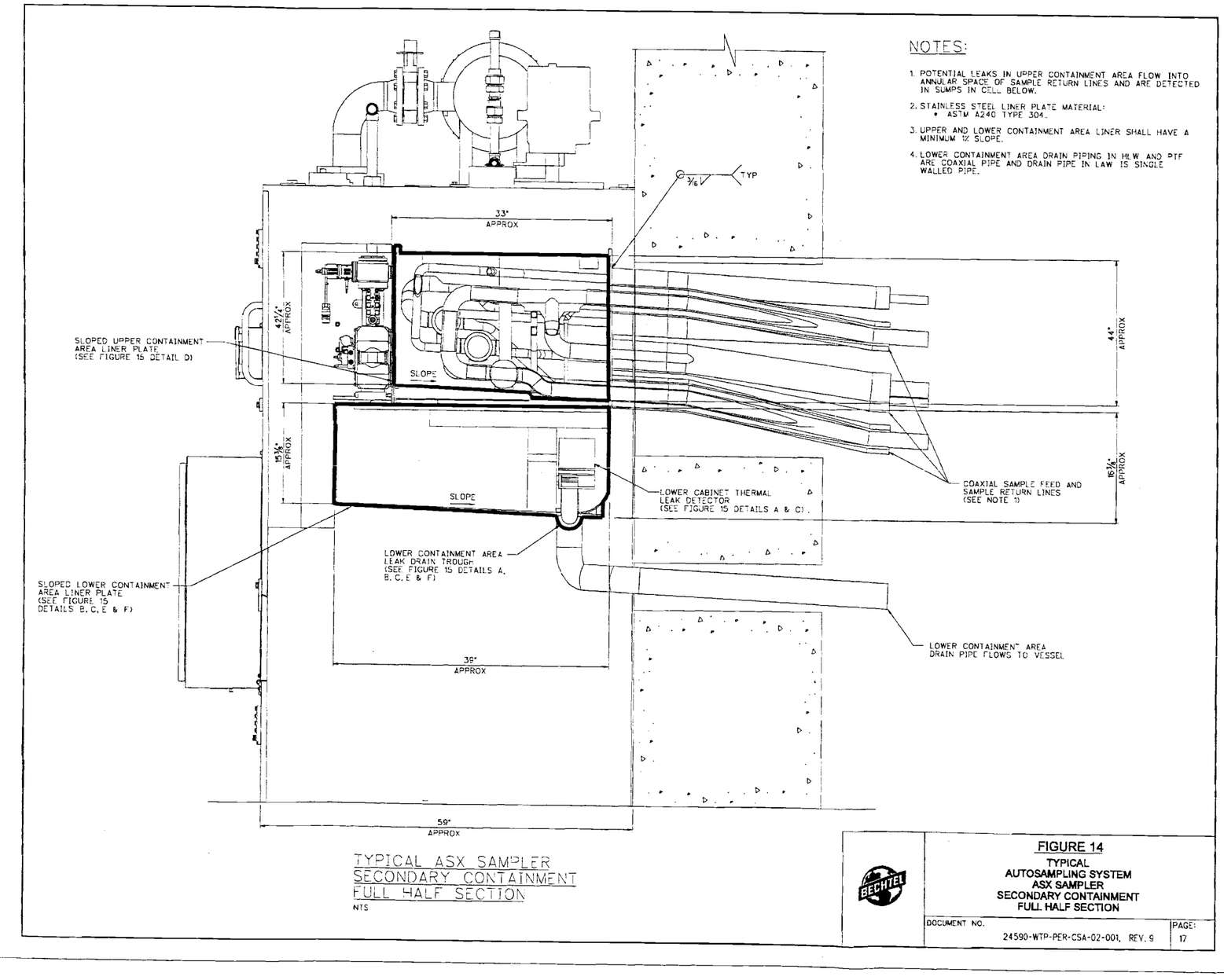
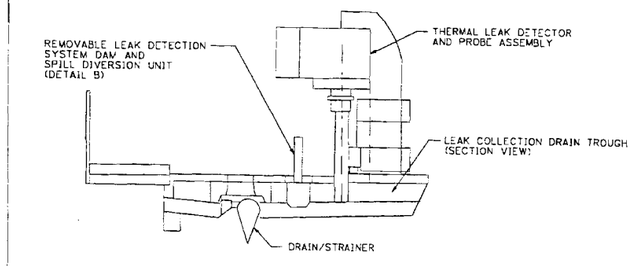
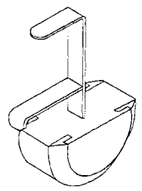


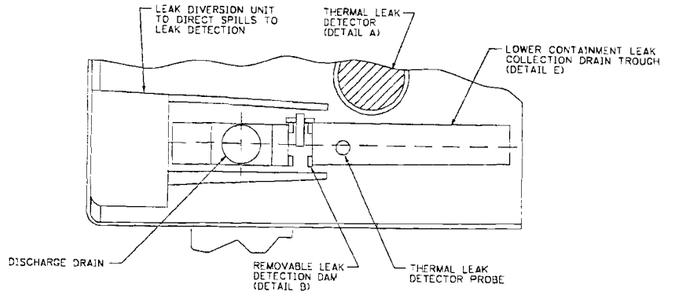
**Figure 15 Typical Autosampling System Lower Containment Area Leak Detection Details**



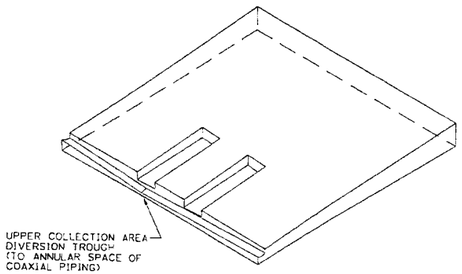

DETAIL A
SECTION VIEW OF DETAIL C
NTS



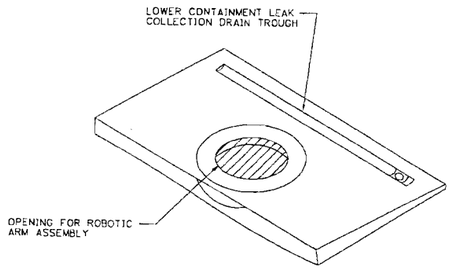
DETAIL B
ISOMETRIC VIEW
REMOVABLE LEAK DETECTION
SYSTEM DAM (WEIR)
NTS



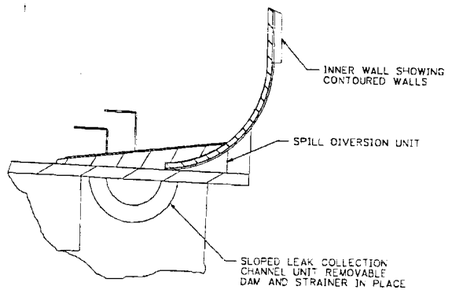

DETAIL C
PLAN VIEW OF DETAIL A
LOWER CONTAINMENT AREA
AND LEAK DIVERSION UNIT
NTS




DETAIL D
ISOMETRIC VIEW
UPPER CONTAINMENT AREA
LINER PLATE
NTS




DETAIL E
ISOMETRIC VIEW
LOWER CONTAINMENT AREA
LINER PLATE
NTS




DETAIL F
SECTION VIEW
NTS

**FIGURE 15**
**TYPICAL AUTOSAMPLING SYSTEM CONTAINMENT AREA AND LEAK DETECTION DETAILS**

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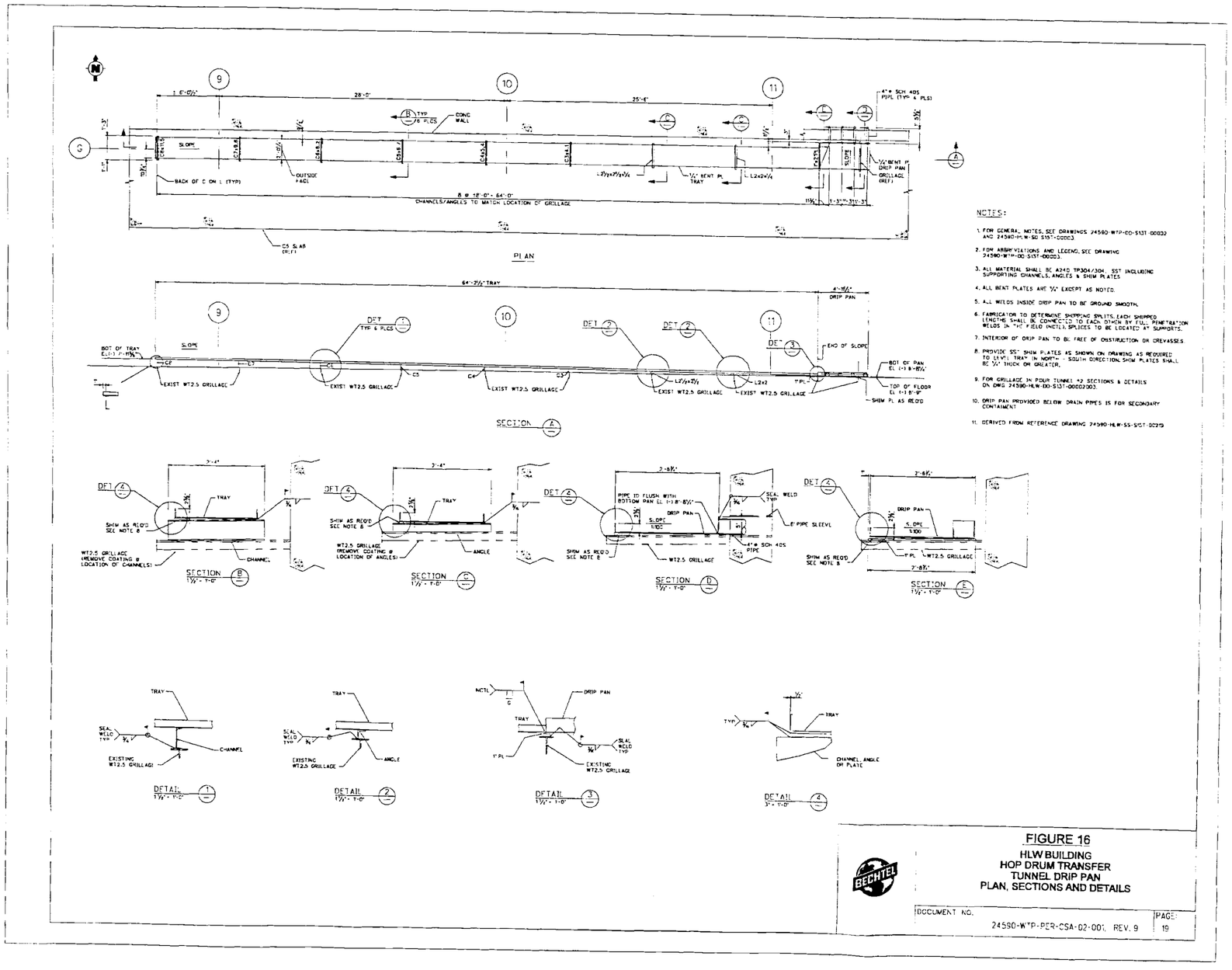
**Figure 16 HLW Building HOP Drum Transfer Tunnel Drip Pan Plan, Sections and Details**



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RPP-WTP PDC

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# Leak Detection in Secondary Containment Systems

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# Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# History Sheet

| Rev | Reason for revision | Revised by |
|---|---|---|
| 0 | Issued for Permitting Use | MCK/NJS |
| 1 | Total rewrite; Issued for Permitting Use | MCK |
| 2 | Issued to incorporate Open Pit Leak Pot | BAS |
| 3 | Format changes | BAS |
| 4 | Total rewrite; Incorporates and supersedes 24590-WTP-PER-J-02-001 Rev 5 | NAG |

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**Figure 5** Ultrasonic Gap Level Measurement ..... 11

**Figure 6** Typical Conductivity Cable Level Measurement for Pipe and Equipment Monitoring ..... 12

# Acronyms, Executive Summary, etc.

| | |
|---|---|
| AEA | Atomic Energy Act |
| DOE | US Department of Energy |
| DWP | Dangerous Waste Permit |
| HLW | high-level waste/ high-level waste vitrification facility |
| LAB | analytical laboratory |
| LAW | low-activity waste/ low-activity waste vitrification facility |
| LDB | leak detection box |
| P&ID | piping and instrumentation diagram |
| PCJ | process control system |
| PTF | pretreatment waste vitrification facility |
| WAC | Washington Administrative Code |
| WTP | Hanford Tank Waste Treatment and Immobilization Plant |

# 1 Introduction

The purpose of this document is to describe the leak detection methodology that will be used to meet the requirements of Washington Administrative Code (WAC) 173-303-640(4)(c)(iii) and Dangerous Waste Permit (DWP) condition III.10.E.9.b. The scope of this document covers the description of the leak detection technology employed for secondary containment systems at the Hanford Tank Waste Treatment and Immobilization Plant (WTP) facilities. The installation and functional testing of the leak detection technology is described herein.

# 2 Applicable Documents

WAC 173-303 - Dangerous Waste Regulations.

# 3 Description

This document describes the leak detection methods and leak detection technologies currently used in dangerous waste secondary containment areas. Dangerous Waste Permitted WTP tanks, miscellaneous units, autosamplers, Pretreatment Facility (PTF) bulges, confinement enclosures, Low-Activity Waste (LAW) melter encasement assemblies, and underground waste transfer lines use leak detection methods and technologies described in this document.

## 3.1 Leak Detection Method

Low-point design features and local monitoring/indication are the two methods employed at the WTP for secondary containment leak detection.

- Low-point leak detection consists of a continuously monitored leak collection point located at the lowest point in a containment area.
- Local leak monitoring/indication uses sensing instruments arranged around regulated equipment or piping.

These leak detection methods are used in WTP secondary containment systems that include:

- sumps
- leak detection boxes
- drains with a weir
- melter encasement assemblies
- confinement enclosures
- rack rooms.

Leak detection technologies could be used to support daily inspection for regulated piping and equipment that have no secondary containment requirements.

### 3.1.1 Leak Detection in Sumps

Sumps are typically stainless steel structures located in the secondary containment areas for tank and miscellaneous unit systems that manage liquid dangerous waste where personnel access is restricted or limited due to high radiation exposure and/or radioactive contamination. Sumps serve as the low point for the containment area and provide a means of detecting leaks and collecting liquid for removal. Each sump is equipped with leak detection monitoring instrumentation. Most sumps are equipped with either fluidic ejectors or pumps for removal of liquid, but some are drained by an operator using a portable pump or are gravity drained and have a weir (Section 3.1.3). The sumps are sized to allow detection of liquids using a radar or bubbler type monitoring instrument.

Typical sump design features are shown in 24590-WTP-PER-CSA-02-001, *Secondary Containment Design.* The leak detection instrumentation for each sump is shown on the Piping and Instrumentation Diagrams (P&IDs).

### 3.1.2 Leak Detection Box

Leak detection boxes (LDB) are used to provide leak detection in the co-axial waste transfer lines. Leak detection boxes are provided at the low point on waste transfer lines so that a leak in the inner process pipe will drain to the annular space of the outer containment pipe and into the leak detection box. Leak detection boxes are located in vessel cells, waste transfer line piping pits at the interface with other systems, and process tunnels where coaxial piping terminates and becomes single-walled piping.

Each LDB is monitored for liquid using a level switch (for example, ultrasonic gap or thermal dispersion) to detect leaks. Once the sensing element of the switch detects a leak, the switch will send a signal to the Process Control System (PCJ) to activate a leak detection alarm.

Leak detection boxes are horizontal stainless steel enclosures provided with a normal drain, an overflow drain, and weir (Figure 1). The drain located on the side of the weir into which the transfer line drains (that is, the containment side of the weir), is normally closed by a plug attached to a rod extending to a area above the leak detection box. The overflow drain, located in the non-containment side of the weir, will have a similar apparatus. The leak detector is a level switch located in the containment side of the weir. The overflow drain remains open for leak detection boxes located in vessel cells and piping tunnels and drain to a sump. For leak detection boxes located in open pit installations, the overflow drain will remain closed and will be opened by operations personnel to drain as needed after placement of appropriate overflow containment receptacle.

Typical LDB design features are shown in Figure 1. The leak detection instrumentation for each LDB is shown on the P&IDs.

### 3.1.3 Drain and Weir/Plug Assemblies

Drain and weir leak detection design is typically used in PTF bulges, WTP autosamplers , and the Laboratory piping and pump pit sumps. In these areas, the secondary containment liner slopes to a drain. A special weir or plug assembly at the drain retains the leaking fluid allowing the activation of the leak detection device. A leak will be detected by a sensing element such as a radar level detector, thermal switch, or ultrasonic gap switch. The leaking fluid is retained behind the weir or plug allowing detection before flowing over the weir/plug into the drain. Once the sensing element detects a leak, the level switch will send a signal to the PCJ to activate a leak detection alarm.

Typical drawings for drain and weir leak detection designs are provided in the *Engineering Specification for Process Bulge Design and Fabrication* (24590-WTP-3PS-MX00-T0001) and the *Secondary Containment Design* (24590-WTP-PER-CSA-02-001)

Specific design and instrumentation for each drain and weir/plug type leak detection system is shown on the P&IDs.

### 3.1.4 LAW Melter Feed Line Encasement Assemblies

The two LAW Melter Feed Line Encasement Assemblies provide leak detection for the LAW melter feed lines, between each process cell wall penetrations and each melter shield wall. The feed lines are surrounded by a sloped bellows assembly. Leak detection is provided by a conductivity cable located under the feed lines, in the lower portion of the bellows assembly. Once a leak is detected, the level switch will send a signal to the PCJ to activate a leak detection alarm. A low-point drain is provided to allow removal of potential leaks.

Melter Encasement Assembly design features are shown in 24590-WTP-PER-CSA-02-001, *Secondary Containment Design*.

### 3.1.5 Confinement Enclosures and Rack Rooms

A confinement enclosure is a walk-in, bulge-like area housing ancillary equipment, such as process piping, valves, and pumps. Confinement enclosures allow hands-on maintenance of equipment while controlling radioactive contamination and shielding personnel outside the enclosure. Rack rooms typically house piping racks; some of which are DWP ancillary equipment piping.

Typically, rack rooms and confinement enclosures provide secondary containment and leak detection for DWP ancillary equipment using a sensing element such as conductivity cable, or a combination of leak detection methods. Localized leak detection will be used primarily around ancillary equipment where either daily visual inspections are not feasible due to obstructed vision by an elevated grating or low-point leak detection is not available because of floor sloping requirements.

## 3.2 Leak Detection Technologies

Several leak detection technologies are utilized at the WTP, including the following:

- radar level detection
- bubbler
- thermal dispersion
- ultrasonic gap
- conductivity cable.

The leak detection technologies utilized at the WTP secondary containment areas are described below.

### 3.2.1 Radar

The radar level detection is provided for most of the WTP secondary containment sumps and some drain and weir assemblies. A typical radar level method employs a radar level transmitter. Radar transmitters are designed to transmit a signal using an antenna, and to receive the return signal with a cone designed to pick up radar high frequency, pulsed signals. Much of the transmitted signal is reflected by the liquid

surface and received at its source. A waveguide is used to channel the signals through different geometry or to avoid nearby equipment that might affect signal quality. Additionally, waveguides are used to move the location of the transmitter out of a high radiation environment into one that can be accessed by service personnel. The transmitter compares the time when the signal was sent to the time when the reflected signal returns. This time difference is then transferred to the PCJ as a level signal. The radar leak detection method will use one radar level detection transmitter.

Secondary containment sumps are designed to be dry with a liquid normally not present. The PCJ will monitor and alarm at a high level. A high-level alarm permits the operator to determine if a breach in the primary containment has occurred and has allowed fluid to flow into the secondary containment sump.

The PCJ will constantly monitor and perform diagnostics on the transmitter/foundation fieldbus data-communications link, and an alarm will result from a number of conditions, including loss of signal power, as required. A transmitter bad-data-quality PCJ alarm will be provided, as required.

Typical configurations of the sump radar leak detection are illustrated in Figure 2.

### 3.2.2 Bubbler

The bubbler level detection is provided for some of the WTP secondary containment sumps. The air bubbler leak-detection uses a dip pipe that extends into the sump. The dip pipe serves as a conduit for air at the pressure slightly greater than the opposed by the hydrostatic head of the liquid being collected in the sump. A differential pressure transmitter measures differences in pressure across the transmitter diaphragm because one side of the diaphragm is connected to the bubbler dip pipe/sensing line and the other side is referenced by a sensing line to the atmospheric pressure above the sump. Presence of liquid in the sump creates a greater air pressure in the dip pipe/sensing line and on the high pressure (HP) side of the diaphragm, resulting in a higher differential pressure, which is converted into a higher level signal to the PCJ. Multiple bubblers will be installed if a lack of maintenance access after the start of operations is expected and no other means of leak detection is provided.

Sumps are designed to be dry with a liquid normally not present. The PCJ will monitor the level and alarm "high level". A high-level alarm permits the operator to determine if a breach in the primary containment has occurred and has allowed fluid to flow into the secondary containment sump.

Additional alarms will be evaluated during design for the leak detection system. The PCJ will constantly monitor and perform diagnostics on the transmitter/foundation fieldbus data-communications link, and an alarm will result from a number of conditions, including loss of signal power, as required. A transmitter bad-data-quality PCJ alarm will allow the operator to indirectly infer a number of conditions, including a loss of bubbler air-purge flow, as required.

A typical configuration of the sump bubbler leak detection is illustrated in Figure 3.

### 3.2.3 Thermal Dispersion

The thermal dispersion level detection is provided for some of the WTP secondary containment systems, such as leak detection boxes and ASX sampler cabinets. The leak detection (level) switch method uses thermal dispersion technology. The measuring element of the level switch contains two temperature-sensitive probes. One probe contains a heated resistance temperature detector (RTD), and the other probe contains an unheated RTD reference at a thermal difference when no liquid is present.

When liquid contacts the probes, the thermal difference decreases and is measured, this will generate a high-level alarm to the PCJ.

A typical configuration of the thermal dispersion leak detection is illustrated in Figure 4.

### 3.2.4 Ultrasonic Gap

Ultrasonic gap leak detection uses a probe with two in-line crystals, a transmitter and a receiver, that have an air gap between them. The transmitting crystal typically sends an inaudible acoustic signal across the air gap to the receiving crystal. When the gap is filled with a liquid the signal strength increases, which causes the instrument to send a high level signal to PCJ.

A typical configuration of the ultrasonic gap leak detection is illustrated in Figure 5.

### 3.2.5 Conductivity Cable

Conductivity cable leak detection is provided for some WTP secondary containment systems, such as LAW Melter Feed Line Encasement Assemblies and may be used in other areas without low-point leak detection, such as rack rooms. Conductivity cable leak detection uses a cable and a resistance sensor to detect the presence of liquid. A conductive sensing cable is run through the area that is being monitored. The cable is terminated on both ends, one end is connected to a modular termination, while the other is connected to an alarm module. When liquid is present on any part of the cable, the resistance of the cable changes and is measured by the alarm module. The alarm module then sends a high-level signal back to the PCJ. The *Secondary Containment Design* (24590-WTP-PER-CSA-02-001), provides a typical configuration of the conductivity cable leak detection technology for the LAW Melter Feed Line Encasement Assemblies.

Conductivity cables can also be used to support daily visual inspection for regulated piping and equipment that is not provided with secondary containment and leak detection. For this application the conductivity cable is run along the bottom section of the pipe or equipment. Figure 6 shows this configuration in a pipe application.

## 3.3 Installation and Functional Testing

Prior to installation, the leak detection sensors will be tested for functionality and then installed and tested in accordance with manufacturer specifications. Leak detection instruments will be accessible for maintenance and periodically self-tested in-situ to verify functionality.

Once installed, the leak detection system, including all instrumentation and other associated equipment, will be tested as a system during initial startup testing. The system will be checked and verified for the proper alarm response.

After installation, instruments used for leak detection will be periodically tested per the manufacturer specifications to ensure they continue to operate per their design.

Figures 1 through 6 generally illustrate the typical installation of the leak-detection system.

### 3.3.1 Radar

The radar transmitter will be located in an area where maintenance will be performed under administrative control. The waveguide will be installed so that the waveguide enters the sump and is placed open-ended, with a gap from the sump bottom. Venting of the waveguide above the liner or berm is required; vent slots will be included as required. As shown in Figure 2, the radar waveguide will go through shielding (the floor or wall using a joggle in the waveguide) to protect the instrument, as well as personnel conducting maintenance operations on the transmitter from the radioactive environment of the cell.

The piping (waveguide) inserted into the process will primarily be welded pipe and will have the capability to be flushed.

### 3.3.2 Bubbler

The air bubbler differential pressure transmitter will be located at least 1 barometric head (approximately 34 feet) above the highest expected liquid surface level. This minimizes the possibility that the transmitter might be contaminated due to possible moisture collection or flow of the liquid up into the dip pipe/sensing line upon the loss of purge air. The transmitter will be located in an area where maintenance will be performed under administrative control.

Figure 3 shows a general sketch of the air bubbler leak-detection system. The sensing lines will go through radiation shielding to protect the instrument. Personnel conducting maintenance operations on the transmitter will be shielded from the radioactive environment of the cell. The bubbler sensing-line air-purge flow will be controlled to provide a minimum bubble rate.

The piping (bubbler dip pipe/sensing line) will have the capability to be flushed.

### 3.3.3 Thermal Dispersion & Ultrasonic Gap

Figures 4 & 5 show general sketches for the level switch configuration to detect liquid in a normally dry sump. The level switch electronics and element connector will be located in an area where maintenance will be performed under administrative control. A pipe protects and supports (and physically guides replacement of) the level switch element from the connector to the pit sump. The level element probes are positioned to properly monitor for liquid at the open end of the pipe.

### 3.3.4 Conductivity Cable

Conductivity cable installed in areas such as the LAW Melter Feed Line Encasement Assemblies is configured in a way such that all low points contain a part of the cable. Typically this means that the cables will lay across the bottom of the encasement assembly.

Conductivity cable used on piping to support daily visual inspection is installed along the bottom of the pipe, with care taken to ensure that all low points are covered.

**Figure 1 Typical Leak Detection Box Level Measurement**

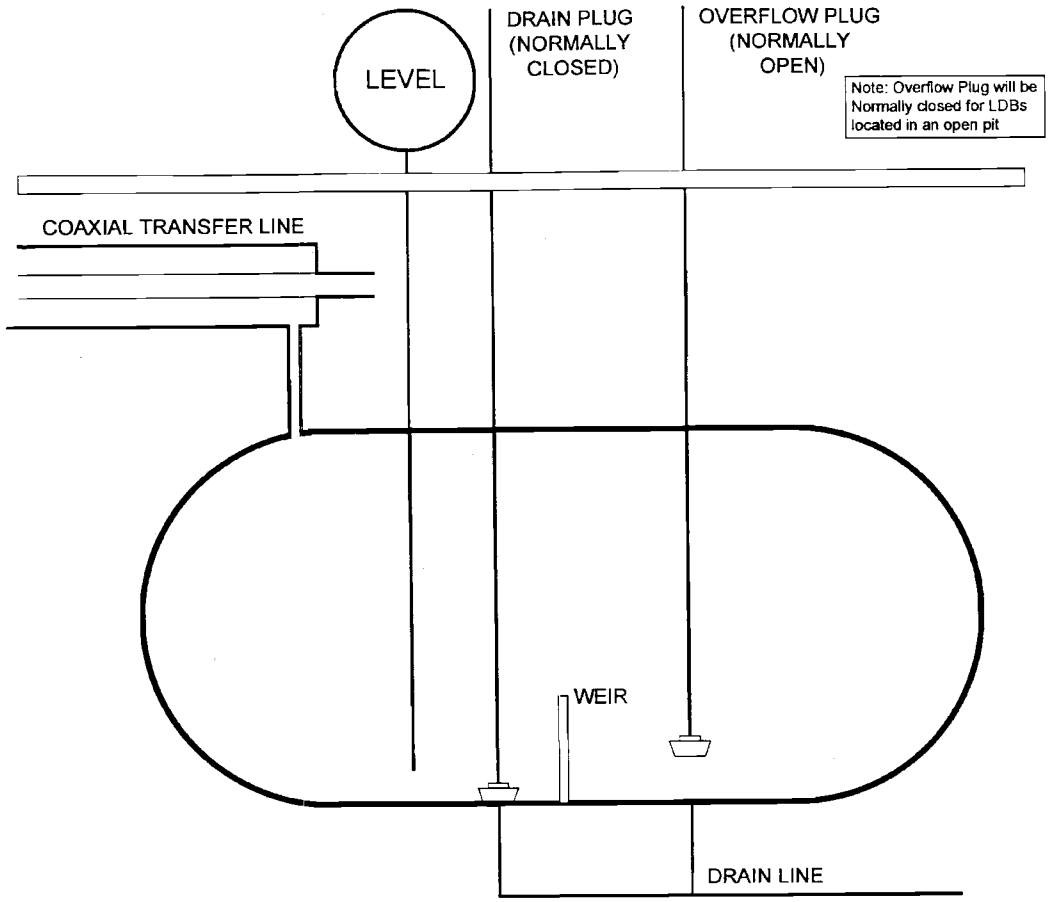


**Figure 2** **Typical Radar Level Measurement for Sumps in C5 Area**

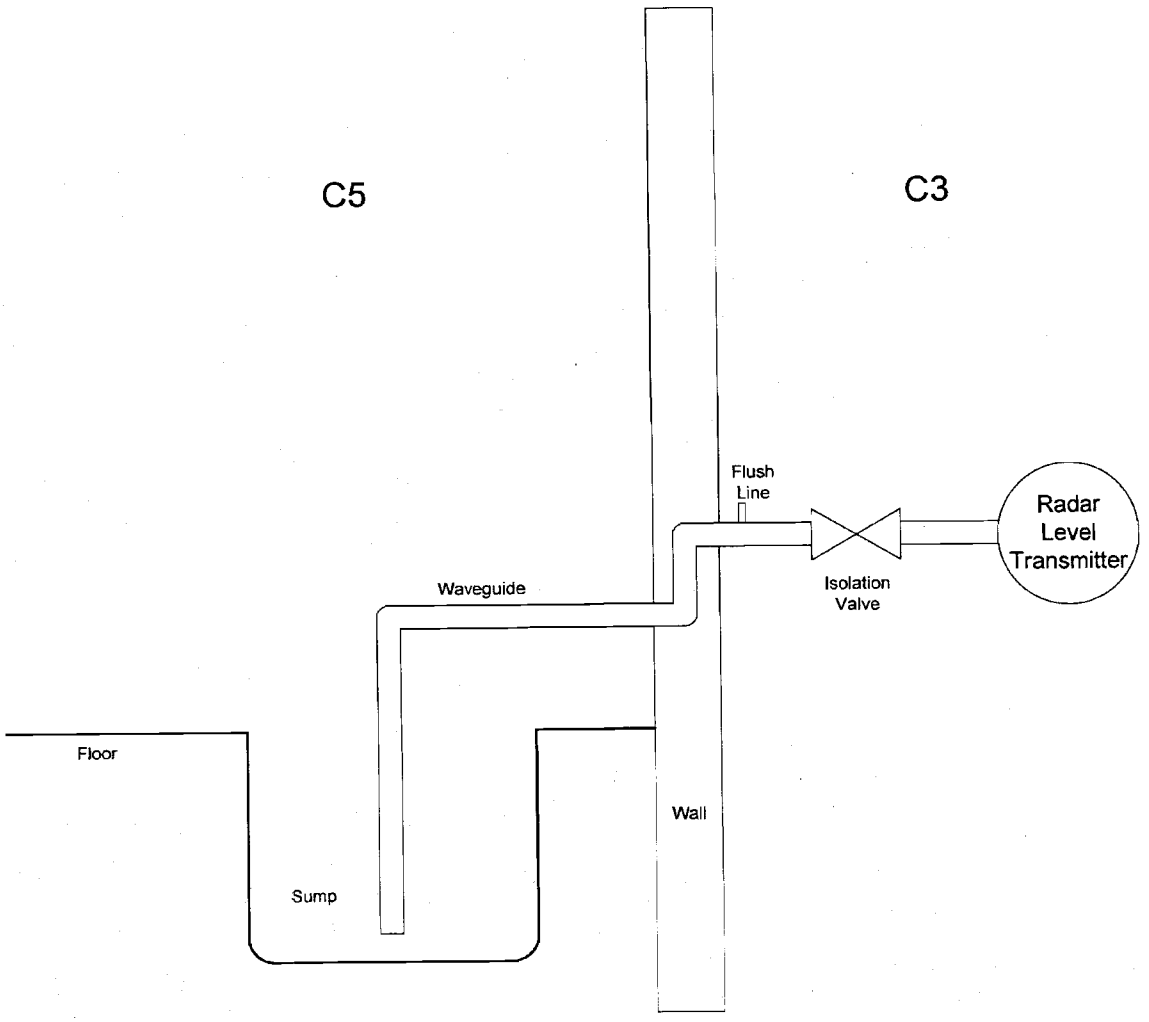


**Figure 3 Typical Bubbler Level Measurement**

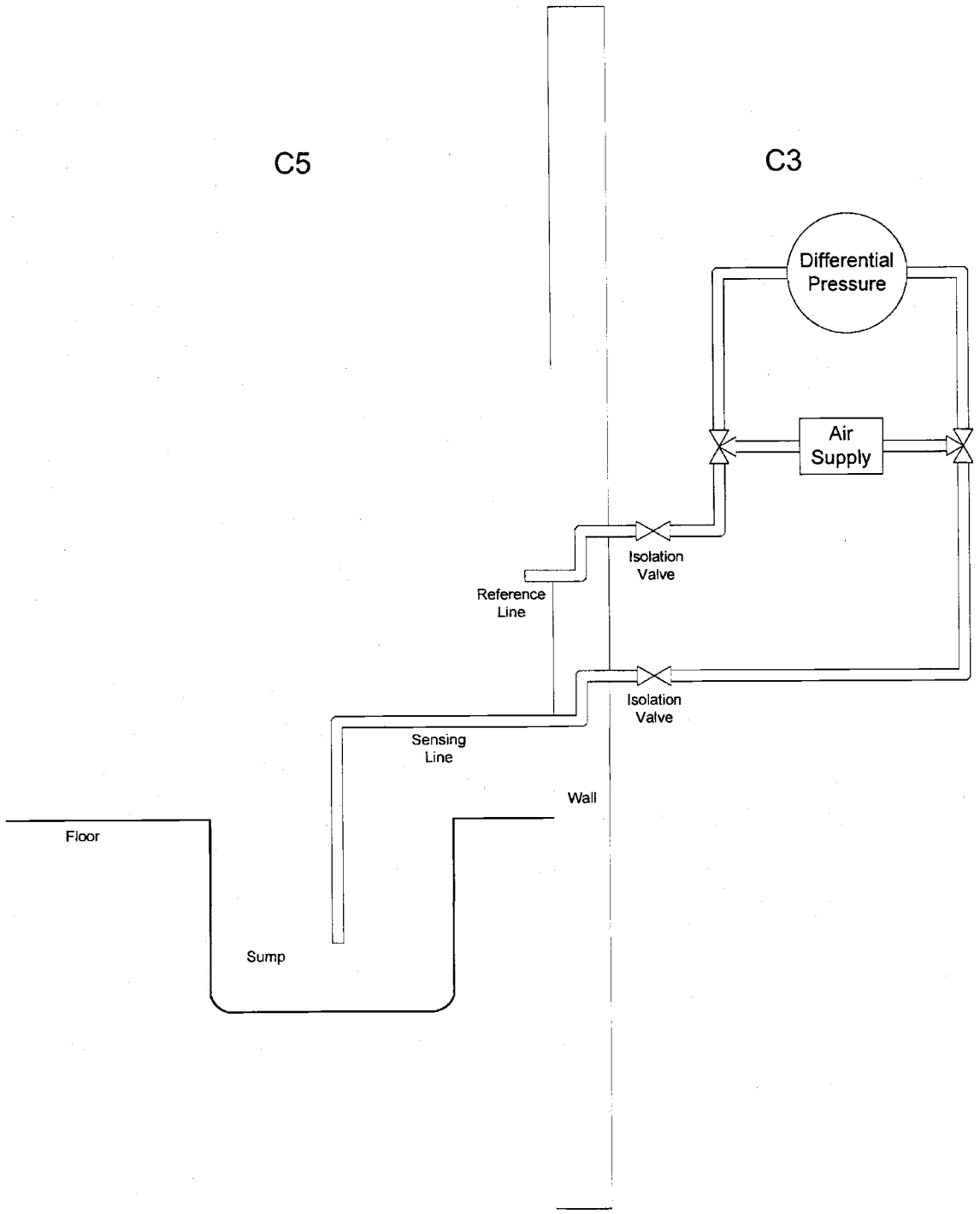


**Figure 4 Typical Thermal Dispersion Level Measurement**

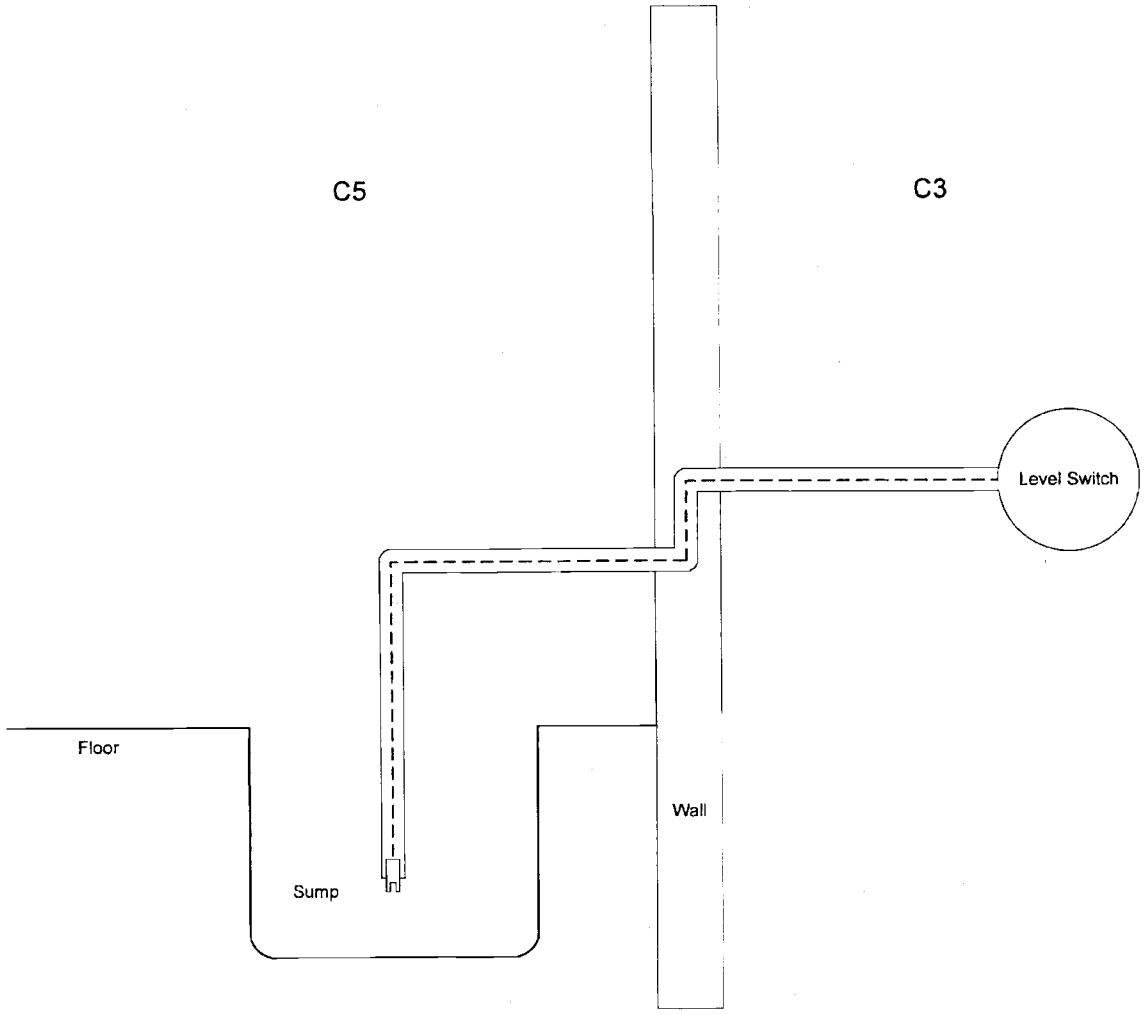


**Figure 5 Ultrasonic Gap Level Measurement**

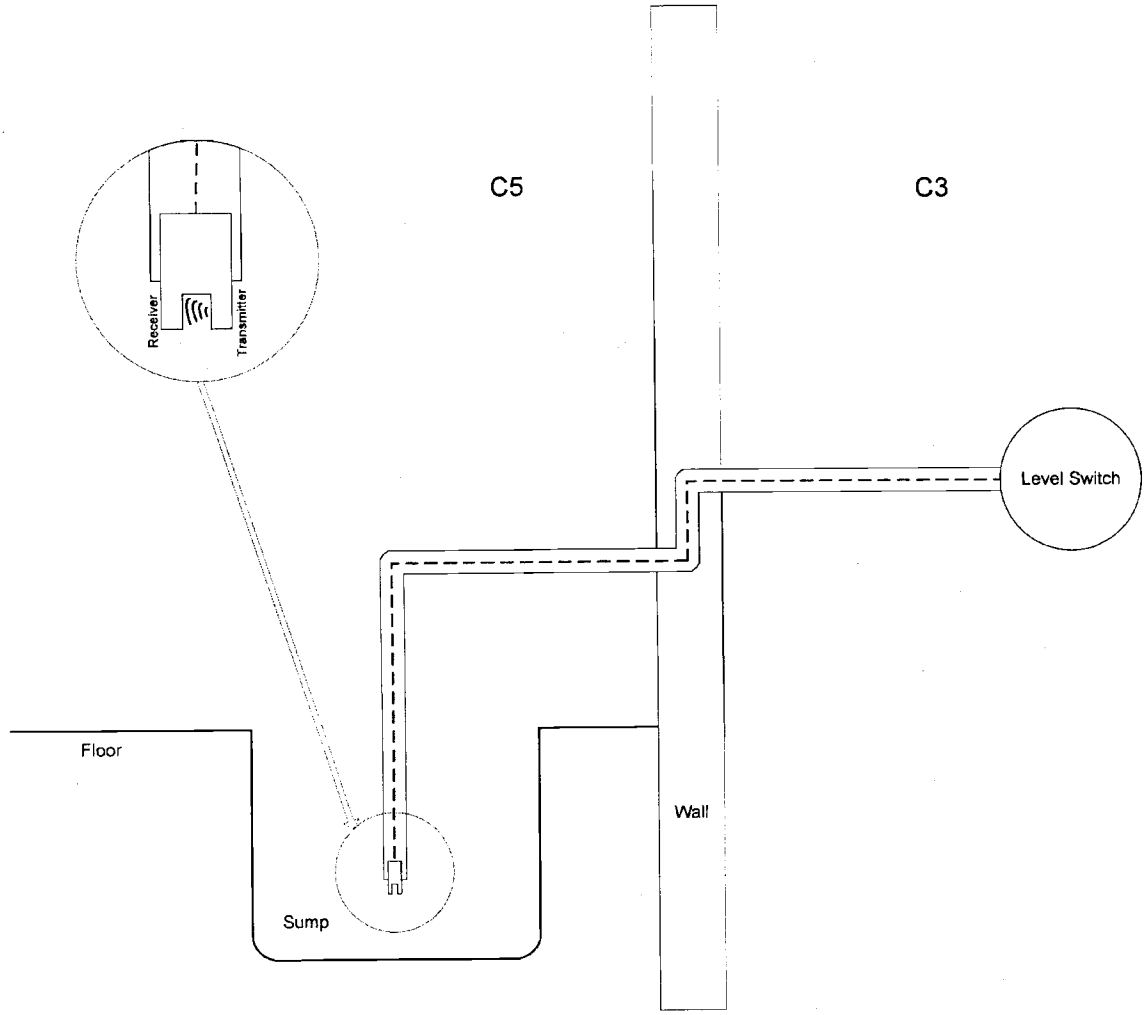
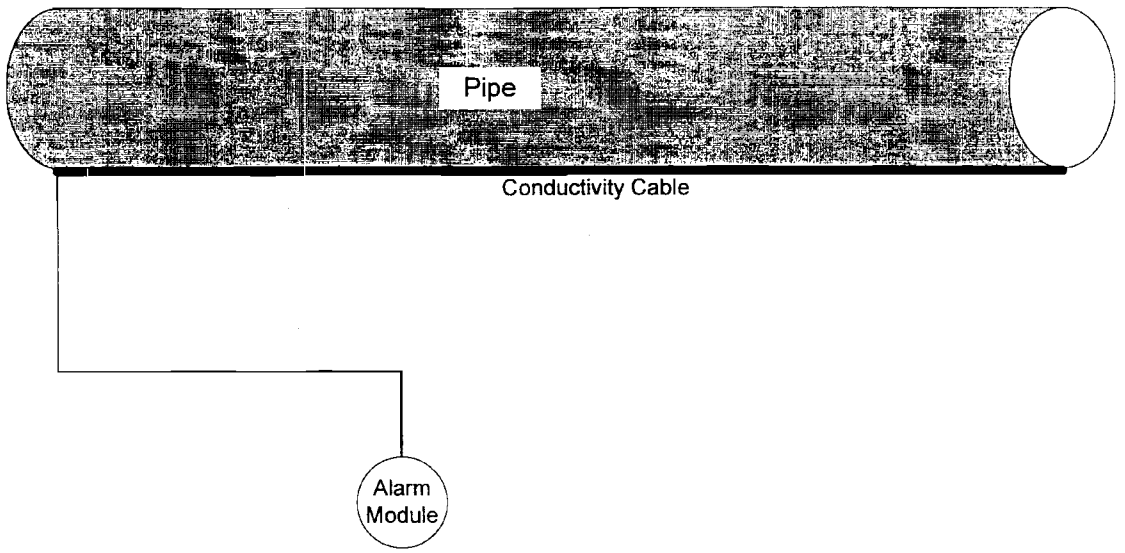


**Figure 6** **Typical Conductivity Cable Level Measurement for Pipe and Equipment Monitoring**



# Permit Design Package
# No. PTF-099, Rev 0

Attachment 2
10-ESQ-212
(12 Pages Double-Sided)

Permit Package No. PTF-099, Revision 0
"Tank System Secondary Containment for PTF ASX Samplers"

## Description of Permit Package PTF-099, Rev. 0

PTF-099, Rev. 0, "Tank System Secondary Containment for PTF ASX Samplers"

Permit package PTF-099 addresses the tank system secondary containment design associated with PTF Autosampling System (ASX) sampler cabinets (ASX-SMPLR-00015, -00017, -00019, -00020, and -00025). The autosamplers are located in Rooms P-0311C, P-0311B, P-0302, P-0301, and P-0307 respectively, at Elevation 56'-0" of PTF.

The PTF ASX autosampler cabinets have both upper and lower secondary containment liners and leak detection for ancillary equipment. The sloped stainless steel upper containment liner routes a leak from the sample feed and return lines to a sump for leak detection. The sloped stainless steel lower containment area diverts liquid to a collection trough. The trough contains a removable weir where liquids collect, activating the thermal level detection switch and alarm to indicate that a leak may have occurred.

Permit Package PTF-099, Rev. 0, includes only an assessment report signed by an independent qualified registered professional engineer (IQRPE) certifying certain portions of the permit package

The following components of this package are already included in the Dangerous Waste Permit, the Administrative Record, or are provided with other permit packages, as listed in the Table of Contents:

- General Arrangement Plan, Elevation 56'0"
- Secondary Containment Design (Submitted with package LAW-034)
- Material Selections for Building Secondary Containment/Leak Detection
- Installation of Tank Systems and Miscellaneous Unit Systems
- Leak Detection in Secondary Containment Systems (Submitted with LAW-034, this document updates and combines permit documents 24590-WTP-PER-J-02-001 and 24590-WTP-PER-J-02-002)
- Sump Data for PTF Facility
- Description of Access for Conducting Integrity Assessments
- Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility
- Prevention of Hydrogen Accumulation in Tank Systems and Miscellaneous Treatment Unit Systems.

# Permit Design Package No. PTF-099, Rev. 0
# Tank System Secondary Containment for PTF ASX Samplers
# Table of Contents

## For Incorporation into the Permit

| Engineering Document Title | Document Number | Revision | Permit Condition | Included | Remarks |
|---|---|---|---|---|---|
| IQRPE Integrity Assessment Report | CCN 169566 | | III.10.E.9.b.i | Y | |
| Permit Design Drawings | | | | | |
| PTF Vitrification Building General Arrangement Plan at El. 56'-0" | 24590-PTF-P1-P01T-00003 | 4 | III.10.E.9.b.ii | N | Provided in 24590-PTF-PCN-ENV-09-006, approved 11/24/09, CCN 209892 (Appendix 8.4) |
| Secondary Containment Design | 24590-WTP-PER-CSA-02-001 | 9 | III.10.E.9.b.ii<br>III.10.E.9.b.iii | N | Included in Package LAW-034 |
| Underground Pipe Protection | N/A | - | III.10.E.9.b.iv | N/A | Not Applicable to the ASX samplers |
| Material Selections for Building Secondary Containment/Leak Detection | 24590-WTP-PER-M-02-001 | 3 | III.10.E.9.b.v | N | Included in Attachment 51, Appendix 7.9 |
| Installation of Tank Systems and Miscellaneous Unit Systems | 24590-WTP-PER-CON-02-001 | 6 | III.10.E.b.vi | N | Included in Attachment 51, Appendix 7.12 as approved in PCN 24590-WTP-PCN-ENV-09-001 (10/01/09) |
| Leak Detection in Secondary Containment Systems | 24590-WTP-PER-J-02-002 | 4 | III.10.E.9.b.ii<br>III.10.E.9.b.v | N | Included in LAW-034 (consolidation of 24590-WTP-PER-J-02-001 and 24590-WTP-PER-J-02-002) |
| Sump Data for PT Facility | 24590-PTF-PER-M-02-006 | 5 | III.10.E.9.b.vii | N | Included in Attachment 51, Appendix 8.5 |
| Description of Access for Conducting Integrity Assessments | 24590-WTP-PER-M-02-005 | 1 | III.10.E.9.b.ix | N | Included in Attachment 51, Appendix 7.15 |
| Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility | 24590-WTP-PER-M-08-002 | 0 | III.10.E.9.b | N | April 29, 2010 letter from Ecology (CCN 217892) for incorporation into the next WTP permit modification |

## For Incorporation into the Administrative Record

| Engineering Document Title | Document Number | Revision | Permit Condition | Included | Remarks |
|---|---|---|---|---|---|
| Prevention of Hydrogen Accumulation in Tank Systems and Miscellaneous Treatment Unit Systems | 24590-WTP-PER-PR-03-001 | 1 | III.10.E.9.b.viii | N | ORP Letter 03-ED-130 dated 8/26/2003 transmitting LAW-029, Rev. 0 to Ecology |

R11223162

AREVA

ISSUED BY
RPP-WTP PDC

AFS-10-0200

169566

June 3, 2010

RPP-WTP
RECEIVED
JUN 0 3 2010
BY PDC

Ms. Susan Parr
Subcontract Formation Specialist
Bechtel National RPP-WTP Project
2435 Stevens Center Place
Richland, Washington 99354

Dear Ms. Parr:

**BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00211
IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR PTF ASX
SECONDARY CONTAINMENT (SAMPLER CABINETS) – IA-3003445-000**

The structural integrity assessment of the subject secondary containment has been completed per the contract requirements and is enclosed for your use. The assessment found that the design is sufficient to ensure that the secondary containment is adequately designed and has sufficient structural strength, compatibility with the waste(s) to be processed/stored/treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

If you have any questions, please contact Tarlok Hundal at (509) 371-1975, or via email at tarlok.hundal@areva.com.

Sincerely,

Fred R. Renz
Contract Management
AREVA Federal Services LLC
Richland Office

llm

Enclosure (1)

cc: D. C. Pfluger, MS 5-L w/enclosures (2)

**AREVA Federal Services LLC**
2101 Horn Rapids Road, RC-19, Richland, WA 99354, P. O. Box 840, Richland, WA 99352
Tel.: 509 375 8096 - Fax: 509 375 8495 - www.areva.com

IA-3003445-000

# IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR PTF ASX SECONDARY CONTAINMENT (SAMPLER CABINETS)

**Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.**

IA-3003445-000

**IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT**
**FOR**
**PTF ASX SECONDARY CONTAINMENT (SAMPLER CABINETS)**

"I, Tarlok Hundal have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the PTF ASX Secondary Containment (Sampler Cabinets), as required by the Washington Administrative Code, *Dangerous Waste Regulations*, Section WAC-173-303-640(3) (a) through (g) applicable components."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design fully satisfies the requirements of the WAC.

The attached review is fourteen (14) pages numbered one (1) through fourteen (14).

Signature

6/3/10
Date

| | | |
|---|---|---|
| **Scope** | Scope of this Integrity Assessment | This assessment addresses the structural integrity of PTF ASX Secondary Containment provided by a sampler cabinet housed in each Autosampler Unit (ASX-SMPLR-00015, -00017, -00019, -00020, and -00025). These autosampler units are located in Room P-0311C, P-0311B, P-0302, P-0301, and P-0307 respectively, at Elevation 56'-0" of the PTF building as shown on the General Arrangement Plan drawing 24590-PTF-P1-P01T-00003. |
| **Summary of Assessment** | | For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design requirements and controls to ensure that the design fully satisfies the requirements of Washington Administrative Code (WAC), Chapter 173-303 WAC, *Dangerous Waste Regulations,* WAC-173-303-640, *Tank Systems.* |

| | | |
|---|---|---|
| **References** | Engineering & Procurement Subcontract Document, Specifications, and Vendor Drawings | Engineering & Procurement Subcontract Document (EP):<br><br>24590-QL-SRA-HAHH-00001, Rev. 13, Autosampling System (ASX), Exhibit D-Scope of Work, Exhibit E-Technical Specifications, and Exhibit F-List of Drawings.<br><br>Specifications:<br><br>Following specifications along with their respective revision numbers and change notices are included in EP document listed above:<br><br>24590-WTP-3PS-G000-T0001, General Specification for Supplier Quality Assurance Program Requirements;<br>24590-WTP-3PS-G000-T0002, Engineering Specification for Positive Material Identification (PMI);<br>24590-WTP-3PS-G000-T0003, General Specification for Packaging, Shipping, Handling, and Storage Requirements;<br>24590-WTP-3PS-G000-T0014, General Specification for Supplier Design Analysis ;<br>24590-WTP-3PS-MV00-T0003, Engineering Specification for Pressure Vessel Fatigue Analysis;<br>24590-WTP-3PS-G000-T0015, General Specification for Environmental Qualification of Mechanical Equipment;<br>24590-WTP-3PS-SS90-T0001, Engineering Specification for Seismic Qualification of Seismic Category I/II Equip. and Tanks;<br>24590-WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III/IV Equip. and Tanks;<br>24590-WTP-3PS-SS00-T0001, Engineering Specification for Welding of Structural Steel Carbon;<br>24590-WTP-3PS-SS00-T0002, Engineering Specification for Welding of Structural Stainless Steel and Welding of Carbon Steel to Stainless Steel;<br>24590-WTP-3PS-AFPS-T0001, Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment;<br>24590-WTP-3PS-MHSS-T0002, Engineering Specification for Autosampling System (ASX).<br><br>Vendor Drawings (Status Code 1 & 2 Drawings *):<br><br>24590-QL-HC4-HAHH-00001-06-00041, Rev. 00F, Autosampling System ASX-SMPLR-00015, Outline Dim & Mtg Dets Sheet 1 of 3;<br>24590-QL-HC4-HAHH-00001-06-00042, Rev. 00F, Autosampling System ASX-SMPLR-00015, Outline Dim & Mtg Dets Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-01842, Rev. 00C, Autosampling System ASX-SMPLR-00015, Outline Dim & Mtg Dets Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-00043, Rev. 00F, Autosampling System ASX-SMPLR-00017, Outline Dim & Mtg Dets Sheet 1 of 2;<br>24590-QL-HC4-HAHH-00001-06-00044, Rev. 00F, Autosampling System ASX-SMPLR-00017, Outline Dim & Mtg Dets Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-00045, Rev. 00F, Autosampling System ASX-SMPLR-00019, Outline Dim & Mtg Dets Sheet 1 of 2;<br>24590-QL-HC4-HAHH-00001-06-00046, Rev. 00F, Autosampling System ASX-SMPLR-00019, Outline Dim & Mtg Dets Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-00047, Rev. 00F, Autosampling System ASX-SMPLR-00020, Outline Dim & Mtg Dets Sheet 1 of 2;<br>24590-QL-HC4-HAHH-00001-06-00048, Rev. 00F, Autosampling System ASX-SMPLR-00020, Outline Dim & Mtg Dets Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-00049, Rev. 00F, Autosampling System ASX-SMPLR-00025, Outline Dim & Mtg Dets Sheet 1 of 2;<br>24590-QL-HC4-HAHH-00001-06-00050, Rev. 00F, Autosampling System ASX-SMPLR-00025, Outline Dim & Mtg Dets Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-01178, Rev. 00C, Autosampling System PTF and HLW Internal Base Table Assembly Sheet 1 of 1;<br>24590-QL-HC4-HAHH-00001-06-01179, Rev. 00C, Autosampling System PTF and HLW Internal Base Table Upper Plate Subassembly Sheet 1 of 1;<br>24590-QL-HC4-HAHH-00001-06-01275, Rev. 00C, Autosampling System PTF and HLW Support Frame Assy Sht. 1 of 3;<br>24590-QL-HC4-HAHH-00001-06-01276, Rev. 00C, Autosampling System PTF and HLW Support Frame Assy Sht. 2;<br>24590-QL-HC4-HAHH-00001-06-01277, Rev. 00B, Autosampling System PTF and HLW Support Frame Assy Sht. 3;<br>24590-QL-HC4-HAHH-00001-06-01201, Rev. 00B, Autosampling System ASX-SMPLR-00017 Support Frame Assy Sht. 1 of 3;<br>24590-QL-HC4-HAHH-00001-06-01202, Rev. 00B, Autosampling System ASX-SMPLR-00017 Support Frame Assy Sht. 2;<br>24590-QL-HC4-HAHH-00001-06-01821, Rev. 00A, Autosampling System ASX-SMPLR-00017 Support Frame Assy Sht. 3; |

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| **References (cont'd)** | Vendor Drawings | Vendor Drawings (Status Code 1 & 2 Drawings *) (cont'd):<br><br>24590-QL-HC4-HAHH-00001-06-01883, Rev. 00B, Autosampling System ASX-SMPLR-00015, Glovebox Subassembly Sheet 1 of 6;<br>24590-QL-HC4-HAHH-00001-06-01884, Rev. 00B, Autosampling System ASX-SMPLR-00015, Glovebox Subassembly Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-01885, Rev. 00B, Autosampling System ASX-SMPLR-00015, Glovebox Subassembly Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-01886, Rev. 00B, Autosampling System ASX-SMPLR-00015, Glovebox Subassembly Sheet 4;<br>24590-QL-HC4-HAHH-00001-06-01887, Rev. 00B, Autosampling System ASX-SMPLR-00015, Glovebox Subassembly Sheet 5;<br>24590-QL-HC4-HAHH-00001-06-01888, Rev. 00B, Autosampling System ASX-SMPLR-00015, Glovebox Subassembly Sheet 6;<br>24590-QL-HC4-HAHH-00001-06-01250, Rev. 00B, Autosampling System ASX-SMPLR-00017, Glovebox Subassembly Sheet 1 of 5;<br>24590-QL-HC4-HAHH-00001-06-01204, Rev. 00B, Autosampling System ASX-SMPLR-00017, Glovebox Subassembly Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-01205, Rev. 00B, Autosampling System ASX-SMPLR-00017, Glovebox Subassembly Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-01206, Rev. 00B, Autosampling System ASX-SMPLR-00017, Glovebox Subassembly Sheet 4;<br>24590-QL-HC4-HAHH-00001-06-01207, Rev. 00B, Autosampling System ASX-SMPLR-00017, Glovebox Subassembly Sheet 5;<br>24590-QL-HC4-HAHH-00001-06-01889, Rev. 00B, Autosampling System ASX-SMPLR-00015, Glovebox Shell Subassembly Sheet 1 of 3;<br>24590-QL-HC4-HAHH-00001-06-01890, Rev. 00B, Autosampling System ASX-SMPLR-00015, Glovebox Shell Subassembly Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-01891, Rev. 00B, Autosampling System ASX-SMPLR-00015, Glovebox Shell Subassembly Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-01143, Rev. 00B, Autosampling System ASX-SMPLR-00017, 19, 20, 25, & 28 Glovebox Shell Assembly Sheet 1 of 3;<br>24590-QL-HC4-HAHH-00001-06-01144, Rev. 00B, Autosampling System ASX-SMPLR-00017, 19, 20, 25, & 28 Glovebox Shell Assembly Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-01145, Rev. 00B, Autosampling System ASX-SMPLR-00017, 19, 20, 25, & 28 Glovebox Shell Assembly Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-01147, Rev. 00B, Autosampling System ASX-SMPLR-00017, 19, 20, 25, & 28 Glovebox Shell Assembly Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-00725, Rev. 00C, Autosampling System ASX-SMPLR-00019, Glovebox Subassembly Sheet 1 of 5;<br>24590-QL-HC4-HAHH-00001-06-00726, Rev. 00C, Autosampling System ASX-SMPLR-00019, Glovebox Subassembly Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-00727, Rev. 00C, Autosampling System ASX-SMPLR-00019, Glovebox Subassembly Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-01163, Rev. 00B, Autosampling System ASX-SMPLR-00019, Glovebox Subassembly Sheet 4;<br>24590-QL-HC4-HAHH-00001-06-01135, Rev. 00B, Autosampling System ASX-SMPLR-00019, Glovebox Subassembly Sheet 5;<br>24590-QL-HC4-HAHH-00001-06-01219, Rev. 00B, Autosampling System ASX-SMPLR-00020, Glovebox Subassembly Sheet 1 of 5;<br>24590-QL-HC4-HAHH-00001-06-01220, Rev. 00B, Autosampling System ASX-SMPLR-00020, Glovebox Subassembly Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-01221, Rev. 00B, Autosampling System ASX-SMPLR-00020, Glovebox Subassembly Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-01222, Rev. 00B, Autosampling System ASX-SMPLR-00020, Glovebox Subassembly Sheet 4;<br>24590-QL-HC4-HAHH-00001-06-01223, Rev. 00B, Autosampling System ASX-SMPLR-00020, Glovebox Subassembly Sheet 5; |

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| References (cont'd) | Vendor Drawings, Plant Drawings, Data Sheet, System Description, and Permit Document | Vendor Drawings (Status Code 1 & 2 Drawings *) (cont'd):<br><br>24590-QL-HC4-HAHH-00001-06-01241, Rev. 00B, Autosampling System ASX-SMPLR-00020, Glovebox Subassembly Sheet 1 of 5;<br>24590-QL-HC4-HAHH-00001-06-01242, Rev. 00B, Autosampling System ASX-SMPLR-00025, Glovebox Subassembly Sheet 2;<br>24590-QL-HC4-HAHH-00001-06-01243, Rev. 00B, Autosampling System ASX-SMPLR-00025, Glovebox Subassembly Sheet 3;<br>24590-QL-HC4-HAHH-00001-06-01244, Rev. 00B, Autosampling System ASX-SMPLR-00025, Glovebox Subassembly Sheet 4;<br>24590-QL-HC4-HAHH-00001-06-01245, Rev. 00B, Autosampling System ASX-SMPLR-00025, Glovebox Subassembly Sheet 5;<br><br>* Status Code 1 Drawing: Bechtel National Inc.'s Code indicating that BNI has "reviewed and approved the drawing for fabrication."<br>Status Code 2 Drawing: Bechtel National Inc.'s Code indicating that BNI has "reviewed and approved the drawing for fabrication, with comments."<br><br>Plant Drawings:<br><br>24590-PTF-P1-P01T-00003, Rev. 4, Pretreatment Facility General Arrangement Plan at El. 56'-0";<br>24590-PTF-P1-P01T-00007, Rev. 9, Pretreatment Facility General Arrangement Section A-A;<br>24590-PTF-DB-S13T-00046, Rev. 11, Pretreatment Facility Structural Concrete Embedments Partial Plan, El. 56'-0", Sh. 1;<br>24590-PTF-DB-S13T-00047, Rev. 13, Pretreatment Facility Structural Concrete Embedments Partial Plan, El. 56'-0", Sh. 2;<br>24590-PTF-DB-S13T-00051, Rev. 9, Pretreatment Facility Structural Concrete Embedments Partial Plan, El. 56'-0", Sh. 6;<br>24590-PTF-DB-S13T-00052, Rev. 11, Pretreatment Facility Structural Concrete Embedments Partial Plan, El. 56'-0", Sh. 7;<br>24590-PTF-M6-ASX-00001, Rev. 2, P&ID PTF Autosampling System Sample Cabinet ASX-SMPLR-00015;<br>24590-PTF-M6-ASX-00003, Rev. 2, P&ID PTF Autosampling System Sample Cabinet ASX-SMPLR-00017;<br>24590-PTF-M6-ASX-00005, Rev. 2, P&ID PTF Autosampling System Sample Cabinet ASX-SMPLR-00019;<br>24590-PTF-M6-ASX-00006, Rev. 2, P&ID PTF Autosampling System Sample Cabinet ASX-SMPLR-00020;<br>24590-PTF-M6-ASX-00007, Rev. 2, P&ID PTF Autosampling System Sample Cabinet ASX-SMPLR-00025.<br><br>Data Sheet:<br><br>24590-PTF-M2D-ASX-00001, Rev. 5, PTF Autosampling System (ASX) Data Sheet for Autosamplers (ASX-SMPLR-00015, -00017, -00019, -00020, and -00025).<br><br>System Description:<br><br>24590-WTP-3YD-ASX-00001, Rev. 0, System Description for the Autosampling System (ASX).<br><br>Permit Document:<br><br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design. |

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| **Design** | The sampler cabinets secondary containment design standards and codes used are appropriate and adequate for their intended use. | Drawings, Specifications, Engineering & Procurement Subcontract Document, and Data Sheet listed above under References;<br><br>ANSI/AISC N690-1994, Specification for the Design, Fabrication, and Erection of Safety Related Structures for Nuclear Facilities, American National Standards Institute;<br>AWS D1.1, Structural Welding Code-Steel, American Welding Society;<br>AWS D1.6, Structural Welding Code-Stainless Steel, American Welding Society;<br>ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers;<br>ASME B13.3, Pressure Piping, American Society of Mechanical Engineers;<br>ASME AG-1-1997 (including AG-1a-2000 Addenda), Code on Nuclear Air and Gas, American Society of Mechanical Engineers;<br>AGS-G001-1998, Guidelines for Gloveboxes, 2nd Edition. | The Specification for Autosampler System and the Engineering & Procurement Subcontract Document require that the sampler cabinets be designed, fabricated, tested, and delivered in accordance with the requirements specified in the codes and standards listed in the Source of Information column in this section. The Data Sheet for Autosampler Units (ASX-SMPLR-00015, -00017, -00019, -00020, and -00025) requires and lists that each unit should be designed with specific ranges of temperature varying from 40° F to 152° F and pressure [(-) 7.3 in. w.g. to (+) 4 in. w.g.] application. The Data Sheet also provides applicable nozzle and fatigue loads. The drawings show that overall dimensions of each shielded autosampler unit (ASX-SMPLR-000015, -000019, -000020, and -000025) are about 82" wide x 59" deep x 96" high and that of ASX-SMPLR-00017 is about 86" wide x 105" deep x 96" high. Each autosampler unit houses the upper and lower secondary containment components (liner plates, leak collection trough, leak detector inside the glovebox). The overall typical dimensions of each glovebox are about 43" wide x 68" long x 42" high. The autosampler gloveboxes are built with varying thicknesses of 304L or 316L stainless steel plates, 3/16" being the minimum thickness. The codes and standards listed in the Source of Information column are appropriate and adequate to provide secondary containment for the intended use of collecting and transporting samples of PTF process waste. |

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| **Design (cont'd)** | The sampler cabinets component enclosure, supports, and foundation design include full weight of sampler cabinets. | Specifications, Data Sheet, and Drawings listed above under References;<br><br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-DC-ENG-06-001, Rev. 0, Design Criteria for Equipment Seismic and Environmental Qualification;<br>24590-QL-HC4-HAHH-00001-11-00038, Rev. 00B, Structural Analysis of ASX-SMPLR-00020;<br>24590-QL-HC4-HAHH-00001-11-00039, Rev. 00C, Structural Analysis of ASX-SMPLR-00019;<br>24590-QL-HC4-HAHH-00001-11-00040, Rev. 00C, Structural Analysis of ASX-SMPLR-00017;<br>24590-QL-HC4-HAHH-00001-11-00042, Rev. 00B, Structural Analysis of ASX-SMPLR-00025;<br>24590-QL-HC4-HAHH-00001-11-00051, Rev. 00B, Structural Analysis of ASX-SMPLR-00015. | The Specification for AutoSampling system (ASX) identifies the secondary containments enclosure, shielding, and supporting steel framing components to be Safety Significant (SS) of Quality Level (Q-2) and the Seismic Category (SC-II). The drawings show that the secondary containment enclosure components (the sampler cabinet) are an integral part of or are located within the bounds of a glovebox structure of each autosampler unit. All secondary containment liners and components within the glovebox are fully welded to confine any waste spillage within the enclosed sampler cabinet which has the leak detection device to alarm any spillage incidents. The leak detection alarm components are SS, Q, and SC-III category are also housed in each glovebox. The glovebox structure is attached to and supported by structural steel framing members. The framing members are enclosed in shielding steel plates around them on top and three sides except the rear side that faces the concrete wall. The Structural Design Criteria uses appropriate applicable standards to define design loads and load combinations. The Specification for the Autosampling System, the Design Criteria for Equipment Seismic and Environmental Qualification, and the Data Sheet require that along with dead weights of the components, the weight of the glovebox filled with water, and the specified temperature and pressure environmental conditions should be appropriately included in the loads and load combinations. The Structural Analysis documents and drawings reviewed show that the secondary containment components of the sampler cabinets have been adequately designed to provide the required containment for any spilled waste fluids. Review of the autosampler units Structural Analysis documents also show that the support system for each unit has adequate strength to sustain the aforementioned loads and is in turn anchored (welded) to the steel embed plates in the concrete floor slab. Furthermore, Chapter 14 of the Basis of Design document requires that the foundation underlying the autosampler units' supports must be adequate to sustain the full load of the units, which is out of scope of this assessment. The assessment of the adequacy of the underlying foundation slab is part of a separate integrity assessment report for the secondary containment of the plant items on this floor (Elevation 56'-0"). |

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| **Design (cont'd)** | Design calculation approach and design basis of support and foundation with design standard and codes references such as AISC code, are adequate. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>24590-WTP-DC-ENG-06-001, Rev. 0, Design Criteria for Equipment Seismic and Environmental Qualification;<br>ANSI/AISC N690-1994, Specification for the Design, Fabrication, and Erection of Safety Related Structures for Nuclear Facilities, American National Standards Institute;<br>24590-QL-HC4-HAHH-00001-11-00038, Rev. 00B, Structural Analysis of ASX-SMPLR-00020;<br>24590-QL-HC4-HAHH-00001-11-00039, Rev. 00C, Structural Analysis of ASX-SMPLR-00019;<br>24590-QL-HC4-HAHH-00001-11-00040, Rev. 00C, Structural Analysis of ASX-SMPLR-00017;<br>24590-QL-HC4-HAHH-00001-11-00042, Rev. 00B, Structural Analysis of ASX-SMPLR-00025;<br>24590-QL-HC4-HAHH-00001-11-00051, Rev. 00B, Structural Analysis of ASX-SMPLR-00015. | The Basis of Design document provides many fundamental general requirements for support and foundation design. The Structural Design Criteria document references adequate detailed design criteria for the design of support steel framing and concrete foundations and footings. The ANSI/AISC N690-1994 code is referenced for support design of SC-II structural steel components. Structural Analysis documents and drawings reviewed show that the upper and lower secondary containment components housed in the gloveboxes are adequately designed and supported to meet the applicable code requirements. |

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| **Foundation Design** | Foundation material is compatible with the support structure. | Specification and Drawings listed in above under References. | Specification for Autosampling System requires that stainless steel material be used for the ASX sampler cabinet confinement enclosure components including upper and lower liner plates. The drawings show that the ASX Autosampler Units (ASX-SMPLR-00015, -000017, -00019, -00020, and -00025) are located at Elevation 56'-0" level of the PTF building. The carbon steel support structure frame base plates of the autosampler units are welded (anchored) to the carbon steel plates embedded in concrete floor slab. The base plates and embed plates are compatible with each other. |
| | Foundation will withstand the effects of frost heave. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria. | The Structural Design Criteria requires all structural foundations for outdoor components to extend below the 30" frost line from the finished grade (Elevation 0'-0"). Rooms housing the ASX Autosampler Units are inside/interior of the PTF building at Elevation 56'-0", therefore, they are not subjected to the detrimental effects of frost heave. |

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| Seismic | Seismic considerations have been adequately addressed. | Drawings listed above under References;<br><br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>24590-WTP-DC-ENG-06-001, Rev. 0, Design Criteria for Equipment Seismic and Environmental Qualification;<br>ANSI/AISC N690-1994, Specification for the Design, Fabrication, and Erection of Safety Related Structures for Nuclear Facilities, American National Standards Institute;<br>24590-QL-HC4-HAHH-00001-11-00038, Rev. 00B, Structural Analysis of ASX-SMPLR-00020;<br>24590-QL-HC4-HAHH-00001-11-00039, Rev. 00C, Structural Analysis of ASX-SMPLR-00019;<br>24590-QL-HC4-HAHH-00001-11-00040, Rev. 00C, Structural Analysis of ASX-SMPLR-00017;<br>24590-QL-HC4-HAHH-00001-11-00042, Rev. 00B, Structural Analysis of ASX-SMPLR-00025;<br>24590-QL-HC4-HAHH-00001-11-00051, Rev. 00B, Structural Analysis of ASX-SMPLR-00015. | The Secondary Containment Design, Structural Design Criteria, and Design Criteria for Seismic and Environmental Qualification documents provide detailed information of design methodology, materials, loads, and load combinations applicable for the sampler cabinets. The Specification for Autosampling system identifies the Quality Level of the system to be QL-2 and the Seismic Classification as SC-II. The ASX system design loads combinations are taken from ANSI/AISC N 690-1994 and analysis for SC-II secondary containment enclosure is performed in accordance with the Specification for Seismic Qualification of Seismic Category I/II Equip. and Tanks document. The secondary containment enclosure and support frame structures are designed in accordance with the requirement of ANSI/AISC N460-1994 code. The frame structure is designed to sustain all applicable loads including seismic and its bases are adequately welded to the embedded steel plates in concrete floor slab supporting the autosampler units. The Structural Analysis documents and drawings reviewed show that the sound engineering techniques are used for the analyses purposes. |

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| **Compatibility** | The stored waste is compatible with its secondary containment and leak detection hardware based on a detailed chemical and physical analysis of the wastes used and other information sources. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection;<br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design;<br>24590-WTP-PER-J-02-002, Rev. 4, Leak Detection in Secondary Containment Systems;<br>24590-QL-HC4-HAHH-00001-11-00038, Rev. 00B, Structural Analysis of ASX-SMPLR-00020;<br>24590-QL-HC4-HAHH-00001-11-00039, Rev. 00C, Structural Analysis of ASX-SMPLR-00019;<br>24590-QL-HC4-HAHH-00001-11-00040, Rev. 00C, Structural Analysis of ASX-SMPLR-00017;<br>24590-QL-HC4-HAHH-00001-11-00042, Rev. 00B, Structural Analysis of ASX-SMPLR-00025;<br>24590-QL-HC4-HAHH-00001-11-00051, Rev. 00B, Structural Analysis of ASX-SMPLR-00015. | The Basis of Design document states that the secondary containment components are to be appropriately lined and any leaks or spills will be removed within 24 hours of a leak detection or in as timely a manner as possible. Based on a detailed chemical and physical analysis of the wastes and other process information sources, the Material Selections document identifies appropriate corrosion resistant materials (stainless steel) for the ASX autosampler units' secondary containment components and leak detection hardware. The drawings and Structural Analysis documents reviewed show that the 304L stainless steel or better material as recommended in Material Selections document is used for the fabrication of the ASX sampler cabinets. The Secondary Containment Design document provides adequate typical construction details including attachment details for the leak detection equipment to be used for secondary containment where required. |

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| **Strength** | The design shows that the secondary containment has sufficient strength and thickness to prevent failure owing to pressure gradients, static head during a release, physical contact with the waste, climatic conditions, and the stress of daily operations (e.g., vehicular traffic). | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design;<br>24590-QL-HC4-HAHH-00001-11-00038, Rev. 00B, Structural Analysis of ASX-SMPLR-00020;<br>24590-QL-HC4-HAHH-00001-11-00039, Rev. 00C, Structural Analysis of ASX-SMPLR-00019;<br>24590-QL-HC4-HAHH-00001-11-00040, Rev. 00C, Structural Analysis of ASX-SMPLR-00017;<br>24590-QL-HC4-HAHH-00001-11-00042, Rev. 00B, Structural Analysis of ASX-SMPLR-00025;<br>24590-QL-HC4-HAHH-00001-11-00051, Rev. 00B, Structural Analysis of ASX-SMPLR-00015. | The PTF general arrangement drawings show ASX autosampler units are located inside the building. Pressure gradients, static head during a release, physical contact with the waste, climatic conditions, and the stresses of daily operations are adequately stated as design goals in the Basis of Design document. The Secondary Containment Design document describes and provides references to the design methodology, materials of construction, loads, and load combinations (including seismic loads) for the PTF facility secondary containment components. The secondary containment enclosures being considered are located in the room inside the PTF Vitrification Building rather than being directly buried in ground, therefore, pressure gradients and vehicular traffic are not considered applicable load cases. However, the Structural Analysis documents reviewed show that the strength of secondary containment enclosure components is sufficient to sustain applicable loads such as static, fluid, and seismic. |

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| **Strength (cont'd)** | The secondary containment system has sufficient strength in the presence of operational stresses from site-specific conditions (i.e., frost, precipitation etc.). | Drawings listed above under References;<br><br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design;<br>24590-WTP-3PS-NLLR-T0002, Rev. 1, Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates;<br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection;<br>24590-QL-HC4-HAHH-00001-11-00038, Rev. 00B, Structural Analysis of ASX-SMPLR-00020;<br>24590-QL-HC4-HAHH-00001-11-00039, Rev. 00C, Structural Analysis of ASX-SMPLR-00019;<br>24590-QL-HC4-HAHH-00001-11-00040, Rev. 00C, Structural Analysis of ASX-SMPLR-00017;<br>24590-QL-HC4-HAHH-00001-11-00042, Rev. 00B, Structural Analysis of ASX-SMPLR-00025;<br>24590-QL-HC4-HAHH-00001-11-00051, Rev. 00B, Structural Analysis of ASX-SMPLR-00015. | The PTF facility drawings show that the secondary containment being considered is installed inside the building. Because it is located inside the building, precipitation and frost are not applicable load cases. The Secondary Containment Design document identifies the applicable load cases (operational stresses) from site specific conditions that must be considered in the design. The Engineering Specification for Furnishing Stainless Steel Liner Plates includes specific provisions for protection and repair of completed liners during the construction process. The Material Selections for Building Secondary Containment document addresses the potential effects of operations conditions on metal liner and the associated maintenance requirements. The Structural Analysis documents reviewed show that the secondary containment components are adequately designed and have sufficient strength to sustain the applicable design loads. |

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| **Foundation Integrity** | The secondary containment is adequately supported by the enclosure structure and foundation below has adequate strength | Drawings listed above under References;<br><br>24590-QL-HC4-HAHH-00001-11-00038, Rev. 00B, Structural Analysis of ASX-SMPLR-00020;<br>24590-QL-HC4-HAHH-00001-11-00039, Rev. 00C, Structural Analysis of ASX-SMPLR-00019;<br>24590-QL-HC4-HAHH-00001-11-00040, Rev. 00C, Structural Analysis of ASX-SMPLR-00017;<br>24590-QL-HC4-HAHH-00001-11-00042, Rev. 00B, Structural Analysis of ASX-SMPLR-00025;<br>24590-QL-HC4-HAHH-00001-11-00051, Rev. 00B, Structural Analysis of ASX-SMPLR-00015;<br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design. | Review of the Structural Analysis documents and drawings shows that the support system for each sampler cabinet has adequate strength to sustain the applicable design loads and is in turn anchored (welded) to the steel embed plates in the concrete floor slab. Chapter 14 of the Basis of Design document requires that the foundation underlying the cabinet support must be adequate to sustain the loads from the weight of the glovebox filled with water, which is out of scope of this assessment. The assessment of the adequacy of the underlying foundation slab is part of a separate integrity assessment report for the secondary containment for the plant items on this floor. |
| **Infiltration** | The design or operation prevents run-on or infiltration of precipitation into the secondary containment. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design. | The Basis of Design document requires the design to provide adequate measures to prevent run-on or infiltration of precipitation. The secondary containment is located inside the PTF Vitrification Building where it is protected from direct precipitation by the building structure as shown in the general arrangement drawings. Therefore this section is not applicable to the secondary containment components being assessed. |
| | The design includes an external moisture barrier or other means to prevent moisture from entering the room. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design. | The Basis of Design document requires the design include provisions to prevent external moisture intrusion. The ASX Autosampler Units shown on the General Arrangement drawings are inside the PTF Vitrification Building at floor Elevation 56'-0" which protects them from precipitation and surface water percolation, therefore, this section is not applicable to them. |

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| **Liner System** | The containment area is free of cracks or gaps and the design discusses methods of their minimization. | 24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design;<br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection. | The Basis of Design document requires the liner system to be free of cracks and gaps. The Secondary Containment Design document provides current adequate design requirements, and codes and standards to design leak tight liners. This document includes appropriate details for installation of stainless steel components free of cracks and gaps. The Material Selections document provides adequate requirements for the secondary containment components. |
| | The design has considered the compatibility of the secondary containment elements with the waste and for preventing it from migrating into the concrete slab below. | 24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection;<br>24590-WTP-PER-CSA-02-001, Rev. 9, Secondary Containment Design. | The Material Selections document contains information on the compatibility of secondary containment stainless steel material usage for containing the waste. The Secondary Containment Design document provides standard installation details for the secondary containment components of the sampler cabinets which ensure leak-tight connections that will prevent the migration of the waste onto the concrete slab below. |

# Master Distribution Schedule for WTP Project Subcontract Management Group



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| **SUBMITTAL TRANSMITTAL:** | ☐ **First Submittal** | ☐ **Re-Submittal** | ☐ **QVRP Package** | ☐ **RFI** |
| ☐ **No Review Required** | ☐ **No Review Required Re-Submittal** | ☐ **Submittal Supplement** | | |
| **CORRESPONDENCE:** | ☒ **With Attachment** | ☐ **W/O Attachment (letter only)** | ☐ **RFI** | |
| | ☐ **Fax as Original (Letter Only)** | ☐ **Fax as Original (With Attachment)** | | |
| ☐ **Pre-Award/Award Package** | ☐ **Executed Change Order Package** | | | |
| ☐ **Executed Amendment Package** | ☐ **Back Charge** | ☐ **Closeout Package** | | |

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| **Subcontract Number:** | 24590-CM-HC4-HXYG-00211 |
| **Subcontract Title:** | Tank Integrity Design Assessments |
| **Subcontractor Name:** | AREVA Federal Services LLC |
| **Subcontract Administrator:** | Susan Parr |

| PDC Document Number | Rev | Document Title | Rev |
|---|---|---|---|
| CCN #169566 | | IQRPE Structural Integrity Assessment Report For PTF ASX Secondary Containment (Sampler Cabinets) - IA-3003445-000) | |
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# Master Distribution Schedule for WTP Project Subcontract Management Group



| | |
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| **Subcontract Number:** | 24590-CM-HC4-HXYG-00211 |
| **Subcontract Title:** | Tank Integrity Design Assessments |
| **Subcontractor Name:** | AREVA Federal Services LLC |
| **Subcontract Administrator:** | Susan Parr |

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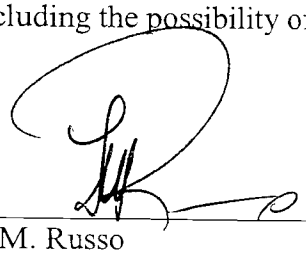
Attachment 3
10-ESQ-212
(2 Pages)

Bechtel National, Inc. and U.S. Department of Energy,
Office of River Protection Certification Statements

# Bechtel National, Inc. Certification

The following certification statement is provided consistent with Contract No. DE-AC27-01RV14136, Section H.26, Environmental Permits, paragraph (g) for the submittal of permit package LAW-034, Revision 0, *Tank System Secondary Containment for LAW ASX Samplers*, and PTF-099, Revision 0, *Tank System Secondary Containment for PTF ASX Samplers*.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



F. M. Russo
Project Director

6/23/10
Date

# U.S. Department of Energy, Office of River Protection Certification

The following certification statement is provided for the submittal of permit package LAW-034, Revision 0, *Tank System Secondary Containment for LAW ASX Samplers*, and PTF-099, Revision 0, *Tank System Secondary Containment for PTF ASX Samplers*.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

D. A. Brockman, Manager
U.S. Department of Energy
Office of River Protection

7/26/10
Date

# Additional Documents Submitted by the Permittees

## Additional Documents Submitted by Permittees

| Engineering Document Title | Document Number | Revision | Remarks |
|---|---|---|---|
| Integrity Assessment Program and Schedule for DWP-Regulated Equipment in the Analytical Laboratory and LAW Facility | 24590-WTP-PER-M-08-001 | Rev. 0 | CCN: 201996, July 7, 2009, letter from Ecology for incorporation into the proposed WTP permit modification |
| Integrity Assessment Program and Schedule for DWP-Regulated Equipment in the PTF and HLW Facility | 24590-WTP-PER-M-08-002 | Rev. 0 | CCN: 217892, April 29, 2010, letter from Ecology for incorporation into the proposed WTP permit modification |
| IQRPE Structural Integrity Assessment Report for LAW Secondary Containment | CCN 169564 | N/A | Consolidate and replace LAW secondary containment IQRPE reports in Appendix 9.11 of the WTP Permit |
| Leak Detection Capability in the PTF | 24590-PTF-PER-M-04-0010 | Rev. 2 | CCN: 219312 transmitted the Leak Detection Capability in the PTF to Ecology for incorporation into the proposed WTP permit modification. |
| Waste Removal Capability for the PTF | 24590-PTF-PER-M-04-0011 | Rev. 1 | CCN: 216932 transmitted the Waste Removal Capability for the PTF to Ecology for incorporation into the proposed WTP permit modification |
| Revise permit conditions III.10.C.9.d and III.10.C.9.h to allow documentation identified in the permit conditions to be submitted every 7 calendar days | 24590-WTP-PCN-ENV-10-002 | N/A | PCN-24590-WTP-PCN-ENV-10-002 transmitted to Ecology for incorporation into the proposed WTP permit modification |

R11040950

ISSUED BY
RPP-WTP PDC

# Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility

Document title:

Document number: 24590-WTP-PER-M-08-001, Rev 0

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Contract deliverable number: Support for Contract Deliverable 7.5

Contract number: DE-AC27-01RV14136

Department: Engineering

Author(s): RB Draper C Stumpenhaus E Yao

Signature: RBDraper

Checked by: SW Vail

Signature: SMVail

Issue status: Approved

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Approved by: JL Julyk

Approver's position: Equipment Project Engineer

Approver's signature: JL Julyk (Signature) 2/10/09 (Date)

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Waste Treatment Plant
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# History Sheet

| Rev | Reason for revision | Revised by |
|---|---|---|
| 0 | Initial Issue. | RB Draper |

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# Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# Executive Summary

This document satisfies the requirements of the River Protection Project Waste Treatment and Immobilization Plant (WTP) Dangerous Waste Permit (DWP) and the Washington Administrative Code (WAC), 173-303-640(3)(b), which provide for development and submittal of a program and schedule for conducting integrity assessments over the life of the regulated tanks and miscellaneous units identified in the DWP. This document addresses the WTP analytical laboratory and the low-activity waste (LAW) vitrification facility regulated tanks and miscellaneous units (and associated secondary containment and ancillary equipment) and has been developed to ensure that these regulated plant items, which manage dangerous waste, will not collapse, rupture, or fail. The regulated equipment in the WTP pretreatment facility (PTF) and high-level waste (HLW) vitrification facility is addressed in the Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility (24590-WTP-PER-M-08-002).

The WTP analytical laboratory and LAW vitrification facility contain new tank systems and miscellaneous units designed and installed in accordance with WAC 173-303-640(3) and WAC 173-303-680. This document describes the design features, materials of construction, and supplier and installation quality programs that establish the baseline conditions and measurements to allow comparisons with future integrity assessment measurements for tanks, miscellaneous units, sumps, bulges, and piping installed in the analytical laboratory and LAW vitrification facility. The baseline conditions in conjunction with operating conditions are used to establish the schedule for the initial integrity assessment following hot commissioning.

# Acronyms

| | |
|---|---|
| ABMA | American Bearing Manufacturers Association |
| ADS | air displacement slurry |
| AEA | Atomic Energy Act of 1954 |
| AHL | analytical hot cell laboratory equipment system |
| AISC | American Institute of Steel Construction, Inc. |
| ALARA | as low as reasonably achievable |
| AMCA | Air Movement and Control Association |
| ANSI | American National Standards Institute |
| API | American Petroleum Institute |
| ARL | analytical radiological laboratory equipment system |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials |
| ASX | autosampling system |
| CCTV | closed-circuit television |
| CDR | construction deficiency report |
| CFR | Code of Federal Regulations |
| $CO_2$ | carbon dioxide |
| CRV | concentrate receipt vessel |
| DOE | United States Department of Energy |
| DWP | dangerous waste permit |
| ETF | Effluent Treatment Facility |
| °F | degrees Fahrenheit |
| ft | feet |
| HCl | hydrogen chloride |
| HEPA | high efficiency particulate air |
| HF | hydrogen fluoride |
| HI | Hydraulic Institute Standards |
| HLW | high-level waste |
| IQRPE | independent, qualified, registered professional engineer |
| LAW | low-activity waste |
| LCP | LAW concentrate receipt process system |
| LDB | leak detection box |
| LERF | Liquid Effluent Retention Facility |
| LFP | LAW melter feed process system |
| LMP | LAW melter process system |
| LOP | LAW primary offgas process system |
| LVP | LAW secondary offgas/vessel vent process system |
| MFPV | melter feed preparation vessel |
| MFV | melter feed vessel |
| MTG/day | metric tons of glass per day |
| $N_2O$ | nitrous oxide |
| NCR | nonconformance report |
| NDE | non-destructive examination |
| NEMA | National Electrical Manufacturers Association |
| NLD | nonradioactive liquid waste disposal system |

| | |
|---|---|
| NO | nitrogen oxide |
| $NO_2$ | nitrogen dioxide |
| $NO_x$ | nitrogen oxides |
| $O_2$ | oxygen |
| % | percent |
| psig | pounds per square inch gauge |
| PTF | pretreatment facility |
| RLD | radioactive liquid waste disposal system |
| SBS | submerged bed scrubber |
| SCO | selective catalytic oxidizer |
| SCR | selective catalytic reduction |
| SNT | American Society for Nondestructive Testing, Inc. |
| $SO_2$ | sulfur dioxide |
| $SO_x$ | sulfur oxides |
| UNS | unified numbering system |
| UPS | uninterruptible power supply |
| VOC | volatile organic compound |
| WAC | Washington Administrative Code |
| WESP | wet electrostatic precipitator |
| wt% | weight percent |
| WTP | Waste Treatment and Immobilization Plant |

# 1 Purpose

The Washington Administrative Code (WAC), 173-303-640(3)(b) requires that: "The owner or operator must develop a schedule for conducting integrity assessments over the life of the tank to ensure that the tank retains its structural integrity and will not collapse, rupture, or fail. The schedule must be based on the results of past integrity assessments, age of the tank system, materials of construction, characteristics of the waste and any other relevant factors."

River Protection Project Waste Treatment and Immobilization Plant (WTP) Dangerous Waste Permit (DWP) conditions require, prior to the initial receipt of dangerous waste, the submittal of an integrity assessment program and schedule for all tanks managing dangerous waste (DWP condition III.10.E.9.e.i), the pretreatment facility (PTF) miscellaneous unit systems (DWP condition III.10.G.10.e.i), the low-activity waste (LAW) vitrification system (DWP condition III.10.H.5.e.i and III.10.I.1.a.v) and the high-level waste (HLW) vitrification system (DWP condition III.10.J.5.e.i and III.10.K.1.a.v). This document is not intended to address all of the requirements of WAC 173-303-640(3). Other WAC requirements will be addressed in future permitting submittals such as the inspection plan, contingency plan, waste analysis plan, closure plan, and certifications provided by the independent, qualified, registered professional engineer (IQRPE).

The purpose of performing integrity assessments is to prevent the collapse, rupture or failure of a component that could result in an unacceptable release of dangerous waste to the environment or could result in an impact to plant operations/activities that would adversely affect the capability of the WTP facilities to perform the overall mission for waste disposal. The purpose of this document is to describe the design features associated with the tanks and miscellaneous units managing dangerous waste and to provide an approach and schedule for integrity assessments for regulated equipment in the analytical laboratory and LAW vitrification facility. The tanks and miscellaneous units described in this document are those presented in 24590-WTP-RPT-ENV-03-002, *Tanks and Miscellaneous Units Regulated by the Dangerous Waste Permit.* The design features provided in this document were compiled from other approved WTP documents; no new design features were developed. Based on a review of the existing information, the schedule for integrity assessments was prepared.

The integrity assessment program and schedule for regulated equipment in the PTF and HLW vitrification facility is presented in 24590-WTP-PER-M-08-002, *Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility.*

# 2 Establishing a Baseline

The WTP analytical laboratory and LAW vitrification facility contain new tank systems and miscellaneous units designed and installed in accordance with WAC 173-303-640(3) and WAC 173-303-680. This section presents information on supplier and installation quality programs, pre-operations baseline measurements, materials of construction, and corrosion and erosion considerations that is used to establish baseline conditions and measurements to allow comparisons with future integrity assessment measurements. The baseline conditions in conjunction with operating conditions are also used to identify tanks and miscellaneous units with lower potential for corrosion and erosion and with higher potential for corrosion and erosion.

This information is then used to establish the schedule for the initial integrity assessment following hot commissioning. Additionally, this section describes the radiological area classifications for the WTP facilities, which determine the accessibility of tanks and miscellaneous units for integrity assessments following hot commissioning.

Section 3 of this document provides a general description of the analytical laboratory and LAW vitrification facility, including the layout of each facility and the distribution of the DWP regulated units within each facility. This information is part of the baseline to establish accessibility of tanks and miscellaneous units for integrity assessments.

Sections 4 and 5 provide detailed descriptions of each DWP regulated tank and miscellaneous unit including ancillary equipment, associated equipment bulges, and secondary containment for the tanks, miscellaneous units, and bulges. This information provides the basis for establishing an integrity assessment schedule for each regulated tank and miscellaneous unit.

Section 6 provides a description of underground piping and secondary containment features for transfer of waste between the WTP PTF and the analytical laboratory or LAW vitrification facility.

Section 7 describes the approach and schedule for integrity assessments to be conducted in comparison to the general baseline conditions and the specific construction and operation details for the DWP regulated tanks and miscellaneous units described in Sections 2 through 6.

## 2.1 Supplier Quality Program

This section describes the vessel supplier quality control requirements described in 24590-WTP-3PS-MV00-T0001, *Pressure Vessel Design and Fabrication*, that are used in conjunction with the pre-operational measurements described in Section 2.3 to establish the non-destructive examination (NDE) baseline prior to installation. The information provided in this section is primarily focused on suppliers of tanks and vessels. The overall supplier quality program that is applicable to tanks, miscellaneous units, pumps, piping, and sumps is described in 24590-WTP-3PS-G000-T0001 and supplier submitted Quality Assurance manuals.

Vessel shell and head sections that are subjected to concentrated or large loads through welded attachments are, prior to welding, ultrasonically examined over 100 percent (%) of the areas in accordance with the following:

- For connections or attachments directly welded to the shell or head, the area tested extends 3 inches beyond the extremity of the weldment.
- For connections or attachments welded via a reinforcement or doubler plate, the shell area tested extends 5 inches beyond each side of the perimeter of the fillet weld attaching the reinforcing or doubler plate to the shell or head.

All full penetration welds attaching internal or external structural components to the heads or shell are radiographically or ultrasonically tested. If fillet welds are used and are not readily radiographically or ultrasonically tested, they are dye-penetrant tested. All full penetration welds forming part of a jacket are radiographically or ultrasonically tested. All welds joining the nozzle neck to the shell or heads, which are not radiographically or ultrasonically tested, are dye-penetrant tested.

Radiography, ultrasonic testing, and dye-penetrant examinations are performed in accordance with American Society of Mechanical Engineers (ASME) Section VIII, Division 1 and ASME Section V.

All NDEs (visual, surface flaw, and radiography) of vessels are carried out after the completion of fabrication, including any heat treatment. NDEs are performed by an inspector certified to the requirements of American Society for Nondestructive Testing, Inc. (SNT) SNT-TC-1A. The interpretation of the results is by either Level II or Level III inspectors certified to SNT-TC-1A.

Ultrasonic testing is in accordance with Appendix 12 of ASME Section VIII, Division 1. Radiographic acceptance criteria are in accordance with ASME Section VIII, Division 1, paragraph UW-51 for full radiography and UW-52 for spot radiography.

The weld and NDE inspection records and associated quality control documents are used to establish the baseline condition of tanks, miscellaneous units, and piping prior to start-up and operations. If supplier documentation is not sufficient, additional NDE is conducted as described in Section 2.3 to establish a baseline prior to start of hazardous waste operations. Results of future integrity assessments will be compared to the baseline condition to evaluate the structural integrity of tanks, miscellaneous units, and piping and to determine whether the schedule of future assessments should be adjusted.

## 2.2 Installation Quality Program

Prior to covering, enclosing, or placing new regulated plant item(s) in use, an independent, qualified installation inspector or an IQRPE, either of whom is trained and experienced in the proper installation of regulated plant items, inspects 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

The following documentation is considered by the independent, qualified installation inspector, or IQRPE, in certifying proper installation of regulated plant items:

- approved welding procedures
- welder qualifications and certifications
- field installation reports
- tightness test reports in accordance with the codes specified by design
- inspector credentials
- field waiver reports (i.e., nonconformance reports [NCRs], construction deficiency reports [CDRs])
- non-compliance reports, corrective action and repair reports (i.e., NCRs, CDRs)

The results of the independent, qualified installation inspector's or IQRPE's inspections at the time of installation of tanks, miscellaneous units, and piping and review of associated documents are used to establish the baseline condition of tanks, miscellaneous units, and piping prior to start-up and operations. Results of future integrity assessments will be compared to the baseline condition to evaluate the structural integrity of tanks, miscellaneous units, and piping and to determine whether the schedule of future assessments should be adjusted.

## 2.3 Pre-Operational Baseline Measurements

Pre-operational baseline NDE measurements are performed on regulated plant items in the analytical laboratory and LAW vitrification facility prior to the initial receipt of dangerous waste. The objective of these measurements is to provide representative data of the initial thicknesses of the plant items. Results of future integrity assessments will be compared to these pre-operational baseline NDE measurements to evaluate the structural integrity of equipment and to determine whether the schedule of future assessments should be adjusted. Integrity assessments conducted during the life of a regulated plant item are discussed in Section 7.

Corrosion and erosion rates are affected by parameters such as material of construction, temperature, chemistry, flow rate, stress, vibration, fluid velocity, particle size, and particle shape. Regulated plant items in the analytical laboratory and LAW vitrification facility are susceptible to various types of damage by several corrosion and erosion mechanisms. The portions of regulated plant items most likely affected by corrosion and erosion are dependent on the kind of equipment (e.g., tanks versus miscellaneous equipment) and can be markedly different. Therefore, this section provides general locations that are considered susceptible areas where pre-operational baseline NDE thickness measurements are to be recorded. In consultation with a corrosion specialist or engineer, specific NDE measurement locations are selected after the installation of the regulated plant item and before the initial receipt of dangerous waste. The portions of regulated plant items that are identified as locations for NDE measurements are based on:

- Material of construction
- Corrosive characteristics of the waste
- Erosive characteristics of the waste
- The velocity or turbulence of waste at the NDE measurement location
- Scope of information to be obtained (representative of other tanks or piping)
- Access to the NDE measurement location (either manually or remotely)
- NDE measurement methods, scope, tools, and techniques that can be used
- Radiation exposure to personnel performing NDE measurements

Specific NDE measurement locations for welds or wall thicknesses are illustrated in Appendix B. These illustrations are provided as information becomes available. NDE measurement locations are also marked on the regulated plant items to allow repetitive measurements at the same locations. Repeating measurements at the same locations improves accuracy of the expected remaining corrosion and erosion allowances of the regulated plant items.

Baseline thickness measurements are made in accordance with written procedures implementing the requirements of ASTM E 797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method. Section 9 of ASTM E 797 provides the requirements for developing a detailed written procedure.

### 2.3.1 Accessible Tanks and Other Regulated Equipment Designed to ASME Pressure Vessel or API Tank Standards

At least one accessible location for thickness monitoring is selected at each of the following major components of an accessible tank:

- Top head (e.g., an area where a connection or attachment is directly welded to the head)
- Bottom head, especially in an area of high potential erosion (e.g., an area where eductor discharge impinges on the bottom head)
- Shell (e.g., an area where a connection or attachment is directly welded to the shell, longitudinal weld attaching the head to the shell, region of the normal operating liquid-vapor interface or high-liquid level, vertical strip along the accessible height of the tank, and horizontal arc along the accessible height of the tank)

For tanks with cooling jackets, measurements are made in the accessible portions of the tank directly above or below the cooling jacket.

### 2.3.2 Other Miscellaneous Units

Several miscellaneous units such as filters, which have internal components that are replaced periodically, are contained in housings that are not designed to ASME pressure vessel standards. Thickness measurements are performed on the external containment housings of these units. At least one accessible location for thickness monitoring is selected at the top, side, and bottom of the housing, especially in an area where a pipe, connection, or attachment is directly welded to the top, side, or bottom.

### 2.3.3 Piping and In-Line Components

For a piping system connecting tanks, miscellaneous units, bulges, and sumps, at least one accessible location for thickness monitoring is selected at the following:

- An area along the straight section of the pipe
- An area near a connecting fitting where flow direction or velocity changes (e.g., elbow, mixing tee, wye, cross, reducer, flange, and valve)
- An area near the insulation, if applicable, where operating temperatures cause frequent or continuous condensation and re-evaporation of moisture

For in-line components such as electric heaters, heat exchangers, and fans, thickness measurements are performed on the external containment housings of these units. At least one accessible location for thickness monitoring is selected at the top, side, and bottom of the housing, especially in an area where a pipe, connection, or attachment is directly welded to the top, side, or bottom.

### 2.3.4 Bulges Containment and Sumps

For bulges containment and sumps, at least one accessible location for thickness monitoring is selected at the following:

- Bottom, especially at the lowest point of a sloped bottom
- Sidewall (e.g., an area where a pipe, connection, or attachment is directly welded, longitudinal weld attaching the head to the shell for circular sumps, and vertical weld attaching the sidewalls for rectangular sumps)

### 2.3.5 Underground Transfer Lines

Since access to the underground transfer lines between the WTP facilities are not possible without excavation, pre-operational baseline and future NDE measurements of these lines are not conducted. As described in Section 6, the underground transfer lines are double-walled. The secondary encasement pipe has a fusion bounded epoxy coating with shrink wrap sleeves covering the clamshell welds and a cathodic protection system using an impressed current system. Corrosion of the secondary containment pipe is not expected to occur due to the epoxy coating and cathodic protection system.

## 2.4 Materials of Construction

In order to ensure tanks, miscellaneous units, and ancillary equipment last for 40 years, corrosion resistant materials, based on operating conditions and expected waste chemistries have been identified; sufficient corrosion and erosion allowances have been specified; and robust design codes (such as ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and ASME B31.3-96, Process Piping) have been used. Table 1 lists design codes for regulated tanks, miscellaneous units, bulges, sumps, and piping in the analytical laboratory and LAW vitrification facility. Table 2 presents the materials of construction and corrosion and erosion allowances for these regulated tanks, miscellaneous units, bulges, sumps, and piping.

Where a potential for erosion exists (due to entrained solids and/or velocities), additional allowance, more erosion resistant materials, or hardfacing is provided. Documentation of positive material identification is provided by vendors and field inspectors and contributes to establishing the baseline for integrity assessments.

The following paragraphs provide background information on the materials of construction and selection rationale used for regulated equipment in the analytical laboratory and LAW vitrification facility.

### 2.4.1 Stainless Steel 304L and 316L

Eight of the regulated tanks, 15 miscellaneous units, and most piping, and all of the bulges in the LAW vitrification facility are made of stainless steel 316L. In the analytical laboratory, piping is generally made of stainless steel 316L. The sumps in the analytical laboratory are made of stainless steel 304L. The primary containment pipe for the double-walled, underground lines that carry wastes between the WTP facilities is made of stainless steel 316L. The materials of construction are listed in Table 2 for regulated plant item.

Stainless steel 304L and 316L are used for sodium hydroxide-containing waste at temperatures between 140 and 200 degrees Fahrenheit (°F). Stainless steel 304L is better than stainless steel 316L in nitric acid, but in the presence of chlorides, stainless steel 316L is more resistant to pitting and cracking. However, at a pH greater than 12, chlorides are not a major concern, except possibly in tight crevices.

The presence of acids and/or halides and higher temperatures can increase the corrosion rates of stainless steel 304L and 316L.

### 2.4.2 Nickel, Chromium, Molybdenum Alloys

The two regulated tanks, the C3 and C5 cell sumps, and some of the piping in the analytical laboratory are made of 6% molybdenum alloy. Three regulated tanks two miscellaneous units, some piping, and most of the sumps in the LAW vitrification facility are made of 6% molybdenum alloy. Several miscellaneous units and some piping in the LAW vitrification facility are made of alloys such as Alloy C-22, and Alloy 625. These alloys tend to be more resistant to acids (low pH) and chlorides than are the 300 series stainless steels. High nickel alloys are somewhat better in alkaline conditions, especially at higher temperatures.

The presence of acids and/or halides and higher temperatures can increase the corrosion rates of stainless steel 304L and 316L.

### 2.4.3 Stainless Steel 347

The housing or hot-side/high temperature elements of a few miscellaneous units in the LAW vitrification facility are made of stainless steel 347. These units are part of the system managing secondary offgas. Stabilized austenitic type 347 stainless steel is suitable for high temperature applications where stainless steel 316L is precluded and dry-air conditions are not conducive to general corrosion.

## 2.5 Corrosion and Erosion Considerations

The following section describes the potential corrosion and erosion degradation mechanisms that may impact the integrity of the tanks and miscellaneous units in the analytical laboratory and LAW vitrification facility. These corrosion and erosion mechanisms are factors used in Sections 4 and 5 to characterize the tanks and miscellaneous units as having lower or higher potential for corrosion and erosion. This information is used in Section 7 to establish the schedule for the initial integrity assessment following hot commissioning. Corrosion/erosion allowances for each class of piping material are provided in 24590-WTP-3PS-P000-T0001, *Piping Material Classes General Description and Summary.*

### 2.5.1 Corrosion

Corrosion is a degradation process affected by many parameters, including temperature, chemistry, flow rate, stress, and vibration. The underlying process of corrosion may be electrochemical, chemical, mechanical, or a combination of these mechanisms. Combinations of parameters can act synergistically, sometimes reducing the corrosion rate, accelerating the corrosion rate, or changing the corrosion mechanism.

Evaluation, selection, and establishment of corrosion control measures begin with design and are implemented during construction and maintained during operation. Periodic assessments, as described in

Section 7, are performed to ensure that tanks and miscellaneous units have sufficient structural integrity and are acceptable for the storage and treatment of hazardous materials.

The corrosion degradation mechanisms applicable to the materials of construction selected for the regulated tanks and miscellaneous units located in the analytical laboratory and LAW vitrification facility are general corrosion, pitting corrosion, stress corrosion cracking, crevice corrosion, corrosion at welds, and vapor phase corrosion. A minimum standard corrosion allowance of 0.040 inch has been generally specified for tanks and miscellaneous units with a design life of 40 years. This corrosion allowance is increased where required for process chemistry reasons or other corrosion or erosion concerns. The corrosion allowances for the regulated tanks, miscellaneous units, bulges, sumps, and piping located in the analytical laboratory and LAW vitrification facility are listed in Table 2.

Eight of the 12 regulated tanks and 15 of the miscellaneous units in the LAW vitrification facility are constructed of low carbon stainless steel 316L, which is generally more resistant to pitting corrosion, stress corrosion cracking, and crevice corrosion than the higher carbon stainless steel 316. The two regulated tanks in the analytical laboratory, plus two tanks and two miscellaneous units in the LAW vitrification facility are made of 6% molybdenum alloy. Two tanks and eight of the miscellaneous units in the LAW vitrification facility are made of high nickel alloy (e.g., Alloy C-22 and Alloy 625). These 6% molybdenum alloy or high nickel alloy materials were selected depending on process chemistry and are more resistant to corrosion in lower pH or higher halide concentrations than the series 300 stainless steels. These alloy materials also maintain stable structures during exposure to high temperatures.

Table 3 summarizes the selection rationale for the materials of construction of the regulated tanks, miscellaneous units, bulges, sumps, and piping in the analytical laboratory and LAW vitrification facility.

### 2.5.2 Erosion

Erosion is the removal of material from a metal surface by the action of particles in a moving liquid or particles in a moving gas. Erosion is a function of the fluid velocity, particle size, particle shape, particle concentration, and hardness of the particles relative to that of the material of construction, among other factors. Erosion-corrosion is corrosion exacerbated by the erosive removal of protective layers (e.g., oxides), which allows corrosion to proceed at a high rate.

The evaluation, selection, and establishment of erosion control measures begin with design and are implemented during construction and maintained during operation. Periodic assessments are performed to ensure that tanks and miscellaneous units have sufficient structural integrity and are acceptable for the storage and treatment of hazardous materials.

The erosion allowances for the regulated tanks, miscellaneous units, bulges, sumps, and piping located in the analytical laboratory and LAW vitrification facility are presented in Table 2. A minimum erosion allowance of 0.004 inch is generally specified for tanks and miscellaneous units containing liquids with a velocity of less than 12 feet per second and having a design life of 40 years. Normally, a corrosion allowance of 0.040 inch, which includes the expected wear from both corrosion and erosion, is specified. Additional erosion allowances are specified for the LAW concentrate receipt process system (LCP) vessels (LCP-VSL-00001 and -00002) that store waste material received from the PTF and for the LAW melter feed process system (LFP) vessels (LFP-VSL-00001, -00002, -00003, and -00004) that combine and mix the process waste material with the abrasive glass formers.

### 2.6 Radiological Area Classifications

Access to DWP regulated tanks and miscellaneous units for future integrity assessments must be consistent with keeping radiation exposure as low as reasonably achievable (ALARA). Selection of points for future NDE inspection and measurements and scheduling of inspections and measurements must take into account potential radiation exposure. Regulated equipment in the WTP analytical laboratory and LAW is generally accessible in that it can be visually and physically examined.

The areas in the analytical laboratory and LAW vitrification facility are divided into five numbered zones based on radiological dose rates (R1 to R5) and potential for contamination (C1 to C5), with the higher number indicating the greater hazard potential, and therefore, the greater degree of control and restriction required. Radiation and contamination areas are classified independently in order to differentiate between the need for shielding or confinement. This numbering system is also used to determine the type of control to be applied for access to these areas.

Two dose equivalent rate levels have been established for each radiological classification: a target and a maximum dose equivalent rate. The target dose equivalent rate, if achieved, would be expected to readily satisfy both the requirements of ALARA and the annual dose criteria of 10 Code of Federal Regulations (CFR) 835.202. In contrast, the maximum dose equivalent rate is the level beyond which it would be very difficult to show compliance with the ALARA requirements. As a general rule, the dose rate criteria are applicable at 12 inches from the radiation source or 12 inches from any surface the radiation penetrates, consistent with the definitions of 10 CFR 835.202. Table 4 provides the criteria to be used for each radiological area classification based on dose rate.

Systems containing radioactive substances are provided with suitable isolation provisions to mitigate diffusion, backflow, or other methods of leakage of the contents to areas where the material is not intended. Table 5 provides the criteria to be used for each radiological area classification based on potential contamination. Table 6 provides the radiological contamination and access classifications for each plant item in the analytical laboratory and LAW vitrification facility.

# 3 Facility Descriptions

This section provides a brief description of the analytical laboratory and LAW vitrification facility and describes the general layout of each facility and the distribution of DWP-regulated tanks and miscellaneous units that are subject to periodic integrity assessments. It also includes a description of underground transfer lines associated with the WTP facilities.

### 3.1 Analytical Laboratory

The WTP processes require the availability of analytical services. The analytical laboratory's main function is to ensure that the final glass product meets all regulatory requirements and standards. The analytical laboratory building is approximately 320 feet (ft) long, 180 ft wide, and 45 ft high. It consists of facilities and systems that support process control, waste form qualification testing, technology testing, management of outsourced sample analysis, and receipt and analysis of samples.

Two systems in the laboratory provide analytical services support: analytical hot cell laboratory equipment system (AHL) and analytical radiological laboratory equipment system (ARL). Fourteen analytical hot cells in the AHL are designed to accommodate remote handling of high-activity samples

and other material with potentially high dose rates. The hot cell equipment receives highly radioactive samples, performs analytical services to support WTP operations, and provides process technology services when required. Thirteen radiological laboratories in the ARL area are designed to handle low-activity sample analysis activities.

The analytical laboratory's radioactive liquid waste disposal system (RLD) collects liquid effluent from the hot cells, radiological laboratories, and other areas in the laboratory for eventual transfer to other facilities for final disposition. The RLD encompasses all vessels, instrumentation, pumps, valves, mixers, transfer pump pits, piping pits, and cells associated with the collection and transfer of liquid effluent generated from the laboratory systems.

Two rooms in the analytical laboratory contain DWP regulated equipment, including one room on the -18-ft, 2-in elevation level and one room on the -19-ft, 2-in elevation level. The analytical laboratory contains two DWP regulated tanks: one located in room A-B003 on the -18-ft, 2-in elevation level and one located in room A-B004 on the -19-ft, 2-in elevation level. A detailed description of the design and process features that determine the integrity assessment program and schedule for DWP-regulated equipment in the analytical laboratory is presented in Section 4.

## 3.2 LAW Vitrification Facility

The LAW vitrification building is a multi-story structure extending from a basement at 21 ft below grade to a roof at 68 ft above grade. It includes the gaseous effluent stack structure starting at the roof level and terminating 200 ft above grade. The LAW vitrification building is a mixed-use occupancy building with a gross floor area of 257,427 square feet (excluding the 42,276 square feet in the basement or below grade) that houses the vitrification system for production of the immobilized low-activity waste. The LAW vitrification facility consists of several distinct parts, including the main process area and support areas such as the annex (administration) building, LAW switchgear building, loading docks (receiving/storage, container import, and export high truck bays), and breathing service air and fire riser enclosure. The main process building is a 4-story windowless structure with a basement. The building foundation, perimeter basement walls, interior pour cave areas, transfer tunnel walls, and process areas in the building's core are constructed of cast-in-place reinforced concrete. The primary superstructure is a structural steel frame.

The LAW building supports the industrial vitrification process that requires taller than normal building heights and large areas. The primary interior functions in the LAW vitrification building consist of two shielded melters and their adjacent supporting process cells. The melters are designed to melt glass formers and waste material into a molten glass pool, and pour that material into LAW containers. The two shielded melters are in a melter gallery at the 3-ft elevation level. The melter containment system is designed to provide radiological shielding and chemical protection. A pour cave, located beneath the melters, services the two melters, and is equipped to provide lifting and transport services for the product containers. The pour cave is lined with stainless steel cladding to provide contamination control.

Eleven rooms in the main process building contain LAW vitrification facility DWP regulated equipment, including four rooms on the 3-ft elevation level, five rooms on the 48-ft elevation level and one room each on the 28-ft elevation level and on the -21-ft elevation level. The LAW vitrification facility contains 12 DWP tanks: 10 tanks located in rooms on the 3-ft elevation level (L-0123, L-0124, and L-0126) and one each located in the rooms on the 28-ft elevation level (L-0218) and -21-ft elevation level (L-B001B). The LAW vitrification facility contains 27 DWP miscellaneous units: 10 units located in rooms on the

3-ft elevation level (L-0112, L-0123, and L-0124) and 17 units located in the five rooms on the 48-ft elevation level (L-0304C, D, E, F, and H).

The primary equipment and materials for the LAW melter process system (LMP) and portions of the primary offgas process system (LOP) located within the melter gallery (room L-0112) are located on the 3-ft elevation level. The wet process cell melter areas (rooms L-0123 and L-0124) located immediately north of the melter gallery contain the equipment for the treated LAW concentrate receipt process system (LCP) and melter feed process system (LFP). In addition, part of the radioactive liquid disposal system (RLD) is located on this level (room L-0126).

The 28-ft elevation and 48-ft elevation levels contain support equipment and processes for the vitrification process. The equipment of the secondary offgas/vessel vent process system (LVP) is housed on these levels. Most of the space on the 28-ft elevation level is above the actual vitrification process and is used to provide access for servicing the process equipment located in limited-access areas on the 3-ft elevation level. The -21-ft elevation level contains the primary pour cave equipment for placing glass from the melters into containers, and support equipment for transferring the waste containers. Part of the RLD system is also located on this level.

A detailed description of the design and process features that determine the integrity assessment program and schedule for DWP-regulated equipment in the PTF is presented in Section 5.

### 3.3 Balance of Facility

There are 21 underground transfer lines carrying dangerous waste that are connected to, or are within, the WTP facilities. The total lengths of these lines range from 289 to 1078 ft. The transfer lines are double-walled and sloped with low-point leak detection systems.

The PTF receives LAW and HLW feeds from the DOE Tank Farms through three transfer lines. The PTF pretreats the feeds and transfers them to the LAW vitrification facility through three transfer lines or to the HLW vitrification facility through four transfer lines.

Secondary waste from the LAW vitrification facility is returned to the PTF for treatment and disposal through four transfer lines. Secondary waste from the HLW vitrification facility is returned to the PTF through four transfer lines. Secondary waste from the analytical laboratory is transferred to the PTF for treatment and disposal through one transfer line. Secondary waste generated within the PTF is transferred through two transfer lines to the Liquid Effluent Retention Facility (LERF)/Effluent Treatment Facility (ETF).

A detailed description of the design and process features that determine the integrity assessment program and schedule for the underground transfer lines is presented in Section 6.

# 4 Analytical Laboratory

This section provides detailed descriptions of the analytical laboratory's DWP-regulated tanks, sumps, and associated piping included in the DWP. These tanks, sumps, and associated piping are periodically assessed to confirm the integrity of their materials of construction. The tanks are as follows:

- Laboratory area sink drain collection vessel (RLD-VSL-00164)
- Hot cell drain collection vessel (RLD-VSL-00165)

For each regulated tank and sump in the analytical laboratory, information is provided on the location of the tank or sump, its purpose, and its design characteristics, including materials of construction and corrosion/erosion allowances. The design standards used for each tank or sump and the characteristics of the waste managed in each tank or sump are also provided. This information is the unit-specific baseline used to establish the approach and schedule for future integrity assessments for the analytical laboratory DWP-regulated tanks and associated sumps and piping.

There are three RLD vessels: floor drain collection vessel (RLD-VSL-00163), laboratory area sink drain collection vessel (RLD-VSL-00164), and hot cell drain collection vessel (RLD-VSL-00165). The floor drain collection vessel (RLD-VSL-00163) collects, contains, and provides for transfer of non-contaminated liquid effluent. Although the floor drain collection vessel is identified as part of the RLD system, it is not designed or permitted to manage mixed or dangerous waste. Vessels RLD-VSL-00164 and RLD-VSL-00165 are tanks included in the DWP and are addressed in this document.

## 4.1 Laboratory Area Sink Drain Collection Vessel (RLD-VSL-00164)

The laboratory area sink drain collection vessel (RLD-VSL-00164) is located in the below grade C3 effluent vessel cell (C3 cell) in Room A-B003 of the analytical laboratory building. The cell floor and the perimeter walls, up to the maximum height of the fire water overflow volume, are covered by a stainless steel liner, which forms part of the secondary containment for the tank. Room A-B003 has a radiological area classification of R4/C5 (Table 6). The C3 cell has an access-plug opening for human access; however, planned human entries in this area are restricted and there is no cell access during normal operations.

Functions of vessel RLD-VSL-00164 include collection and transfer of mixed radioactive liquid streams. It receives effluent from the laboratory sinks, decontamination showers, and autosampling system (ASX) equipment drains; from the receiving and shipping area, process vacuum equipment drains, and floor drains throughout the laboratory; and from the C3 pump pit sump (RLD-SUMP-00045). The contents of the non-DWP floor drain collection vessel (RLD-VSL-00163) are also transferred to vessel RLD-VSL-00164, RLD-VSL-00165, or the non-radioactive liquid waste disposal system (NLD) storage tank NLD-TK-00001. During routine operations, vessel RLD-VSL-00164 discharges to the hot cell drain collection vessel RLD-VSL-00165.

Vessel RLD-VSL-00164 has ASME flanged and dished heads with an approximate inside diameter of 8 ft, 6 inches and a tangent to tangent length of 5 ft, 9 inches. It has a maximum capacity of 3,180 gallons. The vessel has minimum and maximum design pressures of 7 pounds per square inch gauge (psig) and 15 psig, respectively. Its minimum and maximum design temperatures are -20°F and 240°F, respectively.

The vessel RLD-VSL-00164 is equipped with level instrumentation used to maintain the vessel contents within the acceptable operating range and detect primary containment leakage. Laboratory area sink drain collection vessel pumps (RLD-PMP-00182A/B) recirculate vessel contents through three tank eductors (RLD-EDUC-00002A, RLD-EDUC-00002B, and RLD-EDUC-00002C) for mixing, and to

transfer the contents of the tank to RLD-VSL-00165. The eductors are venturi jet devices that use pressurized liquid to entrain solids and mix the vessel contents.

### 4.1.1 Design Standards

Vessel RLD-VSL-00164 is fabricated in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The RLD-VSL-00164 vessel system is also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The vessel is made of a 6% molybdenum alloy (unified numbering system [UNS] N08367 or N08926) to ensure containment for a 40-year life. The vessel shell thickness is 0.375 inch and head top and bottom thicknesses are 0.375 inch (minimum) with the minimum standard corrosion allowance of 0.040 inch, which is approximately 40% more than the 0.024-inch corrosion allowance plus 0.004-inch erosion allowance required for this vessel.

Process piping is designed in accordance with ASME B31.3-96, Process Piping. System piping is generally 316L stainless steel. Piping from the AHL and ARL process drains up to and including the respective collection vessel is typically a higher-grade alloy. In these cases, the piping is typically Alloy C-22 and the vessels are 6% molybdenum alloy.

Pipe that conveys dangerous waste from one containment area to another is double-walled. The outer secondary containment pipes of the double-walled piping are typically carbon steel. System piping is sloped to be self-draining so that liquids drain to vessels, into lines that can be drained, or to leak detection boxes (RLD-LDB-00005 through -00008, and RLD-LDB-00011).

### 4.1.2 Characteristics of the Waste

The volume of influent to vessel RLD-VSL-00164 from the radiological laboratories is estimated to be approximately 67 gallons per day. The contents of the vessel are 91% water by volume, 8.21% chemical source by volume, and negligible solids by volume. Contents include acids (e.g., hydrochloric acid and nitric acid), bases (e.g., sodium hydroxide and potassium hydroxide), metals (e.g., arsenic and chromium), and radionuclides (e.g., thorium and uranium) (24590-LAB-MVC-RLD-00002, 24590-LAB-M0C-60-00008).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in this system. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the laboratory area sink drain collection vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

## 4.2 Hot Cell Drain Collection Vessel (RLD-VSL-00165)

The hot cell drain collection vessel (RLD-VSL-00165) is located in the below grade C5 effluent vessel cell (C5 cell) in Room A-B004 of the analytical laboratory building. The cell floor and the perimeter walls, up to the maximum height of the fire water overflow volume, are covered by a stainless steel liner, which forms part of the secondary containment for the tank. Room A-B004 has a radiological area classification of R5/C5 (Table 6). The C5 cell has an access-plug opening for human access; however, planned human entries in this area are restricted and there is no cell access during normal operations.

Functions of vessel RLD-VSL-00165 include collection and transfer of mixed radioactive liquid streams. It receives effluent from hot cell glovebox drains, hot cell cupsinks, hot cell transfer drawers, master-slave manipulator decontamination gloveboxes, hot cell sample drop stations, and hot cell drain collection vessel pump pits and valve pit sumps. Effluents from the floor drain collection vessel (RLD-VSL-00163) and laboratory area sink drain collection vessel (RLD-VSL-00164) are also transferred to vessel RLD-VSL-00165. During routine operations, vessel RLD-VSL-00165 discharges to the PTF plant wash vessel (PWD-VSL-00044).

Vessel RLD-VSL-00165 has ASME flanged and dished heads with an approximate inside diameter of 16 ft and a tangent to tangent length of 2 ft, 3 inches. It has a maximum capacity of 9,100 gallons. The vessel has minimum and maximum design pressures of 7 psig and 15 psig, respectively. Its minimum and maximum design temperatures are -20°F and 240°F, respectively.

The vessel RLD-VSL-00165 is equipped with level instrumentation used to maintain the vessel contents within the acceptable operating range and detect primary containment leakage. Hot cell drain collection vessel pumps (RLD-PMP-00183A/B) recirculate vessel contents through eight tank eductors (RLD-EDUC-00003A through H) for mixing, and to transfer the contents of the tank to PTF vessel PWD-VSL-00044. The eductors are venturi jet devices that use pressurized liquid to entrain solids and mix the vessel contents.

### 4.2.1 Design Standards

Vessel RLD-VSL-00165 is fabricated in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The RLD-VSL-00165 vessel system is also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The vessel is made of a 6% molybdenum alloy (UNS N08367, N08925, or N08926) to ensure containment for a 40-year life. The vessel shell thickness is 0.5 inch and head top and bottom thicknesses are 0.625 inch (minimum) with the minimum standard corrosion allowance of 0.040 inch, which is approximately 40% more than the 0.024-inch corrosion allowance plus 0.004-inch erosion allowance required for this vessel.

Process piping is designed in accordance with ASME B31.3-96, Process Piping. System piping is generally 316L stainless steel. Piping from the AHL and ARL process drains up to and including the collection vessel is typically a higher-grade alloy. In these cases, the piping is typically Alloy C-22 and the vessels are 6% molybdenum alloy.

Pipe that conveys dangerous waste from one containment area to another is double-walled. The outer secondary containment pipes of the double-walled piping are typically carbon steel. The transfer line from vessel RLD-VSL-00165 to PWD-VSL-00044 is double walled and is stainless steel. System piping is sloped to be self-draining so that liquids drain to vessels, into lines that can be drained, or to leak detection boxes (RLD-LDB-00002, RLD-LDB-00004, and RLD-LDB-00009).

### 4.2.2 Characteristics of the Waste

An average influent volume of 87 gallons per day of liquid waste is collected in vessel RLD-VSL-00165. The contents of the vessel are 92.3% water by volume, 6.9% chemical source by volume, 0.73% sample source by volume, and negligible solids by volume. In addition to the contents of vessel RLD-VSL-00164, RLD-VSL-00165 contents include acids, bases, oxidizers (e.g., sodium peroxide), and instrument

calibration standards (e.g., potassium hydrogen phthalate and potassium chloride) from hot cell glovebox drains, hot cell cupsinks, and other sources (24590-LAB-MVC-RLD-00003).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in this system. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the hot cell drain collection vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

The hot cell drain collection vessel (RLD-VSL-00165) was designed and NDE was completed by the vendor to the same criteria as tanks located in black cells in the PTF and HLW vitrification facility. Since the location of this tank is inaccessible, integrity assessment is limited to the review of operating history in the same manner as for tanks in black cells. Refer to the document "Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility" (24590-WTP-PER-M-08-002) for details of integrity assessment for tanks in black cells.

## 4.3 Secondary Containment (RLD-SUMP-00041, RLD-SUMP-00042, RLD-SUMP-00043A/B, RLD-SUMP-00044, and RLD-SUMP-00045)

The RLD-VSL-00164 and RLD-VSL-00165 tank systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. As described above, each tank is located in a stainless steel lined cell (C3 cell and C5 cell, respectively). Additionally, each cell includes a stainless steel lined sump embedded in the floor:

- sump RLD-SUMP-00041in the C3 cell (A-B003) at elevation -18 ft, 7 in (cell containing RLD-VSL-00164)
- sump RLD-SUMP-00042 in the C5 cell (A-B004) at elevation -19 ft, 2 in (cell containing RLD-VSL-000165)

There are also four stainless steel lined sumps formed by depressions embedded in the floors of the rooms housing sump pumps and valves:

- sumps RLD-SUMP-00043A/B in the two C5 pump pits (A-B005 and A-B007) at elevation -6 ft, 6 in
- sump RLD-SUMP-00044 in the C5 valve/piping pit (A-B006) at elevation -6 ft, 6 in
- sump RLD-SUMP-00045 in the C3 pump pit (A-B002) at elevation -6 ft, 6 in

Room A-B002 has a radiological area classification of R3/C3. Rooms A-B003 and A-B004 have a radiological area classification of R4/C5 and R5/C5, respectively, with no cell access during normal operations. Rooms A-B005, A-B006, and A-B007 have a radiological area classification of R3/R4/C3 (Table 6).

The analytical laboratory C3 cell and C5 cell sumps provide for the collection of tank overflow or leakage; each with a capacity of 30 gallons. The four sumps in the C5 pump pits, C5 valve/piping pit, and C3 pump pit are 0.5-inch deep rectangular depressions embedded in the floors of the stainless steel lined pits and provide for the collection of pump and valve leakage. Pit sump capacities range from approximately 1.4 to 1.6 gallons.

### 4.3.1 Design Standards

The six sumps in the analytical laboratory are dry sumps fabricated in accordance with design methodology specified in American Institute for Steel Construction Inc. (AISC) M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The C3 cell and C5 cell sumps (RLD-SUMP-00041 and RLD-00042) are made of a 6% molybdenum alloy (UNS N08367) to ensure containment for a 40-year life and have a 30-inches diameter and 13-inch depth. The C5 pump pit sumps (RLD-SUMP-00043A/B), C5 piping pit sump (RLD-SUMP-00044) and C3 pump pit sump (RLD-SUMP-00045) are made of stainless steel 304L (UNS S30403). RLD-SUMP-00043A/B are 0.5-inch deep, 1.5-ft by 3.0-ft depressions in the pit liner. RLD-SUMP-00044 and RLD-SUMP-00045 are 0.5-inch deep, 2-ft by 2.5-ft depressions in the pit liner. Sumps and pit liners have a standard 0.04-inch corrosion allowance. All six sumps are equipped with radar level detection.

### 4.3.2 Characteristics of the Waste

During normal operations, the analytical laboratory sumps are dry. The C3 cell and C5 cell sumps (RLD-SUMP-00041 and RLD-SUMP-00042) in combination with the stainless steel cell liners provide secondary containment for wastes from tanks RLD-VSL-00164 and RLD-VSL-00165, respectively. Previous sections described the wastes contained in these tanks. The C5 pump pit sumps (RLD-SUMP-0043A/B) and the C5 valve/piping pit sump (RLD-SUMP-00044) in combination with the stainless steel pit liners provide secondary containment for leaks from pumps and valves/piping associated with tank RLD-VSL-00165. The C3 pump pit sump (RLD-SUMP-00045) in combination with the stainless steel pit liner provides secondary containment for leaks from pumps associated with tank RLD-VSL-000164.

The materials of construction for secondary containment system are compatible with the waste managed in this system. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the system.

# 5 Low-Activity Waste Vitrification Facility

This section provides detailed descriptions of the LAW vitrification facility's DWP-regulated tank systems and miscellaneous unit systems. The tanks, miscellaneous units, bulges, sumps, and piping associated with these systems are assessed periodically to confirm the integrity of their materials of construction. The systems are as follows:

- LCP system (receipt of LAW concentrate from PTF)
- LFP system (preparation and staging of feed for LAW melters)
- LMP system (LAW vitrification )
- LOP system (containment and management of primary off-gas from melters)
- LVP system (management of secondary offgas from melters and gases from vessel vents)
- RLD system (management of radioactive liquid waste and plant wash)

For each tank, miscellaneous unit, bulge, and sump in the LAW vitrification facility, information is provided on the location of the equipment, its purpose, and its design characteristics, including materials of construction and corrosion/erosion allowances. The design standards used for each item of equipment and associated piping, and the characteristics of the waste managed in each tank, miscellaneous unit, bulge, or sump are also provided. This information is the unit-specific baseline used to establish the approach and schedule for future integrity assessments for the LAW vitrification facility DWP-regulated tanks, miscellaneous units, bulges, and sumps.

## 5.1 LAW Concentrate Receipt Process System (LCP)

The LCP system is primarily housed on the 3-ft elevation level in wet process cells L-0123 and L-0124 in the central portion of the LAW building. Most instruments and valves are placed in equipment bulges located on the 28-ft elevation level above the wet process cells. The remainder of the instrumentation can be found on instrument racks located on the same level as the bulges.

### 5.1.1 Melter Concentrate Receipt Vessels (LCP-VSL-00001, LCP-VSL-00002)

The two melter concentrate receipt vessels (CRVs) (LCP-VSL-00001 and -00002) associated with this system are each located in the northwestern corner of separate wet process cells (L-0123 and L-0124). The cell floors and the perimeter walls, up to the maximum height to contain the volume of the largest tank, are covered by a stainless steel liner, which forms part of the secondary containment for the tank. Wet process cell L-0123 contains secondary containment sumps RLD-SUMP-00029 and RLD-SUMP-00030. Wet process cell L-0124 contains secondary containment sumps RLD-SUMP-00031 and RLD-SUMP-00032. Each of the two rooms has a radiological area classification of R5/C5 (Table 6).

The CRVs receive LAW from the PTF. Each CRV has a maximum capacity of 18,130 gallons. The vessels have sufficient storage capacity to allow time for sampling and to supply feed continuously to the two melters, each producing 15 metric tons of glass per day (MTG/day).

Each LAW CRV is equipped with the following:

- Mechanical agitator (LCP-AGT-00001 or -00002)
- Two pumps (LCP-PMP-00001A/B or -00002A/B) to transfer the LAW concentrate

The vessels and process piping have all welded construction and are made of 316L stainless steel (UNS S31603) to ensure containment of the LAW concentrate for a 40-year life.

#### 5.1.1.1 Design Standards

The CRVs (LCP-VSL-00001 and -00002) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The CRVs have ASME flanged and dished heads with an approximate inside diameter of 14 ft and a tangent to tangent length of 12 ft, 9 inches. The vessel shell and head thicknesses are 0.75 inch minimum (shell), 1 inch minimum ASME code flanged and dished (top), and 0.75 inch minimum ASME code flanged and dished (bottom). Thicknesses include the minimum standard corrosion allowance of 0.040 inch, which is adequate for the 0.024-inch corrosion allowance plus a 0.016-inch erosion allowance required for these vessels. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The CRVs include the following vessel internals, which are of a standard design:

- Mechanical agitators (LCP-AGT-00001 and LCP-AGT-00002) - standard design for all LCP and LFP system vessels
- Vessel spray nozzles - standard design for all LCP, LFP, and RLD system vessels
- Instrumentation - standard design for all LCP and LFP vessels

However, the four identical LCP transfer pumps (LCP-PMP-00001A/B and LCP-PMP-00002A/B) have a non-standard design compared to other WTP pumps to accommodate height requirements and pressurized water seal restrictions. The pumps are vertical centrifugal pumps and flange mounted on the vessel. The nominal 88 gallons per minute discharge from the CRV pumps is routed to a valve bulge where the flow is directed by a valve manifold to either of the melter feed preparation vessels (MFPVs), the autosampler, the other CRV, or to the plant wash vessel (RLD-VSL-00003).

To monitor process operating conditions, the blended vessel contents are pumped into the transfer header from either LCP-VSL-00001 using LCP-PMP-00001A/B or LCP-VSL-00002 using LCP-PMP-00002A/B and routed to the autosampler (ASX-SMPLR-00013). The sampling device is located outside the cell in a shielded but accessible location on the 48-ft elevation level. Samples are collected after each receipt of a batch of treated LAW from the PTF in order to confirm formulation prior to delivery to the MFPVs.

Waste transfer line pipes that convey dangerous waste from the PTF to the LAW LCP vessels are double-walled. The material of construction for the pipes is 316L stainless steel. The transfer lines are each encased with an outer carbon steel pipe that drains to a leak detection box (LDB) located in the PTF. System piping is sloped back to the PTF to be self-draining; liquids drain to the ultimate overflow vessel (PWD-VSL-00033) and are recycled for reprocessing. The outer pipe has a hose connection so it can be flushed from the LCP system to the LDB.

#### 5.1.1.2 Characteristics of the Waste

The LAW process is designed to vitrify the liquid portion of DOE tank farm wastes (designated Envelopes A, B, and C) that have undergone ultrafiltration, cesium removal, and evaporation in the PTF. The wastes are grouped into envelopes based on the waste characteristics: Envelope A wastes are low sulfate wastes and make up the bulk of the waste tanks, Envelope B includes high sulfate wastes, and Envelope C includes high organic wastes.

The CRVs receive LAW melter feed from the PTF that is approximately 57.8 weight percent (wt%) water and 42.2 wt% solids with a pH of 14.6 (24590-WTP-M4C-V11T-00010).

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the LCP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the melter concentrate receipt vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 5.1.2 LCP Bulges (LCP-BULGE-00001, LCP-BULGE-00002, LCP-BULGE-00003)

The three concentrate receipt valve bulges associated with the LCP system (LCP-BULGE-00001, LCP-BULGE-00002, and LCP-BULGE-00003) are located on the 28-ft elevation level, above the wet process cells, in room L-0202. Most instruments and valves for the LCP system are placed in the bulges. Room L-0202 has a radiological area classification of R3/C3 (Table 6).

The concentrate receipt valve bulges provide secondary containment away from the process cells; where the control valves and valve actuators are accessible for maintenance. The concentrate receipt bulges drain to a sump (RLD-SUMP-00029 or -00031) that is pumped to the plant wash vessel (RLD-VSL-00003).

The bulges and manual valves are made of 316L stainless steel (UNS S31603) to ensure containment of the LAW concentrate for a 40-year life.

#### 5.1.2.1 Design Standards

The concentrate receipt bulge design follows the standard bulge design philosophies used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-TP001, *Engineering Specification for Process Bulge Design and Fabrication*. Bulge components have a standard 0.040 inch corrosion allowance. Bulge confinement is designed to meet the requirements of AISC M016-89, Manual of Steel Construction. The associated LCP system process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.1.2.2 Characteristics of the Waste

The piping and valves of the LCP bulges (LCP-BULGE-00001, LCP-BULGE-00002, and LCP-BULGE-00003) transfer LAW melter feed received from the CRVs, which is approximately 57.8 weight percent (wt%) water and 42.2 wt% solids with a pH of 14.6 (24590-WTP-M4C-V11T-00010).

The materials of construction for bulges are compatible with the waste managed in the LCP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the LCP bulges are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulges.

## 5.2 LAW Melter Feed Process System (LFP)

The LFP system is primarily housed on the 3-ft elevation level in wet process cells L-0123 and L-0124 in the central portion of the LAW building. Most instruments and valves are placed in equipment bulges located on the 28-ft elevation level, which are above the wet process cells. The remainder of the instrumentation can be found on instrument racks located on the 28-ft elevation level.

### 5.2.1 Melter Feed Preparation Vessels and Melter Feed Vessels (LFP-VSL-00001, LFP-VSL-00002, LFP-VSL-00003, LFP-VSL-00004)

The two MFPVs (LFP-VSL-00001 and -00003) associated with this system are each located in the northeastern corner and the two melter feed vessels (MFVs) (LFP-VSL-00002 and -00004) are each located in the southeastern corner of separate wet process cells (L-0123 and L-0124). The cell floors and

the perimeter walls, up to the maximum height to contain the volume of the largest tank, are covered by a stainless steel liner, which forms part of the secondary containment for the tank. Wet process cell L-0123 contains secondary containment sumps RLD-SUMP-00029 and RLD-SUMP-00030. Wet process cell L-0124 contains secondary containment sumps RLD-SUMP-00031 and RLD-SUMP-00032. Each of the two rooms has a radiological area classification of R5/C5 (Table 6).

The MFPVs receive LAW concentrate from the two CRVs. Each MFPV receives glass formers and sucrose from a dedicated glass former mixer enclosure (GFR-TK-00022 or -00023). Each MFPV has a maximum capacity of 9,123 gallons for receipt and mixing of LAW concentrate with glass formers and sucrose. The MFPVs are sized to support a glass production rate of 15 MTG/day per melter.

The MFVs receive blended LAW melter feed from either of the two MFPVs. Each MFV has a maximum capacity of 9,123 gallons. The MFVs are sized to support a glass production rate of 15 MTG/day per melter.

Each MFPV is equipped with the following:

- One mechanical agitator (LFP-AGT-00001 or -00003)
- Two vertical pumps (LFP-PMP-00001A/B or -00003A/B)

Each MFV is equipped with the following:

- One mechanical agitator (LFP-AGT-00002 or -00004)
- One vertical pump (LFP-PMP-00002 or -00004)
- Six air displacement slurry (ADS) pumps (LFP-PMP-00007 through -00012, or LFP-PMP-00013 through -00018)

The vessels and process piping have all welded construction and are made of 316L stainless steel (UNS S31603) to ensure containment of the LAW melter feed for a 40-year life.

#### 5.2.1.1 Design Standards

The MFPVs (LFP-VSL-00001 and -00003) and MFVs (LFP-VSL-00002 and -00004) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The MFPVs have ASME flanged and dished heads and an approximate inside diameter of 11 ft and a tangent to tangent length of 10 ft, 6 inches. The MFVs have ASME flanged and dished heads and an inside diameter of 11 ft and a tangent-to-tangent height of 10 ft, 6 inches.

The minimum vessel shell and head thicknesses are 0.75 inch (shell), 1 inch ASME code flanged and dished (top), 0.75 inch ASME code flanged and dished (bottom) with the minimum standard corrosion allowance of 0.040 inch, which is adequate for the corrosion allowance with no erosion allowance required for these vessels. However, due to possible high velocities near the agitators, a 0.125-inch allowance is required for the bottom head and shell (including both corrosion and erosion allowance). Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The MFPVs and MFVs include the following vessel internals, which are of a standard design:

- Mechanical agitators - standard design for all LCP and LFP system vessels
- Vessel spray nozzles - standard design for all LCP, LFP, and RLD system vessels
- Instrumentation - standard design for all LCP and LFP vessels

The MFPV and MFV mechanical agitators continuously mix the vessel contents to keep insoluble solids in suspension. For the MFPVs, the time required for uniform blending of each batch is 2 hours.

Each MFPV is equipped with two vertical pumps (LFP-PMP-00001A/B or -00003A/B) and each MFV is equipped with one vertical pump (LFP-PMP-00002 or -00004). The vertical pump discharges at a maximum flow rate of 50 gallons per minute through a valve bulge (LFP-BULGE-00001 or -00002). Discharge from the MFPVs (concentrate, melter feed, or plant wash) is routed to one of the following:

- Corresponding MFV (LFP-VSL-00002 from LFP-VSL-00001, or LFP-VSL-00004 from LFP-VSL-00003)
- Other MFPV (for melter shutdown or batch shimming)
- Same MFPV (to recirculate for sampling)
- Plant wash vessel (RLD-VSL-00003)

Discharge from the MFVs (melter feed or plant wash) is routed to one of the following:

- Either MFPV (in the event of melter shutdown)
- Same MFV (to recirculate for sampling)
- Plant wash vessel (prior to vessel washdown)

The vertical pumps and transfer lines are flushed after every pump shutdown.

Each MFV is equipped with six ADS feed pumps (two ADS feed pumps per each of the three melter zones). ADS pumps are designed without built-in redundancy. The melter is designed to allow one feed nozzle/ADS pump combination per melter zone to be inoperable. Each ADS pump has a corresponding vent valve assembly and an actuator assembly. The bottom of the chamber is hinged to open by the actuator assembly to fill the chamber with slurry. After the bottom of the chamber is closed, air is supplied through the vent valve assembly to pressurize the chamber. The slurry is transferred to the melter using the plant service air pressure as the motive force. The air blows the line clear of feed with each pump stroke.

To monitor process operating conditions, MFPV LFP-VSL-00001 and MFV LFP-VSL-00002 interface with autosampler ASX-SMPLR-00013, and MFPV LFP-VSL-00003 and MFV LFP-VSL-00004 interface with autosampler ASX-SMPLR-00012. Each MFPV shares a sample recirculation line with its corresponding MFV. The sampling devices are located outside the cell in a shielded but accessible location on the 48-ft elevation level. Sampling the MFPVs and MFVs is not a routine operation. The tank contents are sampled during start-up and commissioning to confirm that the glass formers were successfully added and the agitator system is functioning properly. The tank contents may also be sampled during production for tracking melter feed composition.

#### 5.2.1.2 Characteristics of the Waste

The LAW process is designed to vitrify the liquid portion of DOE tank farm wastes (designated Envelopes A, B, and C) that have undergone ultrafiltration, cesium removal, and evaporation in the PTF. The wastes are grouped into envelopes based on the waste characteristics: Envelope A wastes are low sulfate wastes and make up the bulk of the waste tanks, Envelope B includes high sulfate wastes, and Envelope C includes high organic wastes. The contents of MFPVs and MFVs are LAW concentrate and glass formers. The glass formers include silica, boric acid, aluminum silicate, calcium silicate, ferric oxide, zinc oxide, olivine, zirconium silicate, lithium carbonate, rutile, and sucrose.

The MFPVs receive and blend LAW concentrate and glass formers. The MFVs receive the blended melter feed from the MFPVs prior to delivery to the melters (LMP-MLTR-00001 and -00002). The blended contents are approximately 34.7 wt% water and 65.3 wt% solids with a pH of 14.3 (24590-WTP-M4C-V11T-00010).

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the LFP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the melter feed preparation and melter feed vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 5.2.2 LFP Bulges (LFP-BULGE-00001 and LFP-BULGE-00002)

The two valve bulges associated with the LFP system (LFP-BULGE-00001 and LFP-BULGE-00002) are located on the 28-ft elevation level, above the wet process cells, in room L-0202. Most instruments and valves for the LFP system are placed in the bulges. Room L-0202 has a radiological area classification of R3/C3 (Table 6).

The valve bulges for the LFP system provide secondary containment away from the process cell where the control valves and valve actuators that are used in the transfer of blended melter feed between tanks are accessible for maintenance. The LFP bulges drain to a sump (RLD-SUMP-00030 or -00032) that is pumped to the plant wash vessel (RLD-VSL-00003).

The bulges and manual valves are made of 316L stainless steel (UNS S31603) to ensure containment of the melter feed for a 40-year life.

#### 5.2.2.1 Design Standards

The LFP bulge design follows the standard bulge design philosophies used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-TP001, *Engineering Specification for Process Bulge Design and Fabrication.* Bulge components have a standard 0.040 inch corrosion allowance. Bulge confinement is designed to meet the requirements of AISC M016-89, Manual of Steel Construction. The associated LFP system process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.2.2.2 Characteristics of the Waste

The piping and valves of the LFP bulges (LFP-BULGE-00001 and LFP-BULGE-00002) transfer blended melter feed received from the MFPVs and MFVs, which is approximately 57.8 wt% water and 42.2 wt% solids with a pH of 14.6 (24590-WTP-M4C-V11T-00010).

The materials of construction for bulges are compatible with the waste managed in the LFP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the LFP bulges are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulges.

### 5.3 LAW Melter Process System (LMP)

The LMP system is located on the 3-ft elevation level in the melter process cell/melter cave (room L-0112) in the central portion of the LAW building. The melter has three internal compartments: the melt chamber and two discharge chambers. The melt chamber consists of a glass pool zone sometimes referred to as the glass tank, which is lined with refractory material designed to withstand corrosion from molten glass, and a head space called the plenum, which is lined with refractory material to withstand hot corrosive gases, thermal shock, and glass and feed splatter.

### 5.3.1 LAW Melters (LMP-MLTR-00001 and LMP-MLTR-00002)

The two LAW melters (LMP-MLTR-00001 and -00002) are miscellaneous units associated with this system and are located in the western and central portions, respectively, of the melter process cell. The melter process cell has a radiological area classification of R3/C3/C2 (Table 6).

Each LAW melter receives and vitrifies the blended melter feed from one of the two MFVs at a nominal feed rate of 15 MTG/day and discharges molten glass. The overall size of each of the two identical LAW melters is approximately 16 ft high by 21 ft wide by 30 ft long with an estimated weight of 310 short tons (with glass, 320 short tons).

The glass pool and plenum of each melter are constructed with the following kinds of Monofrax refractory bricks: 30% chrome oxide/60% alumina (Monofrax K-3), 80% chrome oxide (Monofrax E), and approximately 100% alumina (Monofrax H). The outer wall of the glass pool consists of alumina-zirconia-silica bonded brick.

#### 5.3.1.1 Design Standards

The LAW melters (LMP-MLTR-00001 and -00002), which are miscellaneous units, are a slurry-fed joule-heated design using Inconel (Alloy 690; UNS N06690) plate electrodes. In these design features, the WTP LAW melters are similar to HLW melters operated at DOE sites such as the Defense Waste Processing Facility melter at the Savannah River Site and the West Valley Demonstration Project melter at West Valley, New York. The design basis for the WTP LAW melter evolves directly from operational experience with prior Duratek melters utilizing similar design features. The most relevant of the designs are the second-generation DM-5000 melter used to process the Savannah River M-Area low-level waste and the WTP LAW pilot melter at the Duratek Columbia, Maryland site. All of the melters described above use Monofrax K-3 fused-cast ceramic refractory as the glass contact refractory material.

The melters are replaceable and have a 5-year design life. In each melter, the walls of the glass pool are constructed in four layers, from interior to exterior:

1) glass contact refractory layer consisting of a 12-inch thick layer of Monofrax K-3.
2) 5-inch thick layer of Monofrax K-3.
3) first 3-inch thick layer of alumina-zirconia-silica bonded brick.
4) second 3-inch thick layer of alumina-zirconia-silica bonded brick.

The interior wall of the glass pool also contains alloy electrodes (Alloy 690, UNS N06690). The vertical lining of the plenum is constructed of Monofrax H. The melter lid, which consists of three refractory layers, is part of the primary containment of the melter plenum gases and is based on previous successful designs of liquid-fed melters.

Several replaceable melter service components (e.g., startup heaters, bubblers, level detectors, feed nozzles and airlift lances) are mounted on the gas barrier lid and enter the melter by means of cylindrical ports through the shield lid. The ports of the gas barrier lid are lined with Alloy 690 sleeves.

#### 5.3.1.2 Characteristics of the Waste

The contents of the LAW melters are the LAW concentrate blended with glass formers from the MFVs described in Section 5.2.1.2.

The materials of construction for these miscellaneous units are compatible with the waste managed in the LMP. The melters are designed to be replaced every 5 years. The schedule for conducting periodic assessments of this system is provided in Table 7.

### 5.4 LAW Primary Offgas Process System (LOP)

The LOP system is primarily housed on the 3-ft elevation level in wet process cells L-0123 and L-0124 and in the melter process cell L-0112 in the central portion of the LAW building. The LOP system includes melter offgas film coolers, submerged bed scrubbers (SBSs), SBS condensate vessels, and wet electrostatic precipitators (WESPs). The regulated units associated with this system include two tanks and eight miscellaneous units. The LOP system includes two bulges associated with the two tanks. The two melter SBS condensate vessels, the two melter SBSs, and the melter WESPs are located in the wet process cells (rooms L-0123 and L-0124). The melter offgas primary film coolers and secondary film coolers are located in the melter process cell (room L-0112). The combined LOP/LVP system removes mercury, acid gases (mainly sulfur oxides [$SO_x$], hydrogen fluoride [HF], and hydrogen chloride [HCl]), nitrogen oxides ($NO_x$), volatile organic compounds (VOCs), particulates, aerosols, and radionuclides from the LAW melter offgas.

### 5.4.1 Melter SBS Condensate Vessels (LOP-VSL-00001 and LOP-VSL-00002)

The two melter SBS condensate vessels (LOP-VSL-00001 and -00002) associated with this system are each located in the southwestern corner of separate wet process cells (L-0123 and L-0124). The cell floors and the perimeter walls, up to the maximum height to contain the volume of the largest tank, are covered by a stainless steel liner, which forms part of the secondary containment for the tank. Wet process cell L-0123 contains secondary containment sumps RLD-SUMP-00029 and RLD-SUMP-00030.

Wet process cell L-0124 contains secondary containment sumps RLD-SUMP-00031 and RLD-SUMP-00032. Each of the two rooms has a radiological area classification of R5/C5 (Table 6).

The SBS condensate vessels receive the liquid overflows from the adjacent SBS, thereby maintaining a constant liquid depth in the SBS. Each SBS condensate vessel has a maximum capacity of 9,056 gallons. The vessel capacity is designed to hold about two days of condensate.

Each SBS condensate vessel is equipped with the following:

- One eductor (LOP-EDUC-00001 or -00002), powered by a side stream from the recycle line, to suspend solids accumulated in the SBS condensate vessel
- One SBS condensate purge pump (LOP-PMP-00001 or -00004) to recycle SBS condensate from the SBS condensate vessel to the SBS
- One spare purge pump (LOP-PMP-00002 or -00005)

The vessels and process piping have all welded construction and are made from Alloy 22 (UNS N06022) to ensure containment of the SBS condensate for a 40-year life.

### 5.4.1.1 Design Standards

The SBS condensate vessels (LOP-VSL-00001 and -00002) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The SBS condensate vessels have ASME flanged and dished heads with an approximate inside diameter of 12 ft and a tangent to tangent length of 8 ft, 2 inches. The vessel shell and head thicknesses are 0.625 inch minimum. Thicknesses include the minimum standard corrosion allowance of 0.040 inch, which is approximately 40% more than the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for these vessels. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

Cooled condensate is recycled from the SBS condensate vessel to the SBS at an approximate normal rate of 80 gallons per minute, which is higher than that of the condensate being removed. The recycle of condensate through the SBS condensate vessel maintains the constant liquid level in the SBS. The recycled condensate contributes to the cooling of the SBS and keeps collected solids in suspension for removal.

### 5.4.1.2 Characteristics of the Waste

The principal gas generated by the melter is steam. Decomposition of salts and organic material also yields carbon dioxide ($CO_2$), sulfur dioxide ($SO_2$), $NO_x$, HCl, and HF. The $NO_x$ is a mixture of nitrogen oxide (NO) and nitrogen dioxide ($NO_2$) with trace amounts of nitrous oxide ($N_2O$). As the offgas cools in the SBS, the steam condenses.

The SBS condensate vessels recirculate overflow from the SBS that is approximately 96.9 wt% water and 3.1 wt% solids (24590-WTP-M4C-V11T-00010). The SBS normally operates at a pH of 9 to minimize impacts to the waste processing at the LERF/ETF. To control stainless steel 316L corrosion rates, the SBS reagent pH can be raised to a pH of 14 when high halide concentrations are measured in the SBS bottoms.

The materials of construction for these vessels and ancillary equipment are compatible with the waste managed in the LOP. The schedule for conducting periodic assessments of this system is provided in Table 7. The SBS condensate vessels are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks. However, these accessible tanks are used as surrogates for inaccessible equipment in the PTF or HLW vitrification facility (24590-WTP-PER-M-08-002). Therefore, the frequency of the integrity assessment of these tanks is accelerated to be consistent with the frequency for tanks with higher potential for corrosion and erosion.

### 5.4.2 Melter Primary and Secondary Film Coolers (LOP-FCLR-00001, LOP-FCLR-00002, LOP-FCLR-00003, and LOP-FCLR-00004)

Each of the two melters has one primary film cooler (LOP-FCLR-00001 and -00003) and one secondary film cooler (LOP-FCLR-00002 and -00004). These coolers are miscellaneous units located in the melter process cell (room L-0112). The melter process cell has a radiological area classification of R3/C3/C2 (Table 6). A primary purpose of the LOP system is to control the melter plenum pressure. Introduction of additional control air into the primary offgas film cooler provides this function while maintaining a relatively constant flow of gas.

The primary film coolers receive melter offgas and cool it with injection air to temperatures below the glass sticking temperature in order to minimize solids deposition on the offgas piping walls. High offgas velocities maintained between the melter and the downstream SBS minimize solids deposition. The secondary film coolers receive injection air, which normally vents through the primary film cooler via the melter plenum. However, when a low vacuum set point is reached in the melter plenum, a butterfly valve in the standby offgas line automatically opens to permit offgas flow through the secondary film cooler, thereby supplementing the primary offgas film cooler in restoring the vacuum in the melter plenum.

#### 5.4.2.1 Design Standards

The primary film coolers (LOP-FCLR-00001 and -00003) and secondary film coolers (LOP-FCLR-00002 and -00004) are fabricated in accordance with ASME B31.3-96, Process Piping. Each film cooler is 10 inches in diameter (inside) and is fabricated from Inconel 690 (UNS N06690). Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.4.2.2 Characteristics of the Waste

The principal gas generated by the melter is steam. Decomposition of salts and organic material also yields $CO_2$, $SO_2$, $NO_x$, HCl, and HF. The $NO_x$ is a mixture of NO and $NO_2$ with trace amounts of $N_2O$. The offgas from the LAW melter plus injection air that passes through the film coolers is approximately 26.8 wt% water, 71.7 wt% gases, and less than 1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction of these miscellaneous units are compatible with the waste managed in the LOP. The melter primary and secondary coolers are designed to be replaced every 5 years. The schedule for conducting periodic assessments of this system is provided in Table 7.

### 5.4.3 Melter Submerged Bed Scrubbers (LOP-SCB-00001 and LOP-SCB-00002)

The two melter SBSs (LOP-SCB-00001 and -00002) are miscellaneous units associated with this system and are each located in the south central portion of separate wet process cells (L-0123 and L-0124). The cell floors and the perimeter walls, up to the maximum height to contain the volume of the largest tank, are covered by a stainless steel liner, which forms part of the secondary containment for the tank. Wet process cell L-0123 contains secondary containment sumps RLD-SUMP-00029 and RLD-SUMP-00030. Wet process cell L-0124 contains secondary containment sumps RLD-SUMP-00031 and RLD-SUMP-00032. Each of the two rooms has a radiological area classification of R5/C5 (Table 6). Each SBS is a passive device designed for aqueous scrubbing of entrained radioactive particulates and removal of aerosols from melter offgas.

Each SBS receives LAW melter offgas and circulates the offgas through the packed bed. Each SBS has a maximum operating volume of 3,690 gallons. The SBS has an offgas inlet flow rate of approximately 1470 standard cubic feet per minute at 600°F and -10 inches of water gauge. A distribution header inside the SBS circulates the liquid to prevent buildup of captured material in the bed by constantly washing the material away. A cooling jacket outside the SBS and cooling coils inside the SBS maintain the scrubbing liquid at a nominal temperature of 122°F.

To help remove solids, the recycle stream is pumped through eight lances that agitate the bottom of the SBS and consolidate the solids near the suction of the SBS water purge pump (LOP-PMP-00003A/B and -00006A/B). The condensate produced, and solids captured, in the SBS are purged every 24 to 48 hours. The SBS water purge pump transfers condensate to a SBS condensate collection vessel (RLD-VSL-00005) at an approximate normal rate of 48 gallons per minute.

The SBSs vessel and process piping have all welded construction and are made from Hastelloy C-22 (UNS N06022) or equivalent to ensure a 40-year life. Each SBS encloses a ceramic packed bed column.

#### 5.4.3.1 Design Standards

The SBS vessels (LOP-SCB-00001 and -00002) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The SBS vessels have ASME flanged and dished heads and an approximate inside diameter of 10 ft and is 6.5 ft high (tangent to tangent). The enclosed packed bed column has a diameter of 6 ft, 2 inches, and a packed bed height of 24 inches.

The minimum SBS shell and head thicknesses are 0.625 inch with the minimum standard corrosion allowance of 0.040 inch, which is approximately 40% more than the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for the vessels housing these miscellaneous units. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.4.3.2 Characteristics of the Waste

The principal gas generated by the melter is steam. Decomposition of salts and organic material also yields $CO_2$, $SO_2$, $NO_x$, HCl, and HF. The $NO_x$ is a mixture of NO and $NO_2$ with trace amounts of $N_2O$. The SBSs receive offgas from the LAW melter plus injection air that has passed through the film coolers and is approximately 26.8 wt% water, 71.7 wt% gases, and less than 1 wt% solids (24590-WTP-M4C-V11T-00010).

The SBS condensate is approximately 96.9 wt% water and 3.1 wt% solids with a pH of 14.4 (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the LOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the melter SBS units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.4.4 Melter Wet Electrostatic Precipitators (LOP-WESP-00001 and LOP-WESP-00002)

The two melter WESPs (LOP-WESP-00001 and -00002) are miscellaneous units associated with this system and are each located in the north central portion of separate wet process cells (L-0123 and L-0124). The cell floors and the perimeter walls, up to the maximum height to contain the volume of the largest tank, are covered by a stainless steel liner, which forms part of the secondary containment for the tank. Wet process cell L-0123 contains secondary containment sumps RLD-SUMP-00029 and RLD-SUMP-00030. Wet process cell L-0124 contains secondary containment sumps RLD-SUMP-00031 and RLD-SUMP-00032. Each of the two rooms has a radiological area classification of R5/C5 (Table 6). After initial aerosol and soluble gas removal in the SBS, the cooled offgas is routed to a WESP for further removal of particulates and aerosols.

Each WESP receives offgas from an SBS at a nominal flow rate of 1,280 standard cubic feet per minute at 122°F and -49 inches of water gauge. The design flow is 2,000 actual cubic feet per minute based on the combined offgas from two idled melters. The offgas enters the unit and passes through a distribution plate and then flows upward through the tubes of the WESP. The tubes act as positive electrodes. A strong electric field is generated along the electrode, supplying a negative charge to aerosols as they pass through the tubes. The negatively charged aerosols move toward the positively charged tube walls where they are removed. The inlet is also provided with a spray to enhance rundown and cleaning. The condensate then drains into a C3/C5 drains/sump collection vessel (RLD-VSL-00004).

The WESP vessels and process piping have all welded construction and are fabricated from a 6% molybdenum alloy (UNS N08367) to ensure a 40-year life.

#### 5.4.4.1 Design Standards

The vessels housing the WESP units (LOP-WESP-00001 and -00002) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The WESP vessels have ASME flanged heads. The WESP shell and head thicknesses include the minimum standard corrosion allowance of 0.040 inch. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.4.4.2 Characteristics of the Waste

The WESPs receive scrubbed melter offgas from the SBS that is approximately 11.4 wt% water, 88.6 wt% gases (primarily nitrogen [$N_2$], oxygen [$O_2$], and $CO_2$), and 0 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the LOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the melter WESP units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.4.5 LOP Bulges (LOP-BULGE-00001 and LOP-BULGE-00002)

The two valve bulges associated with the LOP system (LOP-BULGE-00001 and LOP-BULGE-00002) are located on the 28-ft elevation level, above the wet process cells, in room L-0202. Most instruments and valves for the LOP system are placed in the bulges. Room L-0202 has a radiological area classification of R3/C3 (Table 6).

The valve bulges for the LOP system provide secondary containment away from the process cell where the control valves and valve actuators that are used in the transfer of condensate between tanks are accessible for maintenance. The LOP bulges drain to a sump (RLD-SUMP-00029 or -00031) that is pumped to the plant wash vessel (RLD-VSL-00003).

The bulges and manual valves are made of 316L stainless steel (UNS S31603) to ensure containment of the SBS condensate for a 40-year life.

#### 5.4.5.1 Design Standards

The LOP bulge design follows the standard bulge design philosophies used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-TP001, *Engineering Specification for Process Bulge Design and Fabrication*. Bulge components have a standard 0.040 inch corrosion allowance. Bulge confinement is designed to meet the requirements of AISC M016-89, Manual of Steel Construction. The associated LOP system process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.4.5.2 Characteristics of the Waste

The piping and valves of the LOP bulges (LOP-BULGE-00001 and LOP-BULGE-00002) transfer condensate received from the SBS condensate vessels, which is approximately 96.9 wt% water and 3.1 wt% solids with a pH of 14.4 (24590-WTP-M4C-V11T-00010).

The materials of construction for bulges are compatible with the waste managed in the LOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the LOP bulges are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulges.

## 5.5 LAW Secondary Offgas/Vessel Vent Process System (LVP)

The LVP system is primarily housed on the 28-ft and 48-ft elevation levels in room L-0218 and L-0304C/D/E/F/H of the LAW vitrification building above process cell melter areas located on the 3-ft elevation level. The LVP system consists of preheaters, high efficiency particulate air (HEPA) filters, exhausters, mercury adsorbers, a catalytic oxidizer/reducer, a caustic scrubber, and a caustic collection

tank. The regulated units associated with this system include one tank and 17 miscellaneous units. The LAW caustic collection tank (LVP-TK-00001) is located in room L-0218 in the central portion of the LAW building. The miscellaneous units are located in rooms L-0304C/D/E/F/H. The combined LOP/LVP system removes mercury, acid gases (mainly $SO_x$, HF, and HCl), $NO_x$, VOCs, particulates, aerosols, and radionuclides from the LAW melter offgas.

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

The LAW caustic collection tank (LVP-TK-00001) associated with this system is located in the caustic scrubber blowdown pump room (L-0218) that is below the LAW melter offgas caustic scrubber. The room floors and the perimeter walls, up to the maximum height of the fire water overflow volume, are covered by special protective coating, which forms part of the secondary containment for the tank. The room has a radiological area classification of R2/C2 (Table 6).

The caustic collection tank receives scrub solution that drains from the LAW melter offgas caustic scrubber (LVP-SCB-00001). This liquid is recirculated to the top of the scrubber using caustic scrub solution recirculation pumps (LVP-PMP-00003A/B). This tank is designed for a 2-day hold-up of accumulated caustic scrub solution. To neutralize the acid gases collected in the caustic collection tank, 5 molar caustic is added to the suction side of the transfer pump. Periodically, the scrub solution is discharged to PTF alkaline effluent vessels (RLD-VSL-00017A/B) using caustic blowdown transfer pumps (LVP-PMP-00002A/B).

The caustic collection tank and process piping have all welded construction and are made from 316L stainless steel (UNS S31603) to ensure a 40-year life.

#### 5.5.1.1 Design Standards

The caustic collection tank (LVP-TK-00001) is a commercial grade tank fabricated in accordance with the American Petroleum Institute's construction standards API 650 Appendix J (shop built tanks) and Appendix S (material properties and modified equations for the analysis of stainless steel tanks). The tank is 13 ft in diameter by 14 ft, 4 inches high (to the upper tangent) with a maximum operating volume of 11,920 gallons. Corrosion allowance is 0.040 inch, which includes a 0.024-inch corrosion allowance and a 0.004-inch erosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.5.1.2 Characteristics of the Waste

The caustic collection tank receives scrub solution from the caustic scrubber and recirculates the solution back to the caustic scrubber or, periodically, discharges scrubber bottoms that are approximately 90.1 wt% water and 9.8 wt% dissolved solids with a pH of 9.0 to 9.5 to the PTF (24590-WTP-M4C-V11T-00010, 24590-QL-POA-MKAS-00003-08-00003).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the LVP. The schedule for conducting periodic assessments of this system is provided in Table 7. The caustic collection tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank. However, this tank is used as a surrogate for inaccessible equipment in the PTF or HLW vitrification facility (24590-WTP-PER-M-08-002). Therefore, the frequency of the integrity

assessment of this tank is accelerated to be consistent with the frequency for tanks with higher potential for corrosion and erosion.

### 5.5.2 HEPA Filters (LVP-HEPA-00001A/B, -00002A/B, -00003A)

The HEPA filters (LVP-HEPA-00001A/B, -00002A/B, and -00003A) are miscellaneous units associated with this system and are located in room L-0304H, which has a radiological area classification of R3/C3 (Table 6). HEPA filters provide the final removal of any remaining radioactive particulates from LAW melter offgas to protect downstream equipment from contamination.

The HEPA filters receive the combined offgas stream from the LOP system (WESP offgas) and vent gas from RLD vessels after it is passed through a preheater (LVP-HTR-00001A/B). The heated offgas passes through HEPA filter housings forming two trains: a main train (LVP-HEPA-00001A, -00002A, -00003A) used in normal operations and an auxiliary train (LVP-HEPA-00001B, -00002B) used as an installed back-up. The HEPA filter housings in each train are arranged to form primary and secondary stages of filtration. Each HEPA filter housing contains four individual filters operated in parallel for a total of 20 HEPA filters.

#### 5.5.2.1 Design Standards

The HEPA filters are a vendor package. The two stages of HEPA filters in the LAW vitrification facility consist of parallel banks of HEPA filters, in unshielded, cabinet-type, manual safe-change housings with a standby bank for use during filter change outs. The housings are designed in accordance with ASME AG-1. The HEPA filter inserts are radial flow type, meeting the performance requirements of ASME AG-1. Offgas from the HEPA filters flows through the C3 exhaust ductwork, which is constructed from high-integrity, galvanized, carbon steel, or stainless steel.

#### 5.5.2.2 Characteristics of the Waste

The HEPA filters receive offgas from the LOP system WESP units plus vent gas from the RLD vessels that is approximately 8.3 wt% water, 90.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the LVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEPA filter units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.5.3 Melter Offgas Exhausters (LVP-EXHR-00001A/B/C)

The melter offgas exhausters (LVP-EXHR-00001A/B/C) are miscellaneous units associated with this system and are three multistage centrifugal blowers that are located downstream of the HEPA filters in rooms L-0304C/D/E. These rooms have a radiological area classification of R3/C3 (Table 6).

Each exhauster has a design capacity of 2,550 actual cubic feet per minute at the inlet with a minimum turndown ratio of 3 to 1, a total static pressure of 150 inches WC, and a dedicated uninterruptible power supply (UPS). The exhausters discharge the offgas to the mercury adsorbers at a nominal flow rate of

3,910 actual cubic feet per minute at 216°F and 58 inches of water gauge. Each exhauster is fabricated from 316L stainless steel (UNS S31603) to ensure a 40-year life.

#### 5.5.3.1 Design Standards

The exhausters are part of the C3 exhaust ductwork system, which is constructed from stainless steel with a corrosion allowance of 0.040 inch. The C3 exhaust ductwork distribution systems in the LAW vitrification facility are constructed in accordance with the codes and standards (including ASME AG-1, Air Movement and Control Association [AMCA] codes AMCA-201, 210, and 300; and National Electrical Manufacturers Association [NEMA] MG-1) identified in 24590-WTP-RPT-HV-02-001, WTP Cost Benefit Analysis for C2 and C3 HVAC Systems.

#### 5.5.3.2 Characteristics of the Waste

The exhausters draw filtered offgas from the HEPA filters and discharge it to the mercury mitigation equipment skid (LVP-SKID-00001). The offgas is approximately 8.3 wt% water, 90.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the LVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the exhausters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.5.4 Offgas Mercury Adsorbers (LVP-ADBR-00001A/B)

The offgas mercury adsorbers (LVP-ADBR-00001A and -00001B) are miscellaneous units associated with this system and are located downstream from the exhausters in room L-0304F on the mercury mitigation equipment skid (LVP-SKID-00001). The offgas mercury mitigation equipment skid is located in a room that has a radiological area classification of R3/C3 (Table 6).

The adsorbers use activated carbon to remove mercury and acid gases. The offgas from the HEPA filters flows from the exhausters to the two mercury adsorbers (LVP-ADBR-00001A/B), which are normally operated in series. The mercury concentration in the offgas is reduced to a maximum of 45 micrograms per dry standard cubic meter, and the outlet concentration is measured with a continuous emission monitor. The vessels housing the mercury adsorbers are fabricated from 316L stainless steel (UNS S31603) to ensure a 40-year life.

#### 5.5.4.1 Design Standards

Each mercury adsorber vessel is approximately 8 ft high by 11 ft wide by 26 ft long with an activated carbon bed volume of about 223 cubic feet. The mercury adsorber units are a vendor package. The adsorber housing pressure boundary is designed and fabricated to ASME Section VIII, Division 1, the adsorbers and fire protection system are designed and fabricated to applicable ASME AG-1 requirements, and the interconnect piping and valves are designed and fabricated to ASME B31.3-96. The packaged unit is tested to ASME AG-1 with ASME AG-1a-2000 Addenda, and the pressure boundary pneumatically tested per ASME Section VIII, Division 1.

#### 5.5.4.2 Characteristics of the Waste

The mercury adsorbers receive air discharged from the exhausters and discharge treated offgas to the catalytic oxidizer/reducer skid (LVP-SKID-00002). Both the inlet gas and the offgas are approximately 8.3 wt% water, 90.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the LVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the mercury adsorbers are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.5.5 Selective Catalytic Oxidizer (LVP-SCO-00001) and Selective Catalytic Reduction Unit (LVP-SCR-00001)

The selective catalytic oxidizer (LVP-SCO-00001) and the selective catalytic reduction unit (LVP-SCR-00001) are miscellaneous units associated with this system and are located on the catalytic oxidizer/reducer skid (LVP-SKID-00002), which is downstream from and in the same room as the mercury mitigation equipment skid. The catalytic oxidizer/reduction unit skid is located in a room that has a radiological area classification of R3/C3 (Table 6).

The offgas from the mercury mitigation equipment skid is passed through the catalytic oxidizer/reducer skid (LVP-SKID-00002) that houses a heat recovery exchanger (LVP-HX-00001), and an electric heater (LVP-HTR-00002), as well as the selective catalytic oxidizer (SCO) catalyst (LVP-SCO-00001), and selective catalytic reduction (SCR) catalyst (LVP-SCR-00001).

The heated offgas is passed through the SCO catalyst to oxidize VOCs and carbon monoxide to carbon dioxide and water vapor. The SCO catalyst is a platinum-based material deposited on a metal monolith, which is held in frames and inserted/removed through access doors. The offgas is then injected with a mixture of ammonia vapor and C3 air from an ammonia/air dilution skid (LVP-SKID-00003). Following ammonia injection, the offgas is passed through the SCR catalyst to reduce $NO_x$, to nitrogen and water vapor. The SCR catalyst is a titanium oxide-based material deposited on a metal monolith, which is held in frames and inserted/removed through access doors.

#### 5.5.5.1 Design Standards

The selective catalytic oxidizer (LVP-SCO-00001) and the selective catalytic reduction unit (LVP-SCR-00001) are part of the vendor package for the catalytic oxidizer/reducer skid (LVP-SKID-00002). The housing for the oxidizer unit will be constructed of stainless steel 316L (UNS S31603) stainless steel with corrosion allowance of 0.010 inch. The reduction unit will be constructed of stainless steel 316L (UNS S31603) for fluid side shell components and for ammonia piping and spray; of stainless steel 347 (UNS S34700) or Inconel 960 (UNS N06690) for frame & instrument housings; and of stainless steel 304L (UNS S30403) for structural support not in contact with offgas stream. Corrosion allowance for the reduction unit is 0.010 inch. The housing for the units is constructed in accordance with ASME AG-1 – 1997 Articles AA-400 and CA-400 and ASME Section VIII, Division 1. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.5.5.2 Characteristics of the Waste

The LAW melter decomposes parent nitrate/nitrite compounds, which results in offgas that has high levels of $NO_x$. Although some of the resultant $NO_x$ is decomposed to nitrogen and water in the melter, and some is removed by scrubbing in the SBSs (LOP-SCB-00001 and -00002), the LVP system treats the remaining $NO_x$, plus any VOCs that are present in the LVP offgas stream.

The selective catalytic oxidation/reduction unit (LVP-SCO-00001 and LVP-SCR-00001) removes remaining $NO_x$, plus any VOCs that are present in the LVP offgas stream, prior to discharging the treated offgas to the melter offgas caustic scrubber (LVP-SCB-00001). The inlet offgas is approximately 8.3 wt% water, 90.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 1 wt% solids, and the outlet offgas is approximately 7.2 wt% water, 91.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the LVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the selective catalytic oxidizer and the selective catalytic reduction unit are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.5.6 Electric Heaters (LVP-HTR-00001A/B and LVP-HTR-00002) and Heat Exchanger (LVP-HX-00001)

Two electric heaters (LVP-HTR-00001A/B) associated with this system are located in room L-0304H. One electric heater (LVP-HTR- 00002) and the heat exchanger (LVP-HX-00001) associated with this system is located in room L-0304F on the catalytic oxidizer/reducer skid (LVP-SKID-00002). The heaters and heat exchanger are located in rooms that have a radiological area classification of R3/C3 (Table 6).

The two electric heaters LVP-HTR-00001A/B, in individual housings, receive the combined LOP offgas stream and are used to increase the nominal offgas temperature from 131°F to 149°F to avoid condensation in the melter offgas HEPA filters. Both heaters are operated at less than 50% capacity so that if one fails, the required 18°F temperature increase can be maintained. The heaters are provided with an UPS in the event of a loss of normal power.

The heat recovery exchanger (LVP-HX-00001) raises the temperature of offgas from the mercury mitigation unit using the hot offgas from the SCR catalyst beds. The heat exchanger is a shell and tube design. The electric heater LVP-HTR-00002 is used to supplement the heat recovery exchanger on the catalytic oxidizer/reducer skid (LVP-SKID-00002) primarily during startup and when operating with low $NO_x$ concentrations.

The heaters are made from 316L stainless steel (UNS S31503) to ensure a 40-year life. The heat exchanger is has a 316L stainless steel housing, Incoloy 800/825 (UNS N09900/N08825) heating elements, and stainless steel 347 (UNS S34700) or Inconel 600/690 (UNS N06600/N06900) high temperature surfaces.

#### 5.5.6.1 Design Standards

The heaters and the heat exchanger are parts of the vendor packages. The housing for the units is constructed in accordance with ASME AG-1 – 1997 Articles AA-400 and CA-400 and ASME Section VIII, Division 1. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.5.6.2 Characteristics of the Waste

Heaters LVP-HTR-00001A/B receive offgas from the LOP system WESPs plus vent gas from the RLD vessels and is approximately 8.3 wt% water, 90.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 1 wt% solids (24590-WTP-M4C-V11T-00010). The heat exchanger and heater LVP-HTR-00002 receive offgas that has passed through the mercury mitigation equipment skid.

The materials of construction for these miscellaneous units are compatible with the waste managed in the LVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the heaters and heat exchanger are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.5.7 Melter Offgas Caustic Scrubber (LVP-SCB-00001)

The LAW melter offgas caustic scrubber (LVP-SCB-00001) is a miscellaneous unit associated with this system and is located in an alcove in room L-0304F, adjacent to the area housing the LVP-SKID-00001 and LVP-SKID-00002. The LAW melter offgas caustic scrubber is located in a room that has a radiological area classification of R3/C3 (Table 6).

The caustic scrubber (LVP-SCB-00001) receives offgas from the catalytic oxidation/reduction skid and further treats the offgas by removing acid gases and providing cooling. This scrubber has a nominal offgas inlet flow rate of 9,670 actual cubic feet per minute at 550°F and 11 inches of water gauge.

The caustic scrubber is fabricated from 316L stainless steel (UNS S31603) with the interior from Hastelloy C-276 (UNS N10276) or 316L stainless steel with Hastelloy C-276 or Hastelloy C-22 (UNS N06022) cladding.

#### 5.5.7.1 Design Standards

The vessel housing the caustic scrubber (LVP-SCB-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The caustic scrubber vessel has the minimum standard corrosion allowance of 0.040 inch, which is approximately 40% more than the 0.024-inch corrosion allowance and a 0.004-inch erosion allowance required for the caustic scrubber housing. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.5.7.2 Characteristics of the Waste

The inlet offgas is approximately 7.2 wt% water, 91.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the LVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the caustic scrubber is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

## 5.6 Radioactive Liquid Waste Disposal System (RLD)

The RLD system is located on the 3-ft elevation level and -21-ft elevation level of the LAW vitrification building. Three regulated tanks are associated with this system: the plant wash vessel (RLD-VSL-00003) and the SBS condensate collection vessel (RLD-VSL-00005) located on the 3-ft elevation level (room L-0126) in the eastern portion of the LAW building and the LAW C3/C5 drains/sump collection vessel (RLD-VSL-00004) located below grade at the -21-ft elevation level (room L-B001B). The RLD system also includes two bulges associated with the RLD tanks and sumps located in the process, effluent, and C3/C5 drains cells.

### 5.6.1 Plant Wash Vessel (RLD-VSL-00003)

The plant wash vessel (RLD-VSL-00003) for the LAW vitrification facility is located in the northern portion of the effluent cell (L-0126) that also houses the SBS condensate collection vessel (RLD-VSL-00005). The cell floor and the perimeter walls, up to the maximum height to contain the volume of the largest tank, are covered by a stainless steel liner, which forms part of the secondary containment for the tank. The effluent cell L-0126 contains secondary containment sumps RLD-SUMP-00035 and RLD-SUMP-00036. This room has a radiological area classification of R5/C5 (Table 6).

The plant wash vessel receives plant wash and C3/C5 drains from the C3/C5 drains/sump collection vessel. Dedicated lines to the plant wash vessel are provided for the process/effluent cell sump pump discharge header, C3/C5 drains/sump collection cell sump pump discharge, Melter 1 and Melter 2 concentrate receipt pump discharge headers, Melter 1 and Melter 2 feed preparation/feed transfer pump discharge headers, caustic collection berm drain, and each of the C1/C2 and C3/C5 drains/sump collection transfer pump discharge headers. The plant wash vessel has a maximum capacity of 25,780 gallons.

The plant wash vessel is equipped with the following:

- Mechanical agitator (RLD-AGT-00001) to suspend solids accumulated in the vessel
- Two vertical pumps (RLD-PMP-00001A/B)

The vessel and process piping have all welded construction with the body of the vessel made from 6% molybdenum alloy (UNS N08367/N08926) and the top head made from 316L stainless steel (UNS S31603) to ensure containment of plant wash over a 40-year life.

#### 5.6.1.1 Design Standards

The plant wash vessel (RLD-VSL-00003) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The plant wash vessel has ASME flat flanged top and flanged and dished bottom head with an approximate inside diameter of 16 ft and a height of 15 ft, 5 inches from the top the bottom tangent. The vessel shell and bottom head thicknesses are 0.75

inch minimum. The vessel top thickness is 2.5 inches. The plant wash vessel has the minimum standard corrosion allowance of 0.040 inch, which is approximately 40% more than the 0.024-inch corrosion allowance and a 0.004-inch erosion allowance required. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

A sample supply line to sampler ASX-SMPLR-00012 is routed from the discharge of the transfer pumps (RLD-PMP-00001A/B). Sampling the plant wash vessel is not a routine operation. The tank contents are sampled during start-up and commissioning to confirm proper mixing. Sampling may also occur during production for pH adjustment with sodium hydroxide as required.

#### 5.6.1.2 Characteristics of the Waste

The plant wash vessel is normally empty, but can receive plant wash consisting of sump contents from process and effluent cells, washes or off-specification material from process vessels, drains from the caustic collection berm, and off-specification material from the C1/C2 drains/sump collection vessel, in addition to C3/C5 drains via the C3/C5 drains/sump collection vessel. Plant wash from many of these sources may be corrosive (24590-WTP-M4C-V11T-00010).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the RLD. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the caustic collection tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

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

The LAW C3/C5 drains/sump collection vessel (RLD-VSL-00004) is located in the below grade (-21-ft elevation level) C3/C5 drains cell area (room L-B001B). The cell floor and the perimeter walls, up to the maximum height of the fire water overflow volume, are covered by a stainless steel liner, which forms part of the secondary containment for the tank. The C3/C5 drains cell area (L-B001B) contains secondary containment sump RLD-SUMP-00028. The room has a radiological area classification of R3/C5 (Table 6).

The C3/C5 drains/sump collection vessel receives stack condensate drainage, WESP drains, and C3/C5 drains. Dedicated lines terminating 6 inches above the bottom head within the drains collection vessel are provided for the Melter 1 WESP drain, Melter 2 WESP drain, vessel overflow header, decontamination room drain, melter cooling panel drains, filter room sump transfer, floor drain header at 48-ft elevation level, floor drain header at 28-ft elevation level, and floor drain headers at 3-ft elevation level on the north side and south side. The WESP drains are maintained submerged to ensure the melter offgas does not bypass the WESP. In addition, a dedicated line terminating at the vessel nozzle is provided for the vessel vent header drain. The C3/C5 drains/sump collection vessel has a maximum capacity of 7,696 gallons.

The C3/C5 drains/sump collection vessel is equipped with three mixing eductors (RLD-EDUC-00001A/B/C). Two centrifugal pumps (RLD-PMP-00002A/B) in the C3/C5 drains/sump collection pump bulge (RLD-BULGE-00001) are provided with suction lines from, and a recirculation line to, the C3/C5 drains/sump collection vessel. The recirculated fluid provides the motive force for the mixing eductors.

The vessel and process piping have all welded construction with the body of the vessel made from 316L stainless steel (UNS S31603) and the bottom head clad with 0.1 inch of Inconel 625 (UNS N06625) or better to ensure containment of drains/sump discharge over a 40-year life.

#### 5.6.2.1 Design Standards

The LAW C3/C5 drains/sump collection vessel (RLD-VSL-00004) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The drains/sump collection vessel has ASME flanged and dished heads and an approximate inside diameter of 10 ft and a tangent-to-tangent height of 11 ft. The vessel shell and head thicknesses are 0.5 inch minimum. The LAW C3/C5 drains/sump collection vessel has the minimum standard corrosion allowance of 0.040 inch, which includes the 0.024-inch corrosion allowance and a 0.016-inch erosion allowance required. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

A sample supply line to sampler ASX-SMPLR-00013 is routed from the discharge of the transfer pumps (RLD-PMP-00002A/B). Sampling the LAW C3/C5 drains/sump collection vessel is not a routine operation. The tank contents are sampled during start-up and commissioning to confirm proper mixing. Sampling may also occur during production for pH adjustment with sodium hydroxide as required.

#### 5.6.2.2 Characteristics of the Waste

The LAW C3/C5 drains/sump collection vessel receives WESP drains and unscheduled C3/C5 drains, which may be corrosive (24590-WTP-M4C-V11T-00010).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the RLD. The schedule for conducting periodic assessments of this system is provided in Table 7. The LAW C3/C5 drains/sump collection vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank. However, this tank is used as a surrogate for inaccessible equipment in the PTF or HLW vitrification facility (24590-WTP-PER-M-08-002). Therefore, the frequency of the integrity assessment of this tank is accelerated to be consistent with the frequency for tanks with higher potential for corrosion and erosion.

### 5.6.3 SBS Condensate Collection Vessel (RLD-VSL-00005)

The SBS condensate collection vessel (RLD-VSL-00005) is located in the southern portion of the effluent cell (L-0126) that also houses the LAW vitrification facility plant wash vessel (RLD-VSL-00003). The cell floor and the perimeter walls, up to the maximum height to contain the volume of the largest tank, are covered by a stainless steel liner, which forms part of the secondary containment for the tank. The effluent cell L-0126 contains secondary containment sumps RLD-SUMP-00035 and RLD-SUMP-00036. This room has a radiological area classification of R5/C5 (Table 6).

The SBS condensate collection vessel collects SBS condensate and receives WESP drains from the C3/C5 drains/sump collection vessel. Dedicated lines to the SBS condensate collection vessel are provided for the Melter 1 SBS water purge/SBS condensate purge pump discharge header, Melter 2 SBS water purge/SBS condensate purge pump discharge header, and C3/C5 drains/sump collection transfer pump discharge. The plant wash vessel has a maximum capacity of 25,780 gallons.
The SBS condensate collection vessel is equipped with the following:

- Mechanical agitator (RLD-AGT-00002) to suspend solids accumulated in the vessel
- Two vertical pumps (RLD-PMP-00003A/B)

The vessel and process piping have all welded construction with the body of the vessel made from 6% molybdenum alloy (UNS N08367/N08926) and the top head made from 316L stainless steel (UNS S31603) to ensure containment of SBS condensate over a 40-year life.

#### 5.6.3.1 Design Standards

The SBS condensate collection vessel (RLD-VSL-00005) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The SBS condensate vessel has ASME flat flanged top and flanged and dished bottom head with an approximate inside diameter of 16 ft and a height of 15 ft, 5 inches from the top the bottom tangent. The vessel shell and bottom head thicknesses are 0.75 inch minimum. The vessel top thickness is 2.5 inches. Corrosion allowance is 0.040 inch. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

A sample supply line to sampler ASX-SMPLR-00012 is routed from the discharge of the transfer pumps (RLD-PMP-00003A/B). Sampling the SBS condensate collection vessel is not a routine operation. The tank contents are sampled during start-up and commissioning to confirm proper mixing. Sampling may also occur during production for pH adjustment with sodium hydroxide as required.

#### 5.6.3.2 Hazardous Characteristics of the Waste

The SBS condensate collection vessel receives recirculation from the SBS condensate collection vertical pumps or transfers from the plant wash vertical pumps. SBS condensate has a pH of 14.4 (24590-WTP-M4C-V11T-00010).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the RLD. The schedule for conducting periodic assessments of this system is provided in Table 7. The SBS condensate collection vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank. However, this tank is used as a surrogate for inaccessible equipment in the PTF or HLW vitrification facility (24590-WTP-PER-M-08-002). Therefore, the frequency of the integrity assessment of this tank is accelerated to be consistent with the frequency for tanks with higher potential for corrosion and erosion.

### 5.6.4 RLD Bulges (LOP-BULGE-00001 and LOP-BULGE-00004)

The two bulges associated with the RLD system comprise the C3/C5 pump bulge (RLD-BULGE-00001) and the plant wash/SBS condensate collection vessel valve bulge (RLD-BULGE-00004). The C3/C5 pump bulge is located adjacent to the below grade (-21-ft elevation level) C3/C5 cell area in room L-B001A. The plant wash/SBS condensate collection vessel valve bulge is located on the 28-ft elevation level, above the effluent cell, in room L-0202. Most instruments and valves for the RLD system are placed in the bulges. Rooms L-B001A and L-0202 have a radiological area classification of R3/C3 (Table 6).

The pump and valve bulges for the RLD system provide secondary containment away from the C3/C5 and effluent cells where the pumps, control valves, and valve actuators that are used in the transfer of effluent between tanks are accessible for maintenance. The RLD pump bulge drains to a sump (RLD-SUMP-00028) and the RLD valve bulge drains to a sump (RLD-SUMP-00036). Contents of both sumps are pumped to the plant wash vessel (RLD-VSL-00003)

The C3/C5 pump bulge (RLD-BULGE-00001) confinement is made of 316L stainless steel (UNS31603) and the pumps (RLD-PMP-00002A/B) and valves are made of a 6% molybdenum alloy (UNS N08367) to ensure containment of the C3/C5 effluent for a 40-year life. The plant wash/SBS condensate collection vessel bulge (RLD-BULGE-00004) confinement and manual valves are made of 316L stainless steel (UNS S31603) to ensure containment of the plant wash/SBS condensate for a 40-year life.

#### 5.6.4.1 Design Standards

The RLD bulge designs follow the standard bulge design philosophies used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-TP001, Engineering Specification for Process Bulge Design and Fabrication. Bulge components have a standard 0.040 inch corrosion allowance. Bulge confinement is designed to meet the requirements of AISC M016-89, Manual of Steel Construction. The associated RLD system process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.6.4.2 Characteristics of the Waste

The piping, pumps, and valves of the RLD bulges (RLD-BULGE-00001 and RLD-BULGE-00004) transfer effluent received from the RLD tanks. The materials of construction for bulges are compatible with the waste managed in the RLD system. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the RLD bulges are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulges.

### 5.6.5 Secondary Containment (RLD-SUMP-00028, RLD-SUMP-00029, RLD-SUMP-00030, RLD-SUMP-00031, RLD-SUMP-00032, RLD-SUMP-00035, and RLD-SUMP-00036)

The LAW vitrification facility tank systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. As described above, 11 tanks are located in stainless steel lined cells (wet process cells for Melter 1 and Melter 2), effluent cell, and C3/C5 drain vessel room) and one tank is located inside a berm with a special protective coating (in room L-0218). Each stainless steel lined cell includes a stainless steel lined sump embedded in the floor:

- sump RLD-SUMP-00028 in the C3/C5 drains vessel cell (L-B001B) at elevation -21 ft (cell containing tank RLD-VSL-00004 and drains from RLD-BULGE-00001)
- sumps RLD-SUMP-00029 and RLD-SUMP-00030 in Melter 1wet process cell (L-0123) at elevation 3 ft (cell containing tanks LCP-VSL-00001, LFP-VSL-00001, LFP-VSL-00002, and LOP-VSL-00001; miscellaneous units LOP-SCP-00001 and LOP-WESP-00001; and drains from LCP-BULGE-00001, LCP-BULGE-00002, LFP-BULGE-00001, LMP-LDB-00001, LOP-BULGE-00001)

- sumps RLD-SUMP-00031 and RLD-SUMP-00032 in Melter 2 wet process cell (L-0124) at elevation 3 ft (cell containing tanks LCP-VSL-00002, LFP-VSL-00003, LFP-VSL-00004, and LOP-VSL-00002; miscellaneous units LOP-SCP-00002 and LOP-WESP-00002; and drains from LCP-BULGE-00003, LFP-BULGE-00002, LMP-LDB-00002; LOP-BULGE-00002)
- sumps RLD-SUMP-00035 and RLD-SUMP-00036 in the effluent cell (L-0126) at elevation 3 ft (cell containing tanks RLD-VSL-00003 and RLD-VSL-00005; and drains from RLD-BULGE-00004)

Rooms L-0123, L-0124, L-0126 have a radiological area classification of R5/C5 (Table 6) with no cell access during normal operations. Room L-B001B has a radiological area classification of R3/C5 (Table 6).

The four process cell sumps (RLD-SUMP-00029, RLD-SUMP-00030, RLD-SUMP-00031, and RLD-SUMP-00032), the two effluent cell sumps (RLD-SUMP-00035 and RLD-SUMP-00036), and the C3/C5 drains vessel cell sump (RLD-SUMP-00028) are provided with liquid level detection, alarms, and permanently installed submersible sump pumps. The submersible sump pumps transfer the sump contents to the Plant Wash Vessel (RLD-VSL-00003).

### 5.6.5.1 Design Standards

The seven sumps in the LAW vitrification facility are dry sumps fabricated in accordance with design methodology specified in AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The C3/C5 drains/sump collection vessel cell sump is made of 316L (UNS S31603) and the six process/effluent cell sumps are made of a 6% molybdenum alloy (UNS N08367) to ensure containment for a 40-year life. All sumps have a standard corrosion allowance of 0.040 inches. The process and effluent cell sumps are 30-in diameter by 12-in deep and the C3/C5 drains collection cell sump is 24-inches diameter by 30-inches deep.

### 5.6.5.2 Characteristics of the Waste

During normal operations, the LAW vitrification facility sumps are dry. The four process cell sumps (RLD-SUMP-00029, RLD-SUMP-00030, RLD-SUMP-00031, and RLD-SUMP-00032) in combination with the stainless steel cell liners provide secondary containment for wastes from the following DWP regulated tanks and miscellaneous units, and bulge drains:

- CRVs LCP-VSL-00001and LCP-VSL-00002
- MFPVs LFP-VSL-00001 and LFP-VSL-00003
- MFVs LFP-VSL-00002 and LFP-VSL-00004
- SBSs LOP-SCB-00001 and LOP-SCB-00003
- WESPs LOP-WESP-00001 and LOP-WESP-00002
- SBS condensate vessels LOP-VSL-00001 and LOP-VSL-00002
- LCP bulge drains, LFP bulge drains, LOP bulge drains
- Melter feed line encasement assembly (LMP-LDB-00001 and LMP-LDB-00002) drains

The two effluent cell sumps (RLD-SUMP-00035 and RLD-SUMP-00036) in combination with the stainless steel cell liner provide secondary containment for effluent from the plant wash vessel (RLD-VSL-00003) and the SBS condensate collection vessel (RLD-VSL-00005), plus the effluent vessels bulge (RLD-BULGE-00004) drain. Previous sections described the wastes and effluent contained in these tanks, miscellaneous units, and bulges.

The C3/C5 drains collection sump (RLD-SUMP-000028) in combination with the stainless steel cell liner provides secondary containment for overflow or leakage from the C3/C5 drains/sump collection vessel (RLD-VSL-00004), piping in the C3/C5 drains/sump collection vessel cell, and leakage from piping or valves in RLD-BULGE-00001. Previous sections described the materials managed in the tank and associated piping and bulge.

The materials of construction for secondary containment system are compatible with the waste managed in the LAW vitrification facility. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. The secondary containment system is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the system. However, these accessible sumps are used as surrogates for inaccessible sumps in the PTF or HLW vitrification facility (24590-WTP-PER-M-08-002). Therefore, the frequency of the integrity assessment of these LAW vitrification facility sumps is accelerated to be consistent with the frequency for sumps with higher potential for corrosion and erosion.

# 6 Underground Transfer Lines

This section provides descriptions of the underground transfer lines, including secondary containment, that are used to transfer wastes from the DOE Tank Farms to the WTP PTF and between the WTP facilities. Information is provided on the purpose of these underground transfer lines, and their design characteristics, including materials of construction and corrosion/erosion allowances. The design standards used for the transfer lines are also provided.

There are 21 underground transfer lines carrying dangerous waste that are connected to, or are within, the WTP facilities. The transfer lines are sloped, with eight of the transfer lines having a minimum slope of 1:50 and the remaining 13 lines having a minimum slope of 1:200. All lines, except the lines from the PTF to the LERF/ETF, are sloped toward the PTF and terminate in leak detection boxes located within the PTF pipe tunnels. The PTF to LERF/ETF lines are sloped toward the LERF/ETF facility, and the leak detection boxes are located at the WTP boundary.

All underground transfer lines are double-walled, with a 3-inch-diameter nominal stainless steel primary pipe and a 6-inch-diameter nominal carbon steel secondary pipe. The secondary encasement pipe has a fusion bounded epoxy coating with shrink wrap sleeves covering the clamshell welds and a cathodic protection system using an impressed current system. The epoxy coating provides corrosion protection and reduces the current requirement of the cathodic protection system.

Several secondary pipes are surrounded by a layer of insulation (1 to 2 inches thick) and a protective polymer outer shell (e.g., secondary pipe from the DOE Tank Farm to the WTP PTF). Because of its isolation from the surrounding soil and groundwater intrusion, the secondary pipe does not need to be cathodically protected; however, it is connected to cathodically protected piping at both ends and therefore may receive some cathodic protection within those areas.

Primary transfer lines are flushed after each use to minimize the accumulation of waste material and prevent corrosion of the line. Flushing capabilities for removing leaks or accumulated liquid from the secondary containment pipe are also provided.

The leak detection system of the underground transfer pipes employs leak detection boxes at the low points of the pipes so that in the event that the primary pipe leaks, the leak is contained by the secondary pipe and drains into the leak detection boxes. In each of the leak detection boxes, there is a level switch to detect leaks. Once the sensing element of the switch detects a leak, the switch sends a signal to activate a leak detection alarm.

For leak detection boxes installed inside the PTF (PWD-LDB-00001 through PWD-LDB-00019), the box is a horizontal stainless steel pipe with capped ends, drain, overflow drain, and weir. The drain located between the weir and the closest end cap (which is called the containment side of the weir), is normally closed by a plug attached to a rod extending to an accessible area above the leak detection boxes. The overflow drain, located in the non-containment side of the weir, has a similar apparatus, but remains open. The level switch is located in the containment side of the weir. The design of the leak detection boxes is provided in 24590-WTP-PER-J-02-002 (Low-Point Leak Detection in Secondary Containment Systems Including Buried Co-Axial Transfer Lines) and 24590-BOF-CS-80-00102 (RAD Transfer Lines, Miscellaneous Details, Sheet 3).

The leak detection boxes located at the WTP boundary (RLD-LDB-00012 and RLD-LDB-00013) have a similar design as the leak detection boxes installed inside a building. However, the overflow drain remains closed and is opened only after the placement of an appropriate overflow containment receptacle.

Prior to installation in the leak detection boxes, the leak detection level switches are tested for functionality. The leak detection system is periodically self-tested in-situ, to facilitate continuous operability.

The underground transfer lines are covered with bedding and backfill materials consisting of granular material or controlled density fill as specified in 24590-BOF-3PS-CE01-T0001, *Engineering Specification for Excavation and Backfill.* The bedding material at the building interfaces consists of an expansion absorbing cushion made of mineral inorganic glass fiber material and a dry, free-flowing granular product formulated from select inert, inorganic materials as specified in 24590-BOF-3PS-C000-T0002, *Engineering Specification for Excavation and Backfill of Underground Radioactive Waste Transfer Lines.*

## 6.1 Design Standards

The primary containment pipe for the underground transfer lines between the WTP facilities is stainless steel 316L (UNS S31603). The secondary containment pipe is made of carbon steel. It has an epoxy-coating and cathodic protection system to be corrosion resistant during its 40-year design life. The pipes are designed in accordance with ASME B31.3-96, Process Piping.

The 3-inch-diameter nominal primary pipe has a wall thickness of 0.216 inch. The 6-inch-diameter nominal secondary pipe has a wall thickness of 0.280 inch. Corrosion and erosion allowance for the primary pipe from the DOE Tank Farm to the PTF is 0.0160 inch. Corrosion and erosion allowances for the primary pipe between the WTP facilities range from 0.0425 to 0.0937 inch. There are no corrosion

and erosion allowances specified for the secondary pipe because of the epoxy-coating, the cathodic protection system, and for some of the lines, the insulation and protective polymer outer shell around the pipe.

The likelihood of corrosion of the secondary containment pipe of the transfer lines due to liquid in the annular space is small because any leak from the primary pipe is quickly contained and directed to the leak detection boxes, reducing exposure time. In addition, corrosion of the secondary containment pipe is not expected to occur due to the epoxy coating and cathodic protection system. The use of the tertiary barrier (insulation and protective polymer outer shell) for some of the pipes also isolates the secondary containment pipe from external sources of moisture, which eliminates the occurrence of corrosion.

## 6.2 Characteristics of the Waste

The PTF receives LAW and HLW waste feeds from the DOE Tank Farms through three transfer lines. The LAW waste feed is approximately 63.7 wt% water, 35.5 wt% dissolved solids, and 0.78 wt% solids with a pH of 14. The HLW waste feed is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids with a pH of 13 (24590-WTP-M4C-V11T-00010).

The PTF pretreats the feeds and transfers them to the LAW vitrification facility through three transfer lines or to the HLW vitrification facility through four transfer lines. The treated LAW feed is approximately 57.9 wt% water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of 14. The treated HLW feed is approximately 76.1 wt% water, 5.6 wt% dissolved solids, and 18.3 wt% solids with a pH of 13.7 (24590-WTP-M4C-V11T-00010).

Secondary waste from the analytical laboratory is transferred to the PTF for treatment and disposal through one transfer line. Waste includes contents of the hot cell drain collection vessel (RLD-VSL-00165) that are discharged to the PTF plant wash vessel (PWD-VSL-00044) described in Section 4.2.

Secondary waste from the LAW vitrification facility is returned to the PTF for treatment and disposal through four transfer lines. Waste includes contents of the LAW caustic collection tank (LVP-TK-00001), plant wash vessel (RLD-VSL-00003), and SBS condensate collection vessel (RLD-VSL-00005) described in Sections 5.5.1.2, 5.6.1.2, and 5.6.3.2.

Secondary waste from the HLW vitrification facility is returned to the PTF through four transfer lines. Waste includes contents of the acidic waste vessel (RLD-VSL-00007) and plant wash and drains vessel (RLD-VSL-00008). The acidic waste vessel receives waste that consists of SBS purge, WESP and HEME drainage, and neutralized canister decontamination waste. The blended contents are approximately 98.8 wt% water and 1.2 wt% solids. The plant wash and drains vessel receives various vessel, sump, and plant washes. The blended contents are approximately 99.97 wt% water and 0.03 wt% solids. The contents of both vessels are neutralized to a pH of 8 or greater before transferring to the PTF vessel PWD-VSL-00043 (24590-HLW-N1D-RLD-00006, 24590-HLW-3YD-RLD-00001).

Secondary waste generated within the PTF is transferred through two transfer lines to the LERF/ETF. Waste includes contents of the alkaline effluent vessels (RLD-VSL-00017A/B) and process condensate tanks (RLD-TK-00006A/B). Both vessels receive condensate/effluent that is 100 wt% water with a pH of 11.5 (24590-WTP-M4C-V11T-00010).

The materials of construction for the underground transfer lines are compatible with the waste carried by the lines. The transfer lines are considered to have no potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, corrosion prevention methods such as epoxy coating and cathodic protection system, and nature of the waste managed in the tank. The underground transfer lines are not accessible for inspection without excavation.

# 7 Assessment Approach and Schedule

This section presents the integrity assessment approach and schedule for the regulated plant items in the analytical laboratory, LAW vitrification facility, and for underground transfer lines.

## 7.1 Assessment Approach

This section presents information on the integrity assessments needed to assure regulated plant items retain their structural integrity. These activities and systems include routine inspections, operating history reviews, static liquid volume tests, NDEs, and visual examination. Closed-circuit television (CCTV) systems are placed for operational needs and to view certain equipment, but are not specifically placed to meet integrity assessment requirements. However, where CCTV views include regulated equipment, the CCTV system can be used as an integrity assessment tool.

### 7.1.1 Routine Inspections

Routine inspections (such as visual inspections, camera inspections, and instrumentation inspections) to check for leaks from tanks, miscellaneous units, sumps, and piping are performed and recorded where design features are provided for that purpose to ensure waste has not leaked from a tank, miscellaneous unit, sump or pipe. Routine inspections are a part of normal plant operations and contribute to an understanding of the current operating conditions. Routine inspections are performed in accordance with the requirements of Chapter 6.0 of the WTP DWP as specified in WTP DWP condition III.10.C.5.c, WAC 173-303-640(6) and WAC 173-303-680(3). The data from these routine inspections are considered in scheduling periodic assessments.

### 7.1.2 Integrity Assessments

Periodic integrity assessments will be performed over the life of the regulated plant items to assure they retain their structural integrity and will not collapse, rupture, or fail. All regulated plant items are categorized into different classes. The classification system allows extra assessment efforts to be focused on regulated plant items that may have the highest potential consequences if failure or loss of containment should occur.

Tanks, miscellaneous units, bulges, sumps, and piping with a design life of 40 years are adequately designed and fabricated to last for 40 years without in-service replacement in accordance with procedures and materials of construction described in Section 2 and the design standards described in Sections 4 through 6. For the purpose of scheduling periodic assessments, a regulated plant item is considered to have a lower potential for corrosion and erosion or a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed.

Most equipment is considered to have a lower potential for corrosion and erosion for assessment scheduling. Tanks for which erosion due to higher velocities may occur are considered to have a higher potential for corrosion and erosion. Specifically, tanks with mixers that result in higher velocities are considered to have a higher potential for corrosion and erosion for assessment purposes, even though they are designed with additional thickness to compensate for additional erosion.

The following provides the frequency of assessments for regulated plant items.

- **Frequency of Assessments for Equipment with Lower Potential for Corrosion and Erosion.** Assessment of equipment with lower potential for corrosion and erosion within accessible areas is made during routine or maintenance outages and within 10 years after start of hot commissioning at selected accessible points where baseline NDE measurements had been taken. Subsequent integrity assessments will be based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but will be no more than 10 years between integrity assessments. Ten years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated corrosion and erosion, adequate wall thickness would remain so that failure would be prevented and corrective actions can be taken, if required.
- **Frequency of Assessment for Equipment with Higher Potential for Corrosion and Erosion.** Assessment of equipment with higher potential for corrosion and erosion within accessible areas is made during routine or maintenance outages and within 7 years after start of hot commissioning at selected accessible points where baseline NDE measurements had been taken. Subsequent integrity assessments will be based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but will be no more than 7 years between integrity assessments. Because of the potential for increased corrosion and erosion, 7 years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated corrosion and erosion, adequate wall thickness would remain so that failure would be prevented and corrective actions can be taken, if required.

Vendor-provided weld and NDE inspection records and associated quality control documents are used to establish the baseline condition of equipment prior to start-up and operations. Where supplier documentation is not sufficient, additional NDE is conducted to establish a baseline prior to start of hazardous waste operations. Results of future integrity assessments will be compared to the baseline condition to evaluate the structural integrity of equipment and to determine whether the schedule of future assessments should be adjusted.

Where corrosion and/or erosion rates can be determined, the maximum assessment interval is the smaller of:

Remaining Corrosion Allowance/2N years (where remaining corrosion allowance is the difference between the measured shell thickness and the minimum required thickness in mils, and N is the corrosion rate in mils per year);

or:

Seven and 10 years, respectively, for equipment with higher or lower potential for corrosion and erosion.

### 7.1.3 Operating History Reviews

The operating and maintenance history of tanks, miscellaneous units, bulges, sumps, and piping are evaluated to verify that the regulated plant items have been operating within the process envelope used to determine the material of construction and corrosion and erosion allowances. This assessment includes reviewing the process chemistry and parameters such as pH, pressure and temperature, where available, over the period of assessment. Table 8 provides a summary of the process chemistry and parameters that are monitored and evaluated during the operating history reviews. A description of the detailed process chemistry sampling and analysis conducted on hazardous waste managed in the analytical laboratory and LAW vitrification facility is provided in 24590-WTP-RPT-ENV-01-0003, *Waste Treatment Plant Waste Analysis Plan*. For cases where the process conditions deviate from the design conditions, the data are evaluated to determine potential effects on the regulated plant item corrosion and erosion allowances.

These reviews of operating and maintenance conditions and process chemistry for tanks, miscellaneous units, bulges, sumps and piping are done at least every 2 years, or whenever operating parameters are known to have been outside of the process and operating limitations, or when the process chemistry data identified on the respective Corrosion Evaluation Reports/Material Selection Data Sheets, which were used for initial material selection, are revised to incorporate new process information.

Process monitoring is facilitated by a facility-wide autosampling system. The WTP Autosampling System consists of the following major components:

- Ten Autosampler Units - Two located in the LAW vitrification facility and the remaining units located in the PTF and HLW vitrification facility.
- Each sampler is connected to several components that require sampling of their contents. A list of the samplers, the components connected for sampling, and the source terms for fluids routed to each sampler are presented in Table 9. At each autosampler unit, sample bottles are received from a local carrier magazine, filled with a sample from the waste stream, and dispatched to the analytical laboratory.
- Carrier Posting Station - A stand-alone station located in the LAW vitrification facility for the manual introduction of carriers into the Pneumatic Transfer System. These carriers are dispatched to the LAW laboratory fume hood receipt station.
- Pneumatic Transfer System (PTS) -- A network of transport tubes, diverters, exhausters, HEPA filters, and controlled arrival facilities work concurrently to transfer the carriers and sample bottles for analytical laboratory receipt.
- Fumehood Receipt Station -- This is the analytical laboratory receipt station for LAW samples.
- Hot Cell Receipt Station -- This is the analytical laboratory receipt station for HLW vitrification facility and PTF samples.

Each autosampling unit consists of a main glovebox with a robotic arm, a carrier docking station, and a sample retrieval mechanism. A carrier magazine is positioned locally at each autosampler unit for dispatching new sample bottles and carriers in to the main glovebox. Table 9 provides a summary of the LAW tanks monitored by sampling and analysis.

The LAW melters and film coolers, which are designed to be replaced at the end of their 5-year design life, have replaceable melter components (e.g., bubblers, thermocouples, glass level detectors) that have a design life of 6 months or 12 months. Review of melter operations and maintenance records at the time of component replacements form the basis for the assessment for the melters.

Operating history reviews is the only assessment method suitable for use on underground transfer lines and the analytical laboratory imbedded coaxial lines. Records of leak detections and confirmation of process chemistry conditions assures the integrity of these lines.

### 7.1.4 Static Liquid Volume Tests

Static liquid volume leak tests are made periodically to ensure that there is no leakage by demonstrating that a tank can maintain its liquid level over a period of time when fluid flow into and out of the tank is stopped. Static liquid tests are performed in accordance with procedures described in API 334 or equivalent guidance documents for tanks. Static liquid volume tests are not performed on the analytical laboratory RLD vessels because these vessels receive waste from floor drains and are, therefore, difficult to isolate.

Static liquid volume tests are conducted as part of the integrity assessment of the tank. For tanks considered to have a lower potential for corrosion and erosion, these tests are performed during routine or maintenance outages, within 10 years after start of hot commissioning, and subsequently, every 10 years during the life of the tank, unless observed conditions indicate more frequent assessments should be implemented.

For tanks considered to have a higher potential for corrosion and erosion, the tests are made during routine or maintenance outages, within 7 years after start of hot commissioning, and subsequently, every 7 years during the life of the tank, unless observed conditions indicate more frequent assessments should be implemented.

### 7.1.5 Non-Destructive Examinations

Pre-operational baseline NDE measurements are performed on regulated plant items before the initial receipt of dangerous waste as described in Section 2.3. Subsequent NDE measurements are conducted as part of the integrity assessments. The objective of the NDE measurements is to determine the remaining corrosion and erosion allowances of regulated plant items. Results of NDE measurements collected during future integrity assessments will be compared to the baseline NDE measurements to evaluate the structural integrity of equipment and to determine whether the schedule of future assessments should be adjusted. Thickness measurements allow for confirmation that the expected corrosion and erosion rates at the designed operating conditions and erosive conditions have not been exceeded and that the equipment-specific corrosion/erosion allowances continue to be adequate to maintain structural integrity for the design life.

NDE measurements are to be conducted as part of the integrity assessments for tanks and other regulated plant items designed to pressure vessel standards, for other miscellaneous units, for piping connected to regulated plant items, and for in-line components. Bulges containment and sumps do not receive dangerous waste unless there is a leak from a tank, miscellaneous unit, piping, or in-line component. For bulges containment and sumps, NDE measurements are to be conducted as part of the integrity assessments only when the operating history reviews indicate that a leak had traveled to and entered these

plant items. Operating history reviews is the only assessment method suitable for use on underground transfer lines.

Since the location (C5 cell - room A-B004) of the hot cell drain collection vessel (RLD-VSL-00165) and the C5 cell sump (RLD-SUMP-00042) is inaccessible, the integrity assessment of this tank and its associated sump is limited to the review of operating history in the same manner as for tanks and sumps in black cells in the PTF and HLW vitrification facility. The laboratory area sink drain collection vessel (RLD-VSL-00164) and its associated sump (RLD-SUMP-00041) have the same material of construction and similar wastes as RLD-VSL-00165 and RLD-SUMP-00042, respectively. Therefore, NDE measurements of RLD-VSL-00164 and RLD-SUMP-00042 are used as surrogates for NDE measurements of RLD-VSL-00165 and RLD-SUMP-00041, respectively. For regulated equipment in black cells in the PTF and HLW vitrification facility, Table 10 provides a summary of LAW vitrification equipment that can be used as possible surrogates for NDE measurements. The document "Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility" (24590-WTP-PER-M-08-002) provides additional details of integrity assessment for tanks, miscellaneous units, and sumps in black cells.

The integrity assessment thickness measurements are to be conducted at the same locations as the pre-operational baseline thickness measurements. By taking repeated measurements at the same points, the expected remaining corrosion and erosion allowances of the regulated plant items can be more accurately calculated. NDE measurement locations for welds or wall thicknesses are illustrated in Appendix B. These illustrations are provided as information becomes available.

Similar to the baseline thickness measurements, integrity assessment thickness measurements are made in accordance with written procedures implementing the requirements of ASTM E 797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method. Section 9 of ASTM E 797 provides the requirements for developing a detailed written procedure.

### 7.1.6 Visual Examinations

Visual examinations (conducted with or without the assistance of CCTV) are conducted in accordance with written procedures that conform to the requirements of ASME Section V, Article 9. Visual examinations include:

- Evidence of excessive or uneven settlement of the tank foundation such as distortion and cracks around anchor bolts attaching a tank to an underlying foundation
- Rust, pitting, and other visual evidence of corrosion on the exterior of metal tanks and ancillary equipment, especially at grade level and connections
- Evidence of deterioration of exterior coatings such as rust spots and blisters
- Damage to any insulation being used
- Evidence of possible leaks around the tank or ancillary equipment such as discoloration of coatings
- Cracks or evidence of leaks at joints and welds, especially at connections
- Apparent loss of metal thickness on the tank bottom and sides
- Condition of tank system coatings and linings including cracks, gaps, swelling, blistering, and crinkling

Visual examinations of accessible piping include:

- Sufficient materials and components, selected at random, to satisfy the examiner that they are free from defects
- At least 5% of welds
- Random examination of threaded, bolted or other joints

A process and mechanical handling monitoring CCTV system provides for remote viewing of equipment and operations within specified cave areas and where the radiation levels are too high for personnel access. Cameras are located to give optimum viewing angles and distance to suit the process where required. Although CCTV cameras are placed for operational needs rather than to meet integrity assessment requirements, cameras used to monitor process functions can be used to inspect some regulated plant items. CCTV systems are not required in the analytical laboratory because visual access is not restricted. Within the LAW vitrification facility, CCTV systems are installed in the LAW melter cave and melter wet process cells.

## 7.2 Assessment Schedule

This section presents the integrity assessment schedule for the regulated plant items in the analytical laboratory and LAW vitrification facility.

### 7.2.1 Frequency of Assessments for Equipment with Lower Potential for Corrosion and Erosion

Assessment of equipment considered to have a lower potential for corrosion and erosion is made during routine or maintenance outages and within 10 years after start of hot commissioning at selected accessible points where baseline NDE measurements had been taken. Subsequent integrity assessments will be based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but will be no more than 10 years between integrity assessments. Ten years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated corrosion and erosion, adequate wall thickness would remain so that failure would be prevented and corrective actions could be taken, if required. Table 7 presents the schedule for conducting periodic assessments of regulated plant items located in the analytical laboratory and LAW vitrification facility.

### 7.2.2 Frequency of Assessments for Equipment with Higher Potential for Corrosion and Erosion

Assessment of equipment considered to have a higher potential for corrosion and erosion is made during routine or maintenance outages and within 7 years after hot commissioning at selected accessible points where baseline NDE measurements had been taken. Subsequent integrity assessments will be based on the results of previous integrity assessments, the age of the tank and miscellaneous unit system, materials of construction, characteristics of the waste, and any other relevant factors, but will be no more than 7 years between integrity assessments. Because of the potential for increased corrosion and erosion, 7 years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if

there were significant unanticipated corrosion and erosion, adequate wall thickness would remain so that failure would be prevented and corrective actions could be taken, if required. The schedule for conducting periodic assessments of regulated plant items located in the analytical laboratory and LAW vitrification facility is provided in Table 7.

### 7.2.3 Potential Access Impacts on the Assessment Schedule

The two analytical laboratory tanks and the LAW vitrification facility CRVs, MFPVs, MFVs, plant wash vessel, and SBS condensate vessels are located in cells that are designated R5/C5 areas (high radiation/high contamination). Personnel access is not normally permitted to R5/C5 areas. However, as conditions allow, and subject to an approval process, the process cells may be downposted to permit access for offnormal conditions and/or equipment maintenance, or for integrity assessments. For example, for the LAW vitrification facility CRVs, downposting occurs after source term reduction by emptying and flushing the tanks and after contamination reduction in the cell.

## 7.3 Adjustment of Periods Between Assessments

Subsequent assessment intervals may be reduced based on abnormal events (e.g., seismic event resulting in the category III loads [as defined in Section 5 of 24590-WTP-3PS-FB01-T0001] and the design basis events for the analytical laboratory and LAW vitrification facility described in 24590-LAB-RPT-ENS-04-001 and 24590-LAW-RPT-ENS-03-001, respectively), process conditions, operating histories, routine inspection results, and expected remaining corrosion and erosion allowances of the regulated plant item. Adjustment of the period between assessments may be partially or wholly based on the inspection interval calculation(s) described in the last paragraph of Section 7.1.2 above.

## 7.4 Reporting

Upon completion of a periodic integrity assessment, a report of assessment results is prepared. The report of assessment results is reviewed and certified. The certification includes the following statement from WAC 173-303-810(13)(a): "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The report of assessment results includes: an introduction describing the scope and objectives of the assessment; the methods used to conduct the assessment; the results of the assessment; and conclusions including recommendations regarding the time interval before the next integrity assessment.

Reports of the results of operating history reviews include the following information:

- Date of the examination
- Procedure and revision used
- Technique used
- Results of the examination

  - minimum
  - maximum
  - average
  - standard deviation
- Examination personnel identity and qualifications

The reports of results of static liquid volume tests include:

- Date of the examination
- Procedure and revision used
- Technique used
- Results of the examination
  - minimum
  - maximum
  - average
  - standard deviation
- Examination personnel identity and qualifications

Reports of the results of ultrasonic thickness testing include the following information:

- Date of the examination
- Examination procedure
- Type of instrument
- Standardization blocks, size and material type
- Size, frequency and type of search unit
- Scanning method
- Results
- Maximum and minimum thickness measurements
- Location of measurements
- Personnel data, certification level

The reports of results of visual (conducted with or without use of CCTV) examinations include:

- Date of the examination
- Procedure and revision used
- Technique used
- Results of the examination
- Examination personnel identity and qualifications

### 7.5 Contingency Action

If the integrity assessment program detects problems with a regulated plant item, the contingency plan will be followed. The contingency plan provides a detailed description of procedures that will be implemented for compliance with WAC 173-303-640(7) as required by Dangerous Waste Permit Condition III.10.C.6.b.

# 8 References for Applicable Codes and Regulations

10 CFR 835, Occupational Radiation Protection, Code of Federal Regulations, as amended

American Bearing Manufacturers Association (ABMA) Standard 7 - Shaft and Housing Fits for Metric Radial Ball and Roller Bearings

ABMA Standard 9 - Load Ratings and Fatigue Life for Ball Bearings

ABMA Standard 20 - Radial Bearings of Ball, Cylindrical Roller, and Spherical Roller Types Metric Design

American Institute of Steel Construction, Inc. (AISC) M016-89, Manual of Steel Construction

Air Movement and Control Association (AMCA) 201, Fans and Systems

AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

AMCA 300, Reverberant Room Methods for Sound Testing of Fans

American Petroleum Institute (API) 334, A Guide to Leak Detection for Aboveground Storage Tanks

API 610, Centrifugal Pumps for General Refinery Service

API 650, Welded Steel Tanks for Oil Storage

American Society of Mechanical Engineers (ASME) AG-1, Code on Nuclear Air and Gas Treatment

ASME B31.3-96, Process Piping

ASME B73.1, Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process

ASME B73.2, Specifications for Vertical In-Line Centrifugal Pumps for Chemical Process

ASME Section V, Nondestructive Examination

ASME Section VIII, Division 1, Pressure Vessels

ASME Section IX, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

ASME/American National Standards Institute (ANSI) Y14.5M, Dimensioning and Tolerancing

American Society for Nondestructive Testing, Inc. (SNT), Recommended Practice No. SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing

American Society for Testing and Materials (ASTM) A 276, Specification for Stainless Steel Bars and Shapes

ASTM A 802, Standard Practice for Steel Castings, Surface Acceptance Standards, Visual Examination

ASTM E 797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method

Hydraulic Institute Standards (HI) 2.6, American National Standard for Vertical Pump Tests

National Electrical Manufacturers Association (NEMA) MG-1, Motors and Generators

Washington Administrative Code (WAC) 173-303, Dangerous Waste Regulations, as amended

**Table 1 Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| **Analytical Laboratory Tanks** | | |
| Laboratory Area Sink Drain Collection Vessel | RLD-VSL-00164 | ASME Section VIII Division 1 |
| Hot Cell Drain Collection Vessel | RLD-VSL-00165 | ASME Section VIII Division 1 |
| **Analytical Laboratory Sumps and Piping** | | |
| Sumps | RLD-SUMP-00041<br>RLD-SUMP-00042<br>RLD-SUMP-00043A/B<br>RLD-SUMP-00044<br>RLD-SUMP-00045 | AISC M016-89 |
| Piping | NA | ASME B31.3-96 |
| **Analytical Laboratory Pumps** | | |
| Pumps | RLD-PMP-00182A/B<br>RLD-PMP-00183A/B | ASME B73.1, B73.2 |
| **LAW Tanks** | | |
| Melter 1 Concentrate Receipt Vessel | LCP-VSL-00001 | ASME Section VIII Division 1 |
| Melter 2 Concentrate Receipt Vessel | LCP-VSL-00002 | ASME Section VIII Division 1 |
| Melter 1 Feed Preparation Vessel | LFP-VSL-00001 | ASME Section VIII Division 1 |
| Melter 1 Feed Vessel | LFP-VSL-00002 | ASME Section VIII Division 1 |
| Melter 2 Feed Preparation Vessel | LFP-VSL-00003 | ASME Section VIII Division 1 |
| Melter 2 Feed Vessel | LFP-VSL-00004 | ASME Section VIII Division 1 |
| Melter 1 SBS Condensate Vessel | LOP-VSL-00001 | ASME Section VIII Division 1 |
| Melter 2 SBS Condensate Vessel | LOP-VSL-00002 | ASME Section VIII Division 1 |
| LAW Caustic Collection Tank | LVP-TK-00001 | API 650 Appendices J and S (commercial grade) |
| Plant Wash Vessel | RLD-VSL-00003 | ASME Section VIII Division 1 |
| LAW C3/C5 Drains/Sump Collection Vessel | RLD-VSL-00004 | ASME Section VIII Division 1 |
| SBS Condensate Collection Vessel | RLD-VSL-00005 | ASME Section VIII Division 1 |
| **LAW Miscellaneous Units** | | |
| LAW Melter 1 | LMP-MLTR-00001 | NA |
| LAW Melter 2 | LMP-MLTR-00002 | NA |
| Melter 1 Primary Film Cooler | LOP-FCLR-00001 | ASME B31.3-96 |
| Melter 1 Secondary Film Cooler | LOP-FCLR-00002 | ASME B31.3-96 |
| Melter 2 Primary Film Cooler | LOP-FCLR-00003 | ASME B31.3-96 |
| Melter 2 Secondary Film Cooler | LOP-FCLR-00004 | ASME B31.3-96 |
| Melter 1 Submerged Bed Scrubber | LOP-SCB-00001 | ASME Section VIII Division 1 |
| Melter 2 Submerged Bed Scrubber | LOP-SCB-00002 | ASME Section VIII Division 1 |
| Melter 1 Wet Electrostatic Precipitator | LOP-WESP-00001 | ASME Section VIII Division 1 |
| Melter 2 Wet Electrostatic Precipitator | LOP-WESP-00002 | ASME Section VIII Division 1 |
| LAW Melter Offgas Caustic Scrubber | LVP-SCB-00001 | ASME Section VIII Division 1 |
| HEPA Filters | LVP-HEPA-00001A/B<br>LVP-HEPA-00002A/B<br>LVP-HEPA-00003A | ASME AG-1 |
| Selective Catalytic Oxidizer | LVP-SCO-00001 | ASME Section VIII Division 1 |
| Selective Catalytic Reduction Unit | LVP-SCR-00001 | ASME Section VIII Division 1 |

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| Electric Heaters | LVP-HTR-00001A/B<br>LVP-HTR-00002 | ASME Section VIII Division 1 |
| Heat Exchanger | LVP-HX-00001 | ASME Section VIII Division 1 |
| Offgas Mercury Adsorbers | LVP-ADBR-00001A/B | ASME AG-1<br>ASME Section VIII Division 1<br>(Housing) |
| Melter Offgas Exhausters | LVP-EXHR-00001A/B/C | ASME Section VIII Division 1 |
| **LAW Bulges, Sumps, and Piping** | | |
| Bulges | LCP-BULGE-00001<br>LCP-BULGE-00002<br>LCP-BULGE-00003<br>LFP-BULGE-00001<br>LFP-BULGE-00002<br>LOP-BULGE-00001<br>LOP-BULGE-00002<br>RLD-BULGE-00001<br>RLD-BULGE-00002<br>RLD-BULGE-00003<br>RLD-BULGE-00004 | AISC M016-89 |
| Sumps | RLD-SUMP-00028<br>RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 | AISC M016-89 |
| Piping | NA | ASME B31.3-96 |
| **LAW Pumps** | | |
| Semi-Remote, Self-Priming Pumps | LCP-PMP-00001A/B<br>LCP-PMP-00002A/B | ASME Section IX<br>ABMA Std. 7, 9, and 20<br>ASME/ANSI Y14.5M<br>ASTM A 276 and A 802<br>HI 2.6, 2000<br>NEMA MG-1<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0008) |
| Semi-Remote, Cantilever Pumps | LFP-PMP-00001A/B<br>LFP-PMP-00002<br>LFP-PMP-00003A/B<br>LFP-PMP-00004<br>LOP-PMP-00001<br>LOP-PMP-00002<br>LOP-PMP-00004<br>LOP-PMP-00005<br>RLD-PMP-00001A/B<br>RLD-PMP-00003A/B | ASME Section IX<br>ABMA Std. 7, 9, and 20<br>ASME/ANSI Y14.5M<br>ASTM A 276 and A 802<br>HI 2.6, 2000<br>NEMA MG-1<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0008) |
| Centrifugal Pumps | RLD-PMP-00002A/B | API 610, 8th Edition |

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| Centrifugal Pumps | LOP-PMP-00003A/B<br>LOP-PMP-00006A/B<br>LVP-PMP-00002A/B<br>LVP-PMP-00003A/B | ASME B73.1, B73.2 |
| Submersible Pumps | RLD-PMP-00004<br>RLD-PMP-00025<br>RLD-PMP-00026<br>RLD-PMP-00027<br>RLD-PMP-00028 | manufacturer standard |

Acronyms:

ABMA – American Bearing Manufacturers Association
AISC – American Institute of Steel Construction, Inc.
ANSI – American National Standards Institute
API - American Petroleum Institute
ASME - American Society of Mechanical Engineers
ASTM – American Society for Testing and Materials
HEPA - high efficiency particulate air
HI – Hydraulic Institute Standards
LAW – low-activity waste
NA – not applicable
NEMA – National Electrical Manufacturers Association
SBS - submerged bed scrubber

**Table 2 Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| **Analytical Laboratory Tanks** | | | |
| RLD-VSL-00164 | radioactive liquid | 6% Mo alloy (N08367 or N08926) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| RLD-VSL-00165 | radioactive liquid | 6% Mo alloy (N08367, N08925, or N08926) or better | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| **Analytical Laboratory Sumps** | | | |
| RLD-SUMP-00041<br>RLD-SUMP-00042 | radioactive liquid | 6% Mo alloy (N08367) | 0.040 inch |
| RLD-SUMP-00043A/B<br>RLD-SUMP-00044<br>RLD-SUMP-00045 | radioactive liquid | 304L (S30403) or higher (max 0.030% C; dual certified) | 0.040 inch |
| **Analytical Laboratory Piping** | | | |
| Systems with highly corrosive fluids in high active cells | radioactive liquid | 6% Mo alloy (N08367) | 0.0425 inch |
| Systems with less than 2% solids | radioactive liquid | 316L (S31603) | 0.040 inch |
| Coaxial piping carrier piping | radioactive liquid | Alloy C-22 (N06022) | 0.040 inch |
| **Analytical Laboratory Pumps** | | | |
| RLD-PMP-00182A/B<br>RLD-PMP-00183A/B | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified[2]) | 0.040 inch (includes corrosion and erosion allowances) |
| **LAW Tanks** | | | |
| LCP-VSL-00001<br>LCP-VSL-00002 | LAW concentrate feed | 316L (S31603) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance) |
| LFP-VSL-00001<br>LFP-VSL-00002<br>LFP-VSL-00003<br>LFP-VSL-00004 | LAW melter feed | vessel: 316L (S31603) (max 0.030% C; dual certified)<br>agitator: Stellite 712, or equivalent | 0.040 inch (no erosion allowance specified); 0.125 inch required on bottom head and shell (includes erosion and corrosion allowances) |
| LOP-VSL-00001<br>LOP-VSL-00002 | SBS condensate | Alloy C-22 (N06022) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| LVP-TK-00001 | scrubber solution (caustic) | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| RLD-VSL-00003 | wash/drain effluent | body: 6% Mo alloy (N08367/N08926)<br>top head: 316 (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| **LAW Sumps** | | | |
| RLD-SUMP-00028 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 | radioactive liquid | 6% Mo alloy (N08367) | 0.040 inch |
| **LAW Piping** | | | |
| Systems with less than 2% solids | LAW condensate | Alloy C-22 (N06022) | 0.040 inch |
| Systems with less than 2% solids | scrubber solution (caustic) | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| Systems with less than 2% solids | wash/drain effluent | 6% Mo alloy (N08367/N08926) | 0.040 inch |
| Systems with less than 2% solids | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| Systems with more than 2% solids | LAW concentrate feed | 316L (S31603) | 0.0937 inch |
| Systems with glass formers | LAW melter feed | 316L (S31603) | 0.125 inch |
| LOP off-gas piping (downstream of film coolers to SBS) | LAW melter off-gas | Piping: Alloy 625 (N06625) or Alloy 690 (N06690)<br>Bellows: Alloy 635LCF | none required |
| **LAW Pumps** | | | |
| LCP-PMP-00001A/B<br>LCP-PMP-00002A/B | LAW concentrate feed | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| LFP-PMP-00001A/B<br>LFP-PMP-00002<br>LFP-PMP-00003A/B<br>LFP-PMP-00004 | LAW melter feed | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| LOP-PMP-00001<br>LOP-PMP-00002<br>LOP-PMP-00004<br>LOP-PMP-00005 | SBS condensate | 6% Mo alloy (N08367) | 0.040 inch |
| LOP-PMP-00003A/B<br>LOP-PMP-00006A/B | SBS solution | 6% Mo alloy (N08367) | 0.040 inch |
| LVP-PMP-00002A/B<br>LVP-PMP-00003A/B | caustic scrubbing solution | 316L (S31603) | 0.040 inch |
| RLD-PMP-00001A/B<br>RLD-PMP-00002A/B<br>RLD-PMP-00003A/B | radioactive liquid | 6% Mo alloy (N08367) | 0.040 inch |

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| RLD-PMP-00004<br>RLD-PMP-00025<br>RLD-PMP-00026<br>RLD-PMP-00027<br>RLD-PMP-00028 | radioactive liquid | 316L (S31603) | manufacturer standard |

Notes:

[1] See Appendix A for list of applicable Corrosion Evaluation Reports/Material Selection Data Sheets for DWP-regulated plant items. The corrosion allowance listed includes the erosion allowance.

[2] dual certified = meets the mechanical and chemical requirements of more than one type of steel; e.g., has chemical and mechanical properties complying with both Type 316 and Type 316L, or both Type 304 and Type 304L, specifications. This ensures higher strength material with the chemical composition of the low carbon levels.

Acronyms:

ADBR - offgas mercury adsorbers
C - carbon
°F - degrees Fahrenheit
HEPA - high efficiency particulate air
HTR - heater
EXHR - exhauster
LAW – low-activity waste
Mo - molybdenum
% - percent
SBS - submerged bed scrubber
SCB - scrubber
SCO - selective catalytic oxidizer
SCR - selective catalytic reducer
UNS - unified numbering system

**Table 3 Materials of Construction Specification and Corrosion Potentials**

| Material | UNS Number Specification | Corrosion Potential | Applicable Plant Item Number |
|---|---|---|---|
| **Metals** | | | |
| Stainless steel 304L | S30403 | more resistant to corrosion in nitric acid, if no chlorides are present, than 316L and less prone to stress corrosion cracking than its higher carbon version (stainless steel 304) | LVP-SCR-00001 (structural support not in contact with offgas stream)<br>RLD-SUMP-00043A/B<br>RLD-SUMP-00044<br>RLD-SUMP-00045 |
| Stainless steel 316L | S31603 | more resistant to pitting corrosion, stress corrosion cracking, and crevice corrosion than its higher carbon version (stainless steel 316) | General piping<br>RLD-PMP-00182A/B<br>RLD-PMP-00183A/B<br>LCP-VSL-00001<br>LCP-VSL-00002<br>LFP-VSL-00001<br>LFP-VSL-00002<br>LFP-VSL-00003<br>LFP-VSL-00004<br>LVP-TK-00001<br>RLD-VSL-00004<br>LVP-SCB-00001<br>LVP-HTR-00001A/B<br>LVP-HTR-00002<br>LVP-HX-00001<br>LVP-ADBR-00001A/B<br>LVP-SCO-00001 (housing)<br>LVP-SCR-00001 (fluid side shell components; ammonia piping and spray)<br>LVP-EXHR-00001A/B/C<br>LVP-HEPA-00001A/B, 00002A/B, 00003A (housing only)<br>RLD-SUMP-00028<br>Bulges<br>LCP-PMP-00001A/B<br>LCP-PMP-00002A/B<br>LFP-PMP-00001A/B<br>LFP-PMP-00002<br>LFP-PMP-00003A/B<br>LFP-PMP-00004<br>LVP-PMP-00002A/B<br>LVP-PMP-00003A/B<br>RLD-PMP-00004<br>RLD-PMP-00025<br>RLD-PMP-00026<br>RLD-PMP-00027<br>RLD-PMP-00028 |

| Material | UNS Number Specification | Corrosion Potential | Applicable Plant Item Number |
|---|---|---|---|
| Stainless steel 347 | S34700 | suitable for high temperature applications where 316L is precluded and dry-air conditions are not conducive to general corrosion | LVP-SCR-00001 (frame and instrument housings)<br>LVP-HX-00001 (high temperature surfaces) |
| 6% Mo alloy | N08367<br>N08925<br>N08926 | more resistant to acids and chlorides than the 300 series stainless steels | Piping for highly corrosive fluids<br>RLD-VSL-00164<br>RLD-VSL-00165<br>RLD-VSL-00003<br>RLD-VSL-00005<br>LOP-WESP-00001<br>LOP-WESP-00002<br>RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036<br>RLD-SUMP-00041<br>RLD-SUMP-00042<br>LOP-PMP-00001<br>LOP-PMP-00002<br>LOP-PMP-00004<br>LOP-PMP-00005<br>LOP-PMP-00003A/B<br>LOP-PMP-00006A/B<br>RLD-PMP-00001A/B<br>RLD-PMP-00002A/B<br>RLD-PMP-00003A/B |
| Alloy 22 or Hastelloy C-22 – Ni-Cr-Mo alloy | N06022 | more resistant to acids and chlorides than the 300 series stainless steels or 6% Mo alloy | LOP-VSL-00001<br>LOP-VSL-00002<br>LOP-SCB-00001<br>LOP-SCB-00002 |
| Hastelloy C-276 or equivalent – Ni-Mo-Cr-W alloy | N10276 | more resistant to acids and chlorides than the 300 series stainless steels | LVP-SCB-00001 (interior and nozzles) |
| Incoloy 800 – Ni-Cr alloy | N08800 | excellent resistance to oxidation and carburization; maintains stable structure during exposure to high temperatures; good corrosion resistance to many acidic environments | LVP-HTR-00002 (heating elements) |
| Incoloy 825 – Ni-Fe-Cr with additions of Mo, Cu, and Ti | N08825 | exceptional resistance to many aggressive corrosion environments | LVP-HTR-00002 (heating elements) |

| Material | UNS Number Specification | Corrosion Potential | Applicable Plant Item Number |
|---|---|---|---|
| Inconel 600 (Alloy 600) – Ni-Cr-Fe alloy | N06600 | good oxidation resistance at high temperatures and resistance to chloride ion stress corrosion cracking, corrosion by high-purity water, and caustic corrosion | LVP-HTR-00002 (hi-temp surfaces) |
| Inconel 690 (Alloy 690) – Ni-Cr alloy | N06900 | very resistant to attack from oxidizing chemicals or hot gases | LOP piping between film coolers and SBSs<br>LVP-SCR-00001 (frame and instrument housings)<br>LVP-HTR-00002 (high temperature surfaces)<br>LOP piping between film coolers and SBSs |
| Inconel 625 – Ni-Cr-Mo alloy | N06625 | excellent corrosion resistance to many acids and resists intergranular attack and stress corrosion cracking | LOP-FCLR-00001<br>LOP-FCLR-00002<br>LOP-FCLR-00003<br>LOP-FCLR-00004<br>LOP piping between film coolers and SBSs |
| Stellite 712 – cobalt-based alloy | None available | high corrosion resistance in reducing environments, as well as enhanced wear resistance | LFP-AGT-00001<br>LFP-AGT-00002<br>LFP-AGT-00003<br>LFP-AGT-00004 |

Acronyms:

Cr - chromium
Cu - copper
°F - degrees Fahrenheit
Fe - iron
Mo - molybdenum
Ni - nickel
% - percent
SBS - submerged bed scrubber
Ti - titanium
UNS - unified numbering system
W - tungsten

**Table 4 Radiological Area Classification Based on Dose Rate**

| Classification | Target Dose Equivalent Rate (mrem/hr) for Wide-Spread and Static Radiation Fields (Note 1) | Maximum Dose Equivalent Rate (mrem/hr) (see Notes 2 and 3) | Type of Access Control |
|---|---|---|---|
| R1 Radiological Controlled Area | 0.025 | 0.050 | General Employee Radiological Training (GERT) required to access. |
| R2 Radiological Buffer Area | 0.250 | 0.500 | No limit on occupancy for general employees. A TLD and Rad Worker I training required for entry. |
| R3 (Average Radiation Area) | See Note 1 | 10 | Entry only to carry out prescribed tasks in accordance with normal procedures and a Radiation Work Permit. TLD and Rad Worker I training required for entry into Radiation Areas. |
| R4 (Maximum Radiation Area) | See Note 1 | 100 | Entry only to carry out prescribed tasks in accordance with normal procedures and a Radiation Work Permit. TLD and Rad Worker I training required for entry into Radiation Areas. |
| R5 (High and Very High Radiation Area) | See Note 4 | no specific limit | Normally locked. Entry is unusual and requires management approval. Supplemental dosimetry, a specific RWP, and approved procedures are also required. |

Notes:

1. Occupational doses, and therefore, selection of an appropriate dose rate criterion is very sensitive to occupancy in R3, R4, and R5 areas. Hence, rather than set a specific dose rate target for any of these classifications, the appropriate value should be derived for each individual area by considering the respective contributions to the workers' annual doses and applying the ALARA principle. At early design stages, when insufficient information is available regarding worker occupancy, initial target radiation levels of 2.5 mrem/hr and 25 mrem/hr are to be used for the R3 and R4 classifications, respectively. However, these initial values should be reviewed and adjusted as appropriate, when sufficient occupancy data is available.
2. These maximum dose equivalent rate limits are set based on static whole-body radiation fields. Higher dose equivalent rates may be accepted for transient radiation fields (such as source movements), and for localized radiation fields (such as beams) that are unlikely to produce whole-body exposure, subject to an appropriate justification of the effect on annual dose and ALARA.
3. Notwithstanding the above dose rate equivalent targets and maximums, all radiation levels shall be within prescribed limits and ALARA.
4. When entry to an area that has been classified R5 is intended or anticipated by the design (frequency > 0.1[yr-1]), the design process is obligated to identify the means by which the dose rates in the affected area may be reduced to levels that are R3/R4 (less than 100 mrem/hr) prior to the entry. In any case, entry to all radiation areas is ALARA.

Acronyms:

ALARA - as low as reasonably achievable
mrem/hr - millirems per hour
RWP - radiological work permit
TLD - thermoluminescent dosimetry

**Table 5 Radiological Area Classification Based on Contamination**

| Classification | Typical Type of Control (see Note 1) | Surface Contamination Limit (dpm/100 cm2) (see Note 2) β/γ | Mean Airborne Contamination (Fraction of Exposure Standard; see Note 3) | Description |
|---|---|---|---|---|
| Cl Radiological Controlled Area | GERT | <1,000 | N/A | The C1 area means any area to which access is managed by or for DOE to protect individuals from exposure to radiation and/or radioactive material. For the WTP project, this includes all areas within the site security fence not assigned a higher radiological classification. The C1 area has low potential to be contaminated because there are no direct interfaces with contaminated areas. C1 areas are typically administrative offices, control rooms, conference rooms, locker rooms, restrooms, equipment rooms, truck bays, and non-contiguous support facilities. |
| C2 Radiological Buffer Area | Equipment and personnel are confirmed to be uncontaminated before exit to the uncontrolled C1 area is permitted. C2 areas may not be ventilated directly to the atmosphere. A TLD and Rad Worker I training are required for entry. | <1,000 | N/A | C2 areas are operating areas of the process buildings. C2 areas have direct interfaces with contaminated areas, and have the potential to be contaminated.<br><br>C2 contamination surveys are performed regularly with frequencies as determined by facility trends. |
| C3 Contamination Area | Work in a contaminated area requires protective clothing, a single set of coveralls, canvas booties, rubber shoe covers, appropriate gloves, and head covering. A TLD and Radworker II training are both required for entry. Respiratory protection may, on occasion, be required for specific tasks, but would not normally exceed the requirements for a full-face | ≥ 1,000 but <100,000 | < 40 DAC - hr year | C3 areas are the process areas where the potential for direct contact with radioactive material, contaminated systems and components, or both, exists.<br><br>These areas include the following: |

| Classification | Typical Type of Control (see Note 1) | Surface Contamination Limit (dpm/100 cm2) (see Note 2) β/γ | Mean Airborne Contamination (Fraction of Exposure Standard; see Note 3) | Description |
|---|---|---|---|---|
| | particulate respirator. The interface between a contamination area and the surrounding buffer area is typically a physical barrier; however, there will be maintenance evolutions requiring the temporary posting of contamination areas without the presence of a physical barrier (e.g., areas surrounding filter housings during filter changeout). | | | • maintenance shops<br>• laboratory fume hoods<br>• Cask handling areas<br>• sampling suites<br>• Contact areas where breaking of containment is possible |
| C4 High Contamination Area (Note 4, Note 5) | Work in high contamination areas may require a double set of protective clothing and a multiple step-off pad exit configuration. Table 3-1 of 24590-WTP-MN-ESH-01-001, Waste Treatment Plant Radiological Control Manual, provides guidelines for selecting protective clothing and indicates double sets of protective clothing are selected based on the contamination level in the work area, the anticipated work activity, worker health considerations, and regard for nonradiological hazards that may be present. As indicated in Table 3-1, routine work in high contamination areas may not warrant a double set of protective clothing. Respiratory protection may be required on occasion for specific tasks, but would not normally exceed the requirements for a full-face particulate respirator. High contamination areas should be controlled through use of physical barriers, engineering controls, and/or containment devices, as appropriate, in accordance with Article 337 of 24590-WTP-MN-ESH-01-001, Waste Treatment Plant Radiological Control Manual. | ≥ 100,000 but < ≈ 500,000 | > 40 DAC-hr year but < 12 DAC-hr week or < 1 DAC | C4 areas are highly contaminated as a result of the breaching large, highly contaminated systems or components when use of a glove bag is impractical. |

| Classification | Typical Type of Control (see Note 1) | Surface Contamination Limit (dpm/100 cm2) (see Note 2) β/γ | Mean Airborne Contamination (Fraction of Exposure Standard; see Note 3) | Description |
|---|---|---|---|---|
| C5 Airborne Radioactivity Area | Access to C5 areas is not normally permitted. When access is required, protective clothing for these areas includes high-integrity clothing (plastic suit), and supplied air respirators.<br><br>Exiting into a contaminated area (C5 → C4, C3) requires removing the outer layer of protective clothing.<br><br>ARAs are normally accessed through a permanent or temporary containment structure (tent) provided with its own filtered exhaust. Because entry to an ARA requires the use of respirators, no personnel may perform routine or periodic work within an ARA. | ≥ ≈ 500,000 | >12 DAC-hr week or > 1 DAC | C5 areas are highly contaminated areas that require total enclosure to ensure contamination control. |

Notes:

1. The type of control listed in this column is subject to local variation and is defined by 24590-WTP-MN-ESH-01-001, Waste Treatment Plant Radiological Control Manual, and specified on the RWP. Control regimes shown are expected to be typical.
2. Values shown are for β/γ contamination only. Additional, radionuclide specific limits are provided in Appendix D to 10 CFR 835, Occupational Radiation Protection.
3. Exposure standards are those of Safety Criterion 2.0-1 of 24590-WTP-SRD-ESH-01-001-02 to the worker for normal events. The breathing zone levels of airborne contamination are order-of-magnitude estimates of long-term requirements. Maximum transient values of airborne contamination may be higher.
4. Use of additional controls and respiratory protection must be evaluated when working in areas or on equipment with removable contamination levels greater than 100,000 dpm/100 $cm^2$.
5. The C4 designation is not used at WTP.

Acronyms:

ALARA - as low as reasonably achievable
ARA - Airborne Radioactivity Area
β - beta
CFR – Code of Federal Regulations
cm - centimeter
DAC - derived air concentration
DOE – United States Department of Energy
dpm – disintegrations per minute
γ - gamma
GERT - General Employee Radiological Training
hr - hour
mrem/hr - millirems per hour
N/A – not applicable
RWP - radiological work permit
TLD - thermoluminescent dosimetry
WTP - Hanford Tank Waste Treatment and Immobilization Plant

**Table 6 Summary of Radiological Area Classifications**

| Plant Item Name | Plant Item Number | Radiological Area Classification[1] |
|---|---|---|
| **Analytical Laboratory Tanks** | | |
| Laboratory Area Sink Drain Collection Vessel | RLD-VSL-00164 | R4/C5 |
| Hot Cell Drain Collection Vessel | RLD-VSL-00165 | R5/C5 |
| **Analytical Laboratory Sumps** | | |
| C3 Cell Sump | RLD-SUMP-00041 | R4/C5 |
| C5 Cell Sump | RLD-SUMP-00042 | R5/C5 |
| C5 Pump Pit Pumps and Sumps | RLD-PMP-00183A/B<br>RLD-SUMP-00043A/B | R3/R4/C3 |
| C5 Piping Pit Sump | RLD-SUMP-00044 | R3/R4/C3 |
| C3 Pump Pit Pumps and Sump | RLD-PMP-00182A/B<br>RLD-SUMP-00045 | R3/C3 |
| **LAW Tanks** | | |
| Melter 1 Concentrate Receipt Vessel | LCP-VSL-00001 | R5/C5 |
| Melter 2 Concentrate Receipt Vessel | LCP-VSL-00002 | R5/C5 |
| Melter 1 Feed Preparation Vessel | LFP-VSL-00001 | R5/C5 |
| Melter 1 Feed Vessel | LFP-VSL-00002 | R5/C5 |
| Melter 2 Feed Preparation Vessel | LFP-VSL-00003 | R5/C5 |
| Melter 2 Feed Vessel | LFP-VSL-00004 | R5/C5 |
| Melter 1 SBS Condensate Vessel | LOP-VSL-00001 | R5/C5 |
| Melter 2 SBS Condensate Vessel | LOP-VSL-00002 | R5/C5 |
| LAW Caustic Collection Tank | LVP-TK-00001 | R2/C2 |
| Plant Wash Vessel | RLD-VSL-00003 | R5/C5 |
| LAW C3/C5 Drains/Sump Collection Vessel | RLD-VSL-00004 | R3/C5 |
| SBS Condensate Collection Vessel | RLD-VSL-00005 | R5/C5 |
| **LAW Miscellaneous Units** | | |
| LAW Melter 1 | LMP-MLTR-00001 | R3/C3/C2 |
| LAW Melter 2 | LMP-MLTR-00002 | R3/C3/C2 |
| Melter 1 Primary Film Cooler | LOP-FCLR-00001 | R3/C3/C2 |
| Melter 1 Secondary Film Cooler | LOP-FCLR-00002 | R3/C3/C2 |
| Melter 2 Primary Film Cooler | LOP-FCLR-00003 | R3/C3/C2 |
| Melter 2 Secondary Film Cooler | LOP-FCLR-00004 | R3/C3/C2 |
| Melter 1 Submerged Bed Scrubber | LOP-SCB-00001 | R5/C5 |
| Melter 2 Submerged Bed Scrubber | LOP-SCB-00002 | R5/C5 |
| Melter 1 Wet Electrostatic Precipitator | LOP-WESP-00001 | R5/C5 |
| Melter 2 Wet Electrostatic Precipitator | LOP-WESP-00002 | R5/C5 |
| LAW Melter Offgas Caustic Scrubber | LVP-SCB-00001 | R3/C3 |
| HEPA Filters | LVP-HEPA-00001A/B<br>LVP-HEPA-00002A/B<br>LVP-HEPA-00003A | R3/C3 |
| Selective Catalytic Oxidizer | LVP-SCO-00001 | R3/C3 |
| Selective Catalytic Reduction Unit | LVP-SCR-00001 | R3/C3 |
| Electric Heaters | LVP-HTR-00001A/B<br>LVP-HTR-00002 | R3/C3 |
| Heat Exchanger | LVP-HX-00001 | R3/C3 |
| Offgas Mercury Adsorbers | LVP-ADBR-00001A/B | R3/C3 |
| Melter Offgas Exhausters | LVP-EXHR-00001A/B/C | R3/C3 |

| Plant Item Name | Plant Item Number | Radiological Area Classification[1] |
|---|---|---|
| **LAW Process Pumps** | | |
| Concentrate Receipt Vessel Pumps | LCP-PMP-00001A/B<br>LCP-PMP-00002A/B | R5/C5 |
| Melter Feed Preparation Vessel Pumps | LFP-PMP-00001A/B<br>LFP-PMP-00003A/B | R5/C5 |
| Melter Feed Vessel Pumps | LFP-PMP-00002<br>LFP-PMP-00004 | R5/C5 |
| Melter SBS Water Purge Pumps | LOP-PMP-00003A/B<br>LOP-PMP-00006A/B | R5/C5 |
| Melter SBS Condensate Purge Pumps | LOP-PMP-00001<br>LOP-PMP-00002<br>LOP-PMP-00004<br>LOP-PMP-00005 | R5/C5 |
| Caustic Blowdown Transfer Pump<br>Caustic Scrubbing Solution Recirculation Pump | LVP-PMP-00002A/B<br>LVP-PMP-00003A/B | R2/C2 |
| Plant Wash Discharge Pumps | RLD-PMP-00001A/B | R5/C5 |
| C3/C5 Drains/Sump Collection Transfer Pumps | RLD-PMP-00002A/B | R3/C3 |
| SBS Condensate Collection Discharge Pumps | RLD-PMP-00003A/B | R5/C5 |
| **LAW Bulges and Sumps** | | |
| Concentrate Receipt Valve Bulges | LCP-BULGE-00001<br>LCP-BULGE-00002<br>LCP-BULGE-00003 | R3/C3 |
| Melters 1 and 2 Feed/Preparation Valve Bulges | LFP-BULGE-00001<br>LFP-BULGE-00002 | R3/C3 |
| Melters 1 and 2 Valve Bulges | LOP-BULGE-00001<br>LOP-BULGE-00002 | R3/C3 |
| C3/C5 Pump Bulge | RLD-BULGE-00001 | R3/C3 |
| Plant Wash/SBS Condensate Collection Vessel Valve Bulge | RLD-BULGE-00004 | R3/C3 |
| Melter 1 Process Cell Pumps and Sumps | RLD-PMP-00025<br>RLD-PMP-00026<br>RLD-SUMP-00029<br>RLD-SUMP-00030 | R5/C5 |
| Melter 2 Process Cell Pumps and Sumps | RLD-PMP-00027<br>RLD-PMP-00028<br>RLD-SUMP-00031<br>RLD-SUMP-00032 | R5/C5 |
| Effluent Cell Pumps and Sumps | RLD-PMP-00031<br>RLD-PMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 | R5/C5 |
| C3/C5 Drains Collection Cell Pump and Sump | RLD-PMP-00004<br>RLD-SUMP-00028 | R3/C5 |

Note:

[1] Regulated plant items are accessible except for the hot cell drain collection vessel (RLD-VSL-00165) and sump (RLD-SUMP-00042) in the analytical laboratory.

Acronyms:

HEPA - high efficiency particulate air
LAW – low-activity waste
SBS - submerged bed scrubber

**Table 7 Assessment Schedule**

| Plant Item Name | Plant Item Number | Lower Potential for Corrosion and Erosion | Higher Potential for Corrosion and Erosion | Assessment Schedule[1] |
|---|---|---|---|---|
| **Analytical Laboratory Tanks** | | | | |
| Laboratory Area Sink Drain Collection Vessel | RLD-VSL-00164 | X | | 10 years[2] |
| Hot Cell Drain Collection Vessel[3] | RLD-VSL-00165 | X | | 10 years[2] |
| **Analytical Laboratory Sumps** | | | | |
| C3 Cell Sump | RLD-SUMP-00041 | X | | 10 years[2] |
| C5 Cell Sump[4] | RLD-SUMP-00042 | X | | 10 years[2] |
| C5 Pump Pit Sumps | RLD-SUMP-00043A/B | X | | 10 years[2] |
| C5 Piping Pit Sump | RLD-SUMP-00044 | X | | 10 years[2] |
| C3 Pump Pit Sump | RLD-SUMP-00045 | X | | 10 years[2] |
| **LAW Tanks** | | | | |
| Melter 1 Concentrate Receipt Vessel | LCP-VSL-00001 | | X | 7 years[5] |
| Melter 2 Concentrate Receipt Vessel | LCP-VSL-00002 | | X | 7 years[5] |
| Melter 1 Feed Preparation Vessel | LFP-VSL-00001 | | X | 7 years[5] |
| Melter 1 Feed Vessel | LFP-VSL-00002 | | X | 7 years[5] |
| Melter 2 Feed Preparation Vessel | LFP-VSL-00003 | | X | 7 years[4] |
| Melter 2 Feed Vessel | LFP-VSL-00004 | | X | 7 years[5] |
| Melter 1 SBS Condensate Vessel | LOP-VSL-00001 | X | | 7 years[5,6] |
| Melter 2 SBS Condensate Vessel | LOP-VSL-00002 | X | | 7 years[5,6] |
| LAW Caustic Collection Tank | LVP-TK-00001 | X | | 7 years[5,6] |
| Plant Wash Vessel | RLD-VSL-00003 | X | | 10 years[2] |
| LAW C3/C5 Drains/Sump Collection Vessel | RLD-VSL-00004 | X | | 7 years[5,6] |
| SBS Condensate Collection Vessel | RLD-VSL-00005 | X | | 7 years[5,6] |
| **LAW Miscellaneous Units** | | | | |
| LAW Melter 1 | LMP-MLTR-00001 | NA | NA | NA[7] |
| LAW Melter 2 | LMP-MLTR-00002 | NA | NA | NA[7] |
| Melter 1 Primary Film Cooler | LOP-FCLR-00001 | NA | NA | NA[7] |
| Melter 1 Secondary Film Cooler | LOP-FCLR-00002 | NA | NA | NA[7] |
| Melter 2 Primary Film Cooler | LOP-FCLR-00003 | NA | NA | NA[7] |
| Melter 2 Secondary Film Cooler | LOP-FCLR-00004 | NA | NA | NA[7] |
| Melter 1 Submerged Bed Scrubber | LOP-SCB-00001 | X | | 10 years[2] |

| Plant Item Name | Plant Item Number | Lower Potential for Corrosion and Erosion | Higher Potential for Corrosion and Erosion | Assessment Schedule[1] |
|---|---|---|---|---|
| Melter 2 Submerged Bed Scrubber | LOP-SCB-00002 | X | | 10 years[2] |
| Melter 1 Wet Electrostatic Precipitator | LOP-WESP-00001 | X | | Housing: 10 years[2] |
| Melter 2 Wet Electrostatic Precipitator | LOP-WESP-00002 | X | | Housing: 10 years[2] |
| LAW Melter Offgas Caustic Scrubber | LVP-SCB-00001 | X | | 10 years[2] |
| HEPA Filters | LVP-HEPA-00001A/B<br>LVP-HEPA-00002A/B<br>LVP-HEPA-00003A | X | | 5-year design life for filters; Housing: 10 years[2] |
| Selective Catalytic Oxidizer | LVP-SCO-00001 | X | | Housing: 10 years[2] |
| Selective Catalytic Reduction Unit | LVP-SCR-00001 | X | | Housing: 10 years[2] |
| Electric Heaters | LVP-HTR-00001A/B<br>LVP-HTR-00002 | X | | Housing: 10 years[2] |
| Heat Exchanger | LVP-HX-00001 | X | | Housing: 10 years[2] |
| Offgas Mercury Adsorbers | LVP-ADBR-00001A/B | X | | Housing: 10 years[2] |
| Melter Offgas Exhausters | LVP-EXHR-00001A/B/C | X | | Housing: 10 years[2] |
| **LAW Bulges and Sumps** | | | | |
| Concentrate Receipt Valve Bulges | LCP-BULGE-00001<br>LCP-BULGE-00002<br>LCP-BULGE-00003 | | X | 7 years[5] |
| Melters 1 and 2 Feed/Preparation Valve Bulges | LFP-BULGE-00001<br>LFP-BULGE-00002 | | X | 7 years[5] |
| Melters 1 and 2 Valve Bulges | LOP-BULGE-00001<br>LOP-BULGE-00002 | X | | 10 years[2] |
| C3/C5 Pump Bulge | RLD-BULGE-00001 | X | | 10 years[2] |
| Plant Wash/SBS Condensate Collection Vessel Valve Bulge | RLD-BULGE-00004 | X | | 10 years[2] |
| Melter 1 Process Cell Sumps | RLD-SUMP-00029<br>RLD-SUMP-00030 | X | | 7 years[5,6] |
| Melter 2 Process Cell Sumps | RLD-SUMP-00031<br>RLD-SUMP-00032 | X | | 7 years[5,6] |
| Effluent Cell Sumps | RLD-SUMP-00035<br>RLD-SUMP-00036 | X | | 7 years[5,6] |
| C3/C5 Drains Collection Cell Sump | RLD-SUMP-000028 | X | | 7 years[5,6] |

Notes:

[1] Includes piping associated with the regulated plant item.

[2] Frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments; age of the tank, miscellaneous unit, bulge, or sump; materials of construction; characteristics of the waste; and any other relevant factors, but will be no more than 10 years between integrity assessments.

[3] The hot cell drain collection vessel (RLD-VSL-00165) was designed to the same criteria as tanks located in black cells in the PTF and HLW vitrification facility. Since the location of this tank is inaccessible, integrity assessment is limited to the review of operating history in the same manner as for tanks in black cells. The document "Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility" (24590-WTP-PER-M-08-002) provides details of integrity assessment for tanks in black cells. As described in Section 7.1.5, laboratory area sink drain collection vessel (RLD-VSL-00164) will be used as a surrogate for the inaccessible RLD-VSL-00165, such that the results of NDE measurements for RLD-VSL-00164 will also represent conditions for RLD-VSL-00165.

[4] The C5 cell sump (RLD-SUMP-00042) is inaccessible; therefore, integrity assessment is limited to the review of operating history in the same manner as for sumps in black cells. The document "Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility" (24590-WTP-PER-M-08-002) provides details of integrity assessment for sumps in black cells. As described in Section 7.1.5, C3 cell sump (RLD-SUMP-00041) will be used as a surrogate for the inaccessible RLD-SUMP-00042, such that the results of NDE measurements for RLD-SUMP-00041 will also represent conditions for RLD-SUMP-00042.

[5] Frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments; age of the tank, bulge, or sump; materials of construction; characteristics of the waste; and any other relevant factors, but will be no more than 7 years between integrity assessments.

[6] This accessible regulated plant item is used as a surrogate for inaccessible equipment in the PTF or HLW vitrification facility. Therefore, the frequency of the integrity assessment is consistent with the frequency of the integrity assessment for the inaccessible equipment. See Table 10 for a list of surrogate equipment in the LAW vitrification facility.

[7] Design life is 5 years. Assessment, other than review of operation and maintenance records on annual or semiannual basis, is not required if melter and melter coolers are replaced within less than 7 years. Otherwise, the initial integrity assessment will be conducted within 7 years after start of hot commissioning; frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments, age of the miscellaneous unit system, materials of construction, characteristics of the waste, and any other relevant factors, but will be no more than 7 years between integrity assessments.

Acronyms:

HEPA - high efficiency particulate air
HLW – high-level waste
LAW – low-activity waste
NDE – non-destructive examination
PTF – pretreatment facility
SBS - submerged bed scrubber

**Table 8 Process Chemistry and Parameters Monitored for Operating History Reviews**

| | Aluminum | Chloride | Fluoride | Iron | Nitrate | Nitrite | Phosphate | Sulfate | Mercury | Carbonate | Undissolved solids | Lead | pH | Temperature | Bromide | Hydroxide | Total organic carbon | Particle size/hardness | Dose rate, α, β/γ (inside) | Time of exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Analytical Laboratory** | | | | | | | | | | | | | | | | | | | | |
| RLD-VSL-00164 | | | | | | | | | | | | | | | | | | | | |
| RLD-VSL-00165 | | | | | | | | | | | | | | | | | | | | |
| **LAW Vitrification Facility** | | | | | | | | | | | | | | | | | | | | |
| LCP-VSL-00001<br>LCP-VSL-00002 | | | | | | | | | | | | | | | | | | | | |
| LFP-VSL-00001<br>LFP-VSL-00003 | | | | | | | | | | | | | | | | | | | | |
| LFP-VSL-00002<br>LFP-VSL-00004 | | | | | | | | | | | | | | | | | | | | |
| LOP-VSL-00001<br>LOP-VSL-00002 | | | | | | | | | | | | | | | | | | | | |
| LVP-TK-00001 | | | | | | | | | | | | | | | | | | | | |
| RLD-VSL-00003 | | | | | | | | | | | | | | | | | | | | |
| RLD-VSL-00004 | | | | | | | | | | | | | | | | | | | | |
| RLD-VSL-00005 | | | | | | | | | | | | | | | | | | | | |

Note:

Shaded cells indicate parameter considered in corrosion and erosion evaluation. See Appendix A for list of applicable Corrosion Evaluation Reports/Material Selection Data Sheets.

**Table 9 Summary of Tanks Monitored by the Sampling System**

| Tank Name | Plant Item Number | Comments |
|---|---|---|
| **LAW Vitrification Facility** | | |
| Concentrate Receipt Vessels | LCP-VSL-00001<br>LCP-VSL-00002 | These are tanks considered to have a higher potential for corrosion and erosion. To monitor process operating conditions, tank contents are pumped from the tanks using LCP-PMP-00001A/B and LCP-PMP-00002A/B, respectively, and routed to an autosampler. The sampling device is located outside the process cell in a shielded but accessible location on the 48-foot elevation level. |
| Melter Feed Preparation Vessels | LFP-VSL-00001<br>LFP-VSL-00003 | These are tanks considered to have a higher potential for corrosion and erosion. To monitor process operating conditions, tank contents are pumped from the tanks using LFP-PMP-00001A/B and LFP-PMP-00003A/B, respectively, and routed to an autosampler. The sampling device is located outside the process cell in a shielded but accessible location on the 48-foot elevation level. |
| Melter Feed Vessels | LFP-VSL-00002<br>LFP-VSL-00004 | These are tanks considered to have a higher potential for corrosion and erosion. To monitor process operating conditions, tank contents are pumped from the tanks using LFP-PMP-00002 and LFP-PMP-00004, respectively, and routed to an autosampler. The sampling device is located outside the process cell in a shielded but accessible location on the 48-foot elevation level. |
| Plant Wash Vessel | RLD-VSL-00003 | This tank is considered to have a lower potential for corrosion and erosion. To monitor process operating conditions, tank contents are pumped from the tank using RLD-PMP-00001A/B and routed to an autosampler. The sampling device is located outside the effluent cell area in a shielded but accessible location on the 48-foot elevation level. |

| Tank Name | Plant Item Number | Comments |
|---|---|---|
| LAW C3/C5 Drains/Sump Collection Vessel | RLD-VSL-00004 | This tank is considered to have a lower potential for corrosion and erosion. To monitor process operating conditions, tank contents are pumped from the tank using RLD-PMP-00002A/B and routed to an autosampler. The sampling device is located outside the C3/C5 cell area in a shielded but accessible location on the 48-foot elevation level. |
| SBS Condensate Collection Vessel | RLD-VSL-00005 | This tank is considered to have a lower potential for corrosion and erosion. To monitor process operating conditions, tank contents are pumped from the tank using RLD-PMP-00003A/B and routed to an autosampler. The sampling device is located outside the effluent cell area in a shielded but accessible location on the 48-foot elevation level. |

Acronyms:

LAW – low-activity waste
SBS – submerged bed scrubber

**Table 10** **Accessible LAW Vitrification Facility DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells**

| Plant Item Number | Attributes | Candidate PTF/HLW Vitrification Facility Equipment | | |
|---|---|---|---|---|
| | | Direct Correspondence[1] | Similar Attributes[2] | Limited Similarity[3] – Use High Potential Scenario |
| **LAW Tanks** | | | | |
| LCP-VSL-00001<br>LCP-VSL-00002 | 316L (S31603), receives concentrated LAW, corrosion/erosion allowance specified[4] | PTF<br>TCP-VSL-00001 | PTF<br>CXP-VSL-00001<br>CXP-VSL-00026A/B/C<br>UFP-VSL-00062A/B/C | |
| LFP-VSL-00001<br>LFP-VSL-00002<br>LFP-VSL-00003<br>LFP-VSL-00004 | 316L (S31603), receives concentrated LAW plus glass formers, increased bottom head and shell thickness to provide erosion allowance<br>Represents highest potential scenario for erosion due to contents and from mixing process | | | PTF<br>FEP-VSL-00017A/B<br>FRP-VSL-00002A/B/C/D<br>HLP-VSL-00022<br>HLP-VSL-00027A/B<br>HLP-VSL-00028<br>PWD-VSL-00015<br>PWD-VSL-00016<br>PWD-VSL-00033<br>PWD-VSL-00043<br>RDP-VSL-00002A/B/C<br>UFP-VSL-00001A/B<br>UFP-VSL-00002A/B |
| LOP-VSL-00001<br>LOP-VSL-00002 | Alloy C-22 (N06022), receives SBS condensate, corrosion/erosion allowance specified | HLW<br>HOP-VSL-00903<br>HOP-VSL-00904 | PTF<br>CNP-EVAP-00001<br>HLP-BRKPT-00004<br>HLP-BRKPT-00006 | |
| LVP-TK-00001 | 316L (S31603), receives caustic solution, corrosion/erosion allowance specified | | PTF<br>CNP-VSL-00003<br>CXP-VSL-00004 | |

| Plant Item Number | Attributes | Candidate PTF/HLW Vitrification Facility Equipment | | |
|---|---|---|---|---|
| | | Direct Correspondence[1] | Similar Attributes[2] | Limited Similarity[3] – Use High Potential Scenario |
| RLD-VSL-00004 | 316L (S31603), receives radioactive drains, no corrosion/erosion allowance specified | | PTF<br>PWD-VSL-00044<br>PWD-BRKPT-00007<br>PWD-BRKPT-00008<br>PWD-BRKPT-00009<br>PWD-BRKPT-00010<br><br>HLW<br>RLD-VSL-00002<br>RLD-VSL-00008<br>RLD-BRKPT-00007<br>RLD-BRKPT-00009 | PTF<br>UFP-BRKPT-00001A/B |
| RLD-VSL-00005 | 6% Mo alloy (N08367/N08926), receives LAW SBS condensate, possible strongly acidic waste, standard corrosion allowance | PTF<br>TLP-VSL-00009A/B | HLW<br>RLD-VSL-00007 | |
| **LAW Miscellaneous Units** | | | | |
| LVP-SCB-00001 | 316L (S31603), receives and scrubs vessel vent gases, corrosion/erosion allowance specified | PTF<br>PVP-SCB-00002 | | |
| LOP-WESP-00001<br>LOP-WESP-00002 | 6% Mo alloy (N08367), receive LAW melter offgas (post-scrubber) | HLW<br>HOP-WESP-00001<br>HOP-WESP-00002 | | |
| **LAW Sumps** | | | | |
| RLD-SUMP-00028 | 316L (S31603), receives radioactive liquid | | PTF<br>PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029<br>PWD-SUMP-00032<br>PWD-SUMP-00033 | |

| Plant Item Number | Attributes | Candidate PTF/HLW Vitrification Facility Equipment | | |
|---|---|---|---|---|
| | | Direct Correspondence[1] | Similar Attributes[2] | Limited Similarity[3] – Use High Potential Scenario |
| RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 | 6% Mo alloy (N08367/N08926), receive radioactive drains, standard corrosion allowance | PTF<br>PWD-SUMP-00040<br><br>HLW<br>HOP-SUMP-00003<br>HOP-SUMP-00008<br>RLD-SUMP-00001<br>HCP-SUMP-00001 | | |

Notes:

[1] Same materials of construction, same waste stream, same corrosion/erosion potential.

[2] Same materials of construction, similar waste stream, similar corrosion/erosion potential.

[3] Same materials of construction, waste streams different but similar high potential for corrosion/erosion potential based on similar pH conditions or mixing process.

[4] In addition to standard 0.040-inch corrosion allowance, corrosion evaluation identified tank-specific corrosion/erosion allowances.

Acronyms:

HLW – high-level waste
LAW – low-activity waste
Mo - molybdenum
NDE – non-destructive examination
% - percent
PTF – pretreatment facility
SBS - submerged bed scrubber

# Appendix A

# Applicable Design Documents

# Appendix A
# Applicable Design Documents

24590-101-TSA-W000-0010-409-881, *Final - 100% Design - LAW Melter ADS Pump Operation and Maintenance Manual*

24590-BOF-3PS-C000-T0002, *Engineering Specification for Excavation and Backfill of Underground Radioactive Waste Transfer Lines*

24590-BOF-3PS-CE01-T0001, *Engineering Specification for Excavation and Backfill*

24590-BOF-CS-80-00102, *RAD Transfer Lines, Miscellaneous Details, Sheet 3*

24590-CM-POA-MVA0-00002-03-04, *Drawing – General Arrangement –Melter1 Feed Vessel*

24590-CM-POA-MVA0-00002-03-42, *Drawing – General Arrangement –Melter2 Feed Vessel*

24590-CM-POA-MVA0-00002-03-11, *Drawing – General Arrangement –Melter2 Feed Preparation Vessel*

24590-CM-POA-MVA0-00002-03-22, *Drawing – General Arrangement –Melter1 Feed Preparation Vessel*

24590-CM-POA-MVA0-00002-03-53, *Drawing – General Arrangement – Concentrate Receipt Vessel*

24590-CM-POA-MVA0-00002-03-64, *Drawing – General Arrangement – Concentrate Receipt Vessel*

24590-LAB-3YD-AHL-00001, *System Description for the Analytical Hotcell Laboratory Equipment (AHL)*

24590-LAB-3YD-ARL-00001, *System Description for the Analytical Radiological Laboratory Equipment (ARL)*

24590-LAB-3YD-RLD-00001, *System Description for the Radioactive Liquid Waste Disposal System for the Analytical Laboratory*

24590-LAB-M0C-60-00008, *Estimation of Chemical Usage in the WTP Laboratory*

24590-LAB-M6-RLD-P0001, *P&ID – Lab Radioactive Liquid Waste Disposal System – C5 Collection & Transfer*

24590-LAB-M6-RLD-P0002, *P&ID – Lab Radioactive Liquid Waste Disposal System – C3 Collection & Transfer*

24590-LAB-M6C-RLD-00016, *DWP Change Submittal Data & Flooding Calculation for LAB below-grade cells*

24590-LAB-MPD-RLD-00001, *24590-LAB-RLD-PMP-00183A and B – Self-Priming, Mag-Drive, Horizontal Centrifugal Pump*

24590-LAB-MPD-RLD-00002, *24590-LAB-RLD-PMP-00182A and B – Self-Priming, Mag-Drive, Horizontal Centrifugal Pump*

24590-LAB-MVC-RLD-00002, *Process and Materials Selection Data for Laboratory Area Sink Drain Collection Vessel (RLD-VSL-00164)*

24590-LAB-MVC-RLD-00003, *Process and Materials Selection Data for Hot Cell Drain Collection Vessel (RLD-VSL-00165)*

24590-LAB-MVD-RLD-P0164, *Mechanical Data Sheet: 24590-LAB-MV-RLD-VSL-00164 – Lab Area Sink Drain Collection Vessel*

24590-LAB-MVD-RLD-P0165, *Mechanical Data Sheet: 24590-LAB-MV-RLD-VSL-00165 – Hot Cell Drain Collection Vessel*

24590-LAB-MV-RLD-P0001, *Equipment Assembly Lab Area Sink Drain Collection Vessel RLD-VSL-00164*

24590-LAB-MV-RLD-P0003, *Equipment Assembly Hot Cell Drain Collection Vessel RLD-VSL-00165*

24590-LAB-N1D-RLD-00004, *RLD-SUMP-00182A/B (LAB) – Lab Area Sink Drain Collection Vessel Pump with Bowl Drain*

24590-LAB-N1D-RLD-00005, *RLD-SUMP-00183A/B (LAB) – Hot Cell Drain Collection Vessel Pump with Bowl Drain*

24590-LAB-N1D-RLD-P0002, *Plant Item Material Selection Data Sheet: RLD-VSL-00164 (LAB) - Lab Area Sink Drain Collection Vessel (RLD C3 Vessel)*

24590-LAB-N1D-RLD-P0003, *Plant Item Material Selection Data Sheet: RLD-VSL-00165 (LAB) – Hot Cell Drain Collection Vessel (RLD C5 Vessel)*

24590-LAB-P1-60-00007, *Analytical Laboratory General Arrangement Plan at El (-) 19 ft – 2 in Sections E-E, F-F & G-G*

24590-LAB-PER-J-03-001, *System Logic Description for Analytical Laboratory – Radioactive Liquid Waste System (RLD)*

24590-LAB-PER-M-02-002, *Sump Data for LAB facility*

24590-LAB-RPT-ENS-04-001, *Analytical Laboratory Design Basis Event Selection Report*

24590-LAW-3YD-LCP-00001, *System Description for LAW Concentrate Receipt Process (LCP)*

24590-LAW-3YD-LFP-00001, *System Description for Low-Activity Waste Melter Feed Process System (LFP)*

24590-LAW-3YD-LMP-00001, *System Description for LAW Melter Process System (LMP)*

24590-LAW-3YD-LOP-00001, *System Description for LAW Primary Offgas Process (LOP) and LAW Secondary Offgas/Vessel Vent Process (LVP) Systems*

24590-LAW-3YD-RLD-00001, *System Description for LAW Radioactive Liquid Waste Disposal (RLD) System*

24590-LAW-IBCE-AR-03-001, *International Building Code Evaluation for Low-Activity Waste Vitrification Building (LAW)*

24590-LAW-J0-PTJ-00002, *LAW Vitrification System PTJ, Supplemental Instrument Diagram, CCTV Equipment Plan at El 3 ft - 0 in*

24590-LAW-M6-LVP-P0001, *P&ID – LAW Secondary Offgas/Vessel Vent Process System Melters Secondary Offgas*

24590-LAW-M6-LVP-P0002, *P&ID – LAW Secondary Offgas/Vessel Vent Process System and Stack Discharge Monitoring System*

24590-LAW-M6-LVP-P0003, *P&ID - LAW Secondary Offgas/Vessel Vent Process System Equipment Vents*

24590-LAW-M6-LVP-P0004, *P&ID – LAW Melters Secondary Offgas/Vessel Vent Process System Mercury Mitigation Equipment*

24590-LAW-M6-LVP-P0005, *P&ID - LAW Melters Secondary Offgas/Vessel Vent Process System SCR, VOC & Ammonia Dilution Packages*

24590-LAW-M6-RLD-P0001, *P&ID - LAW Radioactive Liquid Waste Disposal System Plant Wash & SBS Condensate Collection*

24590-LAW-M6-RLD-P0002, *P&ID - LAW Radioactive Liquid Waste Disposal System C3/C5 Drains/Sump Collection*

24590-LAW-MKD-LVP-00012, *24590-LAW-MX-LVP-SKID-00002, 24590-LAW-MX-LVP-00003 - LAW Catalytic Oxidizer/Reducer*

24590-LAW-MPD-LCP-00001, *LCP-PMP-00001A/B – Melter 1 Concentrate Receipt Pumps*

24590-LAW-MPD-LCP-00003, *LCP-PMP-00003A/B – Melter 2 Concentrate Receipt Pumps*

24590-LAW-MPD-LFP-00001, *LFP-PMP-00001A/B – Melter 1 Feed Preparation Vessel Pumps*

24590-LAW-MPD-LFP-00003, *LFP-PMP-00002 – Melter 1 Feed Vessel Pump*

24590-LAW-MPD-LFP-00004, *LFP-PMP-00003A/B – Melter 2 Feed Preparation Vessel Pumps*

24590-LAW-MPD-LFP-00006, *LFP-PMP-00004 – Melter 2 Feed Vessel Pump*

24590-LAW-MPD-LOP-00001, *LOP-PMP-00003A/B – SBS Water Purge Pumps*

24590-LAW-MPD-LOP-00003, *LOP-PMP-00006A/B – SBS Water Purge Pumps*

24590-LAW-MPD-LOP-00007, *24590-LAW-MP-LOP-PMP-00001 24590-LAW-MP-LOP-PMP-00002 24590-LAW-MP-LOP-PMP-00004, 24590-LAW-MP-LOP-PMP-00005 - Melter 1 and 2 SBS Condensate Purge Pumps*

24590-LAW-MPD-LVP-00004, *24590-LAW-MP-LVP-PMP-00002A/B - Caustic Blowdown Transfer Pump*

24590-LAW-MPD-LVP-00006, *24590-LAW-MP-LVP-PMP-00003A/B – Offgas Caustic Scrubber Recirculation Pump*

24590-LAW-MPD-RLD-00001, *24590-LAW-MP-RLD-PMP-00002-A – Centrifugal Pump Data Sheet*

24590-LAW-MPD-RLD-00003, *RLD-PMP-00001A/B – Plant Wash Vessel Discharge Pumps*

24590-LAW-MPD-RLD-00005, *RLD-PMP-00003A/B – SBS Condensate Collection Vessel Discharge Pumps*

24590-LAW-MPD-RLD-00026, *RLD-PMP-00016, 00025, 00026, 00027, 00028, 00031, 00032 – Permanently Installed and Portable (RLD-PMP-00016) Electric Submersible Sump Pumps Transferring Liquid Deposited in Various Sumps to RLD-VSL-00003 and RLD-VSL-00004*

24590-LAW-MPD-RLD-00033, *RLD-PMP-00004 - Permanently Installed Electric Submersible Sump Pump Transferring Liquid Deposited in the C3/C5 Drains/Sumps Collection Vessel Cell Sump to Plant Wash Vessel RLD-VSL-00003*

24590-LAW-MVC-LCP-00002, *LAW Concentrate Receipt Process System (LCP) Data*

24590-LAW-MVD-LVP-00003, *24590-LAW-MV-LVP-ADBR-00001A, 24590-LAW-MV-LVP-ADBR-00001B – Activated Carbon Adsorber for Mercury Abatement (LVP-SKID-00001)*

24590-LAW-MV-LCP-P0001, *Equipment Assembly Concentrate Receipt Collection Vessel LCP-VSL-00001*

24590-LAW-MV-LCP-P0002, *Equipment Assembly Concentrate Receipt Collection Vessel LCP-VSL-00002*

24590-LAW-MV-LOP-P0001, *Equipment Assembly LAW Melter 1 SBS Condensate Vessel LOP-VSL-00001*

24590-LAW-MV-LOP-P0002, *Equipment Assembly LAW Melter 2 SBS Condensate Vessel LOP-VSL-00002*

24590-LAW-MV-RLD-P0001, *Equipment Assembly C3/C5 Drains/Sump Collection Vessel RLD-VSL-00004*

24590-LAW-MV-RLD-P0002, *Equipment Assembly Plant Wash Vessel RLD-VSL-00003*

24590-LAW-MV-RLD-P0003, *Equipment Assembly SBS Condensate Collection Vessel RLD-VSL-00005*

24590-LAW-MXD-LCP-00001, *LCP-Bulge-00001 - Concentrate Receipt Valve Bulge*

24590-LAW-MXD-LCP-00002, *LCP-Bulge-00002 - Concentrate Receipt Valve Bulge*

24590-LAW-MXD-LCP-00003, *LCP-Bulge-00003 - Concentrate Receipt Valve Bulge*

24590-LAW-MXD-LFP-00001, *LFP-BULGE-00001 - Melter 1 Feed/Prep Valve Bulge*

24590-LAW-MXD-LFP-00002, *LFP-BULGE-00002 - Melter 2 Feed / Preparation Valve Bulge*

24590-LAW-MXD-LOP-00001, *LOP-BULGE-00001 - Melter 1 Valve Bulge Mechanical Systems Data Sheet: Process Bulge*

24590-LAW-MXD-LOP-00001, *LOP-BULGE-00002 - Melter 2 Valve Bulge*

24590-LAW-MXD-RLD-00002, *RLD-BULGE-00001 - LAW RLD C3/C5 Pump Bulge*

24590-LAW-MXD-RLD-00002, *RLD-BULGE-00004 – Plant Wash/SBS Condensate Collection Vessel Valve Bulge Mechanical Systems Data Sheet: Process Bulge*

24590-LAW-N1D-LCP-00002, *Corrosion Evaluation: LCP-PMP-00001A/B and LCP-PMP-00002A/B LAW Concentrate Pump*

24590-LAW-N1D-LCP-P0001, *Plant Item Material Selection Data Sheet: LCP-VSL-00001 & LCP-VSL-00002 (LAW) – LAW Concentrate Receipt Vessel*

24590-LAW-N1D-LFP-00006, *Corrosion Evaluation LFP-VSL-00004 Melter 1 & 2 Feed Vessels*

24590-LAW-N1D-LFP-P0004; *Plant Item Material Selection Data Sheet: LFP-VSL-00001, LFP-VSL-00002, LFP-VSL-00003, LFP-VSL-00004*

24590-LAW-N1D-LOP-00006, *LOP-PMP-00001 and 2 and 4 and 5 LAW Melter 1 and 2 SBS Condensate Purge Pumps*

4590-LAW-N1D-LOP-00007, *LOP-PMP-00003A/B & LOP-PMP-00006A/B LAW Melter 1 & 2 SBS Water Purge Pump – Primary & Standby*

24590-LAW-N1D-LOP-P0001, *LOP-SCB-00001 & LOP-SCB-00002 (LAW) Melter 1 and Melter 2 Submerged Bed Scrubbers (SBS)*

24590-LAW-N1D-LOP-P0002, *LOP-VSL-00001 & LOP-VSL-00002 (LAW) Melter 1 & Melter 2 SBS Condensate Vessel*

24590-LAW-N1D-LOP-P0003, *LOP-WESP-00001 & LOP-WESP-00002 (LAW) Melter 1 and Melter 2 Wet Electrostatic Precipitator (WESP)*

24590-LAW-N1D-LOP-P0004, *Plant Item Material Selection Data Sheet LOP Off-gas Piping*

24590-LAW-N1D-LVP- 00001, *LVP-SCB-00001 - Corrosion Evaluation*

24590-LAW-N1D-LVP-P0002, *LVP-TK-00001 (LAW)*

24590-LAW-N1D-LVP-00003, *LVP-EXHR-00001A/B/C (LAW) - Melter Offgas Exhauster*

24590-LAW-N1D-LVP-00004, *LVP-ADBR-00001A/B (LAW) - Offgas Mercury Adsorber*

24590-LAW-N1D-LVP-00005, *LVP-HX-00001 (LAW) - Catalytic Oxidizer Heat Recovery Exchanger*

24590-LAW-N1D-LVP-00006, *LVP-HTR-00002 (LAW) – Catalytic Oxidizer Electric Heater*

24590-LAW-N1D-LVP-00007, *LVP-SCO-00001(LAW) - Thermal Catalytic Oxidizer*

24590-LAW-N1D-LVP-00008, *LVP-SCR-00001 (LAW) - $NO_x$ Selective Catalytic Reducer*

24590-LAW-N1D-LVP-00009, *LVP-HTR-00001A&B (LAW) Melters Offgas HEPA Preheater – Corrosion Evaluation*

24590-LAW-N1D-RLD-00001, *RLD-VSL-00004 (LAW) C3/C5 Drains/Sump Collection Vessel*

24590-LAW-N1D-RLD-00002, *RLD-VSL-00005 (LAW) SBS Condensate Collection Vessel*

24590-LAW-N1D-RLD-00004, *Corrosion Evaluation RLD-PMP-00001A-B LAW*

24590-LAW-N1D-RLD-00005, *RLD-VSL-00003 (LAW) Plant Wash Vessel*

24590-LAW-N1D-RLD-00006, *RLD-SUMP-00029 – RLD-SUMP-00036 (LAW) Process/Effluent Cell Sumps*

24590-LAW-N1D-RLD-00007, *RLD-PMP-00002 A/B LAW - C3/C5 Drains/Sump Collection Transfer Pump*

24590-LAW-N1D-RLD-00009, *RLD-SUMP-00028 (LAW) C3/C5 Drains/Sump Collection Vessel Cell Sump*

24590-LAW-N1D-RLD-P0003, *RLD-VSL-00005 (LAW) SBS Condensate Collection Vessel*

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Analytical Laboratory Fact Sheet dated January 2008

Dangerous Waste Permit WA7890008967, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant, dated September 2007

# Appendix B

# NDE Measurement Locations

# Appendix B
# NDE Measurement Locations

[Drawings to be added following installation of regulated plant items]

ISSUED BY
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# Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility

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# Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# Executive Summary

This document satisfies the requirements of the River Protection Project Waste Treatment and Immobilization Plant (WTP) Dangerous Waste Permit (DWP) and the Washington Administrative Code (WAC), 173-303-640(3)(b), which provide for development and submittal of a program and schedule for conducting integrity assessments over the life of the regulated tanks and miscellaneous units identified in the DWP. This document addresses the WTP pretreatment facility (PTF) and the high-level waste (HLW) vitrification facility DWP-regulated tanks and miscellaneous units (and associated secondary containment and ancillary equipment) and has been developed to ensure that these regulated plant items, which manage dangerous waste, will not collapse, rupture, or fail. The regulated equipment in the WTP analytical laboratory and low-activity waste (LAW) vitrification facility is addressed in the *Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility* (24590-WTP-PER-M-08-001).

The WTP PTF and HLW vitrification facility contain new tank systems and miscellaneous units designed and installed in accordance with WAC 173-303-640(3) and WAC 173-303-680. This document describes the design features, materials of construction, and supplier and installation quality programs that establish the baseline conditions and measurements to allow comparisons with future integrity assessment measurements for tanks, miscellaneous units, breakpots, bulges, sumps, and piping installed in the PTF and HLW vitrification facility. The baseline conditions in conjunction with operating conditions are used to establish the schedule for the initial integrity assessment following hot commissioning.

# Acronyms

| | |
|---|---|
| ABMA | American Bearing Manufacturers Association |
| ADS | air displacement slurry |
| AEA | Atomic Energy Act of 1954 |
| AISC | American Institute of Steel Construction |
| ALARA | as low as reasonably achievable |
| AMCA | Air Movement and Control Association |
| ANSI | American National Standards Institute |
| API | American Petroleum Institute |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials |
| ASX | autosampling system |
| CCTV | closed-circuit television |
| CDR | construction deficiency report |
| CFR | Code of Federal Regulations |
| CNP | cesium nitric acid recovery process system |
| $CO_2$ | carbon dioxide |
| CRP | cesium resin addition process system |
| Cs | cesium |
| CXP | cesium ion exchange (IX) process system |
| DIW | demineralized water system |
| DOE | United States Department of Energy |
| DSS | Duplex Stainless Steel |
| DWP | dangerous waste permit |
| ETF | Effluent Treatment Facility |
| °F | degrees Fahrenheit |
| FEP | waste feed evaporation process system |
| FRP | waste feed receipt process system |
| ft | feet |
| HCP | HLW concentrate receipt system |
| HDH | HLW canister decontamination handling system |
| HEME | high efficiency mist eliminator |
| HEPA | high efficiency particulate air |
| HFP | HLW melter feed process system |
| HI | Hydraulic Institute Standards |
| HLP | HLW storage and feed blending process system |
| HLW | high-level waste |
| HMP | HLW melter process system |
| HOP | HLW melter offgas treatment process system |
| HSH | HLW melter cave support handling system |
| HVAC | heating, ventilation and air-conditioning |
| IHLW | immobilized high-level waste |
| IQRPE | independent, qualified, registered professional engineer |
| IX | ion exchange |
| LAW | low-activity waste |
| LDB | leak detection box |

| | |
|---|---|
| LERF | Liquid Effluent Retention Facility |
| MFPV | melter feed preparation vessel |
| MFV | melter feed vessel |
| mg/L | milligrams per liter |
| MTG | metric tons of glass |
| MTG/day | metric tons of glass per day |
| $N_2$ | nitrogen |
| NCR | nonconformance report |
| NDE | non-destructive examination |
| NOx | nitrogen oxides |
| $O_2$ | oxygen |
| % | percent |
| PIH | pretreatment in-cell handling system |
| PJM | pulse jet mixer |
| PJV | pulse jet ventilation system |
| PTF | pretreatment facility |
| PVP | pretreatment vessel vent process system |
| PVV | process vessel vent exhaust system |
| PWD | pretreatment plant wash and disposal system |
| RDMC | remote decontamination maintenance cave |
| RDP | spent resin and dewatering process system |
| RFD | reverse flow diverter |
| RLD | radioactive liquid waste disposal system |
| SBS | submerged bed scrubber |
| SNT | American Society for Nondestructive Testing, Inc. |
| SPC | special protective coating |
| sq ft | square foot |
| Sr | strontium |
| TCP | treated LAW concentrate storage process system |
| TLP | treated LAW evaporation process system |
| TRU | transuranic elements |
| UFP | ultrafiltration process system |
| UNS | unified numbering system for metals and alloys |
| VOC | volatile organic compound |
| WAC | Washington Administrative Code |
| WESP | wet electrostatic precipitator |
| WTP | Waste Treatment and Immobilization Plant |
| wt% | weight percent |

# 1 Purpose

For owners and operators of tanks used to manage dangerous waste, the Washington Administrative Code (WAC), 173-303-640(3)(b) requires that: "The owner or operator must develop a schedule for conducting integrity assessments over the life of the tank to ensure that the tank retains its structural integrity and will not collapse, rupture, or fail. The schedule must be based on the results of past integrity assessments, age of the tank system, materials of construction, characteristics of the waste and any other relevant factors."

River Protection Project Waste Treatment and Immobilization Plant (WTP) Dangerous Waste Permit (DWP) implements the WAC requirements via conditions that require, prior to the initial receipt of dangerous waste, the submittal of an integrity assessment program and schedule for all tanks managing dangerous waste (DWP condition III.10.E.9.e.i), pretreatment facility (PTF) miscellaneous units (DWP condition III.10.G.10.e.i), low-activity waste (LAW) vitrification system equipment (DWP condition III.10.H.5.e.i and III.10.I.1.a.v), and high-level waste (HLW) vitrification system equipment (DWP condition III.10.J.5.e.i and III.10.K.1.a.v). This document addresses WAC 173-303-640(3)(b). Other WAC requirements will be addressed in future permitting submittals such as the inspection plan, contingency plan, waste analysis plan, closure plan, and certifications provided by the independent, qualified, registered professional engineer (IQRPE).

The purpose of performing integrity assessments is to prevent the collapse, rupture or failure of a component that could result in an unacceptable release of dangerous waste to the environment or could result in an impact to plant operations/activities that would adversely affect the capability of the WTP facilities to perform the overall mission of waste treatment. The purpose of this document is to describe the design features associated with the tanks, miscellaneous units, and underground transfer lines managing dangerous waste and to provide the program and schedule for integrity assessments for DWP-regulated equipment in the PTF and HLW vitrification facility. The tanks and miscellaneous units described in this document are those presented in 24590-WTP-RPT-ENV-03-002, *Tanks and Miscellaneous Units Regulated by the Dangerous Waste Permit.* The design features provided in this document were compiled from other approved WTP documents; no new design features were developed in this document. Some tanks, miscellaneous units, and ancillary equipment that manage dangerous waste have been added or removed from the design since the last revision of 24590-WTP-RPT-ENV-03-002. Added or removed equipment subject to the DWP is noted in the appropriate sections below. Based on a review of the existing information, this program and schedule for integrity assessments was prepared.

The integrity assessment program and schedule for DWP-regulated equipment in the analytical laboratory and LAW vitrification facility is presented in 24590-WTP-PER-M-08-001, *Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility.*

# 2 Establishing a Baseline

The WTP PTF and HLW vitrification facility contain new tank systems and miscellaneous units designed and installed in accordance with WAC 173-303-640(3) and WAC 173-303-680. This section presents information on supplier and installation quality programs, pre-operations baseline measurements,

materials of construction, and corrosion and erosion considerations that is used to establish baseline conditions and measurements to allow comparisons with future integrity assessment measurements. The baseline conditions in conjunction with operating conditions are also used to identify tanks and miscellaneous units with lower potential for corrosion and erosion and with higher potential for corrosion and erosion (Section 7.1.2).

This information is then used to establish the schedule for the initial integrity assessment following hot commissioning. Additionally, this section describes the radiological area classifications for the WTP facilities, which determine the accessibility of tanks and miscellaneous units for integrity assessments following hot commissioning.

The WTP Project organizational charts (24590-WTP-ORC-HR-01-001) cover the design, procurement, construction, and startup phases of WTP and illustrate the program structure and interaction of the functions and disciplines that directly impact features of design, procurement, construction, and commissioning for DWP-regulated equipment. These functions and disciplines include the following at a minimum: environmental and nuclear safety manager, quality and performance assurance manager, safety assurance manager, plant operations manager (startup, commissioning, and training), manager of construction, and manager of engineering. The plant equipment managers report to the manager of engineering.

Section 3 of this document provides a general description of the PTF and HLW vitrification facility, including the layout of each facility and the distribution of the DWP-regulated units within each facility. This information is part of the baseline to establish accessibility of tanks and miscellaneous units for integrity assessments.

Sections 4 and 5 provide detailed descriptions of each DWP-regulated tank and miscellaneous unit including ancillary equipment, associated equipment bulges, and secondary containment for the tanks, miscellaneous units, and bulges. This information provides the basis for establishing an integrity assessment schedule for each DWP-regulated tank and miscellaneous unit.

Section 6 provides a description of underground piping and secondary containment features for transfer of waste between the WTP PTF and the HLW vitrification facility.

Section 7 describes the approach and schedule for integrity assessments to be conducted in comparison to the general baseline conditions and the specific construction and operation details for the DWP-regulated tanks and miscellaneous units described in Sections 2 through 6.

Documents used for the implementation of integrity assessments and reports of assessment results are collected, maintained, and stored in accordance with 24590-WTP-GPP-PADC-002, *Project Records Management.*

## 2.1 Supplier Quality Program

This section describes the pressure vessel supplier quality control requirements described in 24590-WTP-3PS-MV00-T0001, *Pressure Vessel Design and Fabrication,* that are used in conjunction with the pre-operational measurements described in Section 2.3 to establish the non-destructive examination (NDE) baseline prior to installation. The information provided in this section is primarily focused on suppliers of tanks, breakpots, and housings for miscellaneous units, designed to pressure vessel and other standards

(Table 1). The overall supplier quality program that is applicable to tanks, miscellaneous units, breakpots, pumps, piping, and sumps is described in 24590-WTP-3PS-G000-T0001, *Engineering Specification for Supplier Quality Assurance Program Requirements* and supplier submitted Quality Assurance manuals.

Shell and head sections that are subjected to concentrated or large loads through welded attachments are, prior to welding, ultrasonically examined over 100 percent (%) of the areas in accordance with the following:

- For connections or attachments directly welded to the shell or head, the area tested extends 3 inches beyond the extremity of the weldment.
- For connections or attachments welded via a reinforcement or doubler plate, the shell area tested extends 5 inches beyond each side of the perimeter of the fillet weld attaching the reinforcing or doubler plate to the shell or head.

For vessels, all full penetration welds attaching internal or external structural components to the heads or shell are radiographically or ultrasonically tested. If fillet welds are used and are not readily radiographically or ultrasonically tested, they are dye-penetrant tested. All full penetration welds forming part of a jacket are radiographically or ultrasonically tested. All welds joining the nozzle neck to the shell or heads, which are not radiographically or ultrasonically tested, are dye-penetrant tested.

For vessels, all radiography, ultrasonic testing, and dye-penetrant examinations are performed in accordance with American Society of Mechanical Engineers (ASME) Section VIII, Division 1 and ASME Section V.

NDEs, including visual, dye-penetrant, ultrasonic, and radiography, of tanks, breakpots, and housings for miscellaneous units are carried out after the completion of fabrication, including any heat treatment. NDEs are performed by an inspector certified to the requirements of American Society for Nondestructive Testing, Inc. (SNT) SNT-TC-1A. The interpretation of the results is by either Level II or Level III inspectors certified to SNT-TC-1A.

Ultrasonic testing of tanks and components built to ASME Section VIII, Division 1, is in accordance with Appendix 12 of ASME Section VIII, Division 1. Radiographic acceptance criteria of tanks and components built to ASME Section VIII, Division 1, are in accordance with ASME Section VIII, Division 1, paragraph UW-51 for full radiography and UW-52 for spot radiography.

Baseline NDE measurements as described in Section 2.3 are conducted to establish the baseline condition of equipment in known locations prior to start of dangerous waste operations. The weld and NDE inspection records and associated quality control documents provided by the vendors may also be used to supplement the baseline NDE measurements to establish the baseline condition of tanks, breakpots, and housings for miscellaneous units prior to start-up and operations. Results of future integrity assessments will be compared to the baseline condition to evaluate the structural integrity of tanks, breakpots, and housings for miscellaneous units and to determine whether the schedule of future assessments should be adjusted.

## 2.2 Installation Quality Program

The installation of all equipment during the construction phase, including DWP-regulated items, is governed by issued design documents and controlled by quality control procedures. For work performed by direct hire personnel or subcontractors, 24590-WTP-GPP-CON-7101, *Construction Quality Control Program* and 24590-WTP-GPP-CON-4103, *Subcontractor Surveillance, Acceptance, and Closeout* identify responsibilities of installers, field engineers, quality control engineers, and management to ensure items are installed, inspected, tested, and documented. Prior to covering, enclosing, or placing new DWP-regulated plant item(s) in use, an independent, qualified installation inspector or an IQRPE, either of whom is trained and experienced in the proper installation of regulated plant items, inspects 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

The following documentation is considered by the independent, qualified installation inspector, or IQRPE, in certifying proper installation of DWP-regulated plant items:

- approved welding procedures
- welder qualifications and certifications
- field installation reports
- tightness test reports in accordance with the codes specified by design
- inspector credentials
- field waiver reports (i.e., nonconformance reports [NCRs], construction deficiency reports [CDRs])
- non-compliance reports, corrective action and repair reports (i.e., NCRs, CDRs)

The results of construction inspections and the independent, qualified installation inspector's or IQRPE's inspections at the time of installation of tanks, miscellaneous units, breakpots, bulges, sumps, and piping and review of associated documents are used to establish the baseline condition of DWP-regulated equipment prior to start-up and operations. Results of future integrity assessments are compared to the baseline condition to evaluate the structural integrity of tanks, miscellaneous units, breakpots, bulges, sumps, and piping and to determine whether the schedule of future assessments should be adjusted.

## 2.3 Pre-Operational Baseline Measurements

Pre-operational baseline NDE measurements are performed on DWP-regulated plant items in the PTF and HLW vitrification facility prior to the initial receipt of dangerous waste. The objective of these measurements is to provide data representative of the initial thicknesses of the plant items in known locations. For DWP-regulated plant items located in black cells or hard-to-reach locations, baseline NDE measurements are obtained prior to closure of the cells. By design, when construction is complete, black cells have no operating access for equipment maintenance or entry during the 40-year life of the facility.

Hard-to-reach areas are designed for no manual or remote equipment access, replacement, or repair. For accessible regulated plant items, results of future integrity assessment NDE measurements will be compared to these pre-operational baseline NDE measurements to evaluate the structural integrity of equipment and to determine whether the schedule of future assessments should be adjusted. For inaccessible regulated plant items (equipment in black cells or hard-to-reach areas), NDE measurements on accessible equipment will be used as surrogates for comparison to pre-operation baseline measurements. Integrity assessments conducted during the life of a regulated plant item are discussed in Section 7. Use and identification of accessible regulated plant items as surrogates for inaccessible plant items is described in Section 7.

Corrosion and erosion rates are affected by parameters such as material of construction, temperature, chemistry, flow rate, stress, vibration, fluid velocity, particle size, and solids concentration. DWP-regulated plant items in the PTF and HLW vitrification facility are susceptible to various types of damage by several corrosion and erosion mechanisms. The portions of regulated plant items most likely affected by corrosion and erosion are dependent on the kind of equipment (e.g., tanks versus miscellaneous equipment) and can be markedly different. Therefore, this section provides general locations that are considered susceptible areas where pre-operational baseline NDE thickness measurements are to be performed. In consultation with a corrosion specialist or engineer, specific NDE measurement locations are selected after the installation of the regulated plant item and before the initial receipt of dangerous waste. The portions of regulated plant items that are identified as locations for NDE measurements are based on:

- Material of construction
- Corrosive characteristics of the waste
- Erosive characteristics of the waste
- The velocity or turbulence of waste at the NDE measurement location
- Scope of information to be obtained (representative of other tanks or piping)
- Access to the NDE measurement location (either manually or remotely)
- NDE measurement methods, scope, tools, and techniques that can be used
- Radiation exposure to personnel performing NDE measurements

Specific NDE measurement locations for welds or wall thicknesses are illustrated in Appendix B. These drawings are provided as information becomes available and are to be included in future revisions of this document; a set of drawings will be made available no later than 6 months prior to cold commissioning. NDE measurement locations are also marked on the DWP-regulated plant items to allow repetitive measurements at the same locations. Repeating measurements at the same locations improves accuracy of the calculations of the expected remaining corrosion and erosion allowances of the regulated plant items.

Baseline and subsequent thickness measurements are made in accordance with written procedures implementing the requirements of American Society for Testing and Materials (ASTM) E 797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method. Section 9 of ASTM E 797 provides the requirements for developing a detailed written procedure.

### 2.3.1 Accessible Tanks and Other Regulated Equipment Designed to ASME Pressure Vessel or API Tank Standards

At least one accessible location for thickness monitoring is selected at each of the following major components of an accessible tank:

- Top head (e.g., an area where a connection or attachment is directly welded to the head)
- Bottom head, especially in an area of high potential erosion (e.g., an area where eductor discharge impinges on the bottom head)
- Shell (e.g., an area where a connection or attachment is directly welded to the shell, longitudinal weld attaching the head to the shell, region of the normal operating liquid-vapor interface or high-liquid level, vertical strip along the accessible height of the tank, and horizontal arc along the accessible height of the tank)

For accessible tanks with cooling jackets, measurements are made in the accessible portions of the tank directly above or below the cooling jacket.

### 2.3.2 Other Accessible Miscellaneous Units

Several miscellaneous units such as filters, which have internal components that are replaced periodically, are contained in housings that are not designed to ASME pressure vessel standards. Thickness measurements are performed on the external containment housings of these units. At least one accessible location for thickness monitoring is selected at the top, side, and bottom of the accessible housing, especially in an area where a pipe, connection, or attachment is directly welded to the top, side, or bottom.

### 2.3.3 Accessible Piping and In-Line Components

For accessible piping, including jumpers, connecting tanks, miscellaneous units, breakpots, bulges, and sumps, at least one representative location for thickness monitoring is selected at the following:

- An area along a straight run of the pipe
- An area near a connecting fitting where flow direction or velocity changes (e.g., elbow, mixing tee, wye, cross, reducer, flange, and valve)
- An area near the insulation, if applicable, where operating temperatures cause frequent or continuous condensation and re-evaporation of moisture

For in-line components such as electric heaters, heat exchangers, and fans, thickness measurements are performed on the external containment housings of these units. At least one accessible location for thickness monitoring is selected at the top, side, and bottom of the accessible housing, especially in an area where a pipe, connection, or attachment is directly welded to the top, side, or bottom.

### 2.3.4 Bulges and Accessible Sumps

For bulges (by design, bulges are in accessible locations) and accessible sumps, at least one accessible location for thickness monitoring is selected at the following:

- Bottom, especially at the lowest point of a sloped bottom

- Sidewall (e.g., an area where a pipe, connection, or attachment is directly welded, longitudinal weld attaching the head to the shell for circular sumps, and vertical weld attaching the sidewalls for rectangular sumps)

### 2.3.5 Underground Transfer Lines

Since access to the underground transfer lines between the WTP facilities is not possible without excavation, pre-operational baseline and future NDE measurements of these lines are not conducted. As described in Section 6, the underground transfer lines are double-walled. The secondary encasement pipe has a fusion bounded epoxy coating with shrink wrap sleeves covering the clamshell welds and a cathodic protection system using an impressed current system. Corrosion of the secondary containment pipe is not expected to occur due to the epoxy coating and cathodic protection system.

## 2.4 Materials of Construction

In order to ensure tanks, miscellaneous units, and ancillary equipment last for 40 years, corrosion resistant materials, based on operating conditions and expected waste chemistries have been identified; sufficient corrosion and erosion allowances have been specified; and robust design codes (such as ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and ASME B31.3-96, Process Piping) have been used. Table 1 lists design codes for DWP-regulated tanks, miscellaneous units, breakpots, bulges, sumps, pumps, and piping in the PTF and HLW vitrification facility. Table 2 presents the materials of construction and corrosion and erosion allowances for these regulated tanks, miscellaneous units, breakpots, bulges, sumps, pumps, and piping.

Where a potential for erosion exists (due to entrained solids and/or velocities), additional allowance, more erosion resistant materials, or hardfacing is provided. Documentation of positive material identification is provided by vendors and field inspectors (24590-WTP-3PS-G000-T0010, 24590-WTP-3PS-G000-T0002, and 24590-WTP-GPP-PSQ-051, *Positive Material Identification*) and contributes to establishing the baseline for integrity assessments.

The following paragraphs provide background information on the materials of construction and selection rationale used for regulated equipment in the PTF and HLW vitrification facility.

### 2.4.1 Stainless Steel 304L and 316L

The majority of the DWP-regulated tanks, miscellaneous units, breakpots, bulges, sumps, and piping in the PTF and HLW vitrification facility are made of stainless steel 304L and 316L. Stainless steel 304L and 316L are used for sodium hydroxide-containing waste at temperatures between 140 and 200 degrees Fahrenheit (°F). Stainless steel 304L is better than stainless steel 316L in nitric acid, but in the presence of chlorides, stainless steel 316L is more resistant to pitting and cracking. However, at a pH greater than 12, chlorides are not believed to be a major concern, except possibly in tight crevices.

The presence of acids and/or halides and higher temperatures can increase the corrosion rates of stainless steel 304L and 316L.

### 2.4.2 Stainless Steel 347

The hot-side components and high temperature elements of a few miscellaneous units in the HLW vitrification facility are made of stainless steel 347. These units are part of the system managing secondary offgas. Stabilized austenitic type 347 stainless steel is suitable for high temperature applications where stainless steel 316L is precluded and dry-air conditions are not conducive to general corrosion.

### 2.4.3 Nickel, Chromium, Molybdenum Alloys

Several DWP-regulated tanks, miscellaneous units, sumps, and piping in the PTF and HLW vitrification facility are made of alloys such as 6% molybdenum and high nickel alloys such as Alloy C-22 and Alloy 690. These alloys tend to be more resistant to acids (low pH) and chlorides than are the 300 series stainless steels. The presence of acids and/or halides and higher temperatures can increase the corrosion rates of stainless steel 304L and 316L. High nickel alloys are somewhat better in alkaline conditions, especially at higher temperatures.

### 2.4.4 Titanium

Titanium has excellent corrosion resistance due to the stable, continuous, highly adherent, and protective oxide film on its surface. The inert oxide film forms spontaneously and instantly when the fresh metal surface is exposed to air and/or moisture. Titanium is generally more resistant to pitting corrosion, stress corrosion, crevice corrosion, and galvanic corrosion than the 300 series stainless steels.

Titanium is highly resistant to oxidizing acids such as nitric, chromic, and perchloric acids. These oxidizing compounds assure oxide film stability. Titanium offers excellent resistance to corrosion over the full concentration range of nitric acid at sub-boiling temperatures. At higher temperatures, however, titanium's corrosion resistance is highly dependent on nitric acid purity. In hot, very pure solutions or vapor condensates of nitric acid, significant corrosion may occur. On the other hand, various metallic species such as silicon, chromium, iron, or various precious metal ions (i.e., platinum and ruthenium) in very minute amounts tend to inhibit high temperature corrosion of titanium in nitric acid solutions. Titanium's own corrosion product, titanic ion, is also a very potent inhibitor.

Titanium offers moderate resistance to reducing acids such as hydrochloric, sulfuric, and phosphoric acids. Corrosion rates increase with increasing acid concentration or temperature. Small amounts of certain multi-valent metal ions in solution (e.g., ferric ion) can effectively inhibit the corrosion of titanium in reducing acids. In addition, the addition of nitric acid (an oxidizing acid) to hydrochloric or sulfuric acids significantly reduces corrosion rates. Corrosion rates in mixed acids generally rise with increases in the reducing acid component concentration or temperature.

The canister decontamination vessels (HDH-VSL-00002 and HDH-VSL-00004) and associated piping in the HLW vitrification facility are made of titanium, grade 2. Ceric ion, a strong oxidizing agent in nitric acid, is used in the decontamination process. Titanium, grade 2, is expected to have a corrosion rate of less than 0.008 inch per year in boiling, 20% nitric acid. The presence of 80 mg/L titanic ion reduces the corrosion rate in boiling 45% nitric acid to less than 0.001 inch per year. Since the HLW vitrification facility's decontamination system will only use 6% to 12% acid with temperatures normally between 113 to 158°F and due to the presence of ferric and ceric ions in the decontamination solution, the corrosion rate is expected to be much less than 0.001 inch per year.

Hydrogen peroxide can have a significant effect on titanium. At pH 1, the corrosion rates can range from 0.006 to 0.025 inch per year. At pH 11, the corrosion rate is about 0.015 inch per year and at about pH 13.7, the rate is over 2 inches per year. Therefore, the use of titanium is not recommended with hydrogen peroxide (24590-WTP-RPT-M-01-001).

### 2.4.5 Duplex Stainless Steel

Duplex stainless steel (DSS) comprises a family of stainless steels with a wide range of compositions and corrosion resistance. Duplex stainless steels perform well in environments where water-soluble chloride salts and other halogen compounds can be concentrated. DSS materials are also useful where pitting resistance or where stress corrosion cracking may be a problem for other steels. They are typically higher in chromium and lower in nickel than austenitic stainless steels, have similar molybdenum levels, generally contain nitrogen, and some grades contain copper. The term "duplex" refers to those stainless steels that are chemically balanced to solidify primarily in the ferrite phase, with austenite forming as the secondary phase upon cooling. Composition balancing results in these dual-phase alloys (hence the name duplex), with yield strengths two-to-three times that of the austenitic grades.

The high strength cast DSS having a corrosion resistance with improved chloride stress cracking resistance is known as CD4MCu (UNS J93370) and appeared as a standard DSS grade in 1959. Significant refinements occurred in the following decades, which improved the welding, ductility and corrosion resistance through the use of nitrogen. The distinction between first, and second-generation DSS, focuses on the use of nitrogen as a deliberate alloy addition.

CD4MCu is a Fe-Cr-Ni-Cu-Mo alloy with a duplex structure of ferrite and austenite. Moderately high strength and hardness are combined with good ductility and impact properties, resulting in an alloy with superior resistance to abrasion or erosion-corrosion. In chloride-containing environments, the alloy is highly resistant to stress-corrosion cracking. The alloy is also highly resistant to nitric and sulfuric acids. Castings are most commonly used in the solution annealed condition.

The ferrite balance of duplex alloys must be controlled by controlling the nitrogen levels. ASTM has addressed this issue by introducing CD4MCuN (UNS J93372) into ASTM A 890. Although CD4MCu still exists in ASTM A 890, it is strongly recommended that CD4MCuN be substituted for CD4MCu.

CD4MCu and CD3MCuN are recommended material for pump pressure casings for type D-1 (sour water) service pumps in API 610 - 2004, *Centrifugal Pumps for Petroleum, Heavy Duty Chemical, and Gas Industry Services.* CD3MCuN (UNS J93373) is also a Fe-Cr-Ni-Cu-Mo alloy with a duplex structure of ferrite and austenite, but has less carbon and copper contents and more manganese, chromium, nickel, and molybdenum content. It is more corrosion resistant and easier to weld.

## 2.5 Corrosion and Erosion Considerations

The following section describes the potential corrosion and erosion degradation mechanisms that may impact the integrity of the DWP-regulated equipment in the PTF and HLW vitrification facility. These corrosion and erosion mechanisms are factors used in Sections 4 and 5 to characterize the tanks, miscellaneous units, breakpots, bulges, and sumps as having lower or higher potential for corrosion and erosion. This information is used in Section 7 to establish the schedule for the initial integrity assessment

following hot commissioning. Corrosion/erosion allowances for each class of piping material are provided in 24590-WTP-3PS-P000-T0001, *Piping Material Classes General Description and Summary.*

### 2.5.1 Corrosion

Corrosion is a degradation process affected by many parameters, including temperature, process chemistry, flow rate, stress, and vibration. The underlying process of corrosion may be electrochemical, chemical, mechanical, or a combination of these mechanisms. Combinations of parameters can act synergistically, sometimes reducing the corrosion rate, accelerating the corrosion rate, or changing the corrosion mechanism.

Evaluation, selection, and establishment of corrosion control measures begin with design and are implemented during construction and maintained during operation. Periodic assessments, as described in Section 7, are performed to ensure that DWP-regulated equipment has sufficient structural integrity and are acceptable for the storage and treatment of dangerous materials.

The corrosion degradation mechanisms applicable to the materials of construction selected for the DWP-regulated equipment located in the PTF and HLW vitrification facility are general corrosion, pitting corrosion, end grain corrosion, stress corrosion cracking, crevice corrosion, corrosion at welds, corrosion fatigue, vapor phase corrosion, and galvanic corrosion. A minimum 0.040-inch standard corrosion allowance has been generally specified for DWP-regulated equipment with a design life of 40 years. This corrosion allowance is increased where required for process chemistry reasons or other corrosion or erosion concerns. The corrosion allowances for the regulated tanks, miscellaneous units, breakpots, bulges, sumps, and piping located in the PTF and HLW vitrification facility are listed in Table 2.

The majority of the DWP-regulated equipment in the PTF and HLW vitrification facility are constructed of low carbon stainless steel (304L and 316L), which is generally more resistant to pitting corrosion, stress corrosion cracking, and crevice corrosion than the higher carbon stainless steel. Some equipment is made of 6% molybdenum alloy or high nickel alloy (e.g., Alloy C-22) depending on the process chemistry. These materials are more resistant to corrosion in lower pH or higher halide concentrations than the series 300 stainless steels. These materials also maintain stable structures during exposure to high temperatures. Titanium, grade 2, is expected to be more resistant to corrosion in the presence of nitric acid at a high temperature. Titanium's corrosion resistance is highly dependent on nitric acid purity at high temperatures. In hot, very pure solutions or vapor condensates of nitric acid, significant corrosion may occur. Table 3 summarizes the selection rationale for the materials of construction of the regulated tanks, miscellaneous units, breakpots, bulges, sumps, and piping in the PTF and HLW vitrification facility.

### 2.5.2 Erosion

Erosion is the removal of material from a metal surface by the action of particles in a moving liquid or particles in a moving gas. Erosion is a function of the fluid velocity, particle size, particle shape, particle concentration, and hardness of the particles relative to that of the material of construction, among other factors. Erosion-corrosion is corrosion exacerbated by the erosive removal of protective layers (e.g., oxides), which allows corrosion to proceed at a high rate.

The evaluation, selection, and establishment of erosion control measures begin with design and are implemented during construction and maintained during operation. Periodic assessments are performed

to ensure that DWP-regulated equipment have sufficient structural integrity and are acceptable for the storage and treatment of dangerous materials.

The erosion allowances for the DWP-regulated tanks, miscellaneous units, breakpots, bulges, sumps, and piping located in the PTF and HLW vitrification facility are presented in Table 2. A minimum 0.004-inch erosion allowance is generally specified for tanks and miscellaneous units containing liquids with a velocity of less than 12 feet per second and having a design life of 40 years. Normally, a minimum 0.040-inch standard corrosion allowance, which includes the expected wear from both corrosion and erosion, is specified. Additional erosion allowances are specified where required for process chemistry reasons or other erosion concerns.

## 2.6 Radiological Area Classifications

Access to DWP-regulated equipment for future integrity assessments must be consistent with keeping radiation exposure as low as reasonably achievable (ALARA). Selection of points for future NDE inspection and measurements and scheduling of inspections and measurements must take into account potential radiation exposure.

As a consequence of ALARA requirements, DWP-regulated equipment that are located in black cells, which are designed to require and receive no equipment maintenance or entry during the 40-year life of the facility, are not accessible for NDE measurements following baseline measurements. DWP-regulated equipment located in hard-to-reach areas, which are designed for no manual or remote equipment access, replacement, or repair, are also not accessible for NDE measurements following baseline measurements. DWP-regulated equipment in the PTF and HLW vitrification facility outside of black cells and hard-to-reach areas is generally accessible in that it can be visually and physically examined either directly or, for equipment located in hot cells or melter caves (which are designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility) remotely.

The areas in the PTF and HLW vitrification facility are divided into five numbered zones based on radiological dose rates (R1 to R5) and potential for contamination (C1 to C5), with the higher number indicating the greater hazard potential, and therefore, the greater degree of control and restriction required. Radiation and contamination areas are classified independently in order to differentiate between the need for shielding or confinement. This numbering system is also used to determine the type of control to be applied for access to these areas.

Two dose equivalent rate levels have been established for each radiological classification: a target and a maximum dose equivalent rate. The target dose equivalent rate, if achieved, would be expected to readily satisfy both the requirements of ALARA and the annual dose criteria of 10 Code of Federal Regulations (CFR) 835.202. In contrast, the maximum dose equivalent rate is the level beyond which it would be very difficult to show compliance with the ALARA requirements. As a general rule, the dose rate criteria are applicable at 12 inches from the radiation source or 12 inches from any surface the radiation penetrates, consistent with the definitions of 10 CFR 835.202. Table 4 provides the criteria to be used for each radiological area classification based on dose rate.

Systems containing radioactive substances are provided with suitable isolation provisions to mitigate diffusion, backflow, or other methods of leakage of the contents to areas where the material is not intended. Table 5 provides the criteria to be used for each radiological area classification based on

potential contamination. Table 6 provides the radiological contamination and access classifications for each plant item in the PTF and HLW vitrification facility.

# 3 Facility Description

This section provides a brief description of the PTF and HLW vitrification facility, and describes the general layout of each facility and the distribution of DWP-regulated tanks and miscellaneous units that are subject to periodic integrity assessments. It also includes a description of underground transfer lines associated with the WTP facilities.

The WTP design incorporates the "black cell" and "hard-to-reach area" concept as a key part of the facility design for the PTF and HLW vitrification facility. For black cells, this entails locating certain equipment in shielded cells (black cells) for which no maintenance or entry is planned for the 40-year design life of the plant. The contents of black cells are limited to tanks and miscellaneous units with their associated pumping, mixing and sampling systems that employ fluidics (air-driven pulse jet mixers [PJMs], reverse flow diverter [RFD] pumps with no moving parts, and steam ejectors) rather than motor-driven pumps or mechanical agitators. Hard-to-reach areas are designed for no manual or remote equipment access or maintenance.

## 3.1 Pretreatment Facility

The PTF building is a multi-level structure extending from a 45-foot (ft) elevation below grade to a roof at a 119-ft above grade elevation. It includes the gaseous effluent stack structure starting at the roof level and terminating a 200-ft elevation above grade. The PTF building is a mixed-use occupancy building with a 615,219-square foot (sq ft) gross floor area, not including a 15,150-sq ft basement area, housing the processes for pretreating (separation and conversion to a suitable form) both LAW and HLW before transfer to the LAW vitrification facility or HLW vitrification facility for immobilization. The PTF consists of the radioactive material processing area, which is surrounded to the north, south, and east by process bulge, storage, workshop, and change room areas, and the standby control room. Access corridors surround the process and bulge areas on the north, south, and east sides of the building. Cast in place concrete construction is utilized for the building mat foundation, slabs and walls for radioactive shielding of the process cells and other radiological areas. The west exterior wall of the building is constructed of reinforced concrete to the 56-ft elevation level (height of the waste feed receipt cell). The above grade portions of the building consist of a variety of construction methods including, reinforced concrete, structural steel frame, and noncombustible materials. The primary superstructure is a structural steel frame.

The PTF building supports processes that require taller than normal building heights and large areas. The primary interior functions in the PTF building consist of the processing areas in a central hot cell area, multiple black cells, a filter cave, and process bulges all designed to meet confinement and shielding requirements. By design, equipment located in the black cells consists of items that do not require maintenance or repair during the life of the facility. Equipment located in the hot cell and the filter cave is designed to allow remote removal, decontamination, and replacement. In addition, certain hot cell and filter cave process systems include installed spare components to improve the overall availability of the facility. Items of equipment located in process bulges that require repair and replacement are designed and shielded to allow maintenance access.

The PTF contains 61 DWP-regulated tanks with the majority (58) located on the 0-ft elevation level. Thirty-six DWP-regulated tanks are located in black cell rooms on 0-ft elevation level (P-0102, P-0102A, P-0104, P-0106, P-0108, P-0108A/B/C, P-0109, P-0111, P-0112, P-0114, P-0117, and P-0117A), 15 are located in the central hot cell area (P-0123) or the maintenance cave (P-0123A), and 5 are located in accessible rooms (P-0105B, P-0118, P-0119). Two tanks are located outside and northeast of the main PTF building in an accessible bermed area (P-0150). The remaining three DWP-regulated tanks are located in below grade rooms on the -19-ft elevation level (P-B005) and the -45-ft elevation level (P-B002 and P-B003). The PTF contains 56 DWP-regulated miscellaneous units: five units located in black cell rooms (P-0104, P-0106, P-0112, and P-0117); four units located in the central hot cell (P-0123); 15 units located in the filter cave (P-0335) and 18 units located in other rooms on the 56-ft elevation level (P-0302, P-0304, P-0320, P-0324, P-0325, P-0326, and P-0328); and 14 units located in rooms on the 77-ft elevation level (P-0430, P-0431A, P-0433).

The primary equipment and materials for the PTF separation and conversion processes that prepare the untreated waste for transfer to and immobilization at the LAW vitrification and HLW vitrification facilities are located on the 0-ft elevation level including the waste feed evaporation process system (FEP), the ultrafiltration process system (UFP), the HLW lag storage and feed blending process system (HLP), the cesium ion exchange (IX) process system (CXP), the treated LAW evaporation process system (TLP), and the treated LAW concentrate storage process system (TCP). Some of the equipment and materials for the pretreatment support systems are also located on the 0-ft elevation level including the waste feed receipt process system (FRP), the cesium nitric acid recovery process system (CNP), the spent resin collection and dewatering process system (RDP), the plant wash and disposal system (PWD), the radioactive liquid waste disposal system (RLD), the pulse jet ventilation system (PJV), the pretreatment vessel vent process system (PVP), and the pretreatment in-cell handling system (PIH).

Rooms on the 56-ft elevation and 77-ft elevation levels contain support equipment and processes for the pretreatment operations that are accessible during the life of the facility including miscellaneous units and ancillary equipment associated with the CNP, FEP, and TLP; and most of the equipment associated with the PJV, PVP, and the process vessel vent exhaust system (PVV). The -45-ft elevation level contains inter-facility transfer line tunnels and PWD tank pits.

A detailed description of the design and process features that determine the integrity assessment program and schedule for DWP-regulated equipment in the PTF is presented in Section 4.

## 3.2 HLW Vitrification Facility

The HLW vitrification facility is a six-story, steel frame and reinforced concrete structure. The facility has dimensions consisting of an approximate 440-ft length, 275-ft width, and 95-ft height, with several below-grade areas at different elevations down to a 31-ft below ground level. The HLW vitrification facility is a mixed-use occupancy building that houses the vitrification system for production of the immobilized HLW. The radioactive material processing and vitrification areas are contained in concrete structures ("cells" and "caves") near the center of the facility. These processing areas are connected by transfer tunnels and shielded doors designed to shield workers from direct radiation exposure during normal, abnormal, and accident conditions.

In the HLW vitrification facility, there are two melters housed inside caves. The two melter caves are identical, shielded concrete enclosures that are of an approximate 75-ft length, 33-ft width, and 55-ft

height. The HLW vitrification facility's production rate is approximately 6 metric tons of glass per day (MTG/day), with each melter having a design capacity of 3 MTG/day.

The HLW concentrate receipt process system (HCP) delivers HLW concentrate through a coaxial pipeline from the PTF to the HLW vitrification facility. Once inside the facility, piping delivers the concentrate to the HLW melter feed process system (HFP), which includes the melter feed preparation vessels (MFPVs) and melter feed vessels (MFVs). HLW concentrate is delivered to the MFPVs, where it is sampled and analyzed to determine the type of glass formers that need to be added. The HLW concentrate and glass formers are blended to create the feed slurry, transferred to the MFVs, and fed to the melters.

The melters in the HLW melter process system (HMP) convert the blended slurry into molten glass. The glass is poured into cylindrical stainless steel canisters, allowed to cool, and sealed. These canisters have 2-ft diameters, 14.5-ft heights, and weigh more than 4 tons. The sealed canisters are transported to the HLW canister decontamination handling system (HDH) where canister surface contamination is removed. The canisters are then transported to the canister storage cave. In full operation, the HLW vitrification facility can annually produce an average of 480 canisters.

The HLW melter offgas treatment process system (HOP) cools and treats the offgas from the melters so that it meets release criteria for radioactive and chemical material. Additionally, the facility structure, with the ventilation systems in the PJV and PVV, provides secondary confinement of airborne releases. The ventilation system supports confinement of airborne contamination within the building by directing the flow of air from areas of less contamination potential to areas of greater contamination potential. The ventilation system also filters the building exhaust air to meet discharge limits.

The process and operational activities described above, plus the HLW melter cave support handling system (HSH) activities in the HLW vitrification facility generate liquid waste effluents. The RLD receives liquid waste, provides interim storage, and transfers the effluent to the PTF for treatment, recycling, or disposal.

A detailed description of the design and process features that determine the integrity assessment program and schedule for DWP-regulated equipment in the HLW vitrification facility is presented in Section 5.

### 3.3 Balance of Facility

There are 21 underground transfer lines carrying dangerous waste that are connected to, or are within, the WTP facilities. These lines range from 289-ft to 1,078-ft lengths. The transfer lines are double-walled and sloped with low-point leak detection systems.

The PTF receives LAW and HLW feeds from the DOE Tank Farms through three transfer lines. The PTF pretreats the feeds and transfers them to the LAW vitrification facility through three transfer lines or to the HLW vitrification facility through four transfer lines.

Secondary waste from the LAW vitrification facility is returned to the PTF for treatment and disposal through four transfer lines. Secondary waste from the HLW vitrification facility is returned to the PTF through four transfer lines. Secondary waste from the analytical laboratory is transferred to the PTF for treatment and disposal through one transfer line. Secondary waste generated within the PTF is transferred through two transfer lines to the Liquid Effluent Retention Facility (LERF)/Effluent Treatment Facility (ETF).

A detailed description of the design and process features that determine the integrity assessment program and schedule for the underground transfer lines is presented in Section 6.

# 4 Pretreatment Facility

This section provides detailed descriptions of the PTF DWP-regulated tank systems and miscellaneous unit systems. The tanks, miscellaneous units, breakpots, bulges, sumps, and piping associated with these systems are assessed periodically to confirm the integrity of their materials of construction. The WTP design incorporates the "black cell" and "hard-to-reach area" concept as a key part of the facility design for the PTF and HLW vitrification facility. For black cells, this entails locating certain equipment in shielded cells for which no maintenance or entry is planned for the 40-year design life of the plant. Hard-to-reach areas are designed for no equipment access and maintenance.

The systems in the PTF that contain DWP-regulated tanks and miscellaneous units are as follows:

- waste feed receipt process
- waste feed evaporation process
- ultrafiltration process
- HLW lag storage and feed blending process
- cesium ion exchange process
- cesium nitric acid recovery process
- treated LAW evaporation process
- treated LAW concentrate storage process
- spent resin collection and dewatering process
- pretreatment vessel vent process
- process vessel vent exhaust
- pulse jet ventilation
- pretreatment in-cell handling
- plant wash and disposal
- radioactive liquid waste disposal

For each tank, miscellaneous unit, breakpot, bulge, and sump in the PTF, and associated piping, information is provided on the location of the equipment, its purpose, and its design characteristics, including materials of construction and corrosion/erosion allowances. The design standards used for each item of equipment and the characteristics of the waste managed in each tank, miscellaneous unit, breakpot, bulge, sump, and associated piping are also provided. This information is the unit-specific baseline used to establish the approach and schedule for future integrity assessments for the PTF DWP-regulated equipment.

## 4.1 Waste Feed Receipt Process System

The FRP receives and stores waste (both LAW and HLW) from the DOE Tank Farms and, if needed, transfers waste back to the tank farms. The FRP is housed on the 0-ft elevation level primarily in black cells P-0108 and P-0108A/B/C in the western portion of the PTF building. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

### 4.1.1 Waste Feed Receipt Vessels (FRP-VSL-00002A/B/C/D)

The four waste feed receipt vessels (FRP-VSL-00002A/B/C/D) associated with this system are each located in separate rooms (P-0108, P-0108A, P-0108B, and P-0108C) that are each equipped with stainless steel liners, a sump, and a sump ejector. Each stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD system. Each of the four rooms has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The four waste feed receipt vessels are primarily used to receive waste feed and transfer the waste to either the ultrafiltration feed preparation vessels (UFP-VSL-00001A/B) or the waste feed evaporator feed vessels (FEP-VSL-00017A/B). Each tank is designed to receive untreated waste feed from the tank farms and can also receive infrequent transfers from the HLW Feed Receipt Vessel (HLP-VSL-00022) or the FEP (FEP-VSL-00017A/B, FEP-SEP-00001A/B). Each FRP vessel is equipped with remote sampling capability. HLW waste is received from tank farms through HLP-VSL-00022, and if the waste specification is not per WTP waste criteria then the diluted HLW waste is sent only to the FRP-VSL-00002A and then sent back to tank farms thru the FRP pumping system. This is an off-normal case and the connection from HLP-VSL-00022 to FRP-VSL-00002A is through a ridgid jumper that is normally not installed. The maximum capacity of each receipt vessel is 474,000 gallons.

FRP ancillary equipment associated with the waste feed receipt vessels includes the following:

- twelve PJMs for each tank (FRP-PJM-00061 through 00072; FRP-PJM-00017 through 00028; FRP-PJM-00001 through 00004 and FRP-PJM-00029 through 00036; FRP-PJM-00005 through 00016)
- twelve jet pump pairs for each tank (FRP-EJCTR-00002 through 00013; FRP-EJCTR-00024 through 00035; FRP-EJCTR-00046 through 00057; FRP-EJCTR-00068 through 00078 and FRP-EJCTR-00138)
- two transfer pumps (FRP-PMP-00001 and FRP-PMP-00002A)

The PJMs are used for mixing to maintain a uniform concentration of solids for waste feed sampling and transfer and to prevent hydrogen accumulation. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell.

FRP tank ancillary equipment includes two pumps located in the adjacent hot cell (room P-0123): a waste feed return pump (FRP-PMP-00001) used to return off-spec waste feed to the tank farms through one of the three transfer pipelines; and a transfer pump (FRP-PMP-00002A) used to transfer waste feed to FEP-VSL-00017A/B or UFP-VSL-00001A/B. The design flow rate is 100 gallons per minute.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

#### 4.1.1.1 Design Standards

The waste feed receipt vessels (FRP-VSL-00002A/B/C/D) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The FRP vessels have ASME flanged and dished heads with an approximate 47-ft inside diameter and a 26-ft, 10-inch tangent to tangent length. The tank thicknesses are 1-inch (shell), 1.1875-inch minimum ASME code flanged and dished head (top and bottom), with a 2-inch minimum ASME code straight flange (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, plus additional 0.044-inch localized protection required for the bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The FRP vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using FRP-PMP-00002A and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

Piping in the transfer lines that convey dangerous waste from the tank farms to the FRP vessels is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to a leak detection box (LDB) located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00001 through PWD-LDB-00003).

#### 4.1.1.2 Characteristics of the Waste

The PTF process is for receipt, separation, and conversion of the liquid portion of tank farm wastes (designated Envelopes A, B, C, and D). The wastes are grouped into envelopes based on liquids (Envelopes A, B, and C) versus solids (Envelope D). The liquid wastes are grouped by the waste characteristics: Envelope A wastes are low sulfate wastes and make up the bulk of the waste tanks, Envelope B includes high sulfate wastes, and Envelope C includes high organic wastes (24590-WTP-DB-ENG-01-001, *Basis of Design*). The contents of the FRP vessels are the untreated LAW or HLW waste feed from the tank farms.

The FRP vessels receive LAW waste feed from the tank farms that is approximately 63.7 weight percent (wt%) water, 35.5 wt% dissolved solids, and 0.78 wt% solids with a pH of 14.0 (24590-WTP-M4C-V11T-00010). The FRP vessels receive HLW waste feed from the tank farms that is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids (24590-WTP-M4C-V11T-00010). The pH of the contents of the FRP vessels is expected to be 13.8 (24590-PTF-N1D-FRP-P0001).

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the FRP. Assessment for these tanks located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the FRP vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

## 4.2 Waste Feed Evaporation Process System

The FEP receives, blends, and concentrates waste feed and plant recycles. The FEP includes feed vessels; reboilers, separators, and condensers for waste feed evaporation; and a condensate collection vessel. The FEP DWP-regulated units are housed primarily on the 0-ft elevation level in black cell P-0106, the central hot cell (P-0123), and a process bulge area (P-0105B) in the central portion of the PTF and on the 56-ft level in the waste feed evaporator condenser process area (P-0304) building. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

### 4.2.1 Waste Feed Evaporator Feed Vessels (FEP-VSL-00017A/B)

The two waste feed evaporator feed vessels (FEP-VSL-00017A/B) associated with this system are located in the feed evaporator/ultrafiltration black cell (P-0106), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The two waste feed evaporator feed vessels (FEP-VSL-00017A/B) receive waste feed and waste recycles. Waste feed is transferred from the waste feed receipt vessels (FRP-VSL-00002A/B/C/D). Recycles are routed from the plant wash and disposal vessel (PWD-VSL-00044), acidic/alkaline effluent vessels (PWD-VSL-00015 and PWD-VSL-00016), spent resin collection and dewatering process vessels (RDP-VSL-00002A/B/C), and ultrafiltration feed preparation vessels (UFP-VSL-00001A/B). Each feed vessel is equipped with remote sampling capability. The maximum capacity of each receipt vessel is 85,496 gallons.

FEP ancillary equipment associated with the waste feed evaporator vessels includes the following:

- eight PJMs for each tank (FEP-PJM-00001 through 00007 and FEP-PJM-00017; FEP-PJM-00008 through 00015)
- eight jet pump pairs for each tank (FEP-EJCTR-00009 through 00011, FEP-EJCTR-00016 through 00019, and FEP-EJCTR-00039; FEP-EJCTR-00022 through 00024, FEP-EJCTR-00028 through 00031, and FEP-EJCTR-00038)
- two transfer pumps (FEP-PMP-00007A/B)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. FEP vessel ancillary equipment includes two feed pumps (FEP-PMP-00007A/B) located in the adjacent hot cell (room P-0123).

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

#### 4.2.1.1 Design Standards

The waste feed evaporator feed vessels (FEP-VSL-00017A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The FEP feed vessels have ASME 2:1 semi-elliptical heads with an approximate 22-ft inside diameter and a 37-ft, 1-inch tangent to tangent length. The tank thicknesses are 1.00-inch (shell) and 0.75-inch minimum heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, plus additional 0.094-inch localized protection required for the bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The FEP waste feed evaporator feed vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tanks using the feed pumps (FEP-PMP-00007A/B) and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

#### 4.2.1.2 Characteristics of the Waste

The FEP waste feed evaporator feed vessels receive LAW feed that is approximately 63.7 wt% water, 35.5 wt% dissolved solids, and 0.78 wt% solids with a pH of 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-FEP-P0002). The FEP feed vessels may also receive:

- HLW from the HLW feed receipt vessel (HLP-VSL-00022) that is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids with a pH of 13.0
- Waste feed concentrate recycle from the ultrafiltration feed preparation vessels (UFP-VSL-00001A/B) that is 67.2 wt% water, 29.0 wt% dissolved solids, and 3.81 wt% solids with a pH of 14.0
- Plant waste effluent from the plant wash vessel (PWD-VSL-00044)
- Neutralized high-activity effluent from the acidic/alkaline effluent vessels (PWD-VSL-00015 and 00016)
- Spent flush liquor from the spent resin slurry vessels (RDP-VSL-00002A/B/C)

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the FEP. Assessment for these tanks located in black cells is limited to remote monitoring

with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the FEP vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.2.2 Waste Feed Evaporator Condensate Vessel (FEP-VSL-00005)

The waste feed evaporator condensate vessel (FEP-VSL-00005) associated with this system is located in a process (bulge) area (P-0105B), which is equipped with a special protective coating (SPC) as specified by *Field Applied Special Protective Coatings for Secondary Containment Areas* (24590-WTP-3PS-AFPS-TP006) and floor drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. The SPC covers the room floor and perimeter curbing up to the maximum height to contain the total volume of the tank plus 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

FEP ancillary equipment associated with the waste feed evaporator condensate vessel includes two recirculation pumps (FEP-PMP-00006A/B). The waste feed evaporator condensate vessel (FEP-VSL-00005) receives condensate by gravity drain from the waste feed evaporator primary condenser. As the condensate vessel fills, the waste feed evaporator condensate pumps (FEP-PMP-00006A/B) recirculate condensate continuously back to the tank with a portion recycled to the separator vessel for spraying the demister pads. The maximum capacity of the tank is 5,002 gallons.

The tank and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

#### 4.2.2.1 Design Standards

The waste feed evaporator condensate vessel (FEP-VSL-00005) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The FEP waste feed evaporator condensate vessel is vendor designed with an approximate 8-ft inside diameter and a 10-ft, 8-inch total length. The tank thickness is 0.250-inch minimum. Thickness includes the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance plus 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.2.2.2 Characteristics of the Waste

The FEP waste feed evaporator condensate vessel receives condensate that is 100 wt% water with a pH of approximately 10 to 11 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-FEP-P0003).

The materials of construction for this tank are compatible with the waste managed. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.2.3 Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B)

The waste feed evaporator separator vessels (FEP-SEP-00001A/B) associated with this system are miscellaneous units located in the feed evaporator/ultrafiltration black cell (P-0106), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The two evaporator separators are each part of an evaporator train that concentrates waste to provide optimum conditions for waste processing via ultrafiltration and IX. Each waste feed evaporator separator vessel is equipped with an external concentrate pump (FEP-PMP-00008A/B) to transfer concentrate from the separator to the ultrafiltration feed preparation vessels (UFP-VSL-00001A/B).

The separators and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste feed for a 40-year life.

#### 4.2.3.1 Design Standards

The waste feed evaporator separator vessels (FEP-SEP-00001A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The evaporator separators are vendor designed with an approximate 7-ft, 6-inch inside diameter (upper portion) and 11-ft, 5-inch diameter (lower portion) and an approximate 34-ft total length. The shell thickness is 0.500-inch minimum. Thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The evaporator separators form part of a forced-circulation evaporator configuration that is composed of common primary equipment sizes for the separators, plus recirculation pumps (FEP-PMP-00008A/B and FEP-PMP-00009A/B), reboilers (FEP-RBLR-00001A/B), and condensers (FEP-COND-00001A/B, FEP-COND-00002A/B, and FEP-COND-00003A/B).

#### 4.2.3.2 Characteristics of the Waste

The FEP waste feed evaporator separator vessels receive LAW and recycled feed that is approximately 77.5 wt% water, 21.8 wt% dissolved solids, and 0.59 wt% solids with a pH of approximately 13.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-FEP-P0007).

The materials of construction for the FEP evaporator separators and ancillary equipment are compatible with the waste managed in the FEP. Assessment for these miscellaneous units located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the FEP evaporator separators are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the separators.

### 4.2.4 Waste Feed Evaporator Reboilers (FEP-RBLR-00001A/B)

The waste feed evaporator reboilers (FEP-RBLR-00001A/B) associated with this system are miscellaneous units located in the central hot cell (P-0123), which is equipped with a stainless steel liner and three sumps with sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The two evaporator reboilers are each part of an evaporator train that concentrates waste to provide optimum conditions for waste processing via ultrafiltration and IX. Each waste feed evaporator reboiler is equipped with an external recirculation pump (FEP-PMP-00009A/B).

The reboiler shells and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste feed for a 40-year life. Tubes on the reboilers are made of Hastelloy G-30 Alloy (UNS N06030) or equivalent.

#### 4.2.4.1 Design Standards

The waste feed evaporator reboilers (FEP-RBLR-00001A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The evaporator reboilers are vendor designed with a 6-ft inside diameter and a 15-ft length. Thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The evaporator reboilers form part of a forced-circulation evaporator configuration that is composed of common primary equipment sizes for the reboiler separator vessels, plus separators (FEP-SEP-00001A/B), recirculation pumps (FEP-PMP-00008A/B and FEP-PMP-00009A/B), and condensers (FEP-COND-00001A/B, FEP-COND-00002A/B, and FEP-COND-00003A/B).

#### 4.2.4.2 Characteristics of the Waste

The FEP evaporator reboilers receive LAW and recycled feed that is approximately 77.5 wt% water, 21.8 wt% dissolved solids, and 0.59 wt% solids with a pH of 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-FEP-P0008).

The materials of construction for the FEP evaporator reboilers and ancillary equipment are compatible with the waste managed in the FEP. Assessment for these miscellaneous units located in the central hot cell is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the FEP evaporator reboilers are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the reboilers.

### 4.2.5 Waste Feed Evaporator Primary Condensers (FEP-COND-00001A/B), Intercondensers (FEP-COND-00002A/B), and Aftercondensers (FEP-COND-00003A/B)

The waste feed evaporator primary condensers (FEP-COND-00001A/B), intercondensers (FEP-COND-00002A/B), and aftercondensers (FEP-COND-00003A/B) associated with this system are miscellaneous units located in the waste feed evaporator condenser process area (P-0304), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

FEP ancillary equipment associated with the waste feed evaporator condensers includes four ejectors (FEP-EJCTR-00040 through 00043). The evaporator condensers are part of an evaporator train that concentrates waste to provide optimum conditions for waste processing via ultrafiltration and IX. De-entrained water vapor and gases enter the waste feed evaporator primary condensers, where condensable vapors are removed by condensation and discharged by gravity drain to the FEP evaporator condensate vessel (FEP-VSL-00005). Two ejectors (per evaporator train) generate the vacuum requirements that enable boiling at approximately 122°F. The first ejector (FEP-EJCTR-00040 or 00042) discharges steam and noncondensable gases to the waste feed evaporator intercondenser to condense steam from the ejector. The second ejector (FEP-EJCTR-00041 or 00043) draws noncondensable gases from the intercondenser and discharges steam and noncondensable gases to the aftercondenser to condense the ejector steam. The condensate from each of the condensers drains to the FEP evaporator condensate vessel.

The condensers and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the condensate for a 40-year life.

#### 4.2.5.1 Design Standards

The waste feed condensers (FEP-COND-00001A/B, FEP-COND-00002A/B, and FEP-COND-00003A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The evaporator condensers are vendor designed. The nominal dimensions of the primary condensers include a 4-ft, 2-inch inside diameter and a 23-ft length. Thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The evaporator condensers form part of a forced-circulation evaporator configuration that is composed of common primary equipment sizes for the condensers, plus separators (FEP-SEP-00001A/B), recirculation pumps (FEP-PMP-00008A/B and FEP-PMP-00009A/B), and reboilers (FEP-RBLR-00001A/B).

#### 4.2.5.2 Characteristics of the Waste

The FEP condensers receive water vapor and gases (24590-PTF-3YD-FEP-00001). The materials of construction for these units are compatible with the waste managed. The schedule for conducting periodic assessments of these units is provided in Table 7. For the purpose of scheduling periodic assessments, these units are considered to have a lower potential for corrosion and erosion on the basis of

the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the units.

## 4.3 Ultrafiltration Process System

The UFP removes entrained solids and strontium (Sr) and transuranic (TRU) elements from a combined HLW and LAW feed that meets certain envelope definitions. Depending on the feed envelope, different levels of treatment will be required. Envelopes A/D and B/D will require only entrained solids removal, while Envelope C feed will require both entrained solids and Sr/TRU removal. The UFP includes feed preparation vessels, feed vessels, permeate vessels, pumps, pulsepots, breakpots, ejectors, and ultrafilters. The UFP DWP-regulated units are housed primarily on the 0-ft elevation level in black cells (P-0104 and P-0106) and the central hot cell (P-0123) in the central portion of the PTF. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

### 4.3.1 Ultrafiltration Feed Preparation Vessels (UFP-VSL-00001A/B) and Breakpot (UFP-BRKPT-00001B)

The two ultrafiltration feed preparation vessels (UFP-VSL-00001A/B) associated with this system are located in the feed evaporator/ultrafiltration black cell (P-0106) and the ultrafiltration black cell (P-0104), respectively, which are each equipped with a stainless steel liner, a sump, and a sump ejector. Each stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. These rooms have a radiological area classification of R5/C5 and are designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

Two UFP feed preparation vessels (UFP-VSL-00001A/B) receive LAW feed from the FRP (FRP-VSL-00002A/B/C/D), HLW feed from the HLP (HLP-VSL-00022), and evaporator concentrate from the FEP (FEP-SEP-00001A/B). Each feed preparation vessel is equipped with remote sampling capability. The maximum capacity of each tank is 75,593 gallons.

UFP ancillary equipment that is associated with the ultrafiltration feed preparation vessels includes the following:

- one breakpot (UFP-BRKPT-00001B), with a total volume of 175 gallons
- eight PJMs for each tank (UFP-PJM-00001 through 00004, UFP-PJM-00044, UFP-PJM-00053, UFP-PJM-00105, and UFP-PJM-00106; UFP-PJM-00045 through 00050, UFP-PJM-00101, and UFP-PJM-00102)
- eight jet pump pairs for each tank (UFP-EJCTR-00041 through 00042, UFP-EJCTR-00044, UFP-EJCTR-00134, UFP-EJCTR-00152, UFP-EJCTR-00180 through 00181, and UFP-EJCTR-00186; UFP-EJCTR-00140 through 00145, and UFP-EJCTR-00169 through 00170)
- vessel-emptying ejectors (UFP-EJCTR-00019A and UFP-EJCTR-00020A)
- two transfer pumps (UFP-PMP-00041A/B)
- two heat exchangers (UFP-HX-00041A/B)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell.

The UFP vessel concentrate transfer pumps (UFP-PMP-00041A/B) and slurry coolers (UFP-HX-00041A/B) are located in the adjacent hot cell (room P-0123); the breakpot (UFP-BRKPT-00001B) and steam heating vessel-emptying ejectors (UFP-EJCTR-00019A and UFP-EJCTR-00020A) are located in the black cell. The breakpot, located at the 28-ft elevation level in black cell P-0104, receives ultrafiltration recycle from the treated ultrafiltration feed vessels (UFP-VSL-00002A/B), which drains by gravity to the UFP feed preparation vessels.

The tanks, breakpot, and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life. Steam ejector/high temperature components located inside the tanks are made of Alloy C-22 (UNS N06022).

#### 4.3.1.1 Design Standards

The UFP feed preparation vessels (UFP-VSL-00001A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The UFP feed preparation vessels have ASME 2:1 ellipsoidal heads with an approximate 14-ft inside diameter and a 30-ft, 9-inch tangent to tangent length. The tank thicknesses are 1.375-inches (shell) and 0.750-inch minimum head (top) and 1.070-inch minimum head (bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the 0.024-inch corrosion allowance and 0.016-inch erosion allowance required for these tanks), plus additional 0.129-inch localized protection required for bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The UFP feed preparation vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- steam sparge rings
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tanks using the transfer pumps (UFP-PMP-00041A/B) and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

#### 4.3.1.2 Characteristics of the Waste

The UFP feed preparation vessels receive LAW feed from the FRP (FRP-VSL-00002A/B/C/D), HLW feed from the HLP (HLP-VSL-00022), and evaporator concentrate from the FEP (FEP-SEP-00001A/B). LAW feed is approximately 77.5 wt% water, 21.8 wt% dissolved solids, and 0.59 wt% solids (24590-WTP-M4C-V11T-00010). HLW feed is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids (24590-WTP-M4C-V11T-00010). Evaporator concentrate is approximately 66 wt% water, 33 wt% dissolved solids, and 0.089 wt% solids (24590-WTP-M4C-V11T-00010). The waste

streams received by UFP-VSL-00001A/B have pH ranging from approximately 12.0 to 14.0 (24590-PTF-N1D-UFP-P0005).

The materials of construction for the UFP feed preparation vessels, breakpots, and ancillary equipment are compatible with the waste managed in the UFP. Assessment for these tanks located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the UFP vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.3.2 Ultrafiltration Feed Vessels (UFP-VSL-00002A/B)

The two ultrafiltration feed vessels (UFP-VSL-00002A/B) associated with this system are located in the ultrafiltration black cell (P-0104), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The two feed vessels (UFP-VSL-00002A/B) are used to perform solids washing (with process condensate); caustic leaching (with 19 molar sodium hydroxide) of the concentrated solids; and chemical cleaning of the filters through nitric acid (2 molar nitric acid) and caustic (0.1 molar sodium hydroxide) additions. Additional capabilities to perform oxidative leaching have been provided for these tanks. Each feed vessel is equipped with remote sampling capability. The maximum capacity of each receipt vessel is 40,783 gallons.

UFP ancillary equipment associated with the ultrafiltration feed vessels includes the following:

- four recirculation pumps (UFP-PMP-00042A/B and UFP-PMP-00043A/B)
- six PJMs for each tank (UFP-PJM-00006 through 00011; UFP-PJM-00012 through 00017)
- six jet pump pairs for each tank (UFP-EJCTR-00048 through 00051, UFP-EJCTR-00053, and UFP-EJCTR-00062; UFP-EJCTR-00055 through 00058 and UFP-EJCTR-00060 through 00061)
- two transfer pumps (UFP-PMP-00044A/B)
- two heat exchangers (UFP-HX-00001A/B)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. Ultrafiltration feed vessel ancillary equipment includes recirculation pumps (UFP-PMP-00042A/B and UFP-PMP-00043A/B), two transfer pumps (UFP-PMP-00044A/B), and slurry coolers (UFP-HX-00001A/B) located in the adjacent hot cell (room P-0123).

The tanks, heat exchangers, and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste feed for a 40-year life. Steam ejector/high temperature components located inside the tanks are made of Alloy C-22 (UNS N06022).

#### 4.3.2.1 Design Standards

The UFP feed vessels (UFP-VSL-00002A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The UFP feed vessels have ASME 2:1 elliptical heads with an approximate 14-ft inside diameter of and a 30-ft, 9-inch tangent to tangent length. The tank thicknesses are 1.875-inches (shell upper course), 1.250-inches (shell lower course), and 0.625-inch minimum head (top) and 0.875-inch minimum head (bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, plus additional 0.517-inch localized protection required for bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The UFP feed vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- steam sparge rings
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tanks using the transfer pumps (UFP-PMP-00042A/B) and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

#### 4.3.2.2 Characteristics of the Waste

The UFP feed vessels receive waste feed from the UFP feed preparation vessels (UFP-VSL-00001A/B) and cleaning reagents (sodium hydroxide and nitric acid). UFP feed is approximately 67.2 wt% water, 29 wt% dissolved solids, and 3.8 wt% solids with a pH of 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-UFP-P0003).

The materials of construction for the UFP feed vessels and ancillary equipment are compatible with the waste managed in the UFP. Assessment for these tanks located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.3.3 Ultrafilters (UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, UFP-FILT-00005A/B)

The ultrafilters (UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, UFP-FILT-00005A/B) associated with this system (vessels and equipment) are tanks located in the hot cell area (P-0123), which is equipped with a stainless steel liner and three sumps with sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment

for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The ultrafilter tube units (UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, and UFP-FILT-00005A/B) separate solids from the liquid fraction, and concentrate the solids slurry to approximately 20 wt% solids. The maximum capacity of each ultrafilter is 140 gallons.

UFP ancillary equipment associated with each ultrafilter tube unit consists of a pulsepot (UFP-PP-00001A/B, UFP-PP-00002A/B, UFP-PP-00003A/B, UFP-FILT-00004A/B, and UFP-FILT-00005A/B). The pulsepots provide for back-pulsing on the ultrafilter tube units, which may involve adding cleaning chemicals (2 molar nitric acid, 2 molar sodium hydroxide, and process condensate), and are located in the hot cell.

The ultrafilter units and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life. Pulse-posts have all welded construction and are made of stainless steel 304L (UNS S30403).

#### 4.3.3.1 Design Standards

The UFP ultrafilter tube units (UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, and UFP-FILT-00005A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The UFP ultrafilter units are vendor designed with an approximate 16.75-ft diameter. The tank thicknesses include the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.3.3.2 Characteristics of the Waste

The UFP ultrafilters receive waste feed from the UFP feed vessels (UFP-VSL-00002A/B) and pulsepots receive waste feed and cleaning reagents (sodium hydroxide and nitric acid). UFP feed is approximately 67.2 wt% water, 29 wt% dissolved solids, and 3.8 wt% solids with a pH of 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-UFP-P0004).

The materials of construction for the UFP ultrafilters and ancillary equipment are compatible with the waste managed in the UFP. Assessment for these tanks located in the central hot cell is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the UFP ultrafilters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.3.4 Ultrafilter Permeate Vessels (UFP-VSL-00062A/B/C)

The three ultrafiltration permeate vessels (UFP-VSL-00062A/B and UFP-VSL-00062C) associated with this system are located in the feed evaporator/ultrafiltration black cell (P-0106) and the ultrafiltration

black cell (P-0104), respectively, which are each equipped with a stainless steel liner, a sump, and a sump ejector. Each stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. These rooms have a radiological area classification of R5/C5 and are designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The three permeate vessels (UFP-VSL-00062A/B/C) receive process condensate for dilution of permeate prior to transfer to the cesium IX vessel (CXP-VSL-00001) via RFDs (UFP-RFD-00033, UFP-RFD-00038, and UFP-RFD-00044). Each permeate vessel is equipped with remote sampling capability. The maximum capacity of each receipt vessel is 34,700 gallons.

UFP ancillary equipment associated with the ultrafilter permeate vessels includes the following:

- six PJMs for each tank (UFP-PJM-00018 through 00022 and UFP-PJM-00052; UFP-PJM-00039 through 00043 and UFP-PJM-00051; UFP-PJM-00070, UFP-PJM-00073, UFP-PJM-00076 through 00078, and UFP-PJM-00107)
- six jet pump pairs for each tank (UFP-EJCTR-00066 through 00070 and UFP-EJCTR-00150; UFP-EJCTR-00086 through 00089, UFP-EJCTR-00149, and UFP-EJCTR-000159; UFP-EJCTR-00023 through 00024, UFP-EJCTR-00028 through 00029, and UFP-EJCTR-00182 through 00183)
- six charge vessels for each tank (UFP-VSL-00032 through 00034, UFP-VSL-00072 through 00073, and UFP-VSL-00082; UFP-VSL-00035 through 00037, UFP-VSL-00051, UFP-VSL-00075, and UFP-VSL-00083; UFP-VSL-00023 through 00025, UFP-VSL-00069 through 00070, and UFP-VSL-00084)
- six RFDs for each tank (UFP-RFD-00027 through 00028, UFP-RFD-00030, UFP-RFD-00037 through 00038, and UFP-RFD-00049; UFP-RFD-00031 through 00034, UFP-RFD-00039, and UFP-RFD-00047; UFP-RFD-00042 through 00046 UFP-RFD-00048)
- six RFD ejectors for each tank (UFP-EJCTR-00063 through 00064, UFP-EJCTR-00075, UFP-EJCTR-00077, UFP-EJCTR-00079, and UFP-EJCTR-00174; UFP-EJCTR-00006, UFP-EJCTR-00030, UFP-EJCTR-00043, UFP-EJCTR-00167 through 000168, and UFP-EJCTR-000173; UFP-EJCTR-00025 through 00027, UFP-EJCTR-00033, UFP-EJCTR-00166, and UFP-EJCTR-00177)
- three vessel-emptying ejectors (UFP-EJCTR-00073, UFP-EJCTR-00094, and UFP-EJCTR-00013) (these ejectors will not normally be installed)

The PJMs are used for mixing to maintain a uniform concentration of solids for waste feed sampling and transfer and to prevent hydrogen accumulation. Each PJM is connected to a pump jet pump located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer permeate to the CXP, or to transfer waste to the UFP feed preparation vessels (UFP-VSL-00001A/B) or to the PWD or autosampling system (ASX). Each RFD is connected to an ejector located outside the tank. The vessel-emptying ejectors, located external to the tank, are used to empty the tanks and may also be used to facilitate waste transfers.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

#### 4.3.4.1 Design Standards

The UFP permeate vessels (UFP-VSL-00062A/B/C) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The UFP permeate vessels have ASME 2:1 ellipsoidal heads with an approximate 15-ft inside diameter and a 21-ft, 3-inch tangent to tangent length. The tank thicknesses are 0.875-inch (shell) and 0.5625-inch minimum head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance plus 0.004-inch erosion allowance required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The UFP permeate vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tanks using the transfer ejectors and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

#### 4.3.4.2 Characteristics of the Waste

The UFP permeate vessels receive permeate and solids wash from the UFP feed vessels (UFP-VSL-00002A/B). UFP permeate and solids wash is approximately 69.9 wt% water, 30.1 wt% dissolved solids, and 0.0 wt% solids with a pH of 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-UFP-P0008).

The materials of construction for the UFP ultrafilter permeate vessels and ancillary equipment are compatible with the waste managed in the UFP. Assessment for these tanks located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the UFP permeate vessels are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.3.5 UFP Bulges (UFP-BULGE-00001, UFP-BULGE-00002, UFP-BULGE-00005, and UFP-BULGE-00006)

The two reagent and process air valve bulges associated with the UFP (UFP-BULGE-00001 and UFP-BULGE-00002) are located adjacent to the filter cave on the 56-ft elevation level in room P-0301. The valve bulges for the UFP provide secondary containment away from the black cells and hot cell,

where the control valves and valve actuators are accessible for maintenance. Room P-0301 has a radiological area classification of R3/C3 (Table 6).

The two ultrafiltration utility bulges associated with the UFP (UFP-BULGE-00005 and UFP-BULGE-00006) are located on the 56-ft elevation level in rooms P-0311 and P-0311A. The utility bulges for the UFP provide secondary containment away from the black cells and hot cell, where the control valves and valve actuators are accessible for maintenance. Rooms P-0311 and P-0311A have a radiological area classification of R3/C3 (Table 6).

The bulges and manual valves are made of stainless steel 316L (UNS S31603) to ensure containment of the reagents and process condensate for a 40-year life.

#### 4.3.5.1 Design Standards

The UFP bulge design follows the standard bulge design used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-T0001, *Engineering Specification for Process Bulge Design and Fabrication*. Bulge confinement for UFP-BULGE-00001 and UFP-BULGE-00002 is designed to meet the requirements of AISC M016-89, Manual of Steel Construction. Bulge confinement for UFP-BULGE-00005 and UFP-BULGE-00006 is designed to meet the requirements of ANSI/AISC N690-94, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities. The associated UFP process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.3.5.2 Characteristics of the Waste

The UFP reagent and process air bulges (UFP-BULGE-00001 and UFP-BULGE-00002) cycle plant air, reagents (sodium hydroxide or nitric acid), and process condensate to the UFP pulsepots (UFP-PP-00001A/B, UFP-PP-00002A/B, and UFP-PP-00003A/B). The UFP utility bulges (UFP-BULGE-00005 and UFP-BULGE-00006) cycle process condensate through the UFP recirculation loop. The process condensate, which is received from the process condensate tanks (RLD-TK-00006A/B), is 100 wt% water with a pH of 11.5 (24590-WTP-M4C-V11T-00010).

The materials of construction for bulges are compatible with the waste managed in the UFP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the UFP bulges are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulges.

### 4.4 HLW Lag Storage and Feed Blending Process System

The HLP receives and stores HLW waste from the tank farm, receives and stages HLW intermediate products (i.e., treated solids and Sr/TRU precipitates), blends HLW intermediate products and cesium concentrate prior to transfer to the HLW vitrification facility and, if needed, transfers waste and treated solids back to the tank farms. The HLP is housed on the 0-ft elevation level primarily in black cells P-0102 and P-0102A adjacent to the southeastern margin of the central hot cell area in the PTF building. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

### 4.4.1 HLW Feed Receipt Vessel (HLP-VSL-00022)

The HLW feed receipt vessel (HLP-VSL-00022) associated with this system is located in the HLW receipt and blending black cell (P-0102A), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The HLW feed receipt vessel receives waste feed from the tank farm. Received waste is sampled prior to transfer for processing. Depending on the sampling results, the HLW waste suitable for processing is transferred to either the ultrafiltration feed preparation vessels (UFP-VSL-00001A/B) or the waste feed evaporator feed vessels (FEP-VSL-00017A/B) (Envelopes A and B), or to the waste feed receipt vessels (FRP-VSL-00002A/B/C/D) (Envelopes A/B/C/D) for filtration, evaporation, or blending, respectively. Waste unsuitable for processing is transferred back to the tank farms. The HLW feed receipt vessel is equipped with remote sampling capability. The maximum capacity of the tank is 270,600 gallons.

HLP ancillary equipment associated with the HLW waste feed receipt vessel includes the following:

- twelve PJMs (HLP-PJM-00056 through 00057 and HLP-PJM-00084 through 00093)
- twelve jet pump pairs (HLP-EJCTR-00041 through 00048, HLP-EJCTR-00076 through 00077, and HLP-EJCTR-00087 through 00088)
- one recirculation pump (HLP-PMP-00021)

The PJMs are used for mixing to maintain a uniform concentration of solids for waste feed sampling and transfer and to prevent hydrogen accumulation. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The pump (HLP-PMP-00021) located in the adjacent hot cell (room P-0123) provides transfer capabilities to the FEP, FRP, and UFP, or to the tank farm by way of FRP tanks.

The tank and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

#### 4.4.1.1 Design Standards

The HLW feed receipt vessel (HLP-VSL-00022) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The HLW feed receipt vessel has ASME flanged and dished heads with an approximate 38-ft inside diameter of and a 24-ft, 2-inch tangent to tangent length. The tank thicknesses are 1-inch (shell), 1-inch minimum ASME code flanged and dished head (top and bottom), with a 2-inch minimum ASME code straight flange (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the 0.024-inch corrosion allowance and 0.016-inch erosion allowance required for this tank), plus additional 0.398-inch localized protection required for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The HLW feed receipt vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00021 and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

#### 4.4.1.2 Characteristics of the Waste

The HLW feed receipt vessel receives HLW waste feed from the tank farms that is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids with a pH of 13.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-HLP-P0003).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the HLP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HLW feed receipt vessel is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.4.2 HLW Lag Storage Vessels (HLP-VSL-00027A/B) and Breakpot (HLP-BRKPT-00004)

The two HLW lag storage vessels (HLP-VSL-00027A/B) associated with this system are located in the HLW storage black cell (P-0102), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The two HLW lag storage vessels receive solid slurries that were concentrated in the UFP, such as Sr/TRU precipitate (Envelope C) or treated solids (Envelopes A/D and B/D). These solid slurries are received, segregated, and staged separately in either of the two HLW lag storage vessels. Each HLW lag storage vessel is equipped with remote sampling capability. The maximum capacity of each tank is 127,260 gallons.

HLP ancillary equipment associated with the HLW lag storage vessels includes the following:

- eight PJMs for each tank (HLP-PJM-00060 through 00067 and HLP-PJM-00068 through 00075)

- eight jet pump pairs for each tank (HLP-EJCTR-00001 through 00008 and HLP-EJCTR-00021 through HLP-EJCTR-00028)
- one breakpot (HLP-BRKPT-00004), with a total volume of 92 gallons
- two transfer pumps (HLP-PMP-00017A/B)

The PJMs are used for mixing to maintain a uniform concentration of solids for blended waste feed sampling and transfer and to prevent hydrogen accumulation. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell.

The HLP cesium concentrate receipt breakpot (HLP-BRKPT-00004) is located on the 28-ft elevation level in the black cell. The breakpot receives cesium concentrate from the cesium evaporator (CNP-EVAP-00001) and eluate contingency storage vessel (CNP-VSL-00003), which drains by gravity to the HLW lag storage vessel HLP-VSL-00027B.

The two HLW transfer pumps (HLP-PMP-00017A/B) are located in the adjacent hot cell (room P-0123). Both pumps have the capability to recirculate between and within the two vessels and transfer to the tank farm, while HLP-PMP-00017B associated with vessel HLP-VSL-00027B has the ability to transfer to the HLW vitrification facility. For transfers of off-specification material to the tank farm, HLP-PMP-00017A/B operate in series with the waste feed return pump (FRP-PMP-00001).

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life. The breakpot is made of Alloy C-22 (UNS N06022).

#### 4.4.2.1 Design Standards

The HLW lag storage vessels (HLP-VSL-00027A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The HLW lag storage vessels have ASME flanged and dished heads with an approximate 25-ft inside diameter of and a 29-ft, 6-inch tangent to tangent length. The tank thicknesses are 1 1inch (shell), 1-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, plus additional 0.436-inch localized protection required for bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The HLW lag storage vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00017A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

#### 4.4.2.2 Characteristics of the Waste

The contents of the HLW lag storage vessels are primarily treated HLW solids, cesium concentrate, and Sr/TRU precipitate solids from the LAW pretreatment process. The HLW wastes include Sr/TRU precipitate slurries and cesium concentrates recovered from LAW pretreatment tanks (UFP-VSL-00002A/B and FEP-SEP-00001B). Vessel HLP-VSL-00027B also receives cesium concentrate from the treated LAW evaporator concentrate vessel (TCP-VSL-00002) and eluate contingency storage vessel (CNP-VSL-00003), which is received by gravity drain from the cesium concentrate receipt breakpot (HLP-BRKPT-00004); and off-specification resin from the spent resin slurry vessels (RDP-VSL-00002A/B/C).

The HLW lag storage vessels contain waste for transfer to the HLW vitrification facility that is approximately 76.1 wt% water, 5.6 wt% dissolved solids, and 18.3 wt% solids with a pH of 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-HLP-P0007).

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the HLP. Assessment for these tanks that are located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HLW lag storage vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.4.3 HLW Feed Blending Vessel (HLP-VSL-00028) and Breakpot (HLP-BRKPT-00006)

The HLW feed blending vessel (HLP-VSL-00028) associated with this system is located in the HLW receipt and blending black cell (P-0102A), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The HLW feed blending vessel receives treated solids for blending prior to transfer to the HLW vitrification facility for immobilization. The HLW feed blending vessel is equipped with remote sampling capability. The maximum capacity of each tank is 142,200 gallons.

HLP ancillary equipment associated with the HLW feed blending vessel includes the following:

- eight PJMs (HLP-PJM-00076 through 00083)
- eight jet pump pairs (HLP-EJCTR-00031 through 00038)
- one breakpot (HLP-BRKPT-00006), with a total volume of 92 gallons
- two transfer pumps (HLP-PMP-00019A/B)

The PJMs are used for mixing to maintain a uniform concentration of solids for blended waste feed sampling and transfer and to prevent hydrogen accumulation. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell.

The HLP cesium concentrate receipt breakpot (HLP-BRKPT-00006) is located at the 28-ft elevation in the black cell. The breakpot receives cesium concentrate from the CNP evaporator separator (CNP-EVAP-00001), and drains by gravity to the HLW feed blending vessel.

The two HLW melter feed pumps (HLP-PMP-00019A/B), located in the adjacent hot cell (room P-0123), are used primarily for periodic transfer of blended waste to the HLW vitrification feed vessels (HFP-VSL-00001 and HFP-VSL-00005) and to provide recirculation within the feed blending vessel. Additionally, the HLW melter feed pumps are used for transfer to the HLW lag storage vessels or return of off-specification materials to the tank farm via the waste feed return pump (FRP-PMP-00001).

The tank and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life. The breakpot is made of Alloy C-22 (UNS N06022).

#### 4.4.3.1 Design Standards

The HLW feed blending vessel (HLP-VSL-00028) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The HLW feed blending vessel has ASME flanged and dished heads with an approximate 26-ft, 6-inch inside diameter of and a 29-ft tangent to tangent length. The tank thicknesses are 1-inch (shell), 1-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, plus additional 0.434-inch localized protection required for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The HLW feed blending vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00019A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

Piping in the transfer lines that convey off-specification treated solids from the HLP vessel to the tank farms is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to an LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00004 through PWD-LDB-00007).

#### 4.4.3.2 Characteristics of the Waste

The contents of the HLW feed blending vessel are primarily treated HLW solids, cesium concentrate, and Sr/TRU precipitate solids from the UFP process. The HLW wastes include Sr/TRU precipitate slurries and cesium concentrates recovered from UFP and CNP vessels (UFP-VSL-00002A/B and CNP-EVAP-00001); cesium concentrate from the treated CNP evaporator concentrate vessel (CNP-EVAP-00001) and eluate contingency storage vessel (CNP-VSL-00003), which is received by gravity drain from the cesium concentrate receipt breakpot (HLP-BRKPT-00006); and off-specification resin from the spent resin slurry vessels (RDP-VSL-00002A/B/C). This tank may also receive treated cesium and Sr/TRU slurry from the Hanford cesium and Sr/TRU capsules.

The HLW feed blending vessel contains blended waste for transfer to the HLW vitrification facility that is approximately 76.1 wt% water, 5.6 wt% dissolved solids, and 18.3 wt% solids with a pH of 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-HLP-P0010).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the HLP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HLW feed blending vessel is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.5 Cesium Ion Exchange Process System

The CXP removes cesium from filtered process liquor to prepare it for treatment in the LAW vitrification facility melters. Cesium removal is accomplished by treating the LAW feed in an IX system that uses an organic media with a high selectivity and capacity for cesium that can be regenerated and reused. The CXP is housed on the 0-ft elevation level primarily in black cells P-0111 and P-0114 adjacent to the northern margin of the central hot cell area, and in the hot cell (room P-0123) in the PTF building. Some valves and transfer and return pumps are located in the central hot cell for remote maintenance access; some pumps are located in an accessible area (room P-0110C).

#### 4.5.1 Cesium Ion Exchange Feed Vessel (CXP-VSL-00001)

The cesium IX feed vessel (CXP-VSL-00001) associated with this system is located in the cesium IX black cell (P-0111), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The CXP feed vessel receives LAW from ultrafiltration and provides feed buffer capacity to allow continuous operation of the IX system. This tank is also used as a point of recycle for the IX system if the cesium treated LAW is found to be out of specification for cesium (Cs)-137 (137Cs) content. The maximum capacity of the tank is 103,350 gallons.

CXP ancillary equipment associated with the CXP feed vessel includes the following:

- two cesium IX feed coolers (CXP-HX-00001A/B)
- two pumps (CXP-PMP-00001A/B)

The cesium IX feed coolers (CXP-HX-00001A/B) are used to control the temperature of the LAW and reagent feeds to the columns. The cesium IX feed pumps (CXP-PMP-00001A/B) are used to feed LAW, reagents, and water to the IX columns for LAW loading and displacement, and for pre-elution rinse, elution, post-elution rinse, and caustic regeneration.

The tank, ancillary equipment, and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

#### 4.5.1.1 Design Standards

The cesium IX feed vessel (CXP-VSL-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The cesium IX feed vessel has ASME flanged and dished heads with an approximate 23-ft inside diameter and a 26-ft, 6-inch tangent to tangent length. The tank thicknesses are 1-inch (shell), 1-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium IX feed vessel includes the following tank internals, which are of a standard design with no moving parts:

- vessel spray nozzles
- level, density, and temperature instrumentation

#### 4.5.1.2 Characteristics of the Waste

The contents of the cesium IX feed vessel are primarily ultrafiltration permeate from the LAW pretreatment process (UFP-VSL-00062A/B/C). This tank is also used as a point of recycle for the IX system if the cesium treated LAW is found to be out of specification for 137Cs content.
The cesium IX feed vessel contains filtered LAW for transfer to the cesium IX columns that is approximately 73.4 wt% water, 26.6 wt% dissolved solids, and 0 wt% solids with a pH of approximately 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CXP-P0001).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the CXP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium IX feed vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.5.2 Cesium Ion Exchange Reagent Vessel (CXP-VSL-00005)

The cesium IX reagent vessel (CXP-VSL-00005) associated with this system is located in the cesium IX black cell (P-0111) at the 56-ft elevation level, which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The cesium IX reagent vessel (CXP-VSL-00005) is designed to receive demineralized water, nominal 0.25 molar sodium hydroxide solution, nominal 0.1 molar sodium hydroxide solution, and standby nitric acid as fresh reagents. In addition, the cesium IX reagent vessel receives recycled spent regeneration caustic solution from the cesium IX caustic rinse collection vessel (CXP-VSL-00004). The maximum capacity of the tank is 1,141 gallons.

The tank and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the reagents for a 40-year life.

#### 4.5.2.1 Design Standards

The cesium IX reagent vessel (CXP-VSL-00005) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The cesium IX reagent vessel has ASME flanged and dished heads with an approximate 5-ft inside diameter and a 6-ft, 6-inch tangent to tangent length. The tank thicknesses are 0.375-inch (shell) and 0.250-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium IX reagent vessel includes the following tank internals, which are of a standard design with no moving parts:

- vessel spray nozzles
- level, density, and temperature instrumentation

#### 4.5.2.2 Characteristics of the Waste

The contents of the cesium IX reagent vessel are primarily demineralized water and fresh reagents (nominal 0.025 molar sodium hydroxide, nominal 0.1 molar sodium hydroxide or, under standby conditions, 0.1 molar nitric acid). Tank contents are 98 wt% water and less than 2 wt% solids. Contents have a pH of 13.0 (24590-PTF-N1D-CXP-P0008).

The materials of construction for this tank are compatible with the waste managed in the CXP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium IX reagent vessel is considered to have a lower potential for corrosion and erosion on the basis

of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.5.3 Cesium Ion Exchange Columns (CXP-IXC-00001 through CXP-IXC-00004)

The cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004) associated with this system are miscellaneous units located in the hot cell area (P-0123), which is equipped with a stainless steel liner and three sumps with sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The cesium IX columns consist of vessels holding a resin bed to adsorb cesium from treated LAW feed received from the cesium IX feed vessel (CXP-VSL-00001). The cesium IX columns produce a treated LAW of greatly reduced cesium concentration (and therefore reduced gamma radiation). The columns are also designed to desorb the cesium during the elution and regeneration sequences such that the resin bed can be cleaned of cesium to be used in another cycle of loading. The maximum capacity of each tank is 680 gallons.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste for a 40-year life. The IX columns are designed for remote removal and replacement after a design life of 10 years.

#### 4.5.3.1 Design Standards

The cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The cesium IX columns have ASME 2:1 elliptical heads (top and bottom) with an approximate 4-ft inside diameter and a 17-ft, 9-inch tangent to tangent length. The tank thicknesses are 0.5-inch (shell and heads). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for the IX columns . Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.5.3.2 Characteristics of the Waste

The contents of the cesium IX columns are primarily resin and ultrafiltration permeate from the LAW pretreatment process from the cesium IX feed vessel (CXP-VSL-00001). The cesium IX columns also receive demineralized water and reagents (CXP-VSL-00005) for the regeneration of the IX resin.

The cesium IX columns receive filtered LAW that is approximately 73.4 wt% water, 26.6 wt% dissolved solids, and 0 wt% solids with a pH ranging from 0.3 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CXP-00002).

The materials of construction for cesium IX column vessels are compatible with the waste managed in the CXP. Assessment for these tanks that are located in the hot cell is limited to remote monitoring with remote removal, decontamination, and replacement planned on a 10-year basis for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium IX column vessels are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.5.4 Cesium Ion Exchange Treated LAW Collection Vessels (CXP-VSL-00026A/B/C)

The cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C) associated with this system are located in the treated LAW collection black cell (P-0114), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The three cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C) receive cesium-depleted filtered LAW prior to transfer to the treated LAW evaporator separator (TLP-SEP-00001). Each collection vessel is equipped with remote sampling capability. The maximum capacity of each tank is 39,000 gallons.

CXP ancillary equipment associated with the cesium IX treated LAW collection vessels includes the following:

- six PJMs for each tank (CXP-PJM-00002 through 00007; CXP-PJM-00008 through 00013; CXP-PJM-00014 through 00019)
- six jet pump pairs for each tank (CXP-EJCTR-00049 through 00054; CXP-EJCTR-00055 through 00060; CXP-EJCTR-00061 through 00066)
- two feed pumps (CXP-PMP-00002A/B)

The PJMs are used for mixing to maintain a uniform concentration for waste feed for sampling. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The cesium IX treated LAW feed pumps (CXP-PMP-00002A/B), located external to the tanks, are used to empty the tanks and to facilitate waste transfers.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

#### 4.5.4.1 Design Standards

The cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The cesium IX treated LAW collection vessels have ASME 2:1 semielliptical heads (top and bottom) with an approximate 15-ft inside diameter and a 26-ft, 6-inch tangent to tangent length. The tank thicknesses are

0.75-inch (shell and heads). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for each tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium IX treated LAW collection vessels include the following tank internals, which are of a standard design with no moving parts:

- vessel spray nozzles
- level, density, and temperature instrumentation
- PJMs

#### 4.5.4.2 Characteristics of the Waste

The contents of the cesium IX treated LAW collection vessels are cesium depleted filtered LAW from the cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004).

The cesium depleted filtered LAW is approximately 73.4 wt% water, 26.6 wt% dissolved solids, and 0 wt% solids with a pH of approximately 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CXP-P0003).

The materials of construction for the cesium IX treated LAW collection vessels are compatible with the waste managed in the CXP. Assessment for these tanks that are located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium IX treated LAW collection vessels are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.5.5 Cesium Ion Exchange Caustic Rinse Collection Vessel (CXP-VSL-00004)

The cesium IX caustic rinse collection vessel (CXP-VSL-00004) associated with this system is located in the cesium IX black cell (P-0111), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The cesium IX caustic rinse collection vessel receives spent caustic regeneration solution that has been discharged from the cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004) during the regeneration sequence. The maximum capacity of the tank is 11,085 gallons.

CXP ancillary equipment associated with the cesium IX caustic rinse collection vessel includes the following:

- one PJM (CXP-PJM-00001)

- one jet pump pair (CXP-EJCTR-00009)
- four charge vessels (CXP-VSL-00006 through 00009)
- four RFDs (CXP-RFD-00004A/B and CXP-RFD-00005 through 00006)
- four RFD ejectors (CXP-EJCTR-00007 through 00008 and CXP-EJCTR-00011 through 00012)

The PJM is used for mixing added reagents. The PJM is connected to a jet pump pair located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer nominal 0.1 molar sodium hydroxide solution out of the tank to the cesium IX reagent vessel (CXP-VSL-00005) or to remove excess solution to the acidic/alkaline effluent vessels (PWD-VSL-00015 or PWD-VSL-00016). Each RFD is connected to an ejector located outside the tank.

The tank and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste feed for a 40-year life.

### 4.5.5.1 Design Standards

The cesium IX caustic rinse collection vessel (CXP-VSL-00004) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The caustic rinse collection vessel has ASME flanged and dished heads with an approximate 10-ft, 5-inch inside diameter and a 14-ft, 3-inch tangent to tangent length. The tank thicknesses are 0.375-inch (shell) and 0.250-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance plus 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium IX caustic rinse collection vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles
- level, density, and temperature instrumentation

### 4.5.5.2 Characteristics of the Waste

The contents of the cesium IX caustic rinse collection vessel are primarily demineralized water and spent reagents. Tank contents are 98 wt% water and less than 2 wt% solids. Contents have a pH of 13.0 (24590-PTF-N1D-CXP-P0008).

The materials of construction for this tank are compatible with the waste managed in the CXP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium IX caustic rinse collection vessel is considered to have a lower potential for corrosion and

erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.5.6 CXP Bulge (CXP-BULGE-00004) and CRP Bulge (CRP-BULGE-00001)

The valve bulge associated with the CXP (CXP-BULGE-00004) is located on the 56-ft elevation level, above the black cells, in room P-0317. The bulge (CRP-BULGE-00001) for the cesium resin addition process system (CRP), which has no DWP-regulated tanks and miscellaneous units, is also located in Room P-0317. The valve bulge for the CXP and the CRP bulge provide secondary containment away from the black cells and hot cell, where the control valves and valve actuators are accessible for maintenance. Room P-0317 has a radiological area classification of R3/C3 (Table 6).

The bulge and manual valves are made of stainless steel 316L (UNS S31603) to ensure containment of the spent IX resin and resin transport liquid for a 40-year life.

#### 4.5.6.1 Design Standards

The CXP and CRP bulge design follows the standard bulge design used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-T0001, *Engineering Specification for Process Bulge Design and Fabrication*. CXP bulge confinement is designed to meet the requirements of AISC M016-89, Manual of Steel Construction. CRP bulge confinement is designed to meet the requirements of ANSI/AISC N690-94, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities. The associated CXP process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.5.6.2 Characteristics of the Waste

The CXP bulge (CXP-BULGE-00004) transfers spent resin and resin transport liquid between the cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004) and the spent resin slurry vessels (RDP-VSL-00002A/B/C). These materials have a pH of 1 (24590-PTF-N1D-RDP-P0001). The CRP bulge (CRP-BULGE-00001) transfers fresh or spent resin and resin transport liquid to the IX columns.

The materials of construction for the bulges are compatible with the waste managed in the CXP/RDP/CRP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the CXP and the CRP bulges are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulges.

## 4.6 Cesium Nitric Acid Recovery Process System

The CNP supports the CXP. The CNP provides eluant to the CXP and also receives eluate from the CXP. The CNP is housed primarily on the 0-ft elevation level in black cells P-0111 and P-0112 adjacent to the northern margin of the central hot cell area, and in the central hot cell (room P-0123) in the PTF building. Associated miscellaneous units are also housed on the 56-ft elevation level in room P-0320 and the 77-ft elevation level in room P-0430. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

### 4.6.1 Cesium Evaporator Eluant Lute Pot (CNP-VSL-00001) and Breakpot (CNP-BRKPT-00002)

The cesium evaporator eluant lute pot (CNP-VSL-00001) associated with this system is located in the resin disposal/CNP evaporator process black cell (P-0112), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The cesium evaporator eluant lute pot provides a vacuum seal between the cesium evaporator breakpot (CNP-BRKPT-00002) and the cesium evaporator separator (CNP-EVAP-00001). The eluant from the cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004) enters the lute pot by gravity drain from the breakpot and flows under vacuum to the cesium evaporator separator (CNP-EVAP-00001). The maximum capacity of the lute pot is 109 gallons.

CNP ancillary equipment associated with the cesium evaporator eluant lute pot includes the following:

- one breakpot (CNP-BRKPT-00002), with a total volume of 175 gallons
- one vessel-emptying ejector (CNP-EJCTR-00001)

The vessel-emptying ejector operates with an internal swirl wash nozzle to fluidize and remove solids, if any, that may collect in the lute pot over time.

The tank, breakpot, and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the eluant for a 40-year life.

#### 4.6.1.1 Design Standards

The cesium evaporator eluant lute pot (CNP-VSL-00001) and the ancillary breakpot (CNP-BRKPT-00002) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The lute pot has ASME code flanged and dished heads with a 1.5-inch straight flange (top and bottom). The lute pot has an approximate 4-ft inside diameter and a 3-ft tangent to tangent length. The tank thicknesses are 0.25-inch minimum (shell and heads). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% greater than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium evaporator eluant lute pot includes vessel spray nozzles, which are of a standard design with no moving parts.

#### 4.6.1.2 Characteristics of the Waste

The contents of the cesium evaporator eluant lute pot are primarily demineralized water from the post-elution rinse of the cesium IX columns. Tank contents are 98.2 wt% water and less than 2 wt% dissolved

solids. Contents have a pH of 0.5 under routine operating conditions (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CNP-P0011).

The materials of construction for this tank are compatible with the waste managed in the CNP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium evaporator eluant lute pot is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.6.2 Cesium Evaporator Separator Vessel (CNP-EVAP-00001)

The cesium evaporator separator vessel (CNP-EVAP-00001) associated with this system is a miscellaneous unit located in the resin disposal/CNP evaporator process black cell (P-0112), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The cesium evaporator separator, which is initially charged with nitric acid for recovery of vapor product at the desired molarity, receives the cesium eluate from the cesium IX columns via the cesium evaporator eluate lute pot (CNP-VSL-00001). The separator operates under vacuum. The salts in the eluate are accumulated as a nitric acid/cesium liquor in the bottom of the separator and are transferred to the HLP (HLP-VSL-00027B or HLP-VSL-00028). Acid and water vapor product passes through a demister near the top of the separator, and then passes to the refluxed cesium evaporator nitric acid rectifier (CNP-DISTC-00001).

CNP ancillary equipment associated with the waste cesium evaporator separator includes the following:

- two vessel-emptying ejectors (CNP-EJCTR-00012and CNP-EJCTR-00013)
- one offgas ejector (CNP-EJCTR-00037)
- one transfer pump (CNP-PMP-00001)

The evaporator has all welded construction and is made of Alloy C-22 (UNS N06022) to ensure containment of the acid and eluate for a 40-year life.

#### 4.6.2.1 Design Standards

The cesium evaporator separator vessel (CNP-EVAP-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The cesium evaporator separator is vendor designed with nominal dimensions of 4-ft, 6-inch upper internal diameter, 6-ft, 5-inch lower internal diameter, and 22-ft, 11-inch overall height. The nominal 0.500-inch shell thickness

includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.6.2.2 Characteristics of the Waste

The contents of the cesium evaporator separator are primarily demineralized water from the post-elution rinse of the cesium IX columns plus a nitric acid charge. The cesium evaporator separator contents are 98.2 wt% water and less than 2 wt% dissolved solids. Contents have a pH of 0.5 under routine operating conditions (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CNP-P0011).

The materials of construction for this unit are compatible with the waste managed in the CNP. Assessment for this unit that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium evaporator separator is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the separator.

### 4.6.3 Cesium Evaporator Concentrate Reboiler (CNP-HX-00001)

The cesium evaporator concentrate reboiler (CXP-HX-00001) associated with this system is a miscellaneous unit located in a hot cell area (P-0123), which is equipped with a stainless steel liner and three sumps with sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The cesium evaporator concentrate reboiler is a heat exchanger that uses low pressure steam to heat the nitric acid charged cesium concentrate pumped from the cesium evaporator separator. Heated eluate is recirculated to the separator.

The tube-and-shell heat exchanger and process piping have all welded construction; the tube side of the unit is made of Alloy C-22 (UNS N06022) and the shell and piping are made of stainless steel 316L (UNS S31603) to ensure containment of the contents for a 40-year life.

#### 4.6.3.1 Design Standards

The cesium evaporator concentrate reboiler (CNP-HX-00001) is a tube-and-shell heat exchanger. The unit is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The evaporator concentrate reboiler is a vendor package with dimensions determined by the vendor. Thickness includes the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this unit. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.6.3.2 Characteristics of the Waste

The contents of the cesium evaporator concentrate reboiler are primarily demineralized water from the post-elution rinse of the cesium IX columns plus a nitric acid charge. Reboiler contents are 98.2 wt% water and less than 2 wt% dissolved solids, with a pH ranging from 0.3 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CNP-P0004).

The materials of construction for the cesium evaporator concentrate reboiler are compatible with the waste managed in the CNP. Assessment for this miscellaneous unit located in the central hot cell is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this unit is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium evaporator concentrate reboiler is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the reboiler.

### 4.6.4 Cesium Evaporator Nitric Acid Rectifier (CNP-DISTC-00001)

The cesium evaporator nitric acid rectifier (CNP-DISTC-00001) associated with this system is a miscellaneous unit located in the CNP evaporator rectifier process area (P-0320), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

The cesium evaporator nitric acid rectifier receives vapor leaving the cesium evaporator separator that contains water and nitric acid. The rectifier increases the concentration of the recovered acid. Recovered acid (0.5 molar nitric acid) flows from the bottom of the rectifier to the cesium evaporator recovered nitric acid vessel (CNP-VSL-00004). Water vapor enters the cesium evaporator condensers (CNP-HX-00002 through CNP-HX-00004).

The cesium evaporator nitric acid rectifier has all welded construction and is made of 6% molybdenum alloy (N08367/N08926) to ensure containment of the contents for a 40-year life.

#### 4.6.4.1 Design Standards

The cesium evaporator nitric acid rectifier (CNP-DISTC-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The cesium evaporator nitric acid rectifier is vendor designed with nominal dimensions comprising a 3-ft inside diameter and a 12-ft tangent to tangent length. Shell thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.6.4.2 Characteristics of the Waste

The cesium evaporator nitric acid rectifier receives water vapor and gases (24590-PTF-3YD-CNP-00001). The materials of construction for this unit are compatible with the waste managed. The schedule for conducting periodic assessments of this unit is provided in Table 7. For the purpose of scheduling periodic assessments, this unit is considered to have a lower potential for corrosion and erosion on the

basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the unit.

### 4.6.5 Cesium Evaporator Primary Condenser (CNP-HX-00002), Intercondenser (CNP-HX-00003), and Aftercondenser (CNP-HX-00004)

The cesium evaporator primary condenser (CNP-HX-00002), intercondenser (CNP-HX-00003), and aftercondenser (CNP-HX-00004) associated with this system are miscellaneous units located in the CNP evaporator condenser room (P-0430), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 77-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

CNP ancillary equipment associated with the cesium evaporator condensers includes the following:

- two vacuum steam ejectors (CNP-EJCTR-00010A/B)
- one transfer/recirculation pump (CNP-PMP-00002)

The cesium evaporator condensers are part of an evaporator train that removes excess water from the pre-elution and post-elution rinses sent to the cesium evaporator separator vessel from the cesium IX columns. De-entrained water vapor and nitric acid enter the cesium evaporator primary condenser (CNP-HX-00002), where condensable vapors are removed by condensation. Two ejectors generate the vacuum requirements that enable boiling. The first ejector (CNP-EJCTR-00010A) discharges steam and noncondensable gases to the cesium evaporator intercondenser (CNP-HX-00003) to condense steam from the ejector. The second ejector (CNP-EJCTR-00010B) draws noncondensable gases from the intercondenser and discharges steam and noncondensable gases to the aftercondenser (CNP-HX-00004) to condense the ejector steam. The condensate from each of the condensers is discharged to the acidic/alkaline effluent vessels (PWD-VSL-00015 and PWD-VSL-00016).

The condensers and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the contents for a 40-year life.

#### 4.6.5.1 Design Standards

The cesium evaporator primary condenser (CNP-HX-00002), intercondenser (CNP-HX-00003), and aftercondenser (CNP-HX-00004) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The cesium evaporator condensers are vendor designed with nominal dimensions comprising a 3-ft inside diameter and a 12-ft tangent to tangent length. Shell thickness includes the minimum 0.040-inch standard corrosion allowance, which is approximately 40% greater than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for these units. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.6.5.2 Characteristics of the Waste

The cesium evaporator condensers receive water vapor and gases (24590-PTF-3YD-CNP-00001). The materials of construction for these units are compatible with the waste managed. The schedule for conducting periodic assessments of these units is provided in Table 7. For the purpose of scheduling periodic assessments, these units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the units.

### 4.6.6 Eluate Contingency Storage Vessel (CNP-VSL-00003) and Breakpots (CNP-BRKPT-00001 and CNP-BRKPT-00002)

The eluate contingency storage vessel (CNP-VSL-00003) associated with this system is located in the cesium IX black cell (P-0111), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The eluate contingency storage vessel receives acid that needs reprocessing from the cesium evaporator recovered nitric acid vessel (CNP-VSL-00004), cesium concentrate from the cesium evaporator separator (CNP-EVAP-00001), or cesium eluate from the cesium IX columns for temporary storage. Acid, cesium eluate, and cesium concentrate enter the eluate contingency storage vessel by gravity drain from the cesium concentrate breakpot (CNP-BRKPT-00001). The maximum capacity of the tank is 21,570 gallons.

CNP ancillary equipment associated with the eluate contingency storage vessel includes the following:

- two breakpots (CNP-BRKPT-00001 and CNP-BRKPT-00002), each with a total volume of 175 gallons
- four PJMs (CNP-PJM-00013 through 00016)
- four jet pump pairs (CNP-EJCTR-00015 through 00018)
- one charge vessel (CNP-VSL-00166)
- one RFD (CNP-RFD-00003)
- one RFD ejector (CNP-EJCTR-00023)
- three vessel-emptying ejectors (CNP-EJCTR-00034 through 000036)

The PJMs are used for mixing tank contents. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The charge vessel located within the parent tank is used in conjunction with the RFD. The RFD, located within the tank, is used to transfer temporarily stored cesium eluate to the cesium evaporator separator (CNP-EVAP-00001) via the cesium evaporator breakpot (CNP-BRKPT-00002). The RFD is connected to an RFD ejector located outside the tank. Vessel-emptying ejectors are used to remove cesium concentrate to the HLP (HLP-VSL-00027B or HLP-VSL-00028).

The tank and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the tank contents for a 40-year life. The tank cooling jacket, which removes heat generated in CNP-VSL-00003 caused by radioactive decay and/or neutralization, is made of stainless steel 304L (UNS 30403).

#### 4.6.6.1 Design Standards

The eluate contingency storage vessel (CNP-VSL-00003) and the ancillary breakpots (CNP-BRKPT-00001 and 00002) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The contingency storage vessel has ASME code flanged and dished heads with 2-inch straight flange (top and bottom). The tank has an approximate inside 14-ft diameter and a 16-ft tangent to tangent length. The tank thicknesses are 0.75-inch minimum (shell and top head) and 1.125-inch (bottom head). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the required 0.024-inch corrosion allowance and 0.016-inch erosion allowance), plus additional 0.016-inch localized protection required for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The eluate contingency storage vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessel
- RFD
- vessel spray nozzles
- level, density, and temperature instrumentation

#### 4.6.6.2 Characteristics of the Waste

The contents of the eluate contingency storage vessel are primarily cesium concentrate from the cesium evaporator separator, demineralized water from the post-elution rinse of the cesium IX columns, or nitric acid from the recovered nitric acid vessel. Tank contents are 98.2 wt% water and less than 2 wt% dissolved solids (eluant), recovered nitric acid, or 47.6 wt% water and 57.4 wt% dissolved solids (cesium concentrate). Contents have a pH of 0.3 (eluant and recovered nitric acid) or a pH of 14 (cesium concentrate) (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CNP-P0009).

The materials of construction for this tank are compatible with the waste managed in the CNP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the eluate contingency storage vessel is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.6.7 Cesium Evaporator Recovered Nitric Acid Vessel (CNP-VSL-00004)

The cesium evaporator recovered nitric acid vessel (CNP-VSL-00004) associated with this system is located in the resin disposal/CNP evaporator process black cell (P-0112), which is equipped with a

stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

Recovered acid flows by gravity from the bottom of the cesium evaporator nitric acid rectifier (CNP-DISTC-00001) to the cesium evaporator recovered nitric acid vessel (CNP-VSL-00004). Recovered nitric acid is transferred directly into the eluant stream feeding the IX columns (CXP-IXC-00001 through 00004) via pumps (CXP-PMP-00001A/B). The cesium evaporator recovered nitric acid vessel is equipped with remote sampling capability. The maximum capacity of the tank is 11,115 gallons.

CNP ancillary equipment associated with the cesium evaporator recovered nitric acid vessel includes the following:

- four PJMs (CNP-PJM-00019 through 00022)
- four jet pump pairs (CNP-EJCTR-00024 through 00027)
- one charge vessel (CNP-VSL-00162)
- one RFD (CNP-RFD-00005)
- one RFD ejector (CNP-EJCTR-00028)
- one vessel-emptying ejector (CNP-EJCTR-00014)

The PJMs are used for mixing tank contents. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The charge vessel located within the parent tank is used in conjunction with the RFD. The RFD, located within the tank, is used to transfer recovered acid requiring reprocessing to the eluate contingency storage vessel (CNP-VSL-00003) via the cesium concentrate breakpot (CNP-BRKPT-00001). The RFD is connected to an RFD ejector located outside the tank. The vessel-emptying ejector is used for vessel decontamination.

The tank and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the tank contents for a 40-year life.

#### 4.6.7.1 Design Standards

The cesium evaporator recovered nitric acid vessel (CNP-VSL-00004) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The tank has ASME code flanged and dished heads (top and bottom). The tank has an approximate 9-ft, 6-inch inside diameter and a 19-ft tangent to tangent length. The tank thicknesses are 0.625-inch minimum (shell) and 0.500-inch (top and bottom head). Thicknesses include the minimum0.040-inch standard corrosion allowance, which is adequate for the required 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium evaporator recovered nitric acid vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessel
- RFD
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor halide, cesium and nitric acid concentrations, tank contents are routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

#### 4.6.7.2 Characteristics of the Waste

The contents of the cesium evaporator recovered nitric acid vessel are nitric acid. Contents have a pH of 0.5 (24590-PTF-3YD-CNP-00001).

The materials of construction for this tank are compatible with the waste managed in the CNP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium evaporator recovered nitric acid vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.7 Treated LAW Evaporation Process System

The TLP increases the concentration of the treated LAW prior to transfer to the LAW vitrification facility for glassification. The TLP also provides lag storage capacity and reduction/concentration for LAW submerged bed scrubber (SBS) condensate recycled from the LAW vitrification facility. The TLP is housed primarily on the 0-ft elevation level primarily in black cells P-0117 and P-0117A adjacent to the northeastern margin of the hot cell area, in the hot cell (room P-0123), and in room P-0118 in the eastern portion of the PTF building. Some miscellaneous units are located on the 56-ft elevation level in room P-0325. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access or in accessible areas.

#### 4.7.1 LAW SBS Condensate Receipt Vessels (TLP-VSL-00009A/B)

The LAW SBS condensate receipt vessels (TLP-VSL-00009A/B) associated with this system are located in the treated LAW evaporator and concentrate storage black cells (P-0117 and P-0117A), which are each equipped with a stainless steel liner, a sump, and a sump ejector. Each stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. These rooms have a radiological area classification of R5/C5 and are designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The LAW SBS condensate receipt vessels receive and neutralize SBS condensate liquor from the LAW vitrification facility for feed to the treated LAW evaporator separator (TLP-SEP-00001). Under infrequent conditions, these tanks also receive LAW concentrate recycle from the treated LAW concentrate storage vessel (TCP-VSL-00001) and pretreatment off-specification effluents. Each LAW SBS concentrate receipt vessel is equipped with remote sampling capability. The maximum capacity of each tank is 130,010 gallons.

TLP ancillary equipment associated with the LAW SBS condensate receipt vessels includes the following:

- eight PJMs for each tank (TLP-PJM-00001 through 00008; TLP-PJM-00009 through 00016)
- four jet pump pairs (TLP-EJCTR-00009 through 00016; TLP-EJCTR-00018 through 00025)
- two transfer pumps (TLP-PMP-00005A/B)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The two SBS condensate feed pumps (TLP-PMP-00005A/B), located in the adjacent accessible room P-0110D, are used to transfer waste feed to the treated LAW evaporator separator (TLP-SEP-00001).

The tanks and process piping have all welded construction and are made of 6% molybdenum alloy (UNS N08367/N08926) to ensure containment of the tank contents for a 40-year life.

#### 4.7.1.1 Design Standards

The LAW SBS concentrate receipt vessels (TLP-VSL-00009A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The LAW SBS concentrate receipt vessels have ASME flanged and dished heads with an approximate 26-ft inside diameter and a 27-ft, 4-inch tangent to tangent length. The tank thicknesses are 1.000-inch (shell and heads). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the required 0.024-inch corrosion allowance and 0.016-inch erosion allowance), plus additional 0.056-inch localized protection required for bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The LAW SBS concentrate receipt vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using TLP-PMP-00005A/B and routed to a glovebox. The sampling device is located outside the cell in a shielded but accessible location.

Piping in the transfer line that conveys dangerous waste from the LAW vitrification facility to the TLP tanks is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer

line is encased with an outer carbon steel pipe that drains to an LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00014).

#### 4.7.1.2 Characteristics of the Waste

The LAW SBS concentrate receipt vessels receive SBS condensate from the LAW vitrification facility. SBS condensate has a pH of 6.8 to 9.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-TLP-P0001).

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the TLP. Assessment for these tanks located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the LAW SBS concentrate receipt vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.7.2 Treated LAW Evaporator Separator Vessel (TLP-SEP-00001)

The treated LAW evaporator separator vessel (TLP-SEP-00001) associated with this system is a miscellaneous unit located in the treated LAW evaporator black cell (P-0117), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

TLP ancillary equipment associated with the treated LAW evaporator separator includes two pumps (TLP-PMP-00011A/B). The treated LAW evaporator separator receives the cesium-depleted treated LAW from the cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C) and SBS condensate from the LAW SBS condensate receipt vessels (TLP-VSL-00009A/B). The separator operates under vacuum. The concentrated LAW accumulated in the bottom of the separator is transferred to the treated LAW concentrate storage vessel (TCP-VSL-00001) using the treated LAW evaporator concentrate pumps (TLP-PMP-00011A/B). Water vapor and gases pass through demister pads near the top of the separator, and de-entrained vapor and non-condensable gases then pass to the treated LAW evaporator separator condensers (TLP-COND-00001 through TLP-COND-00003).

The evaporator separator has all welded construction and is made of stainless steel 304L (UNS S30403)) to ensure containment of the waste for a 40-year life.

#### 4.7.2.1 Design Standards

The treated LAW evaporator separator vessel (TLP-SEP-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The treated LAW evaporator separator is vendor designed with nominal dimensions of 7-ft, 6-inch upper internal diameter, 11-ft, 5-inch lower internal diameter, and 9-ft overall height. A nominal 0.500-inch shell thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.7.2.2 Characteristics of the Waste

The treated LAW evaporator separator condenses cesium depleted filtered LAW from the cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C) and SBS condensate from the LAW SBS concentrate receipt vessels (TLP-VSL-00009A/B) to produce the concentrated treated LAW that is transferred to the LAW vitrification facility.

The concentrated treated LAW is approximately 57.9 wt% water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of approximately 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-TLP-P0005).

The materials of construction for the treated LAW evaporator separator are compatible with the wastes managed in the TLP. Assessment for this miscellaneous unit located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this unit is provided in Table 7. For the purpose of scheduling periodic assessments, the treated LAW evaporator separator is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the separator.

### 4.7.3 Treated LAW Evaporator Reboiler (TLP-RBLR-00001)

The treated LAW evaporator reboiler (TLP-RBLR-00001) associated with this system is a miscellaneous unit located in the hot cell area (P-0123), which is equipped with a stainless steel liner and three sumps with sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The treated LAW evaporator reboiler is part of an evaporator train that concentrates waste to provide optimum conditions for waste processing prior to the transfer to the treated LAW concentrate receipt vessel (TCP-VSL-00001) and subsequent delivery to the LAW vitrification facility. The treated LAW evaporator reboiler is equipped with an external recirculation pump (TLP-PMP-00001).

The tube-and-shell reboiler and process piping have all welded construction; the tube side of the unit is made of Hastelloy G-30 Alloy (N06030) or equivalent and the shell side is made of stainless steel 304L (UNS S30403) to ensure containment of the contents for a 40-year life.

#### 4.7.3.1 Design Standards

The treated LAW evaporator reboiler (TLP-RBLR-00001) is a tube-and-shell heat exchanger. The unit is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The evaporator reboiler is a vendor package with dimensions determined by the vendor. Thickness includes the minimum 0.040-inch standard corrosion allowance, which is adequate for the

0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this unit. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.7.3.2 Characteristics of the Waste

The contents of the treated LAW evaporator reboiler are treated LAW concentrate from the LAW pretreatment process. The reboiler receives cesium depleted filtered LAW from the cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C), SBS condensate from the LAW SBS concentrate receipt vessels (TLP-VSL-00009A/B), and increasingly concentrated treated LAW that is recirculated from the treated LAW evaporator separator (TLP-SEP-00001).

The cesium depleted filtered LAW is approximately 73.4 wt% water, 26.6 wt% dissolved solids, and 0 wt% solids with a pH of 14.0 (24590-WTP-M4C-V11T-00010). SBS condensate has a pH of 14.4. The concentrated treated LAW to be transferred to the LAW vitrification facility's LAW concentrate receipt vessels (LCP-VSL-00001 and LCP-VSL-00002) is approximately 57.9 wt% water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of 14.0 (24590-WTP-M4C-V11T-00010).

The materials of construction for the treated LAW evaporator reboiler are compatible with the wastes managed in the TLP. Assessment for this miscellaneous unit located in the central hot cell is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this unit is provided in Table 7. For the purpose of scheduling periodic assessments, the treated LAW evaporator reboiler is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the reboiler.

### 4.7.4 Treated LAW Evaporator Primary Condenser (TLP-COND-00001), Intercondenser (TLP-COND-00002), and Aftercondenser (TLP-COND-00003)

The treated LAW evaporator primary condenser (TLP-COND-00001), intercondenser (TLP-COND-00002), and aftercondenser (TLP-COND-00003) associated with this system are miscellaneous units located at 56-ft elevation level in the treated LAW condenser area (P-0325), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

TLP ancillary equipment associated with the treated LAW evaporator condensers includes two ejectors (TLP-EJCTR-00064 and TLP-EJCTR-00067).

The treated LAW evaporator condensers are part of an evaporator train that removes excess water from the cesium-depleted treated LAW sent to the treated LAW evaporator separator vessel from the cesium IX columns. De-entrained water vapor and gases enter the treated LAW evaporator primary condenser (TLP-COND-00001), where condensable vapors are removed by condensation. Two ejectors generate the vacuum requirements that enable boiling. The first ejector (TLP-EJCTR-00064) discharges steam and noncondensable gases to the treated LAW evaporator intercondenser (TLP-COND-00002) to condense steam from the ejector. The second ejector (TLP-EJCTR-00067) draws noncondensable gases from the intercondenser and discharges steam and noncondensable gases to the aftercondenser (TLP-COND-

00003) to condense the ejector steam. The condensate from each of the condensers is discharged to the treated LAW evaporator condensate vessel (TLP-VSL-00002).

The condensers and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the contents for a 40-year life.

#### 4.7.4.1 Design Standards

The treated LAW evaporator primary condenser (TLP-COND-00001), intercondenser (TLP-COND-00002), and aftercondenser (TLP-COND-00003) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The treated LAW evaporator condensers are vendor designed with nominal dimensions for the primary condenser comprising a 4-ft, 2-inch inside diameter and a 23-ft length. Shell thickness includes the minimum 0.040-inch standard corrosion allowance, which is approximately 40% greater than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for these units. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.7.4.2 Characteristics of the Waste

The treated LAW evaporator condensers receive water vapor and gases (24590-PTF-3YD-TLP-00001). The materials of construction for these units are compatible with the waste managed. The schedule for conducting periodic assessments of these units is provided in Table 7. For the purpose of scheduling periodic assessments, these units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the units.

### 4.7.5 Treated LAW Evaporator Condensate Vessel (TLP-VSL-00002)

The treated LAW evaporator condensate vessel (TLP-VSL-00002) associated with this system is located in the alkaline effluent collection area (P-0118), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the volume of the largest tank in the room plus 20 minutes of fire water sprinkler discharge Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

TLP ancillary equipment associated with the treated LAW evaporator condensate vessel includes two pumps (TLP-PMP-00002A/B). The treated LAW evaporator condensate vessel receives condensate from the treated LAW evaporator condensers and treated LAW evaporator separator demister by gravity drain, which is then transferred to the process condensate tanks (RLD-TK-00006A/B) using the treated LAW evaporator condensate pumps (TLP-PMP-00002A/B). A remote sampling point for this tank is located on the discharge side of the condensate pumps. The maximum capacity of the tank is 2,300 gallons.

The tank and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the contents for a 40-year life.

#### 4.7.5.1 Design Standards

The treated LAW evaporator condensate vessel (TLP-VSL-00002) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The treated LAW evaporator condensate vessel has ASME flanged and dished heads with a 6-ft approximate inside diameter and a 11-ft tangent to tangent length. The tank thicknesses are 0.250 in (shell and heads). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

To monitor process operating conditions, tank contents are pumped from the tank using TLP-PMP-00002A/B and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location.

#### 4.7.5.2 Characteristics of the Waste

The treated LAW evaporator condensate vessel receives condensed water vapor (24590-PTF-3YD-TLP-00001). The materials of construction for this tank are compatible with the waste managed. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.8 Treated LAW Concentrate Storage Process System

The TCP is designed to provide storage capacity for treated LAW concentrate, and then transfer treated LAW concentrate from the PTF to the LAW vitrification facility. The TCP is housed on the 0-ft elevation level primarily in black cell P-0117A in the eastern portion of the PTF building. Valves and transfer and return pumps are located in an adjacent accessible area.

### 4.8.1 Treated LAW Concentrate Storage Vessel (TCP-VSL-00001)

The treated LAW concentrate storage vessel (TCP-VSL-00001) associated with this system is located in the treated LAW concentrate storage black cell (P-0117A), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The treated LAW concentrate storage vessel receives up to 7 days of lag storage for treated LAW concentrate from the TLP evaporator (TLP-SEP-00001). The treated LAW concentrate storage vessel is equipped with remote sampling capability. The maximum capacity of the tank is 146,740 gallons.

TCP ancillary equipment associated with the treated LAW concentrate storage vessel includes the following:

- eight PJMs (TCP-PJM-00001 through TCP-PJM-00008)
- eight jet pump pairs (TCP-EJCTR-00002 through TCP-EJCTR-00009)
- two transfer pumps (TCP-PMP-00001A/B)

The PJMs are used to mix, suspend solids, and maintain a homogeneous mixture for sampling and transfer. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The two transfer pumps are located in an adjacent C3 room (room P-0116) and are used to transfer treated LAW to the LAW vitrification facility.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the treated LAW for a 40-year life.

#### 4.8.1.1 Design Standards

The treated LAW concentrate storage vessel (TCP-VSL-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The treated LAW concentrate storage vessel has ASME flanged and dished heads with an approximate 26-ft, 6-inch inside diameter and a 30-ft, 2-inch tangent to tangent length. The tank thicknesses are 1-inch (shell), and 1-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the 0.024-inch corrosion allowance and 0.016-inch erosion allowance required for this tank), plus additional 0.164-inch localized protection required for bottom head to accommodate PJM discharge velocities. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The treated LAW concentrate storage vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using TCP-PMP-00001A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

Piping in the transfer lines that convey treated LAW from the storage vessel to the LAW vitrification facility is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to an LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00016 through PWD-LDB-00018).

#### 4.8.1.2 Characteristics of the Waste

The contents of the treated LAW concentrate storage vessel are treated LAW concentrate from the LAW pretreatment process. The concentrated treated LAW to be transferred to the LAW vitrification facility LAW concentrate receipt vessels (LCP-VSL-00001 and LCP-VSL-00002) is approximately 57.9 wt%

water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of approximately 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-TCP-P0001).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the TCP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the treated LAW concentrate storage vessel is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.8.2 TCP Bulge (TCP-BULGE-00004)

The valve bulge associated with the TCP (TCP-BULGE-00004) is located on the 0-ft elevation level, adjacent to the treated LAW concentrate storage black cell, in room P-0116. The valve bulge for the TCP provides secondary containment away from the black cells and hot cell, where the control valves and valve actuators are accessible for maintenance. Room P-0116 has a radiological area classification of R3/C3 (Table 6).

The bulge and manual valves are made of stainless steel 316L (UNS S31603) to ensure containment of the treated LAW concentrate and treated solids for a 40-year life.

#### 4.8.2.1 Design Standards

The TCP bulge design follows the standard bulge design used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-T0001, *Engineering Specification for Process Bulge Design and Fabrication*. Bulge confinement is designed to meet the requirements of ANSI/AISC N690-94, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities. The associated TCP process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.8.2.2 Characteristics of the Waste

The TCP bulge (TCP-BULGE-00004) transfers treated LAW, treated solids, waste feed, and process condensate. The treated LAW concentrate is approximately 57.9 wt% water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of 14.0; treated solids are approximately 20.0 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for the bulge are compatible with the waste managed in the TCP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the TCP bulge is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulge.

## 4.9 Spent Resin Collection and Dewatering Process System

The RDP supports the CXP by removing spent IX resin from the IX columns. The RDP is the point of verification that spent IX resin meets waste acceptance criteria and can be transferred out of the PTF for disposal as solid radioactive waste. The RDP also includes the process for dewatering the resin. The

RDP is housed on the 0-ft elevation level primarily in black cell P-0112 in the western portion of the PTF building and accessible cell P-0119 in the eastern portion of the PTF building. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

### 4.9.1 Spent Resin Slurry Vessels (RDP-VSL-00002A/B/C)

The spent resin slurry vessels (RDP-VSL-00002A/B/C) associated with this system are located in the resin disposal/CNP evaporator black cell (P-0112), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The spent resin slurry vessels serve as both the source of transport liquid and the receipt vessels for spent resin slurry and are used to collect and transfer a batch of spent resin every week. The spent resin slurry vessels are equipped with remote sampling capability. The maximum capacity of each tank is 15,230 gallons.

RDP ancillary equipment associated with the spent resin slurry vessels includes the following:

- four PJMs for each tank (RDP-PJM-00001 through RDP-PJM-00004; RDP-PJM-00005 through RDP-PJM-00008; RDP-PJM-00009 through RDP-PJM-00012)
- four jet pump pairs for each tank (RDP-EJCTR-00001 through RPD-EJCTR-00004; RDP-EJCTR-00005 through RDP-EJCTR-00008; RDP-EJCTR-00009 through RDP-EJCTR-00012)
- two transfer pumps (RDP-PMP-00008A/B)

The PJMs are used to mix, suspend solids, and maintain a homogeneous mixture for sampling and transfer. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The two spent resin slurry pumps are located in the adjacent hot cell area (room P-0123) and are used to transfer liquid and slurry to and from the spent resin slurry vessels.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

#### 4.9.1.1 Design Standards

The spent resin slurry vessels (RDP-VSL-00002A/B/C) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. Each spent resin slurry vessel has ASME 2:1 elliptical heads with an approximate 12-ft inside diameter and a 14-ft tangent to tangent length. The tank thicknesses are 0.750-inch (shell) and 0.625-inch minimum heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the 0.024-inch corrosion allowance and 0.016-inch erosion allowance required for this tank), plus additional 0.060-inch localized protection required for bottom head to accommodate PJM discharge velocities. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The spent resin slurry vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using RDP-PMP-00008A/B and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location.

#### 4.9.1.2 Characteristics of the Waste

Contents of the spent resin slurry vessels consist of spent resin from the cesium IX columns plus transport fluid, and have a pH of 1 (24590-PTF-N1D-RDP-P0001). During normal operations, the tanks contain approximately 8% volume/volume solids. The solids content is greater during the first few minutes of displacement when the incoming slurry line is over 50% volume/volume solids.

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the RDP. Assessment for these tanks that are located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the spent resin slurry vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.9.2 Spent Resin Dewatering Moisture Separation Vessel (RDP-VSL-00004)

The spent resin dewatering moisture separation vessel (RDP-VSL-00004) associated with this system is located in the spent resin dewatering equipment room (P-0119), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to a height to contain the volume of the tank plus 20 minutes of fire water sprinkler discharge, and forms part of the secondary containment for the tank. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5/R3/C3 and is accessible during the 40-year life of the facility (Table 6). Room P-0119 is normally maintained as an R3/C3 area except when dewatering operations are being performed, at which time the room is designated as R5/C5.

The spent resin dewatering moisture separation vessel is part of a vendor dewatering package provided to reduce the water content of the spent resin to below transportation and disposal limits within the specified processing time. This tank and ancillary equipment are mounted on the spent resin dewatering skid (RDP-SKID-00001). The maximum capacity of the tank is 101 gallons.

RDP ancillary equipment associated with the spent resin dewatering moisture separation vessel includes the following:

- spent resin dewatering container pump (RDP-PMP-00011)
- spent resin dewatering blower (RDP-BLWR-00001)

- spent resin dewatering prefilters (RDP-FILT-00001A/B)
- spent resin dewatering coalescing filters (RDP-FILT-00002A/B)
- spent resin dewatering fill head (RDP-SP-00001)
- spent resin dewatering sample cylinder (RDP-SMPLR-00001)

The tank and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

#### 4.9.2.1 Design Standards

The spent resin dewatering moisture separation vessel (RDP-VSL-00004) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The spent resin dewatering moisture separation vessel is vendor designed with an approximate2-ft inside diameter and 5-ft total length. The tank thickness are 0.250-inch minimum (shell), 0.500-inch minimum (top head), and 0.625-inch minimum (bottom head). Thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.9.2.2 Characteristics of the Waste

Contents of the spent resin dewatering moisture separation vessel consist of spent resin from the cesium IX columns plus transport fluid, and have a pH of 1 (24590-PTF-N1D-RDP-P0002) . During normal operations, the tank contains approximately 8% volume/volume solids.

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the RDP. The schedule for conducting periodic assessments of this tank is provided in Table 7. This tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank. However, for purposes of integrity assessment, this tank is used as a surrogate for inaccessible equipment in the PTF or HLW vitrification facility. Therefore, the frequency of the integrity assessment of this tank is accelerated to be consistent with the frequency for tanks with higher potential for corrosion and erosion.

### 4.10 Pretreatment Vessel Vent Process System and Process Vessel Vent System

The PVP consists of the forced and passive purge air supply to the pretreatment process tanks, vent exhaust collection header, and the process treatment for removal of soluble nitrogen oxide compounds (NOx) and acid gases, solid particulates, liquid droplets, and mists from the vent gases. The PVP controls the hydrogen concentration below the lower flammability limit, and also provides oxidation and removal of volatile organic compounds (VOCs) present in the exhaust gases. The vessel vent exhaust fans in the PVV control and maintain the suction pressure inside the various process tanks in the pretreatment area. The PVP and PVV are primarily housed on the 56-ft elevation level in the filter cave (P-0335) or in accessible areas on the 56-ft and 77-ft elevation levels. Some equipment is located on the 0-ft elevation level in black cells (P-0102A and P-0104).

The PVV provides the containment and confinement of sources of contamination inside the process tanks. The system consists of heating, ventilation and air conditioning (HVAC) equipment, controls,

instrumentation, piping and accessories to support the removal of vent exhausts from various process tanks by the PVP.

### 4.10.1 Caustic Scrubber (PVP-SCB-00002)

The caustic scrubber (PVP-SCB-00002) associated with this system is a miscellaneous unit located in the ultrafiltration black cell (P-0104), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The caustic scrubber (PVP-SCB-00002) receives offgas from the vessel vent header and provides confinement of the exhaust gases, absorbs soluble NOx and acid gases, and removes large solid particulates from the exhaust gases. The scrubber includes a demister that provides for condensation of excess water vapor from the vent exhaust gases. The vessel vent scrubber recirculation pumps (PVP-PMP-00001A/B) supply the scrubbing liquid solution to the top of the packed bed section of the scrubber (routed through the vessel vent scrubbing liquid cooler PVP-HX-00002) and supply part of the solution directly to the bottom of the tank to provide adequate mixing.

The caustic scrubber is fabricated from stainless steel 316L (UNS S31603) with the column packing and demister packing made from 6% molybdenum alloy (UNS N08367).

#### 4.10.1.1 Design Standards

The caustic scrubber (PVP-SCB-00002) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The caustic scrubber housing has the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance and a 0.004-inch erosion allowance required for the caustic scrubber housing. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.10.1.2 Characteristics of the Waste

The inlet offgas is approximately 0.1 wt% water, 99.9 wt% gases (primarily air with small amounts of NOx and acid gases), and less than 1 wt% solids (24590-WTP-M4C-V11T-00010, 24590-PTF-3YD-PVP-00001).

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PVP. Assessment for this miscellaneous unit that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the caustic scrubber is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the caustic scrubber.

### 4.10.2 Scrubbing Liquid Cooler (PVP-HX-00002)

The scrubbing liquid cooler (PVP-HX-00002) associated with this system is a miscellaneous unit located in a process (bulge) area (P-0302), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

The scrubbing liquid cooler removes heat of reaction and condensation from the exhaust gases by chilled water circulation. The vessel vent scrubber recirculation pumps (PVP-PMP-00001A/B) circulate the scrubbing liquid from the scrubber through the cooler and returns the solution to the top of the packed bed section of the scrubber.

The scrubbing liquid cooler and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the contents for a 40-year life.

#### 4.10.2.1 Design Standards

The scrubbing liquid cooler (PVP-HX-00002) is a plate and frame heat exchanger. The unit is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The scrubbing liquid cooler is a vendor package with dimensions determined by the vendor. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.10.2.2 Characteristics of the Waste

The scrubbing liquid cooler receives the caustic scrubbing liquid (5 molar sodium hydroxide) with entrained gases (primarily NOx and acid gases) and less than 1 wt% solids (24590-WTP-M4C-V11T-00010, 24590-PTF-3YD-PVP-00001).

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PVP. The schedule for conducting periodic assessments of this unit is provided in Table 7. For the purpose of scheduling periodic assessments, the scrubbing liquid cooler is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in this miscellaneous unit.

### 4.10.3 HEME Filters (PVP-HEME-00001A/B/C)

The HEME filters (PVP-HEME-00001A/B/C) associated with this system are miscellaneous units located in the filter cave (P-0335). The filter cave has miscellaneous units contained within separate concrete bermed areas lined with stainless steel. For the bermed areas, the floor slopes to openings on the south side of the bermed area, which allows leaks to flow to black cells P-0102 and P-0102A. (Floor drains cited in the DWP have been removed from the design.). Each drain is equipped with leak detection instrumentation. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The HEME filters receive the combined vessel vent exhaust stream flow from the caustic scrubber (PVP-SCB-00002) and are used to remove fine aerosols and particulates. Remote change out capability for the filter cartridges from the HEMEs is provided.

The HEME housing and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste stream for a 40-year life.

#### 4.10.3.1 Design Standards

The HEME filters (PVP-HEME-00001A/B/C) are housed in tanks fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and code-stamped. The HEME vessels have ASME flanged and dished heads with an approximate 5-ft, 6-inch inside diameter and a 12-ft, 6-inch tangent to tangent length. The housing vessel thicknesses are 0.625-inch (shell) and 0.500-inch minimum heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.10.3.2 Characteristics of the Waste

The HEME filters receive caustic scrubber offgas is approximately 0.2 wt% water, 99.9 wt% gases (primarily NOx and hydroxide ion) and less than 1 wt% solids (24590-WTP-M4C-V11T-00010, 24590-PTF-3YD-PVP-00001).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PVP. Assessment for these miscellaneous units located in the filter cave is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEME filters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 4.10.4 Vessel Ventilation HEME Drain Collection Vessel (PVP-VSL-00001)

The vessel ventilation HEME drain collection vessel (PVP-VSL-00001) associated with this system is located in the HLW receipt and blending black cell (P-0102A), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The vessel ventilation HEME drain collection vessel receives the effluent from the HEME filters. The HEME drain transfer pumps (PVP-PMP-00002A/B) are used for recirculation and for transfer of the HEME drain effluent to the plant wash vessel (PWD-VSL-00044). The maximum capacity of the tank is 1,969 gallons.

The vessel ventilation HEME drain collection vessel and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the effluent for a 40-year life.

#### 4.10.4.1 Design Standards

The vessel ventilation HEME drain collection vessel (PVP-VSL-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The HEME drain collection vessel has ASME 2:1 semi-elliptical heads with an approximate 6-ft inside diameter and a 7-ft, 4-inch tangent to tangent length. The tank thicknesses are 0.500-inch minimum shell and heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.10.4.2 Characteristics of the Waste

The vessel ventilation HEME drain collection vessel receives demineralized water with entrained particulates washed from the HEME filters. Contents of the tank are approximately 100 wt% water with less than 1 wt% solids, and have a pH of 10 to 11 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-PVP-P0002).

The materials of construction for this tank are compatible with the waste managed in the PVP. Assessment for this tank located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the vessel ventilation HEME drain collection vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.10.5 Primary and Secondary HEPA Filters (PVV-HEPA-00001A/B and PVV-HEPA-00002A/B)

The PVV primary HEPA filters (PVV-HEPA-00001A/B) associated with this system are miscellaneous units located in the filter cave (P-0335). The HEPA filters, which are dry off-gas equipment and are not required to have secondary containment, sit on concrete. However, the filter cave has other miscellaneous units contained within separate concrete bermed areas lined with stainless steel. For the bermed areas, the floor slopes to openings on the south side of the bermed area, which allows leaks to flow to black cells P-0102 and P-0102A. (Floor drains cited in the DWP have been removed from the design.) Room P-0335 has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The PVV secondary HEPA filters (PVV-HEPA-00002A/B) associated with this system are miscellaneous units located in the HEPA filter room (P-0324) adjacent to the filter cave. This room is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. Room P-0324 has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

The HEPA filters receive the vessel vent stream from the vessel vent caustic scrubber (PVP-SCB-00002) following removal of aerosols and particulates by the HEME filters (PVP-HEME-00001A/B/C). The gas passes through HEPA filter housings forming two trains: a main train (PVV-HEPA-00001A and PVV-HEPA-00002A) used in normal operations and an auxiliary train (PVV-HEPA-00001B and PVV-HEPA-00002B) used as an installed back-up. The HEPA filter housings in each train are arranged to form primary and secondary stages of filtration.

The HEPA filters housing and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste stream for a 40-year life.

#### 4.10.5.1 Design Standards

The HEPA filters are a vendor package. The primary and secondary HEPA filters are radial flow-type and are installed in the vertical position in specially designed housings. The primary HEPA filter housings are designed for remote maintenance. The secondary HEPA filters are in manual safe-change housings. The housings are in designed accordance with ASME AG-1.

#### 4.10.5.2 Characteristics of the Waste

The HEPA filters receive outlet vapors from the HEME filters that are approximately 22.8 wt% water, 77.2 wt% gases (primarily nitrogen [$N_2$], oxygen [$O_2$], and carbon dioxide [$CO_2$]), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PVV/PVP. Assessment for the primary HEPA filters located in the filter cave is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The secondary HEPA filters are accessible. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEPA filter units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 4.10.6 VOC Oxidizer Unit (PVP-OXID-00001)

The VOC oxidizer unit (PVP-OXID-00001) associated with this system is a miscellaneous unit located in the PVP thermal oxidizer room (P-0326) adjacent to the filter cave. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; this room has an SPC, but no DWP-regulated floor drains. Room P-0326 has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The VOC oxidizer unit is an electrically-heated, regenerative thermal oxidizer that is part of the VOC abatement process, which removes vapor phase organic compounds from the PVP vent gas. The abatement process takes place within an oxidation system (PVP-OXID-00001 and PVP-CLR-00001) followed by an adsorption system (PVP-ABS-00001A/B and PVP-FILT-00001).

The VOC oxidizer unit housing and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the vent gas for a 40-year life.

#### 4.10.6.1 Design Standards

The VOC oxidizer unit (PVP-OXID-00001) is a custom-built vendor package. The housing for the VOC oxidizer unit has a minimum 0.375-inch thickness, which includes a 0.0625-inch corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.10.6.2 Characteristics of the Waste

The VOC oxidizer unit receives filtered vent gas from the HEPA filters that is approximately 95.1 wt% water vapor, 4.9 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PVV/PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the VOC oxidizer unit is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in this miscellaneous unit.

### 4.10.7 After Cooler (PVP-CLR-00001)

The after cooler (PVP-CLR-00001) associated with this system is a miscellaneous unit located in the PVP thermal oxidizer room (P-0326) adjacent to the filter cave. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; this room has an SPC, but no DWP-regulated floor drains. This room has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The after cooler is a finned-tube heat exchanger that is part of the VOC abatement process, which removes vapor phase organic compounds from the PVP vent gas. The abatement process takes place within an oxidation system (PVP-OXID-00001 and PVP-CLR-00001) followed by an adsorption system (PVP-ABS-00001A/B and PVP-FILT-00001).

The tube-and-shell after cooler and process piping have all welded construction; the shell is made of stainless steel 304L (UNS S30403) to ensure containment of the vent gas for a 40-year life. The tubes are made of stainless steel 316L (UNS S31603).

#### 4.10.7.1 Design Standards

The after cooler (PVP-CLR-00001) is a tube-and-shell heat exchanger. The unit is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The after cooler is a vendor package with dimensions determined by the vendor. Thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.10.7.2 Characteristics of the Waste

The after cooler receives filtered vent gas from the oxidizer unit that is approximately 95.1 wt% water vapor, 4.9 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PVV/PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the after cooler is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in this miscellaneous unit.

### 4.10.8 Carbon Bed Adsorbers (PVP-ADBR-00001A/B)

The carbon bed adsorbers (PVP-ADBR-00001A/B) associated with this system are miscellaneous units located in the carbon bed adsorber room (P-0328) adjacent to the filter cave. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; this room has an SPC, but no drains. This room has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The carbon bed adsorbers are part of the VOC abatement process, which removes vapor phase organic compounds from the PVP vent gas. The abatement process takes place within an oxidation system (PVP-OXID-00001 and PVP-CLR-00001) followed by an adsorption system (PVP-ABS-00001A/B and PVP-FILT-00001). The carbon bed adsorbers operate as a polishing step for abatement of organic compounds downstream of the thermal oxidizer and after cooler.

The carbon bed adsorbers housing and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the vent gas for a 40-year life.

#### 4.10.8.1 Design Standards

The carbon bed adsorbers (PVP-ADBR-00001A/B) are housed in tanks fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, but are not code-stamped. The carbon bed adsorber vessels have the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.10.8.2 Characteristics of the Waste

The carbon bed adsorbers receive filtered vent gas from the after cooler that is approximately 95.1 wt% water vapor, 4.9 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PVV/PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the carbon bed adsorbers are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 4.10.9 Adsorber Outlet Filter (PVP-FILT-00001)

The adsorber outlet filter (PVP-FILT-00001) associated with this system is a miscellaneous unit located in the carbon bed adsorber room (P-0328) adjacent to the filter cave. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; this room has an SPC, but no drains. This room has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The adsorber outlet filter is a medium efficiency filter that is part of the VOC abatement process, which removes vapor phase organic compounds from the PVP vent gas. The abatement process takes place within an oxidation system (PVP-OXID-00001 and PVP-CLR-00001) followed by an adsorption system (PVP-ABS-00001A/B and PVP-FILT-00001). In order to prevent carbon fines (dust) emissions to the exhaust fans and PVV stack, a dust filter (PVP-FILT-00001) is provided downstream of the vessel vent carbon bed adsorbers.

The adsorber outlet filter housing and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the vent gas for a 40-year life.

#### 4.10.9.1 Design Standards

The adsorber outlet filter (PVP-FILT-00001) is housed in a vessel fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The adsorber outlet filter vessel has the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.10.9.2 Characteristics of the Waste

The adsorber outlet filter receives filtered vent gas from the carbon bed absorbers that is approximately 95.1 wt% water vapor, 4.9 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PVV/PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the adsorber outlet filter is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in this miscellaneous unit.

### 4.10.10 PVV Exhaust Fans (PVV-FAN-00001A/B)

The PVV exhaust fans (PVV-FAN-00001A/B) associated with this system are miscellaneous units located in the PJV fan room (P-0433), which is equipped with an SPC. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; there are no drains. This room has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The PVV exhaust fans are located downstream of the VOC abatement equipment in the PVP to draw treated exhausts through the HEPA filters and the components of the PVP.

The PVV exhaust fans are made of stainless steel and have some components with a 10-year life.

#### 4.10.10.1 Design Standards

The PVV exhaust fans (PVV-FAN-00001A/B) are a vendor package and are designed in accordance with ASME AG-1.

#### 4.10.10.2 Characteristics of the Waste

The PVV exhaust fans receive filtered vent gas from the VOC abatement process or directly from the PVV HEPA filters that is approximately 95.1 wt% water vapor, 4.9 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PVV/PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the PVV exhaust fans are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 4.10.11 PVP Bulges (PVP-BULGE-00001, PVP-BULGE-00002, PVP-BULGE-00014, PVP-BULGE-00019, PVP-BULGE-00020, and PVP-BULGE-00021)

The two valve bulges associated with the PVP (PVP-BULGE-00001 and PVP-BULGE-00002) are located on the 0-ft elevation level, adjacent to black cells, in rooms P-0105 and P-0101A. Each room is equipped with an SPC and floor drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. The SPC covers the room floor and perimeter curbing. The valve bulges for the PVP provide secondary containment away from the black cells and hot cell, where the control valves and valve actuators are accessible for maintenance. Rooms P-0105 and P-0101A have a radiological area classification of R3/C3 (Table 6).

A vessel vent heat exchanger bulge associated with the PVP (PVP-BULGE-00014) is located on the 56-ft elevation level in room P-0302, which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. The vessel vent heat exchanger bulge provides secondary containment away from the filter cave, where the control valves and valve actuators are accessible for maintenance. Room P-0302 has a radiological area classification of R3/C3 (Table 6).

Three high point vent bulges associated with the PVP (PVP-BULGE-00019 through PVP-BULGE-00021) plus two high point vent bulges associated with the demineralized water system (DIW) (DIW-BULGE-00001 and DIW-BULGE-00002) are located on the 56-ft elevation level in rooms P-0303B, P-0303C, P-0320, or the 77-ft elevation level in room P-0430. These bulges provide hydrogen mitigation in the PTF. The rooms on the 56-ft elevation level have a radiological area classification of R3/C3. Room P-0430 has a radiological area classification of R2/C3.

The bulges and manual valves are made of stainless steel 316L (UNS S31603) to ensure containment of the wastes for a 40-year life.

#### 4.10.11.1 Design Standards

The PVP bulge design follows the standard bulge design used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-T0001, *Engineering Specification for Process Bulge Design and Fabrication*. Bulge confinement is designed to meet the requirements of ANSI/AISC N690-94, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities (PVP-BULGE-00001, PVP-BULGE-00002, PVP-BULGE-00019, PVP-BULGE-00020, and PVP-BULGE-00021) or AISC M016-89, Manual of Steel Construction (PVP-BULGE-00014). The associated PVP process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.10.11.2 Characteristics of the Waste

The PVP caustic scrubber transfer pump bulge (PVP-BULGE-00001) houses the scrubber recirculation pumps (PVP-PMP-00001A/B) and transfers scrubber effluent from the PVP caustic scrubber (PVP-SCB-00002) to the plant wash vessel (PWD-VSL-00044). The HEME drain vessel pump bulge (PVP-BULGE-00002) houses the HEME drain transfer pumps and transfers radioactive condensate to the plant wash vessel (PWD-VSL-00044). The vessel vent heat exchanger bulge (PVP-BULGE-00014) houses the scrubbing liquid cooler (PVP-HX-00002).

The materials of construction for pump and heat exchanger bulges are compatible with the waste managed in the PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the PVP bulges are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulges. The high point vent hydrogen mitigation bulges (PVP-BULGE-00019 through PVP-BULGE-00021, and DIW-BULGE-00001 and DIW-BULGE-00002) will undergo periodic assessment in the same manner as for PVP pump and heat exchanger bulges.

### 4.11 Pulse Jet Ventilation System

The PJV provides the containment and confinement of vent exhausts from various RFDs and PJMs operating inside the PTF process tanks. The system consists of process treatment and HVAC equipment, controls, instrumentation, piping, and accessories for the exhausts from RFD and PJMs operating inside various process tanks in the PTF. The PJV is housed on the 56-ft elevation level in the filter cave (P-0335) or in accessible areas on the 56-ft and 77-ft elevation levels. Note that tank PJV-VSL-00002 listed in the DWP, which was to have been located in a black cell (P-0102), has been eliminated from the PTF design. The two associated PJV drain transfer pumps (PJV-PMP-00001A/B) and the PJV drain pump bulge (PJV-BULGE-00001) have also been eliminated from the PTF design.

#### 4.11.1 PJV Demisters (PJV-DMST-00002A/B/C)

The PJV demisters (PJV-DMST-00002A/B/C) associated with this system are miscellaneous units located in the filter cave (P-0335). The filter cave has miscellaneous units contained within separate concrete bermed areas lined with stainless steel. For the bermed areas, the floor slopes to openings on the south side of the bermed area, which allows leaks to flow to black cells P-0102 and P-0102A. (Floor drains cited in the DWP have been removed from the design.) This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a

maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The demisters receive exhaust from the RFD/PJV inlet header and sub-headers and are used to remove fine aerosols and mist. They are passive devices with low maintenance requirements and high reliability.

The PJV demisters and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the exhaust for a 40-year life.

#### 4.11.1.1 Design Standards

The PJV demisters (PJV-DMST-00002A/B/C) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The demisters have ASME flanged and dished heads with an approximate 8-ft inside diameter and a 12-ft, 6-inch tangent to tangent length. The housing vessel thicknesses are 0.750-inch (shell) and 0.500-inch minimum heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.11.1.2 Characteristics of the Waste

The PJV demisters receive PJV exhaust vapor that is approximately 99.9 wt% water vapor and 0.1 wt% gases (primarily $N_2$, $O_2$, and $CO_2$) (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PJV exhaust system. Assessment for the PJV demisters located in the filter cave is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the PJV demisters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 4.11.2 PJV Primary and Secondary Exhaust HEPA Filters (PJV-HEPA-00001A/B/C/D/E/F/G and PJV-HEPA-00002A/B/C/D/E/F)

The PJV primary exhaust HEPA filters (PJV-HEPA-00001A/B/C/D/E/F/G) associated with this system are miscellaneous units located in the filter cave (P-0335). The HEPA filters, which are dry off-gas equipment and are not required to have secondary containment, sit on concrete. However, the filter cave has other miscellaneous units contained within separate concrete bermed areas lined with stainless steel. For the bermed areas, the floor slopes to openings on the south side of the bermed area, which allows leaks to flow to black cells P-0102 and P-0102A. (Floor drains cited in the DWP have been removed from the design.) Room P-0335 has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6). The PJV secondary exhaust HEPA filters (PJV-HEPA-00002A/B/C/D/E/F) associated with this system are miscellaneous units located in the PJV secondary HEPA filter room (P-0431A), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 77-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20

minutes of fire water sprinkler discharge. Room P-0431A has a radiological area classification of R2/C3 and is accessible during the 40-year life of the facility (Table 6).

Following removal of aerosols by the PJV demisters (PJV-DMST-00002A/B/C), the HEPA filters receive the PJV exhaust that has been mixed with a predetermined amount of pre-filtered and heated air from a C3 area in order to reduce the relative humidity of the combined exhaust stream to 70%. There are seven primary filter housings, arranged in parallel, configured in a running/standby arrangement to allow on-line filter change. The gas passes through HEPA filter housings forming two trains: a main train (PJV-HEPA-00001A/B/C/D/E and PJV-HEPA-00002A/B/C/D) used in normal operations and an auxiliary train (PJV-HEPA-00001F/G and PJV-HEPA-00002E/F) used as an installed back-up. Exhaust gases from the primary exhaust HEPA filter housings are routed to the outlet header then to the secondary exhaust HEPA filters, PJV-HEPA-00002A through F, located in a C3 ventilation area. The HEPA filter housings in each train are arranged to form primary and secondary stages of filtration.

The HEPA filter housings and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste stream for a 40-year life.

#### 4.11.2.1 Design Standards

The PJV HEPA filters are a vendor package. The both the primary and secondary HEPA filters are radial flow-type and are installed in the vertical position in specially designed housings. The primary HEPA filter housings are designed for remote maintenance. The secondary HEPA filters are in manual safe-change housings. The housings are in designed accordance with ASME AG-1.

#### 4.11.2.2 Characteristics of the Waste

The PJV exhaust HEPA filters receive PJV exhaust vapor from the PJV demisters, which is approximately 100 wt% water vapor (24590-WTP-M4C-V11T-00010) , and which is mixed with a predetermined amount of pre-filtered and heated air from a C3 area in order to reduce the relative humidity of the combined exhaust stream to 70% prior to entering the filters (24590-PTF-3YD-PJV-00001).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PJV exhaust system. Assessment for the PJV primary HEPA filters located in the filter cave is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The secondary HEPA filters are in an accessible room. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the PJV HEPA filters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, and nature of the exhaust managed in these miscellaneous units.

### 4.11.3 PJV Exhaust Fans (PJV-FAN-00001A/B/C)

The PJV exhaust fans (PJV-FAN-00001A/B/C) associated with this system are miscellaneous units located in the PJV fan room (P-0433), which is equipped with an SPC. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; there are no drains. This room has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The PJV exhaust fans are located downstream of the PJV HEPA filters to draw treated exhausts through the HEPA filters and the components of the PJV.

The PJV exhaust fans are made of stainless steel and have some components with a 10-year life.

#### 4.11.3.1 Design Standards

The PJV exhaust fans (PJV-FAN-00001A/B/C) are a vendor package and are designed in accordance with ASME AG-1.

#### 4.11.3.2 Characteristics of the Waste

The PJV exhaust fans receive filtered PJV exhaust vapor that is approximately 100 wt% water vapor (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PJV exhaust system. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the PJV exhaust fans are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, and nature of the exhaust managed in these miscellaneous units.

### 4.12 Pretreatment In-Cell Handling System

The PIH comprises all handling equipment that is necessary for the maintenance of the central hot cell. The primary functions of the PIH are to transport items between the process area hot cell (room P-0123) and remote decontamination maintenance cave (RDMC) (room P-0123A), to perform any remote maintenance, and to prepare failed equipment for disposal or repair. The PIH is located on the 0-ft elevation level.

#### 4.12.1 Decontamination Soak Tank (PIH-TK-00001)

The decontamination soak tank (PIH-TK-00001) associated with this system is located in the RDMC (P-0123A), which is equipped with a stainless steel liner, two sumps, and two sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to a height of 18 feet (for PIH spray decontamination operations), which is more than adequate to contain the volume of the tank in the event of flooding, and forms part of the secondary containment for the tank. Sumps and sump ejectors are part of the PWD. This room has a radiological classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to the RDMC, or recovered remotely by external means to the RDMC during the 40-year life of the facility (Table 6).

The decontamination soak tank (PIH-TK-00001) is used to immerse equipment in a non-combustible decontamination solution before being shipped out in waste drums for disposal or before direct hands-on maintenance is allowed.

The decontamination soak tank and process piping have all welded construction and are made from stainless steel 316L (UNS S31603) to ensure a 40-year life.

#### 4.12.1.1 Design Standards

The decontamination soak tank (PIH-TK-00001) is a commercial grade tank fabricated in accordance with American Petroleum Institute (API) 650 Appendix J (shop built tanks) and Appendix S (material properties and modified equations for the analysis of stainless steel tanks). The tank has an 8-ft diameter with an overall 4-ft, 7-inch height. Tank walls have a minimum 0.500-inch thickness. Corrosion allowance is the minimum 0.040-inch standard; there is no erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.12.1.2 Characteristics of the Waste

The contents of the decontamination soak tank are primarily demineralized water and nitric acid spray (nominal 0.5 molar nitric acid). Contents may have a pH of less than 7.0 under routine operating conditions (24590-PTF-N1D-PIH-P0001).

The materials of construction for this tank are compatible with the waste managed in the PIH. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the decontamination soak tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste.

### 4.13 Plant Wash and Disposal System

The PWD receives effluent for storage, neutralization, and transfer to evaporation systems. The effluent includes plant wash from pretreatment process tanks and sumps, acidic and alkaline effluent generated during pretreatment operations, and solids wash permeate from ultrafiltration. The PWD also receives plant wash from the HLW and LAW vitrification facilities, HLW SBS condensate vessels, as well as wastes from the analytical laboratory. The PWD is located primarily on the 0-ft elevation level in hot cells (P-0104 and P-0109) or on the -19-ft and -45-ft elevation levels.

### 4.13.1 Acidic/Alkaline Effluent Vessels (PWD-VSL-00015 and PWD-VSL-00016) and Breakpots (PWD-BRKPT-00015 and PWD-BRKPT-00016)

The two acidic/alkaline effluent vessels (PWD-VSL-00015 and PWD-VSL-00016) associated with this system are located in the acidic/alkaline effluent collection black cell (P-0109), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6). Acidic and alkaline effluent is received, stored, and neutralized in acidic/alkaline effluent vessels (PWD-VSL-00015 and PWD-VSL-00016) prior to transfer. Neutralized high-activity effluent is transferred to the feed preparation vessels (FEP-VSL-00017A/B) and neutralized low-activity effluent is transferred to the plant wash vessel (PWD-VSL-00044). This transfer is only done should these tanks need to be cleaned out. The only way to make this transfer is by installing a steam ejector that is normally not installed. Each acidic/alkaline effluent vessel is equipped with remote sampling capability. The maximum capacity of each tank is 119,150 gallons.

PWD ancillary equipment associated with the acidic/alkaline effluent vessels includes the following:

- two breakpots (PWD-BRKPT-00015 and PWD-BRKPT-00016), each with a total volume of 288 gallons
- six charge vessels for each tank (PWD-VSL-00101 through PWD-VSL-00106; PWD-VSL-00111 through PWD-VSL-00116)
- eight PJMs for each tank (PWD-PJM-00001 through PWD-PJM-00008; PWD-PJM-00011 through PWD-PJM-00018)
- eight jet pump pairs for each tank (PWD-EJCTR-00001 through PWD-EJCTR-00008; PWD-EJCTR-00011 through PWD-EJCTR-00015, PWD-EJCTR-00017, PWD-EJCTR-00018, and PWD-EJCTR-00151)
- six RFD ejectors for each tank (PWD-EJCTR-00101 through PWD-EJCTR-00106; PWD-EJCTR-00111 through PWD-EJCTR-00116)
- six RFDs for each tank (PWD-RFD-00101 through PWD-RFD-00106; PWD-RFD-00111 through PWD-RFD-00116)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer neutralized effluent to the FEP feed preparation vessels (FEP-VSL-00017A/B) or the ASX. Each RFD is connected to an ejector located outside the tank. Vessel-emptying ejectors, located external to the tank, are used to empty the tanks and to transfer low-activity effluent to the plant wash vessel.

The breakpots, located at the 56-ft elevation level in black cell P-0109, receive acid/caustic effluent from the treated ultrafiltration feed vessels (UFP-VSL-00002A/B), which drains by gravity to the PWD acidic/alkaline effluent vessels.

The tanks, breakpots, and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

#### 4.13.1.1 Design Standards

The acidic/alkaline effluent vessels (PWD-VSL-00015 and PWD-VSL-00016) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The acidic/alkaline effluent vessels have ASME 2:1 elliptical heads with an approximate 22-ft inside diameter and a 34-ft, 7-inch tangent to tangent length. The tank thicknesses are 1-inch minimum shell and heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the 0.024-inch corrosion allowance and 0.016-inch erosion allowance required for these tanks), plus additional localized protection required for bottom head to accommodate PJM discharge required for these tanks. The additional protection for PWD-VSL-00015 is a 0.093-inch erosion allowance, and additional protection for PWD-VSL-00016 is a 0.077-inch erosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The acidic/alkaline effluent vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tanks using the transfer ejectors and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location.

#### 4.13.1.2 Characteristics of the Waste

The acidic/alkaline effluent vessels receive and neutralize effluent streams from the UFP, CXP, and CNP. Contents are approximately 70 to 100 wt% water and up to 30 wt% dissolved solids with pH ranging from 0.3 to 14 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-PWD-P0003).

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the PWD. Assessment for these tanks that are located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the acidic/alkaline effluent vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.13.2 Plant Wash Vessel (PWD-VSL-00044) and Breakpots (PWD-BRKPT-00007 through 00010, PWD-BRKPT-00017, and PWD-BRKPT-00019)

The plant wash vessel (PWD-VSL-00044) associated with this system is located in the ultrafiltration black cell (P-0104), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The plant wash vessel receives rinsed or flushed dilute high-activity plant wash and recycles including PTF HEME drains, demister drains, spent scrubber solution from the PVP, contaminated effluent from the LAW vitrification facility, laboratory drains and flushes, and waste from the HLW vitrification facility via PWD-VSL-00043. During non-routine operations, the plant wash vessel may also receive plant washings from tank internals and from cell exterior surfaces. The plant wash vessel is sized to receive washes from the largest potential wash and still be able to handle routine transfers from other sources. The plant wash vessel is equipped with remote sampling capability. The maximum capacity of the tank is 103,024 gallons.

PWD ancillary equipment associated with the plant wash vessel includes the following:

- six breakpots (PWD-BRKPT-00007 through 00010, PWD-BRKPT-00017, and PWD-BRKPT-00019), each with a total volume of 175 gallons
- six charge vessels (PWD-VSL-00121 through 00126)
- eight PJMs (PWD-PJM-00021 through 00028)
- eight jet pump pairs (PWD-EJCTR-00021 through 00028)
- six RFDs (PWD-RFD-00121 through 00126)
- six RFD ejectors (PWD-EJCTR-00121 through 00126)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer samples to the ASX or to transfer effluent to the waste feed preparation vessels (FEP-VSL-00017A/B). Each RFD is connected to an ejector located outside the tank. A vessel-emptying ejector, installed from the UFP end, is used to empty the tank and to transfer low-activity effluent to acidic/alkaline effluent vessel (PWD-VSL-00016). This vessel-emptying ejector is normally not installed and is used only when PWD-VSL-00044 needs to be cleaned out.

During non-routine operations, the plant wash vessel receives plant washes by gravity drain via breakpots. Two breakpots (PWD-BRKPT-00007 and PWD-BRKPT-00019) are located at the56-ft elevation level in black cell P-0113. Four breakpots (PWD-BRKPT-00008 through 00010 and PWD-BRKPT-00017) are located at the 28-ft elevation level in black cell P-0104.

The tank, breakpots, and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

### 4.13.2.1 Design Standards

The plant wash vessel is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The tank has ASME 2:1 semi-elliptical heads with an approximate 23-ft inside diameter and a 26-ft, 6-inch tangent to tangent length. The tank thicknesses are 0.875-inch shell and heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the required 0.024-inch corrosion allowance and 0.016-inch erosion allowance), plus additional 0.067-inch localized protection required for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The plant wash vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles

Piping in the transfer lines that convey dangerous waste from the LAW and HLW vitrification facilities to the plant wash vessel is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to a LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00013 and PWD-LDB-00019).

#### 4.13.2.2 Characteristics of the Waste

The plant wash vessel receives plant wash that is typically 100 wt% water, with a pH of 10 to 11 (24590-PTF-N1D-PWD-P0001). However, this tank is also designed to receive material from PWD-VSL-00033, which can have a pH from 0.2 to 14, and material from all of the hot cell/black cell sumps.

The materials of construction for this tank are compatible with the waste managed. Assessment for this tank located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.13.3 Ultimate Overflow Vessel (PWD-VSL-00033)

The ultimate overflow vessel (PWD-VSL-00033) associated with this system is located in the overflow vessel pit (P-B003), which is equipped with a stainless steel liner, a sump, and two sump ejectors. Room P-B003, along with room P-B002, is located in the -45-ft elevation pit. The two rooms are connected by a 3-ft wide by 8-ft, 6-inch high opening and share a sump and sump ejectors. The stainless steel liner, which forms part of the secondary containment for the tank, covers the room floor and the perimeter walls up to the maximum height to contain the highest liquid level (-23-feet elevation) resulting from flooding due to failure of the largest tank in the black cell and hot cell containment area. In addition, the stainless steel liner extends upward an additional 2 feet to accommodate secondary containment of the piping tunnels (rooms P-B001 and P-B004) that are connected to the -45-ft elevation pit at the -21-ft elevation level. Room P-B003 has a radiological area classification of R5/C5 and is designed for limited remote access during the 40-year life of the facility (Table 6).

The ultimate overflow vessel receives and transfers routine effluent from other line drains and pit sump PWD-SUMP-00040. The ultimate overflow vessel also receives overflows from vessels throughout the PTF, which are non-routine activities. The maximum capacity of the tank is 41,650 gallons.

PWD ancillary equipment associated with the ultimate overflow vessel includes the following:

- two charge vessels (PWD-VSL-00131 through 00132)
- eight PJMs (PWD-PJM-00031 through 00038)
- eight jet pump pairs (PWD-EJCTR-00031 through 00038)
- two RFD ejectors (PWD-EJCTR-00131 through 00132)
- two RFDs (PWD-RFD-00131 through 00132)
- one vessel-emptying ejector (PWD-EJCTR-00120)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer the effluent from PWD-VSL-00033 to PWD-VSL-00044. A vessel-emptying ejector is used for non-routine transfers to the plant wash vessel (PWD-VSL-00044) via the breakpot drain header. Each RFD is connected to an ejector located outside the tank.

The contents of PWD-VSL-00033 cannot be sampled directly but can be sampled in PWD-VSL-00044, if needed, to verify the operating chemistry in PWD-VSL-00033. Collection of samples can be performed by lowering the PWD-VSL-00044 vessel level to the minimum operating volume, transferring the contents from PWD-VSL-00033 to PWD-VSL-00044, and then sampling the contents in PWD-VSL-0044.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste for a 40-year life.

### 4.13.3.1 Design Standards

The ultimate overflow vessel (PWD-VSL-00033) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The tank has ASME flanged and dished heads with an approximate 24-ft inside diameter and a 7-ft, 5-inch tangent to tangent length. The tank thicknesses are 1-inch shell and heads (top and bottom), with a 2-inch minimum ASME code straight flange (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the required 0.024-inch corrosion allowance and 0.016-inch erosion allowance), plus additional 0.083-inch localized protection required for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The ultimate overflow vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles
- level, density, and temperature instrumentation

Piping in the transfer lines that convey dangerous waste from the LAW and HLW vitrification facilities to the plant wash vessel is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to a LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00010 and PWD-LDB-00019).

### 4.13.3.2 Characteristics of the Waste

The ultimate overflow vessel receives numerous streams, mainly highly basic (pH of 13 to 14), with the exception of the RDP and CNP component streams which can be as low as pH of 0.2 (24590-PTF-3YD-PWD-00001).

The materials of construction for this tank are compatible with the waste managed. Assessment for this tank located in the -45-ft elevation pit is limited to remote monitoring and limited remote access for the 40-year life of the facility. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.13.4 HLW Effluent Transfer Vessel (PWD-VSL-00043)

The HLW effluent transfer vessel (PWD-VSL-00043) associated with this system is located in the HLW drain vessel pit (room P-B002), which is equipped with a stainless steel liner, a sump, and a sump ejector. Room P-B002, along with room P-B003, is located in the -45-ft elevation pit. The two rooms are connected by a 3-ft wide by 8-ft, 6-inches high opening and share a sump with two sump ejectors. The stainless steel liner, which forms part of the secondary containment for the tank, covers the room floor and the perimeter walls up to the maximum height to contain the highest liquid level (-23-feet elevation) resulting from flooding due to failure of the largest tank in the black cell and hot cell containment area. In addition, the stainless steel liner extends upward an additional 2 feet to accommodate secondary containment of the piping tunnels (rooms P-B001 and P-B004) that are connected to the -45-ft elevation pit at the -21-ft elevation level. This room has a radiological area classification of R5/C5 and is designed for limited remote access during the 40-year life of the facility (Table 6).

The HLW effluent transfer vessel receives and stores waste from the HLW vitrification facility, pit sump (PWD-SUMP-00040), and various line drains. The maximum capacity of the tank is 41,650 gallons.

PWD ancillary equipment associated with the HLW effluent transfer vessel includes the following:

- two charge vessels (PWD-VSL-00141 and PWD-VSL-00142)
- eight PJMs (PWD-PJM-00041 through 00048)
- eight jet pump pairs (PWD-EJCTR-00041 through 00048)
- two RFD ejectors (PWD-EJCTR-00141 and PWD-EJCTR-00142)
- two RFDs (PWD-RFD-00141 and PWD-RFD-00142)
- one vessel-emptying ejector (PWD-EJCTR-00119)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer the effluent from vessel PWD-VSL-00043 to PWD-VSL-00044. A vessel-emptying ejector is used for non-routine transfers to the plant wash vessel (PWD-VSL-00044) via the breakpot drain header. Each RFD is connected to an ejector located outside the tank. Vessel-emptying ejectors, located external to the tank, are used to empty the tanks and to transfer low-activity effluent to the plant wash vessel.

The contents of PWD-VSL-00043 cannot be sampled directly but can be sampled in PWD-VSL-00044, if needed, to verify the operating chemistry in PWD-VSL-00043. Collection of samples can be performed by lowering the PWD-VSL-00044 vessel level to the minimum operating volume, transferring the

contents from PWD-VSL-00043 to PWD-VSL-00044, and then sampling the contents in PWD-VSL-0044.

The tanks, seal pot, and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste for a 40-year life. Steam ejector/high temperature components, located inside the tank, are made of Alloy C-22 (UNS N06022).

### 4.13.4.1 Design Standards

The HLW effluent transfer vessel (PWD-VSL-00043) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The tank has ASME flanged and dished heads with an approximate 24-ft inside diameter and a 7-ft, 5-inch tangent to tangent length. The tank thicknesses are 1-inch shell and heads (top and bottom), with a 2-inch minimum ASME code straight flange (top and bottom). Thicknesses include the a non-standard 0.080-inch corrosion allowance, which is adequate for the required 0.024-inch corrosion allowance and 0.016-inch erosion allowance, and eliminates the need for additional localized protection for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The HLW effluent transfer vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles
- level, density, and temperature instrumentation

Piping in the transfer lines that convey dangerous waste from the LAW and HLW vitrification facilities to the plant wash vessel is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to a LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00008 through 00009, and PWD-LDB-00011).

### 4.13.4.2 Characteristics of the Waste

The HLW effluent transfer vessel receives HLW streams with a near neutral pH of 8 (24590-PTF-N1D-PWD-P0002.

The materials of construction for this tank are compatible with the waste managed. Assessment for this tank located in the -45-ft elevation pit is limited to remote monitoring and limited remote access for the 40-year life of the facility. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.13.5 C3 Floor Drain Collection Vessel (PWD-VSL-00046)

The C3 floor drain collection vessel (PWD-VSL-00046) associated with this system is located in the C2/C3 floor drain collection vessel room (P-B005), which is equipped with an SPC, a sump, and sump pump. The SPC covers the room floor and perimeter walls up to the maximum height to contain 30 minutes of fire water sprinkler discharge from the C2 and C3 areas of the PTF. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

The C3 floor drain collection vessel receives C3 area wastes, sample wastes, and transfer waste from PTF floor drains. Tank contents are typically transferred to RLD-VSL-00017A/B using the PWD transfer pumps (PWD-PMP-00024A/B). However, if sampling indicates that the material meets the balance of the facility non-radioactive liquid waste disposal acceptance criteria, contents are transferred to PWD-VSL-00045. The C3 floor drain collection vessel is equipped with remote sampling capability. The maximum capacity of the tank is 4,982 gallons.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the liquid waste for a 40-year life.

#### 4.13.5.1 Design Standards

The C3 floor drain collection vessel (PWD-VSL-00046) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The C3 floor drain collection vessel has ASME 2:1 semi-elliptical heads with an approximate 7-ft inside diameter and a 10-ft, 6-inch tangent to tangent length. The tank thicknesses are 0.4375-inch minimum shell and heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance plus 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 4.13.5.2 Characteristics of the Waste

The C3 floor drain collection vessel receives floor drain effluent that is typically 100 wt% water (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-PWD-P0006).

The materials of construction for this tank are compatible with the waste managed. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 4.13.6 Secondary Containment (PWD-SUMP-00001 through -00013, PWD-SUMP-00001A and -00002A, PWD-SUMP-00026, PWD-SUMP-00028, PW-SUMP-29, PWD-SUMP-00031 through -00036, PWD-SUMP-00040, and PWD-SUMP-00071)

The PTF tank systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The 56 tanks located inside the PTF building include 54 tanks in stainless steel-lined cells or rooms, and two tanks in rooms lined with an SPC; all of which are located on the 0-ft elevation level or below grade (-19-ft and -45-ft elevation levels). Each stainless steel-lined cell or room and one of the SPC-lined rooms includes one or more sumps embedded in the floor.

Sumps in the stainless steel-lined black cells on the 0-ft elevation level include:

- sumps PWD-SUMP-00001, PWD-SUMP-00001A, PWD-SUMP-00002, and PWD-SUMP-00002A in each of the feed receipt black cells (P-0108, P-0108A, P-0108B, and P-0108C)
- sump PWD-SUMP-00003 in the feed evaporator/ultrafiltration black cell (P-0106)
- sump PWD-SUMP-00004 in the ultrafiltration black cell (P-0104)
- sumps PWD-SUMP-00005 and PWD-SUMP-00006 in the HLW storage black cell (P-0102) and HLW receipt and blending black cell (P-0102A)
- sump PWD-SUMP-00007 in the acidic/alkaline effluent collection black cell (P-0109)
- sumps PWD-SUMP-00008 and PWD-SUMP-00009 in the cesium IX black cell (P-0111) and resin disposal/CNP evaporator process black cell (P-0112)
- sump PWD-SUMP-00010 in the reserved space black cell (P-0113) (although this room contains no tanks or miscellaneous units, it is part of the secondary containment for postulated flooding associated with tanks in adjoining black cells)
- sump PWD-SUMP-00011 in the treated LAW collection black cell (P-0114)
- sumps PWD-SUMP-00012 and PWD-SUMP-00013 in the treated LAW evaporator and concentrate storage black cells (P-0117 and P-0117A)

Sumps on the 0-ft elevation level in the remotely-accessible stainless steel-lined hot cell and RDMC include:

- sumps PWD-SUMP-00026, PWD-SUMP-00028, and PWD-SUMP-00029 in the hot cell (P-0123)
- sumps PWD-SUMP-00032 and PWD-SUMP-00033 in the RDMC (P-0123A).

Sumps on the 0-ft elevation level in accessible rooms with stainless steel liners include:

- sump PWD-SUMP-00031 in the spent resin dewatering equipment room (P-0119)
- sump PWD-SUMP-00036 in the alkaline effluent collection area (P-0118)

There are two additional sumps (PWD-SUMP-00034 and PWD-SUMP-00035) on the 0-ft elevation level in rooms (P-0121A and P-0122A) that do not contain DWP-regulated tanks or miscellaneous units.

Two sumps are located below grade:

- sump PWD-SUMP-00040 serves two connected stainless steel-lined rooms (P-B002 and P-B003) in the HLW drain/overflow vessel pit at the -45-ft elevation level
- sump PWD-SUMP-00071 is located at the -19-ft elevation level in the C2/C3 floor drain collection vessel room (P-B005), which has an SPC

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary. Secondary containment in the PTF black cells and hot cell area located on the 0-ft elevation level is designed with hydraulic connections. The purpose of these connections is to allow large amounts of fluid

to move from the black cells into the hot cell and subsequently drain into the below grade HLW effluent transfer vessel (PWD-VSL-00043) and the ultimate overflow vessel (PWD-VSL-00033) in the -45-ft elevation pit. The size of the postulated flood is defined as the total volume (capacity of the shell and both heads) of the largest vessel in the containment area. If a large volume leak were to occur, the spill will spread into each room of the black cell containment areas before eventually spreading into the hot cell.

Cell-to-cell hydraulic connections in the PTF have been placed to create the following three black cell containment areas:

- the cells containing the FRP vessels: P-0108, P-0108A, P-0108B, and P-0108C
- the cells on the south side of the hot cell: P-0102, P-0102A, P-0104, and P-0106
- the cells on the north side of the hot cell: P-0109, P-0111, P-0112, P-0113, P-0114, P-0117, and P-0117A.

With a few exceptions, all of the sumps are located in rooms that have a radiological area classification of R5/C5 (Table 6) with either no cell access or limited remote access during normal operations. The exceptions are the accessible rooms P-0119, P-0121A, and P-0122A that have a radiological classification of R5/C5/R3/C3 and P-0118 and P-B005 that have a radiological area classification of R3/C3 (Table 6).

The 24 sumps on the 0-ft elevation level are provided with radar-type liquid level detection and an ejector that discharges liquid from the sump to the plant wash vessel (PWD-VSL-00044). The sump at the -19-ft elevation level is provided with radar-type liquid level detection and an ejector that discharges liquid from the sump to the floor drain collection vessel (PWD-VSL-00045). The sump at the -45-ft elevation level is provided with a bubbler-type level detection and two ejectors that transfer the sump contents to the ultimate overflow vessel (PWD-VSL-00033) and the HLW effluent transfer vessel (PWD-VSL-00043).

The 19 sumps in the black cells and rooms P-0118, P-0119, P-0121A, and P-0122A are fabricated from stainless steel 304L (UNS S30404) and the 5 sumps in the hot cell and RDMC are fabricated from stainless steel 316L (UNS S31603) to ensure containment of any liquid waste for a 40-year life. The sump in the -45-ft elevation pit is fabricated from 6% molybdenum alloy (UNS N08367). The sump in the C2/C3 floor drain collection vessel room (P-B005) has an SPC.

### 4.13.6.1 Design Standards

The 26 PWD sumps in the PTF are dry sumps. All stainless steel sumps are fabricated in accordance with design methodology specified in American National Standards Institute/American Institute for Steel Construction Inc. (ANSI/AISC) N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The 24 sumps on the 0-ft elevation level are 30 inches in diameter by 28 inches deep, and the C2/C3 floor drains collection vessel room sump is 30 inches in diameter by 18 inches deep. The sump in the -45-ft elevation pit is rectangular with dimensions of 60 inches long by 30 inches wide by 30 inches deep.

### 4.13.6.2 Characteristics of the Waste

During normal operations, the PTF sumps are dry. The sumps, in combination with the stainless steel or SPC liners, provide secondary containment for wastes from the following DWP-regulated tanks and miscellaneous units, and drains:

- waste feed receipt vessels FRP-VSL-00002A/B/C/D (PWD-SUMP-00001, PWD-SUMP-00001A, PWD-SUMP-00002, PWD-SUMP-00002A)
- waste feed evaporator feed vessels FEP-VSL-00017A/B and separators FEP-SEP-00001A/B; and ultrafiltration feed preparation vessel UFP-VSL-00001A and permeate vessels UFP-VSL-00062A/B (PWD-SUMP-00003)
- ultrafiltration feed preparation vessel UFP-VSL-00001B, feed vessels UFP-VSL-00002A/B, and permeate vessel UFP-VSL-00062C; caustic scrubber PVP-SCB-00002; and plant wash vessel PWD-VSL-00044 (PWD-SUMP-00004)
- HLW feed receipt vessel HLP-VSL-00022 and feed blending vessel HLP-VSL-00028; and HEME drain collection vessel PVP-VSL-00001 (PWD-SUMP-00005)
- HLW lag storage vessels HLP-VSL-00027A/B (PWD-SUMP-00006)
- acidic/alkaline effluent vessels PWD-VSL-00015 and PWD-VSL-00016 (PWD-SUMP-00007)
- cesium IX feed vessel CXP-VSL-00001, reagent vessel CXP-VSL-00005, and caustic rinse collection vessel CXP-VSL-00004; and eluate contingency vessel CNP-VSL-00003 (PWD-SUMP-00008)
- cesium evaporator eluant lute pot CNP-VSL-00001, separator CNP-EVAP-00001, and recovered nitric acid vessel CNP-VSL-00004; and spent resin slurry vessels RDP-VSL-00002A/B/C (PWD-SUMP-00009)
- cesium IX treated LAW vessels CXP-VSL-00026A/B/C (PWD-SUMP-00011)
- LAW SBS condensate receipt vessel TLP-VSL-00009A and evaporator separator vessel TLP-SEP-00001 (PWD-SUMP-00012)
- LAW SBS condensate receipt vessel TLP-VSL-00009B and concentrate storage vessel TCP-VSL-00001 (PWD-SUMP-00013)
- waste feed evaporator reboilers FEP-RBLR-00001A/B; ultrafilters UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, and UFP-FILT-00005A/B; cesium IX columns CXP-IXC-00001 through CXP-IXC-00004; cesium evaporator concentrate reboiler CXP-HX-00001; treated LAW evaporator reboilers (PWD-SUMP-00026, PWD-SUMP-00028, and PWD-SUMP-00029)
- spent resin dewatering moisture separation vessel RDP-VSL-00004 (PWD-SUMP-00031)
- decontamination soak tank PIH-TK-00001 (PWD-SUMP-00032 and PWD-SUMP-00033)
- treated LAW evaporator condensate vessel TLP-VSL-00002 and RLD-VSL-00017A/B (PWD-SUMP-00036)
- ultimate overflow vessel PWD-VSL-00033 and HLW effluent transfer vessel PWD-VSL-00043 (PWD-SUMP-00040)
- C3 floor drain collection vessel PWD-VSL-00046 (PWD-SUMP-00071)

Previous sections describe the materials managed in the tanks, miscellaneous units, and associated piping. The materials of construction for secondary containment system are compatible with the waste managed

in the PTF. Assessment for sumps located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. Assessment for sumps located in hot cells is limited to remote monitoring with remote maintenance and decontamination planned for the 40-year life of the facility. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each cell or room is considered to have the same potential for corrosion and erosion as the tank or miscellaneous unit that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same cell or room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

For the purposes of integrity assessment, sump PWD-SUMP-00036 is used as a surrogate for inaccessible sumps in the PTF. Therefore, the frequency of the integrity assessment of this sump is accelerated to be consistent with the frequency for sumps with higher potential for corrosion and erosion (Table 7).

## 4.14 Radioactive Liquid Waste System

The PTF RLD receives evaporator overhead condensate for recycle as process condensate and LAW caustic scrubber waste for transfer to the LERF/ETF or back to evaporation depending on sample analysis. Excess process condensate is also transferred to the LERF/ETF. The RLD is located on the 0-ft elevation level in accessible rooms and in the P-0150 area located outside of the PTF building.

### 4.14.1 Alkaline Effluent Vessels (RLD-VSL-00017A/B)

The alkaline effluent vessels (RLD-VSL-00017A/B) associated with this system are located in the alkaline effluent collection area (P-0118), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

The alkaline effluent vessels receive, store, and discharge low-activity alkaline and other suspect activity effluent generated within the PTF and receive caustic scrub solution from the LAW vitrification facility. Each alkaline effluent vessel is equipped with remote sampling capability. The maximum capacity of each tank is 34,340 gallons.

RLD ancillary equipment associated with the alkaline effluent vessels includes the following:

- one jet mixer for each tank (RLD-MXR-00001; RLD-MXR-00002)
- two transfer pumps (RLD-PMP-00005A/B)

The jet mixers are used to mix, suspend solids, and maintain a homogeneous mixture for sampling and transfer. The two alkaline effluent pumps are located in room P-0118 and are used to provide recirculation to the jet mixers and to transfer tank contents.

The tanks and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste feed for a 40-year life.

#### 4.14.1.1 Design Standards

The alkaline effluent vessels (RLD-VSL-00017A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The alkaline effluent vessels have ASME 2:1 semi-elliptical heads (top and bottom) with an approximate 16-ft inside diameter and a 17-ft, 6-inch tangent to tangent length. The tank thicknesses are 1-inch (shell) and 1-inch minimum head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The alkaline effluent vessels include the following tank internals, which are of a standard design with no moving parts:

- jet mixers
- vessel spray nozzles

To monitor for compliance with LERF/ETF acceptance criteria, tank contents are pumped from the tank using the alkaline effluent pumps (RLD-PMP-00005A/B) and routed to a sampler.

Piping in the transfer lines that convey dangerous waste from the LAW vitrification facility to the alkaline effluent vessels is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to a LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00012 and PWD-LDB-00015).

#### 4.14.1.2 Characteristics of the Waste

The alkaline effluent vessels receive condensate/effluent that is 100 wt% water, with a pH approximately 13.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-RLD-P0002).

The materials of construction for these tanks are compatible with the waste managed. The schedule for conducting periodic assessments of these tanks is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.14.2 Process Condensate Tanks (RLD-TK-00006A/B)

The process condensate tanks (RLD-TK-00006A/B) associated with this system are located outside of the PTF building in the diked concrete RLD containment area (P-0150), which is equipped with an SPC, a sump, and a sump pump. The SPC covers the floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of one tank plus the maximum rainfall for a 24-hour period, and forms part of the secondary containment for the tanks. This area does not have a radiological area classification and is accessible during the 40-year life of the facility (Table 6).

The process condensate tanks receive, sample, and discharge low-activity condensate/effluent. Each process condensate tank is equipped with remote sampling capability. The maximum capacity of each tank is 394,000 gallons.

RLD ancillary equipment associated with the process condensate tanks includes the following:

- one jet mixer for each tank (RLD-MXR-00003 and RLD-MXR-00004)
- six pumps (RLD-PMP-00011A/B, RLD-PMP-00012A/B, and RLD-PMP-00014A/B)

The jet mixers are used to mix, suspend solids, and maintain a homogeneous mixture for sampling and transfer. The six pumps are located inside the diked P-0150 area. The two process condensate transfer pumps (RLD-PMP-00011A/B) are used to transfer off-spec effluent to TLP-VSL-00009A/B. The two process condensate recirculation pumps (RLD-PMP-00012A/B) are used to provide recirculation to the jet mixers. The two process condensate distribution pumps (RLD-PMP-00014A/B) are used to transfer tank contents for reuse in the PTF.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the condensate/effluent for a 40-year life.

### 4.14.2.1 Design Standards

The process condensate tanks (RLD-TK-00006A/B) are commercial grade tanks fabricated in accordance with the API construction standards API 650 Appendix J (shop built tanks) and Appendix S (material properties and modified equations for the analysis of stainless steel tanks). The process condensate tanks have an approximate 42-ft inside diameter and an overall 33-ft, 4-inch height. The tank thicknesses are 0.250-inch (first course shell, roof, and floor) and 0.1875-inch minimum (second course shell). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The process condensate tanks include the following tank internals, which are of a standard design with no moving parts:

- jet mixers
- vessel spray nozzles

To monitor for compliance with LERF/ETF acceptance criteria, tank contents are pumped from the tank using the process condensate transfer pumps (RLD-PMP-00011A/B) and routed to a manual sampler.

Piping in the transfer lines to and from the tanks is double-walled. The material of construction for the pipes is stainless steel 316L (UNS S31603). The transfer lines are each encased with an outer carbon steel pipe that drains to a LDB (RLD-LDB-00012 and RLD-LDB-00013).

### 4.14.2.2 Characteristics of the Waste

The process condensate tanks receive condensate/effluent that is 100 wt% water, with a pH of approximately 11.0 to 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-RLD-00001).

The materials of construction for these tanks are compatible with the waste managed. The schedule for conducting periodic assessments of these tanks is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 4.14.3 Secondary Containment (RLD-SUMP-00003)

The PTF tank systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. As described above, two of the four tanks in the RLD system are located inside the PTF building in a stainless steel-lined room (P-0118) with two PWD sumps. The remaining two RLD tanks (RLD-TK-00006A/B) are located outside the PTF building in the concrete containment area (P-0150), which is equipped with a sump (RLD-SUMP-00003). The containment area (P-0150) has no radiological area classification (Table 6).

P-0150 does not have floor drains; in the event of flooding, liquid is removed from the containment area to the alkaline effluent vessels (RLD-VSL-00017A/B) in the PTF building.

The sump in the RLD containment area is provided with radar-type liquid level detection and a pump (RLD-PMP-00191) that discharges liquid (primarily rainfall and liquid from spray wash stations) from the sump to the alkaline effluent vessels (RLD-VSL-00017A/B). The sump is a depression at the low point of the containment area measuring 78 inches by 48 inches by 36 inches deep with an epoxy SPC to ensure containment of liquid waste for a 40-year life.

#### 4.14.3.1 Design Standards

The sump in containment area (P-0150) is a dry sump designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

#### 4.14.3.2 Characteristics of the Waste

During normal operations, the containment area sump (RLD-SUMP-00003) is dry. The sump, in combination with the SPC, provides secondary containment for wastes from RLD-TK-00006A/B and associated pumps and piping. These two tanks receive condensate/effluent that is 100 wt% water, with a pH of approximately 11.0 to 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-RLD-00001).

The materials of construction for secondary containment system are compatible with the waste managed in the PTF RLD containment area. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the system.

# 5 High-Level Waste Facility

This section provides detailed descriptions of the HLW vitrification facility DWP-regulated tank systems and miscellaneous unit systems. The tanks, miscellaneous units, breakpots, sumps, and piping associated with these systems are assessed periodically to confirm the integrity of their materials of construction. The WTP design incorporates the "black cell" and "hard-to-reach area" concept as a key part of the facility design for the PTF and HLW vitrification facility. For black cells, this entails locating certain equipment in shielded cells for which no maintenance or entry is planned for the 40-year design life of the plant. Hard-to-reach areas are designed for no equipment access and maintenance.

The systems in the HLW vitrification facility that contain DWP-regulated tanks and miscellaneous units are as follows:

- HLW melter feed process
- HLW melter process
- HLW melter offgas treatment process
- HLW melter cave support handling
- HLW canister decontamination handling
- pulse jet ventilation
- radioactive liquid waste disposal

For each tank, miscellaneous unit, breakpot, and sump in the HLW vitrification facility, information is provided on the location of the equipment, its purpose, and its design characteristics, including materials of construction and corrosion/erosion allowances. The design standards used for each item of equipment and the characteristics of the waste managed in each tank, miscellaneous unit, breakpot, sump, and associated piping are also provided. This information is the unit-specific baseline used to establish the approach and schedule for future integrity assessments for the HLW vitrification facility DWP-regulated equipment.

## 5.1 HLW Melter Feed Process System

The HFP prepares melter feed from pretreated waste and transfers it to the melters to produce a vitrified product. The process consists of mixing appropriate amounts of glass formers and additives (e.g., anti-foaming agents) with the pretreated radioactive feed concentrate and pumping the resulting slurry to two melters for vitrification.

The DWP-regulated plant items associated with the HFP are the MFPVs (HFP-VSL-00001 and HFP-VSL-00005) and MFVs (HFP-VSL-00002 and HFP-VSL-00006). Associated with Melter 1 are vessels HFP-VSL-00001 and HFP-VSL-00002, located in a melter cave (room H-0117) on the 0-ft elevation level. Associated with Melter 2 are vessels HFP-VSL-00005 and HFP-VSL-00006, located in the second melter cave (room H-0106) on the 0-ft elevation level.

### 5.1.1 Melter Feed Preparation Vessels (HFP-VSL-00001 and HFP-VSL-00005) and Melter Feed Vessels (HFP-VSL-00002 and HFP-VSL-00006)

The MFPV HFP-VSL-00001 and MFV HFP-VSL-00002 are located in melter cave room H-0117. Vessels HFP-VSL-00005 and HFP-VSL-00006 are located in melter cave room H-0106. Each room is equipped with a stainless steel liner, sump (HFP-SUMP-00002 or HFP-SUMP-00005), and sump ejector (RLD-EJCTR-00172 or RLD-EJCTR-00178). Both rooms have a radiological area classification of R5/C5 and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

In the MFPVs, HLW concentrate (e.g., solids from ultrafiltration, Sr/TRU precipitate, Cs concentrate, and future Cs/Sr capsule waste) and glass formers from a dedicated tank, GFR-TK-00025 or GFR-TK-00031 (the GFR tanks are not located inside the melter caves), are combined to produce the melter feed slurry. The blended melter feed slurry is batch-transferred to the MFVs, where it is continuously transferred to the melters. Each of the MFPVs and MFVs has a maximum capacity of 8,370 gallons. The MFPVs and MFVs are remotely replaceable.

Each of the MFPVs is equipped with the following:

- mechanical agitator (HFP-AGT-00001 or HFP-AGT-00004)
- air spargers for purging hydrogen from head space and for agitation
- anti-foaming agent addition capability
- two mechanical pumps to transfer waste to the MFVs and to the autosampler (HFP-PMP-00005A/B or HFP-PMP-00018A/B)
- demister on the vent line for de-entrainment (HFP-DMST-00001 or HFP-DMST-00003)
- instrumentation for level, density, and pressure measurements
- thermowell for temperature measurements
- cooling jacket to remove radioactive decay heat and heat dissipated from the agitator
- internal fixed nozzles for periodic wash-downs
- steam ejector (HFP-EJCTR-0001 or HFP-EJCTR-0005) for transfer to the plant wash and drains vessel (RLD-VSL-00008)
- overflow line to sump HFP-SUMP-00002 or HFP-SUMP-00005

Each of the MFVs is equipped with the following:

- mechanical agitator (HFP-AGT-00002 or HFP-AGT-00005)
- air spargers for purging hydrogen from head space and for agitation
- anti-foaming agent addition capability
- air displacement slurry (ADS) transfer pumps (HFP-PMP-00001/HFP-PMP-00002 or HFP-PMP-00014/ HFP-PMP-00015)
- demister on the vent line for de-entrainment (HFP-DMST-00002 or HFP-DMST-00004)
- instrumentation for level, density, and pressure measurements

- thermowell for temperature measurements
- cooling jacket to remove radioactive decay heat and heat dissipated from the agitator
- internal fixed nozzles for periodic wash-downs
- steam ejector (HFP-EJCTR-0002 or HFP-EJCTR-0004) for transfer to RLD-VSL-00008
- overflow line to sump HFP-SUMP-00002 or HFP-SUMP-00005
- sample pump (HFP-PMP-00007 or HFP-PMP-00017) to transfer waste to the autosampler

The MFPVs, MFVs, internal components, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

#### 5.1.1.1 Design Standards

The MFPVs and MFVs are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. These tanks have ASME flanged and dished heads (bottom head has a 77-inch-wide flat center section) with an approximate 11-ft inside diameter and a 9-ft, 6-inch tangent to tangent length. The tank shell and head thicknesses are 0.625 to 0.875-inch (shell), 0.875-inch minimum (top), and 0.750-inch minimum (bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance for the top, which is adequate for the corrosion allowance with no erosion allowance. However, due to possible high velocities near the agitators, a 0.125-inch allowance is required for the bottom and shell (including both corrosion and erosion allowances) for additional localized protection. The mechanical agitators, pumps, demisters, and steam ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.1.1.2 Characteristics of the Waste

The HLW concentrate is classified as Envelope D and can include supernate classified as Envelope A, B, or C (24590-WTP-DB-ENG-01-001). The contents of the MFPVs and MFVs are HLW concentrate and glass formers. The glass formers can include silica, boric acid, lithium carbonate, zinc oxide, borax, sodium carbonate, and sucrose (24590-WTP-PSAR-ESH-01-002-04).

The MFPVs receive and blend HLW concentrate and glass formers. The MFVs receive the blended melter feed from the MFPVs prior to delivery to the melters. The blended contents are approximately 76 wt% water and 24 wt% solids with a pH of approximately 13.0 (24590-HLW-M5-V17T-P0001, 24590-WTP-M4C-V11T-00010, 24590-HLW-N1D-HFP-P0003, 24590-HLW-N1D-HFP-P0004).

The materials of construction for the MFPVs, MFVs, and ancillary equipment are compatible with the waste managed in the HFP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 5.1.2 Secondary Containment (HFP-SUMP-00001, HFP-SUMP-00002, HFP-SUMP-00004, and HFP-SUMP-00005)

The HFP tank systems and HOP miscellaneous unit systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The HFP tanks

described above are located in stainless steel-lined rooms H-0106 and H-0117 with sumps HFP-SUMP-00002 and HFP-SUMP-00005 embedded in the floor. Two sumps (HFP-SUMP-00001 and HFP-SUMP-00004) are located in stainless steel-lined rooms H-0302 and H-0308 containing the HOP wet electrostatic precipitators (WESPs) (discussed in Section 5.3.4). All rooms have a radiological area classification of R5/C5 (Table 6).

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary. Sumps HFP-SUMP-00002 and HFP-SUMP-00005 are equipped with radar-type level detectors and have ejectors. Sumps HFP-SUMP-00001 and HFP-SUMP-00004 are gravity drain sumps without leak detection instrumentation; waste entering the sumps flows by gravity to the plant wash and drains vessel (RLD-VSL-00008), which has a radar level instrumentation. All sumps are fabricated with 6% molybdenum alloy (UNS N08367).

If the capacity of HFP-VSL-00001 or HFP-VSL-00002 in room H-0117 is exceeded, the excess overflows to sump HFP-SUMP-00002, which is located in the same room. Additionally, leaks from these tanks flow into the sump. An ejector (RLD-EJCTR-00172) transfers the sump contents to RLD-VSL-00008.

If the capacity of HFP-VSL-00005 or HFP-VSL-00006 in room H-0106 is exceeded, the excess overflows to sump HFP-SUMP-00005, which is located in the same room. Leaks from these tanks flow into the sump. An ejector (RLD-EJCTR-00178) transfers the sump contents to RLD-VSL-00008.

Sump HFP-SUMP-00001 is located in room H-0308 with miscellaneous unit WESP HOP-WESP-00001. Leaks from HOP-WESP-00001 flow into this sump. Additionally, if the capacity of the transfer manifold is exceeded, sump HFP-SUMP-0001 receives the overflow. The waste entering the sump flows by gravity to RLD-VSL-00008.

Sump HFP-SUMP-00004 is located in room H-0302 with HOP-WESP-00002. Leaks from HOP-WESP-00002 flow into this sump. Additionally, if the capacity of the transfer manifold is exceeded, sump HFP-SUMP-0004 receives the overflow. The waste entering the sump flows by gravity to RLD-VSL-00008.

#### 5.1.2.1 Design Standards

Sumps HFP-SUMP-00002 and HFP-SUMP-00005 are dry sumps, with dimensions of 31.5 inches in length by 25.5 inches in width by 16 inches in depth. Sumps HFP-SUMP-00001 and HFP-SUMP-00004 are gravity drain sumps, with dimensions of 30 inches in diameter by 18 inches deep. All sumps are fabricated in accordance with design methodology specified in ANSI/AISC N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

#### 5.1.2.2 Characteristics of the Waste

During normal operations, the sumps are dry. The sumps, in combination with the stainless steel-lined rooms, provide secondary containment for wastes from HFP tanks (HFP-VSL-00001, HFP-VSL-00002, HFP-VSL-00005, and HFP-VSL-00006) and from HOP miscellaneous unit WESPs (HOP-WESP-00001

and HOP-WESP-00002). Previous sections and Section 5.3.4 describe the materials managed in these tanks, miscellaneous units, and associated piping. The materials of construction for secondary containment system are compatible with the waste managed in the HFP and HOP.

The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each room is considered to have the same potential for corrosion and erosion as the tank or miscellaneous unit that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

## 5.2 HLW Melter Process System

The HMP is comprised of two melters, each with the same design. The melters are fed a blend of HLW concentrate and glass former additives from the MFVs. The melters convert the blended slurry into molten glass. The constituents of the HLW concentrate undergo chemical reactions, converting to their respective oxides, and dissolve in the molten glass. The molten glass is contained using heat-resistant ceramic refractory bricks. Cooling water panels are provided to cool glass within the refractory brick seams. The molten glass is poured into stainless steel canisters and allowed to cool, forming a highly durable borosilicate glass waste form. Immobilized high-level waste (IHLW) is the resulting product. The DWP-regulated plant items associated with the HMP are the melters (HMP-MLTR-00001 and HMP-MLTR-00002), which are considered miscellaneous units. These melters are located in the melter caves (rooms H-0117 and H-0106, respectively) on the 0-ft elevation level.

### 5.2.1 HLW Melters (HMP-MLTR-00001 and HMP-MLTR-00002)

Melters HMP-MLTR-00001 and HMP-MLTR-00002 are located in melter cave rooms H-0117 and H-0106, respectively. The area of each room containing a melter and its ancillary equipment is equipped with a stainless steel liner, sump (HSH-SUMP-00003 or HSH-SUMP-00007), and sump ejector (RLD-EJCTR-00171 or RLD-EJCTR-00179). Both rooms have a radiological area classification of R5/C5 and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

Each melter receives and vitrifies the blended feed slurry from one of the two MFVs at a nominal feed rate of 3 MTG/day and discharges molten glass. The overall size of each of the two identical melters consist of an approximate 14-ft length, 14-ft width, and 11-ft height with an estimated weight of 89 short tons (with glass, the estimated weight is 101 short tons).

Each melter has three internal compartments: the melt chamber and two discharge chambers. The melt chamber consists of a glass pool zone sometimes referred to as the glass tank, which is lined with refractory material designed to withstand corrosion from molten glass, and a head space called the plenum, which is lined with refractory material to withstand hot corrosive gases, thermal shock, and glass and feed splatter.

The glass pool and plenum of each melter are constructed with one of the following kinds of refractory bricks supplied by Monofrax: 30 wt% chrome oxide with 60 wt% alumina (Monofrax K-3), 80 wt%

chrome oxide (Monofrax E), and 93 wt% alumina (Monofrax H). The outer wall of the glass pool consists of alumina-zirconia-silica bonded brick.

#### 5.2.1.1 Design Standards

The confinement structures and components of the HLW melters are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII and ASME B31.3-96, Process Piping. The HLW melters are a slurry-fed, joule-heated design using Inconel 690 (UNS N06690) plate electrodes. These melters are remotely replaceable and have a minimum 5-year design life. In each melter, the walls of the glass pool are constructed in four layers, from interior to exterior:

1) glass contact refractory layer consisting of a 12-inch thick layer of Monofrax K-3
2) 5-inch thick layer of Monofrax E
3) first 3-inch thick layer of alumina-zirconia-silica bonded brick
4) second 3-inch thick layer of alumina-zirconia-silica bonded brick

The interior wall of the glass pool also contains alloy electrodes (Alloy 690, UNS N06690). The internal plenum wall refractory is a 9-inch layer of Monofrax H blocks that extend to the melter lid. The lid, which consists of three refractory layers, is part of the primary containment of the melter plenum gases and is based on previous successful designs of liquid-fed melters. Refractory corrosion rates are accounted for in the melter design.

Several replaceable melter service components (e.g., bubblers, level detectors, and thermowells) are mounted on the gas barrier lid and enter the melter by means of cylindrical ports through the shield lid. The ports of the gas barrier lid are lined with Alloy 690 sleeves.

#### 5.2.1.2 Characteristics of the Waste

The contents of the melters are the HLW concentrate and glass formers from the MFVs (24590-WTP-PSAR-ESH-01-002-04, 24590-HLW-3YD-HMP-00001).

The materials of construction for the miscellaneous units are compatible with the waste managed in the HMP. The melters are designed to be replaced every 5 years. The schedule for conducting periodic assessments of the melters is provided in Table 7.

### 5.3 HLW Melter Offgas Treatment Process System and Process Vessel Vent Exhaust System

The HOP is designed to control the melter pressure, cool the melter and PVV offgas, remove radioactive particulates, and treat gaseous chemicals to permit the release of the offgas to the environment. The HOP consists of film coolers, submerged bed scrubbers (SBSs), SBS condensate receiver vessels, WESPs, HEMEs, and HEPA filters. It also includes thermal catalytic oxidizers, selective catalytic reducers, silver mordenite columns, activated carbon adsorbers, booster fans, and stack extraction fans.
The melter-lid mounted film coolers reduce the temperature of the melter offgas before it enters the SBSs. In the SBSs, offgas is drawn through the submerged packed beds. The temperature of the offgas is further reduced, and larger particles, aerosols, and soluble constituents are removed inside the SBSs. The WESPs remove additional radioactive aerosols to extend the life of downstream equipment filter media.

Offgas from the PVV, which has no DWP-regulated tanks and miscellaneous units, enters the HOP between the WESPs and HEMEs. The HEMEs remove radioactive aerosols from the melter offgas and vessel vent offgas. Condensate from the SBSs and wash water from the WESPs and HEMEs are collected in tanks and recirculated through the SBSs or transferred to the RLD. The HEPA filters remove entrained particulates by forcing the offgas through two sets of filters. The offgas from the HEPA filters passes through thermal catalytic oxidizers and selective catalytic reducers to treat the VOCs and NOx. The offgas then passes through the silver mordenite columns to remove gaseous halides, particularly iodine-129. After it passes through these columns, the offgas is further treated by activated carbon adsorbers to remove volatile mercury. The booster extraction fans are used to provide motive force to move the offgas through the HOP. After the offgas passes through the HOP treatment processes, the stack extraction fans discharge the offgas to the atmosphere through the HLW vitrification facility's exhaust stack.

The DWP-regulated plant items associated with the HOP include the following:

- melter-lid mounted film coolers (HOP-FCLR-00001 through HOP-FCLR-00004) located in rooms H-0106 and H-0117 on the 0-ft elevation level
- SBSs (HOP-SCB-00001 and HOP-SCB-00002) located in rooms H-0106 and H-0117 on the 0-ft elevation level
- SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904) located in rooms H-B005 and H-B021 on the -21-ft elevation level
- WESPs (HOP-WESP-00001 and HOP-WESP-00002) located in rooms H-0302 and H-0308 on the 37-ft elevation level
- HEMEs (HOP-HEME-00001A/B and HOP-HEME-00002A/B) located in rooms H-0106 and H-0117 on the 0-ft elevation level
- HEPA electric preheaters (HOP-HTR-00001B, HOP-HTR-00002A, and HOP-HTR-00005A/B) located in room H-0104 on the 0-ft elevation level
- HEPA filters (HOP-HEPA-00001A/B, HOP-HEPA-00002A/B, HOP-HEPA-00007A/B, and HOP-HEPA-00008A/B) located in room H-0104 on the 0-ft elevation level
- catalyst skid preheaters (HOP-HX-00001 and HOP-HX-00003) and electric heaters (HOP-HTR-00001 and HOP-HTR-00007) located in room H-A123 on the 0-ft elevation level
- thermal catalytic oxidizers (HOP-SCO-00001 and HOP-SCO-00004) and NOx selective catalytic reducers (HOP-SCR-00001 and HOP-SCR-00002) located in room H-A123 on the 0-ft elevation level
- silver mordenite preheaters (HOP-HX-00002 and HOP-HX-00004) located in room H-A123 on the 0-ft elevation level
- silver mordenite columns (HOP-ABS-00002 and HOP-ABS-00003) located in room H-B001B on the -21-ft elevation level
- activated carbon adsorbers (HOP-ADBR-00001A/B and HOP-ADBR-00002A/B) located in room H-A123 on the 0-ft elevation level
- booster extraction fans (HOP-FAN-00001A/B/C and HOP-FAN-00009A/B/C) located in room H-B001C at the -21-ft elevation level and stack extraction fans (HOP-FAN-00008A/B/C and HOP-FAN-00010A/B/C) located in room H-0429 on the 58-ft elevation level

### 5.3.1 Film Coolers (HOP-FCLR-00001 through HOP-FCLR-00004)

Each of the two melters has two film coolers. Melter HMP-MLTR-00001 has film coolers HOP-FCLR-00001 and HOP-FCLR-00003 located in melter cave room H-0117. Melter HMP-MLTR-00002 has film coolers HOP-FCLR-00002 and HOP-FCLR-00004 located in melter cave room H-0106. The area of each room containing film coolers is equipped with a stainless steel liner, sump (HSH-SUMP-00003 or HSH-SUMP-00007), and sump ejector (RLD-EJCTR-00171 or RLD-EJCTR-00179). Both rooms have a radiological area classification of R5/C5 and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

The primary function of the film coolers is to cool the melter offgas below the particle sticking temperature to minimize solids deposition on the film cooler and offgas piping walls. The offgas exits a melter and mixes with air in the film cooler. The film cooler is a double-walled pipe that introduces compressed air axially through a series of holes or slots in the inner wall of the film cooler. The injection of compressed air into the melter offgas also helps minimize solids build-up within the film cooler. There is the capability to add water to the film cooler inlet air. The water addition can be used periodically to flush solids build up from the air distribution slots. Use of water addition for solids cleaning may result in rapid vaporization of water to steam. Thus, the water addition rate is controlled to avoid the possibility of melter pressurization.

Each film cooler is 22 inches in diameter by 23.5 inches long, and made of Inconel 690 (UNS N06690). The film coolers are anticipated to have a service life of 5 years.

#### 5.3.1.1 Design Standards

The film coolers are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.3.1.2 Characteristics of the Waste

The principal gas generated by the melter is steam. The offgas from the film coolers is approximately 13.1 wt% water, 85.7 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction of these miscellaneous units are compatible with the waste managed in the HOP. The film coolers are designed to have an operating life of 5 years. The schedule for conducting periodic assessments of this system is provided in Table 7.

### 5.3.2 Submerged Bed Scrubbers (HOP-SCB-00001 and HOP-SCB-00002)

The SBSs (HOP-SCB-00001 and HOP-SCB-00002) are miscellaneous units located in melter cave rooms H-0117 and H-0106, respectively. The SBS HOP-SCB-00001 is associated with Melter 1, and SBS HOP-SCB-00002 is associated with Melter 2. Rooms H-0117 and H-0106 have a radiological area classification of R5/C5 and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

The purpose of the SBSs is to remove entrained radioactive particulates from the melter offgas. The SBS contains a bed, packed with 1-inch-diameter ceramic spheres, used to quench and scrub the particulates from the melter offgas. The melter offgas enters at the bottom of the SBS through an inlet pipe that runs down through the center of the bed, travels upward through the bed, and exits through the top for further treatment by the WESPs. The bed has an approximate 6-ft diameter and 2-ft height. The bed has a slotted plate on the top to contain the bed packing, and a slotted plate with tubular risers on the bottom to facilitate two-phase flow. The level of water is held at approximately 3 inches above the bed by three overflow weirs. Scrub solution is recirculated through the SBS from the SBS condensate receiver vessel (HOP-VSL-00903 or HOP-VSL-00904) using two recycle lines, each of which is subdivided into four water jet lines. The water jet lines recirculate solution on the bottom to suspend collected solids. The solids are removed from the SBS by transferring the slurry from the bottom to the acidic waste vessel (RLD-VSL-00007) located in the RLD.

The SBS has automatically controlled cooling coils and jackets on the top, sides, and bottom that are used to cool the melter offgas to the desired discharge temperature and to regulate the scrubbing solution temperature. A spray system is installed to allow the decontamination of the SBS with demineralized water or nitric acid. Each SBS also has two vessel-emptying ejectors (HOP-EJCTR-00053A/B or HOP-EJCTR-00918A/B). Each SBS has a maximum capacity of 4,516 gallons.

Leaks from the SBSs flow to sumps HOP-SUMP-00003 and HOP-SUMP-00008 by gravity drains. HOP-SUMP-00003 and HOP-SUMP-00008 are located in rooms H-B021 and H-B005, which are located directly below rooms H-0117 and H-0106, respectively.

The SBSs, their internal components, and process piping are made of Alloy C-22 (UNS N06022) to ensure a 40-year life. The cooling coils and jackets are made of Alloy C-22 (UNS N06022) and stainless steel 304L (UNS S30403), respectively. The ceramic spheres are made of aluminum oxide or an equivalent material. The cooling coils and jackets, packed beds, and/or entire SBSs are remotely replaceable.

### 5.3.2.1 Design Standards

The SBSs are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. These SBSs have ASME flanged and dished heads with an approximate 12-ft inside diameter and a 5-ft, 9-inch tangent to tangent length. The shell and head thicknesses are 0.6875-inch minimum (shell), 0.6250-inch minimum (top), and 0.8750-inch minimum (bottom). Thicknesses include a 0.080-inch corrosion allowance, which is more than the minimum 0.040-inch standard corrosion allowance and adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for these miscellaneous units. The ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

### 5.3.2.2 Characteristics of the Waste

The SBSs remove radioactive particulates that are present in the melter offgas. The offgas from the SBSs is 8.9 wt% water, 90.0 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.1 wt% solids. The liquid effluent from the SBSs is approximately 99 wt% water and 1 wt% solids with a pH ranging from 1.0 to 8.5 (24590-HLW-M5-V17T-P0003, 24590-WTP-M4C-V11T-00010, 24590-HLW-N1D-HOP-00010).

The materials of the SBSs and ancillary equipment are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, these miscellaneous units are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the miscellaneous units.

### 5.3.3 SBS Condensate Receiver Vessels (HOP-VSL-00903 and HOP-VSL-00904)

The SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904) are located in black cell rooms H-B021 and H-B005, respectively. The area of each room containing a SBS condensate receiver vessel is equipped with a stainless steel liner, a sump (HOP-SUMP-00003 or HOP-SUMP-00008), and two sump ejectors (RLD-EJCTR-00053A/B or RLD-EJCTR-00176A/B). Both rooms have a radiological area classification of R5/C5 and are designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The SBS condensate receiver vessels collect condensate generated by the SBSs and condensate and wash solutions generated by the WESPs and HEMEs. The contents are recirculated through the SBSs or transferred to the acidic waste vessel (RLD-VSL-00007) in the RLD. Each tank has a maximum capacity of 9,891 gallons.

Each SBS condensate receiver vessel is equipped with the following:

- pressure, level, and temperature instruments, with the temperature elements replaceable through a joggle sleeve.
- cooling water jacket
- RFDs (HOP-RFD-00001A/B and HOP-RFD-00002A/B or HOP-RFD-00003A/B and HOP-RFD-00004A/B)
- RFD ejectors (HOP-EJCTR-00913 through HOP-EJCTR-00916 or HOP-EJCTR-00925 through HOP-EJCTR-00928)
- RFD charge vessels (HOP-VSL-00004A/B and HOP-VSL-00101A/B or HOP-VSL-00905A/B and HOP-VSL-00906A/B)
- PJMs (HOP-PJM-00001 through 00003 and HOP-PJM-00007 or HOP-PJM-00008 through 00011)
- PJM ejectors (HOP-EJCTR-00909 through 00912 or HOP-EJCTR-00921 through 00924)
- vessel-emptying ejectors (HOP-EJCTR-00003A/B or HOP-EJCTR-00929A/B)

The tanks, their internal components, and process piping are made of Alloy C-22 (UNS N06022) to ensure a 40-year life. The cooling jackets on the tank exterior are made of stainless steel 304L (UNS S30403).

#### 5.3.3.1 Design Standards

The SBS condensate receiver vessels are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. These tanks have an approximate 12-ft inside diameter and a 7-ft, 9-inch tangent to tangent length. The shell and head thicknesses are 0.6250-inch (shell) and 0.6875-inch minimum (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a

0.004-inch erosion allowance required for this tank. Additional erosive wear plates of at least 0.081-inch thickness of Alloy C-22 (UNS N06022) are provided as localized protection for the applicable portions of the bottom head to accommodate erosive wear due to the PJM discharges. The RFDs, RFD charge vessels, PJMs, and vessel-emptying ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.3.3.2 Characteristics of the Waste

The SBS condensate receiver vessels receive condensate and wash solutions generated by the SBSs, WESPs, and HEMEs. The blended contents are approximately 99 wt% water and 1 wt% solids with a pH ranging from 1.0 to 8.5 (24590-HLW-M5-V17T-P0003, 24590-WTP-M4C-V11T-00010, 24590-HLW-N1D-HOP-00009).

The materials of the SBS condensate receiver vessels and ancillary equipment are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 5.3.4 Wet Electrostatic Precipitators (HOP-WESP-00001 and HOP-WESP-00002)

The WESPs (HOP-WESP-00001 and HOP-WESP-00002) are miscellaneous units located in hard-to-reach areas H-0308 and H-0302, respectively. The area of each room containing a WESP is equipped with a stainless steel liner and gravity drain sump (HFP-SUMP-00001 or HFP-SUMP-00004). The WESP HOP-WESP-00001 is associated with Melter 1, and WESP HOP-WESP-00002 is associated with Melter 2. Rooms H-0308 and H-0302 have a radiological area classification of R5/C5 (Table 6).

After initial aerosol and soluble gas removal in the SBS, the cooled melter offgas is routed to a WESP for further removal of particulates and aerosols. The WESP houses vertical tubes that act as positive electrodes. Each of these tubes also has a single negatively charged electrode, which runs down the centerline of each tube. A high voltage transformer/rectifier supplies the power to these electrodes. To insure a uniform distribution of the inlet offgas into the electrode tubes, a gas distributor may be used. The strong electric field, generated by the discharge electrode, generates electrons that apply a negative charge to the offgas particles. These negatively charged particles are then attracted to the positively charged tube walls. The collected particles are partially washed from the tube wall by entrained condensate that also collects on the inner tube wall. The solids are periodically washed from the tubes using water sprays located above the tubes. The water and collected particulates drain into the SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904). The WESP electric field and power is controlled by setting the voltage applied between the electrodes.

The WESPs drain directly into HOP-VSL-00903 and HOP-VSL-00904. There are currently no sumps in the WESPs for hold-up and collection of liquid. The WESP drain flow rate is small compared to other streams flowing into HOP-VSL-00903 and HOP-VSL-00904, making a sample of the HOP-VSL-00903 and HOP-VSL-00904 contents non-representative of the WESP effluent.

The WESP housings and process piping are made of 6% molybdenum alloy (UNS N08367) to ensure a 40-year life.

#### 5.3.4.1 Design Standards

The WESP housings are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The shell and head thicknesses include the minimum 0.040-inch standard corrosion allowance (with no erosion allowance). Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.3.4.2 Characteristics of the Waste

The WESPs receive scrubbed melter offgas from the SBSs that is approximately 8.9 wt% water, 90 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.1 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the WESPs are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.3.5 High Efficiency Mist Eliminators (HOP-HEME-00001A/B and HOP-HEME-00002A/B)

The HEMEs (HOP-HEME-00001A/B and HOP-HEME-00002A/B) are miscellaneous units located in melter cave rooms H-0117 and H-0106, respectively. The HEMEs HOP-HEME-00001A/B are associated with Melter 1, and HEMEs HOP-HEME-00002A/B are associated with Melter 2. Rooms H-0117 and H-0106 have a radiological area classification of R5/C5 and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

The purpose of the HEMEs is to further remove radioactive aerosols from the melter offgas and vessel vent offgas, thereby reducing the solids-loading rates on the downstream HEPA filters. A HEME is a wet filter that has a minimum aerosol removal efficiency of approximately 99% for aerosols less than one micron. A water misting nozzle is installed in the HEME gas inlet. The water mist facilitates manual washings of primarily water soluble solids from the filter elements. As the offgas passes through the HEME, the liquid droplets and other aerosols in the offgas interact and adhere to the filaments by surface tension. The droplets agglomerate, grow, and eventually acquire enough mass to flow by gravity to the bottom of the unit and drain into the SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904). As the condensate flows down through the filter bed, a washing action is generated that helps remove and dissolve accumulated solids from the filter elements.

Solids will accumulate in the bed over time, causing the pressure drop across the filter to increase. When the pressure drop across the HEME reaches a predefined level, it is taken offline and washed with demineralized water to remove the accumulated solids. Insoluble solids may remain, and their accumulation eventually leads to the replacement of the HEME filter elements due to high differential pressures. The filter elements can be changed out remotely. The HEMEs may be filled with nitric acid to allow the filters to soak, thus facilitating solids removal. The spent nitric acid soak solution is eventually drained to the SBS condensate receiver vessels.

Leaks from the HEMEs can flow to sumps HOP-SUMP-00003 and HOP-SUMP-00008 by gravity drains. HOP-SUMP-00003 and HOP-SUMP-00008 are located in rooms H-B021 and H-B005, which are located directly below rooms H-0117 and H-0106, respectively.

The HEMEs and process piping are made of 6% molybdenum alloy (UNS N08367) to ensure a 40-year life.

#### 5.3.5.1 Design Standards

The HEME housings are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. These HEME housings have ASME flanged and dished heads with an approximate 5-ft, 6-inch inside diameter and a 12-ft, 2-inch tangent to tangent length. The shell and head thicknesses are 0.5-inch minimum. Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for the HEME housings. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.3.5.2 Characteristics of the Waste

The HEMEs remove radioactive aerosols that are present in the offgas. The inlet offgas is approximately 8.9 wt% water, 89.9 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEMEs are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.3.6 HEPA Electric Preheaters (HOP-HTR-00001B, HOP-HTR-00002A, and HOP-HTR-00005A/B)

The HOP HEPA electric preheaters (HOP-HTR-00001B, HOP-HTR-00002A, and HOP-HTR-00005A/B) are miscellaneous units located within the west wall of the hot cell room H-0104 (HLW filter cave). This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

The main function of the electric preheaters is to raise the temperature of the saturated offgas from the HEMEs to a higher temperature (above the dew point) to eliminate liquid aerosols and reduce the relative humidity to prevent condensate accumulation that can cause damage to the HEPA filters. The preheaters contain heating elements. Element failure is detected by a loss of current flow through the element with an associated indicator. The failed element is replaced as appropriate. Temperature indicators are also provided in the preheaters to detect abnormally high temperatures. Controls are provided to turn off the heater power when an abnormally high temperature is detected.

The HEPA electric preheater housings and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

#### 5.3.6.1 Design Standards

The HEPA electric preheaters are of a standard design used for the WTP PJV and HOP systems. The electric preheater housings are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and ASME AG-1; code stamping is not required. The thickness of the housings includes the minimum 0.040-inch standard corrosion allowance. The heaters are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.3.6.2 Characteristics of the Waste

The offgas from the HEPA electric preheaters is approximately 9.0 wt% water, 89.8 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEPA electric preheaters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.3.7 HEPA Filters (HOP-HEPA-00001A/B, HOP-HEPA-00002A/B, HOP-HEPA-00007A/B, and HOP-HEPA-00008A/B)

The HEPA filters (HOP-HEPA-00001A/B, HOP-HEPA-00002A/B, HOP-HEPA-00007A/B, and HOP-HEPA-00008A/B) are miscellaneous units located in hot cell room H-0104. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

The main function of the HEPA filters is to perform high efficiency removal of sub-micron particulates from the heated offgas. Each of the two melters has a module of HEPA filters. Each module is comprised of two filter banks, located back to back, in a housing with a common center wall and secured on a single mounting frame. Melter HMP-MLTR-00001 has filter banks HOP-HEPA-00001A/B and HOP-HEPA-00002A/B, while melter HMP-MLTR-00002 has filter banks HOP-HEPA-00007A/B and HOP-HEPA-00008A/B. Each bank has an entrance plenum with baffles, an inlet plenum above the filter deck with access covers for each filter element, a filter deck with a row of HEPA filters, an outlet plenum below the filter deck, and an exit plenum with access portal and cover. The filters are guided into the module by stainless steel guide rails. Sample injection and removal ports are provided on the housing or piping.

The HEPA housings and process piping are made of stainless steel 304L (UNS S30403) to ensure a 40-year life. The HEPA filters are to be replaced when needed.

#### 5.3.7.1 Design Standards

The HEPA filters are of a standard design used for the WTP PJV, HOP, and HVAC systems. The HEPA filters are a vendor package. The HEPA filters are a radial flow type, meeting the performance requirements of ASME AG-1. The HEPA housings are designed in accordance with ASME AG-1.

#### 5.3.7.2 Characteristics of the Waste

The offgas from the HEPA filters is approximately 8.8 wt% water, 89.9 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.3 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEPA filters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.3.8 Catalyst Skid Preheaters (HOP-HX-00001 and HOP-HX-00003) and Electric Heaters (HOP-HTR-00001 and HOP-HTR-00007)

The catalyst skid preheaters (HOP-HX-00001 and HOP-HX-00003) and electric heaters (HOP-HTR-00001 and HOP-HTR-00007) are miscellaneous units located in room H-A123. HOP-HX-00001 and HOP-HTR-00001 are installed on the catalyst skid HOP-SCO-00002, and HOP-HX-00003 and HOP-HTR-00007 are installed on the catalyst skid HOP-SCO-00003. Room H-A123 has a radiological area classification of R3/C2/C3 (Table 6).

Each catalyst skid contains the components to catalytically decompose the VOCs and reduce the NOx in the offgas at an elevated temperature. The skids are designed not to exceed a 25-ft length by 5-ft width by 10-ft height.

The offgas is passed through a catalyst skid preheater and a catalyst skid electric heater before entering the thermal catalytic oxidizers and NOx selective catalytic reducers. The catalyst skid preheaters are plate-type recuperative heat exchangers designed to recover heat from the offgas exhaust of the catalyst skids. The catalyst skid electric heaters heat the offgas to the final temperature for reaction. The electric heaters are element-type mounted on a removable flanged plate for ease of maintenance.

The catalyst skid preheaters (cold side and enclosure), electric heaters, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life. The hot-side components and heat exchanger tubes for the preheaters are made of stainless steel 347 (UNS S34700).

#### 5.3.8.1 Design Standards

The catalyst skid preheaters and electric heaters are of a standard design used for the WTP PJV and HOP systems. The heaters are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.3.8.2 Characteristics of the Waste

The offgas from the catalyst skid preheaters and electric heaters is approximately 10.5 wt% water, 88.3 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the catalyst skid preheaters and electric heaters are

considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.3.9 Thermal Catalytic Oxidizers (HOP-SCO-00001 and HOP-SCO-00004) and $NO_x$ Selective Catalytic Reducers (HOP-SCR-00001 and HOP-SCR-00002)

The thermal catalytic oxidizers (HOP-SCO-00001 and HOP-SCO-00004) and NOx selective catalytic reducers (HOP-SCR-00001 and HOP-SCR-00002) are miscellaneous units located in room H-A123. HOP-SCO-00001 and HOP-SCR-00001 are installed on the catalyst skid HOP-SCO-00002, and HOP-SCO-00004 and HOP-SCR-00002 are installed on the catalyst skid HOP-SCO-00003. Room H-A123 has a radiological area classification of R3/C2/C3 (Table 6).

Each catalyst skid contains the components to catalytically decompose the VOCs and reduce the NOx in the offgas. After the offgas passes through a catalyst skid preheater and catalyst skid electric heater, it enters the thermal catalytic oxidizers and NOx selective catalytic reducers. The thermal catalytic oxidizer is a noble metal-based (likely platinum) honeycomb structure that provides the contact surface to facilitate VOC decomposition. The NOx selective catalytic reducer is a metal oxide (e.g., vanadium) honeycomb structure that provides the contact surface to facilitate the NOx and ammonia (injected in front of the selective catalytic reducer) reaction to decompose the NOx.

The thermal catalytic oxidizer housings, selective catalytic reducer housings, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life. The catalyst beds are anticipated to have a service life of 2 to 4 years.

#### 5.3.9.1 Design Standards

The thermal catalytic oxidizers and selective catalytic reducers are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII; ASME B31.3-96, Process Piping; and AISC M016-89, Manual of Steel Construction. The housings for the oxidizer and reducers have no required standard corrosion allowances. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.3.9.2 Characteristics of the Waste

The thermal catalytic oxidizers and selective catalytic reducers remove VOCs and NOx that are present in the offgas. The inlet offgas is approximately 10.5 wt% water, 88.3 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the thermal catalytic oxidizers and selective catalytic reducers are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.3.10 Silver Mordenite Preheaters (HOP-HX-00002 and HOP-HX-00004)

The silver mordenite preheaters (HOP-HX-00002 and HOP-HX-00004) are miscellaneous units located in room H-A123. This room has a radiological area classification of R3/C2/C3 (Table 6).

The silver mordenite preheaters are high temperature, industrial plate heat exchangers and recover heat from the offgas exhaust of catalyst skids HOP-SCO-00002 and HOP-SCO-00003. The preheaters adjust the temperature of the offgas to the desired level before it enters the silver mordenite columns. The preheaters have pressure and temperature instrumentation.

The silver mordenite preheaters and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

#### 5.3.10.1 Design Standards

The silver mordenite preheaters are of a standard design used for the WTP PJV and HOP systems. The preheater housings are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1; code stamping is not required. The heaters are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.3.10.2 Characteristics of the Waste

The offgas from the silver mordenite preheaters is approximately 10.6 wt% water, 88.2 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the silver mordenite preheaters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.3.11 Silver Mordenite Columns (HOP-ABS-00002 and HOP-ABS-00003)

The silver mordenite columns (HOP-ABS-00002 and HOP-ABS-00003) are miscellaneous units located in room H-B001B. This room has a radiological area classification of R2/C2 (Table 6).

The silver mordenite columns are located downstream of the catalyst skids, after the offgas has passed through the silver mordenite preheaters. These columns remove gaseous halogens such as radioactive iodine-129, fluorine, and chlorine from the offgas. Halide monitors are located downstream of the columns to monitor for breakthrough, which indicates the need for media replacement. When the silver mordenite cartridge loading capacity is exhausted, the cartridge can be replaced similar to a HEPA filter.

The silver mordenite column housings and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life. The silver mordenite cartridges are to be periodically replaced, approximately every 5 years.

#### 5.3.11.1 Design Standards

The silver mordenite column housings are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and ASME AG-1/1a; code stamping is not required. The housings for the columns have no minimum standard corrosion allowances. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.3.11.2 Characteristics of the Waste

The silver mordenite columns remove gaseous halogens from the offgas. The inlet offgas is approximately 10.6 wt% water, 88.2 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the silver mordenite columns are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.3.12 Activated Carbon Adsorbers (HOP-ADBR-00001A/B and HOP-ADBR-00002A/B)

The activated carbon adsorbers (HOP-ADBR-00001A/B and HOP-ADBR-00002A/B) are miscellaneous units located in room H-A123. The two activated carbon adsorbers HOP-ADBR-00001A/B are associated with Melter 1, and activated carbon adsorbers HOP-ADBR-00002A/B are associated with Melter 2. Room H-A123 has a radiological area classification of R3/C2/C3 (Table 6).

The sulfur impregnated activated carbon columns remove volatile mercury compounds from the offgas at a mildly elevated temperature. Each column consists of two activated carbon beds; each bed has a volume of approximately 2 cubic meters. The beds are operated in series during normal operations. When gaseous mercury is detected breaking through the leading bed, the offgas flow is manually changed to make the trailing bed the leading bed, and only one column is used while the exhausted bed is removed and replaced. The flow is then changed to make the fresh bed the trailing bed.

The activated carbon adsorbers and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life. The minimum design life of the activated carbon media is 1 year at nominal concentrations of mercury with the beds operating in series.

#### 5.3.12.1 Design Standards

The activated carbon adsorbers are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and ASME AG-1. These adsorbers have an approximate 12-ft length, 9-ft width, and 13-ft height. The shell and head thicknesses are 0.375-inch. The adsorbers have no minimum standard corrosion allowances. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

### 5.3.12.2 Characteristics of the Waste

The activated carbon adsorbers remove volatile mercury compounds that are present in the offgas. The inlet offgas is approximately 8.8 wt% water, 90.0 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the activated carbon adsorbers are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

## 5.3.13 Booster Extraction Fans (HOP-FAN-00001A/B/C and HOP-FAN-00009A/B/C) and Stack Extraction Fans (HOP-FAN-00008A/B/C and HOP-FAN-00010A/B/C)

The booster extraction fans (HOP-FAN-00001A/B/C and HOP-FAN-00009A/B/C) are located in room H-B001C, which has a radiological area classification of R2/C2. The stack extraction fans (HOP-FAN-00008A/B/C and HOP-FAN-00010A/B/C) are located in room H-0429, which has a radiological area classification of R2/C2/C3 (Table 6). These fans are miscellaneous units.

The booster extraction fans are three 50% capacity fans that operate in parallel (two primary fans that provide 100% capacity for normal operations and one standby fan) to partially provide the offgas motive force for the HOP and PVV. The stack extraction fans are also three 50% capacity fans that operate in parallel (two primary fans and one standby fan) to provide the balance of the offgas motive force for the HOP and PVV systems and to discharge the treated offgas to the atmosphere through the HLW vitrification facility's exhaust stack. The fans and their control systems are the same. The extraction fans have variable speed drives.

The booster extraction fans, stack extraction fans, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

### 5.3.13.1 Design Standards

The booster extraction fans and stack extraction fans are of a standard design used for the WTP PJV and HOP systems. The fans are fabricated in accordance with the ASME AG-1. The fans are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

### 5.3.13.2 Characteristics of the Waste

The offgas from the booster extraction fans is approximately 8.8 wt% water, 90.0 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids. The offgas from the stack extraction fans is approximately 8.2 wt% water, 90.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the booster extraction fans and stack extraction fans are considered to have a lower potential for corrosion and erosion on the basis of the materials of

construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.3.14 Secondary Containment (HOP-SUMP-00003 and HOP-SUMP-00008)

The HOP tank systems and miscellaneous unit systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The HOP SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904) described above are located in stainless steel-lined rooms H-B005 and H-B021 with sumps HOP-SUMP-00003 and HOP-SUMP-00008 embedded in the floor. Both rooms are black cells, have a radiological area classification of R5/C5, and are designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary. Sumps HOP-SUMP-00003 and HOP-SUMP-00008 are equipped with radar-type level detectors and have ejectors. All sumps are fabricated with 6% molybdenum alloy (UNS N08367).

Leaks from the SBS condensate receiver vessel HOP-VSL-00903 flow into sump HOP-SUMP-00003. This sump also receives waste, through the gravity floor drain, from the secondary containment for the Melter 1 miscellaneous units SBS (HOP-SCB-00001) and HEMEs (HOP-HEME-00001A/B). The SBS and HEMEs are located in the western section of Melter Cave 1 (room H-0117), which is located directly above the SBS drains collection cell 1 (room H-B021). Two ejectors (RLD-EJCTR-0053A/B) transfer the waste from sump HOP-SUMP-00003 to the plant wash and drains vessel (RLD-VSL-00008).

Leaks from HOP-VSL-00904 flow into sump HOP-SUMP-00008. This sump also receives waste, through the gravity floor drain, from the secondary containment for the Melter 2 miscellaneous units SBS (HOP-SCB-00002) and HEMEs (HOP-HEME-00002A/B). The SBS and HEMEs are located in the western section of Melter Cave 2 (room H-0106), which is located directly above the SBS drain collection cell 2 (H-B005). Two ejectors (RLD-EJCTR-00176A/B) transfer the waste to RLD-VSL-00008.

#### 5.3.14.1 Design Standards

Sumps HOP-SUMP-00003 and HOP-SUMP-00008 are dry sumps, with dimensions of 30 inches in diameter by 18 inches deep. All sumps are fabricated in accordance with design methodology specified in ANSI/AISC N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

#### 5.3.14.2 Characteristics of the Waste

During normal operations, the sumps are dry. The sumps, in combination with the stainless steel-lined rooms, provide secondary containment for wastes from the melters' SBS condensate receiver vessels, SBSs, and HEMEs. Previous sections describe the materials managed in these tanks, miscellaneous units, and associated piping. The materials of construction for secondary containment system are compatible with the waste managed in the HOP.

Assessment for sumps located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each room is considered to have the same potential for corrosion and erosion as the tank or miscellaneous unit that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

## 5.4 HLW Melter Cave Support Handling System

The function of the HSH is to mechanically handle all remote equipment associated with the melter caves to allow normal melter process operations. Since personnel access is not allowed into the melter caves, tasks are performed remotely through a combination of shield doors and windows, cranes, manipulators, tool transfer ports, and other ancillary mechanical handling equipment.

The DWP-regulated plant items associated with the HSH include the decontamination tanks (HSH-TK-00001 and HSH-TK-00002) for the two melter caves. These tanks are located in rooms H-0310A and H-0304A, respectively, on the 0-ft elevation level.

### 5.4.1 Decontamination Tank Melter Cave 1 (HSH-TK-00001) and Decontamination Tank Melter Cave 2 (HSH-TK-00002)

The decontamination tanks HSH-TK-00001 and HSH-TK-00002 are located in rooms H-0310A and H-0304A, respectively. The area of each room containing a tank is equipped with a stainless steel liner, sump (HSH-SUMP-00008 or HSH-SUMP-00009), and sump ejector (RLD-EJCTR-00026 or RLD-EJCTR-00173). Both rooms have a radiological area classification of R5/C5 (Table 6).

The decontamination tanks are operated in several modes: soak, spray, heating, sparging, or chemical injection. Soak mode fills the tank with the selected plant wash media. The decontamination factor may be increased when soaking by sparging the tank with compressed air injected through the bottom spray ring. Alternately, the tank contents may be heated by injecting high pressure steam through the bottom spray ring. Spray mode conserves plant wash media and would normally be used for first pass gross decontamination. Decontamination chemicals may be injected from a drum station and pump located outside of the melter cave. Each of the decontamination tanks has a maximum capacity of 3,718 gallons.

Each of the decontamination tanks has a centrifugal pump (HSH-PMP-00001 or HSH-PMP-00002) for the delivery of high pressure wash media to the spray rings and for discharging the contents of the tank.

The decontamination tanks, their internal components, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

#### 5.4.1.1 Design Standards

The decontamination tanks are fabricated in accordance with API 620. Each tank has a 6-ft diameter and 20-ft height with an open top. Corrosion allowance is the minimum 0.040-inch standard, with no erosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.4.1.2 Characteristics of the Waste

The decontamination tanks contain demineralized water, nitric acid, or other suitable decontamination solutions. The pH of the tanks' contents may be near 0 (24590-HLW-N1D-HSH-P0001).

The materials of construction for the decontamination tanks and ancillary equipment are compatible with the waste managed in the HSH. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 5.4.2 Secondary Containment (HSH-SUMP-00003 and HSH-SUMP-00007 through HSH-SUMP-00009)

The HSH tank systems, HMP miscellaneous unit systems, and HOP miscellaneous unit systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The HSH tanks described above are located in stainless steel-lined rooms H-0304A and H-0310A with sumps HSH-SUMP-00008 and HSH-SUMP-00009 embedded in the floor. Two sumps (HSH-SUMP-00003 and HSH-SUMP-00007) are located in stainless steel-lined rooms H-0106 and H-0117 containing melters and film coolers. Rooms H-0304A and H-0310A have a radiological area classification of R5/C5. Rooms H-0106 and H-0117 are hot cells, have a radiological area classification of R5/C5, and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary. Sumps HSH-SUMP-00003 and HSH-SUMP-00007 are equipped with bubbler-type level detectors, while sumps HSH-SUMP-00008 and HSH-SUMP-00009 are equipped with radar-type level detectors. All sumps have ejectors and are fabricated with 6% molybdenum alloy (UNS N08367).

Sump HSH-SUMP-00003 is located in the central section of Melter Cave 1 (room H-0117). Miscellaneous units located in this room include melter HMP-MLTR-00001 and film coolers HOP-FCLR-00001 and HOP-FCLR-00003. An ejector (RLD-EJCTR-00171) transfers the waste to the plant wash and drains vessel (RLD-VSL-00008).

Sump HSH-SUMP-00007 is located in the central section of Melter Cave 2 (room H-0106). Miscellaneous units located in this room include melter HMP-MLTR-00002 and film coolers HOP-FCLR-00002 and HOP-FCLR-00004. An ejector (RLD-EJCTR-00179) transfers the waste to RLD-VSL-00008.

If the capacity of the decontamination tank melter cave 1 (HSH-TK-00001) is exceeded, the excess overflows into sump HSH-SUMP-00008 located in the Melter 1 equipment decontamination pit (room H-0310A). An ejector (RLD-EJCTR-00026) transfers the waste to RLD-VSL-00008.

If the capacity of tank HSH-TK-00002 is exceeded, the excess overflows into sump HSH-SUMP-00009 located in the Melter 2 equipment decontamination pit (room H-0304A). An ejector (RLD-EJCTR-00173) transfers the waste to RLD-VSL-00008.

#### 5.4.2.1 Design Standards

All sumps are dry sumps, with dimensions of 31.5 inches in length by 25.5 inches in width by 16 inches in depth. The sumps are fabricated in accordance with design methodology specified in ANSI/AISC N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

#### 5.4.2.2 Characteristics of the Waste

During normal operations, the sumps are dry. The sumps, in combination with the stainless steel-lined rooms, provide secondary containment for wastes from the HSH tank systems, HMP miscellaneous unit systems, and HOP miscellaneous unit systems. Previous sections describe the materials managed in these tanks, miscellaneous units, and associated piping.

The materials of construction for secondary containment system are compatible with the waste managed in the HSH, HMP, and HOP. Assessment for sumps located in hot cells is limited to remote monitoring with remote maintenance and decontamination planned for the 40-year life of the facility. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each room is considered to have the same potential for corrosion and erosion as the tank or miscellaneous unit that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

### 5.5 HLW Canister Decontamination Handling System

The HDH decontaminates filled and sealed IHLW canisters using a ceric nitrate bath. The decontamination process effluent is collected, neutralized, and transferred to the RLD for sampling. The HDH is designed to decontaminate two IHLW canisters per day, based on one canister holding approximately 3 MTG and the HLW vitrification facility production rate of 6 MTG/day.

The DWP-regulated plant items associated with the HDH include the rinse tunnel canister rinse vessel (HDH-VSL-00001) located in the canister rinse tunnel (room H-B039B) at the -16-ft, 6-inch elevation level, canister decon vessels (HDH-VSL-00002 and HDH-VSL-00004) located in the canister decontamination/swabbing cave (room H-B035) at the -16-ft elevation level, and waste neutralization vessel (HDH-VSL-00003) located in room H-B035 at the -16-ft elevation level.

#### 5.5.1 Rinse Tunnel Canister Rinse Vessel (HDH-VSL-00001)

The rinse tunnel canister rinse vessel (HDH-VSL-00001) is located in room H-B039B, which is equipped with a stainless steel liner, sump (HDH-SUMP-00001), and sump ejector (RLD-EJCTR-00055). This room has a radiological area classification of R3/R5/C3/C5 (Table 6).

After transferring a filled IHLW canister into vessel HDH-VSL-00001, the canister is washed with low-pressure demineralized water to remove any loose contamination. The tank has a maximum capacity of approximately 3,300 gallons.

The rinse tunnel canister rinse vessel is equipped with piping for the demineralized water, a spray ring assembly that rinses the IHLW canister, a level transmitter and switch, an overflow line to sump HDH-SUMP-00001, and a centrifugal pump (HDH-PMP-00001) that transfers decontamination effluent from the tank to the waste neutralization vessel (HDH-VSL-00003). The batch volume for the tank is 360 gallons. The pump runs during the batch transfers so that water is pumped out as the rinse water is added into the tank. Therefore, the tank is not required to hold the entire batch volume of demineralized water during normal operations.

The rinse tunnel canister rinse vessel, its internal components, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

#### 5.5.1.1 Design Standards

The rinse tunnel canister rinse vessel is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1; code stamping is not required. The corrosion allowance is the minimum 0.040-inch standard allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping. The centrifugal discharge pump is of a standard design.

#### 5.5.1.2 Characteristics of the Waste

The rinse tunnel canister rinse vessel contains demineralized water with negligible solids by volume. The average pH of the contents is 7.

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the HDH. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the rinse tunnel canister rinse vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 5.5.2 Canister Decon Vessels (HDH-VSL-00002 and HDH-VSL-00004)

The canister decon vessels (HDH-VSL-00002 and HDH-VSL-00004) are located in room H-B035, which is equipped with a stainless steel liner, sump (HDH-SUMP-00003), and sump ejector (RLD-EJCTR-00054). This room has a radiological area classification of R3/R5/C3/C5 (Table 6).
The canister decon vessels are used to hold the filled IHLW canister and ceric nitrate solution during the decontamination process. Each tank has a maximum capacity of 630 gallons.

The canister decon vessels are equipped with piping for demineralized water, hot water, condensate effluent, cooling water supply and return, and process air for sparging. These tanks are also equipped with dual thermocouples with controllers for the heating/cooling coils; level, pressure, and density transmitters; two spray rings for the nitric acid and demineralized water rinses; a nozzle for the decontamination solution; dual steam ejectors (HDH-EJCTR-00003A/B and HDH-EJCTR-00056A/B); and an overflow line to the waste neutralization vessel (HDH-VSL-00003).

The canister decon vessels, their internal components, and process piping are made of titanium (UNS R50400) to ensure a 40-year life.

#### 5.5.2.1 Design Standards

The canister decon vessels are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1; code stamping is not required. The tanks have ASME semi-elliptical bottom with an approximate 2-ft, 6-inch inside diameter and a 18-ft, 4-inch tangent to tangent length. The shell and bottom thicknesses are 0.3125-inch (shell) and 0.3125-inch minimum (bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for this tank. The canister decon vessels have a separate, hinged lid assembly. The ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.5.2.2 Characteristics of the Waste

The canister decon vessels contain demineralized water, ceric nitrate, and nitric acid with negligible solids by volume. The pH of the contents is approximately 0 to 0.5 (24590-HLW-N1D-HDH-P0003).

The materials of construction for these tanks and ancillary equipment are compatible with the waste originating from the HDH. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the canister decon vessels are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

### 5.5.3 Waste Neutralization Vessel (HDH-VSL-00003)

The waste neutralization vessel (HDH-VSL-00003) is located in room H-B035, which is equipped with a stainless steel liner, sump (HDH-SUMP-00003), and sump ejector (RLD-EJCTR-00054). This room has a radiological area classification of R3/R5/C3/C5 (Table 6).

The waste neutralization vessel is used for the neutralization of the spent decontamination solution from the canister decontamination vessels (HDH-VSL-00002 and HDH-VSL-00004), steam condensate, and decontamination effluent from the rinse tunnel canister rinse vessel (HDH-VSL-00001) prior to the transfer of the contents to the RLD for sampling. The tank has a maximum capacity of 5,315 gallons.

The waste neutralization vessel is equipped with piping for the spray rings, sodium hydroxide addition, and hydrogen peroxide addition. It also has level, temperature, and pressure transmitters. HDH-VSL-00003 has an overflow line to sump HDH-SUMP-00003 and inlet nozzles from the canister decontamination vessels (HDH-VSL-00002 and HDH-VSL-00004) effluents and overflows, steam condensate from the canister decontamination vessels' heating coils, and effluent from the rinse tunnel canister rinse vessel (HDH-VSL-00001). Three steam ejectors (HDH-EJCTR-00002A/B and HDH-EJCTR-00057) empty the contents of HDH-VSL-00003 to the RLD (dual ejectors to RLD-VSL-00007 and an ejector to RLD-VSL-00008).

The waste neutralization vessel, its internal components, and process piping are made of stainless steel 304L (UNS S30403) to ensure a 40-year life.

#### 5.5.3.1 Design Standards

The waste neutralization vessel is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The tank has ASME flanged and dished heads with an approximate 7-ft inside diameter and a 17-ft tangent to tangent length. The shell and head thicknesses are 0.625-inch (shell) and 0.625-inch minimum (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.016-inch erosion allowance required for this tank. The three steam ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.5.3.2 Characteristics of the Waste

The waste neutralization vessel contains demineralized water, cerous nitrate, nitric acid, sodium hydroxide, and hydrogen peroxide with negligible solids by volume. The contents are neutralized to a pH of 8 or greater prior to the transfer of the contents to the RLD for sampling (24590-HLW-3YD-HDH-00002).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the HDH. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the waste neutralization vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 5.5.4 Secondary Containment (HDH-SUMP-00001 through HDH-SUMP-00003)

The HDH tank systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The HDH tanks described above are located in stainless steel-lined rooms H-B035 and H-B039B with sumps HDH-SUMP-00001 and HDH-SUMP-00003 embedded in the floor. A third sump (HDH-SUMP-00002) is located in the SPC-lined, canister rinse bogie maintenance room H-B039A that does not contain tanks. Rooms H-B035 and H-B039B have a radiological area classification of R3/R5/C3/C5, and room H-B039A has a radiological area classification of R3/C3 (Table 6).

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary. Sumps HDH-SUMP-00001 through HDH-SUMP-00003 are equipped with radar-type level detectors and have either ejectors or pumps. All sumps are fabricated with 6% molybdenum alloy (UNS N08367).

Leaks from the rinse tunnel canister rinse vessel (HDH-VSL-00001) flow into sump HDH-SUMP-00001. This sump is equipped with an ejector (RLD-EJCTR-00055) that transfers the waste to the plant wash and drains vessel (RLD-VSL-00008).

Sump HDH-SUMP-00002 is located in room H-B039A. Leaks in this room flow into this sump. A pump located at the sump (RLD-PMP-00023) transfers the waste to RLD-VSL-00008.

Leaks from the canister decon vessels (HDH-VSL-00002 and HDH-VSL-00004) and waste neutralization vessel (HDH-VSL-00003) flow into sump HDH-SUMP-00003. If the capacity of HDH-VSL-00003 is

exceeded, the excess overflows into sump HDH-SUMP-00003, which is located in the same room. This sump is equipped with an ejector (RLD-EJCTR-00054) that transfers the waste to RLD-VSL-00008.

#### 5.5.4.1 Design Standards

Sumps HDH-SUMP-00001 through HDH-SUMP-00003 are dry sumps, with dimensions of 30 inches in diameter by 18 inches deep. All sumps are fabricated in accordance with design methodology specified in ANSI/AISC N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

#### 5.5.4.2 Characteristics of the Waste

During normal operations, the sumps are dry. The sumps, in combination with the stainless steel-lined or SPC-lined rooms, provide secondary containment for wastes from HDH-VSL-00001 through HDH-VSL-00004. Previous sections describe the materials managed in these tanks and associated piping.

The materials of construction for secondary containment system are compatible with the waste managed in the HDH. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each room is considered to have the same potential for corrosion and erosion as the tank that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

### 5.6 Pulse Jet Ventilation System

The PJV primarily contains and treats gaseous emissions from HLW fluidics equipment and siphon air ejectors to ensure that regulatory standards and safety requirements are met before the gaseous emissions are discharged to the environment. Fluidics equipment and siphon air ejectors generate emissions that must be contained and treated before being discharged. Potentially contaminated liquid that has formed within the PJV piping is directed to RLD-VSL-00002 for recycle to the PTF.

The DWP-regulated plant items associated with the PJV are the electric heater (PJV-HTR-00002), HEPA filters (PJV-HEPA-00004A/B and PJV-HEPA-00005A/B), and pulse jet fans (PJV-FAN-00002A/B). These plant items are miscellaneous units. The HEPA filters and electric heater are located in room H-0104 on the 0-ft elevation and 14-ft elevation levels, respectively. The pulse jet fans are located in room H-0424 on the 58-ft elevation level.

### 5.6.1 Electric Heater (PJV-HTR-00002)

The PJV HEPA electric heater is a miscellaneous unit located within the west wall of the hot cell room H-0104 (HLW filter cave). This room has a radiological area classification of R5/C5 (Table 6).

The main function of the electric heater is to raise the temperature of the offgas to a higher temperature to eliminate liquid aerosols and reduce the relative humidity to prevent condensate accumulation that can cause damage to the HEPA filters. The heater is likely to be exposed to radioactive contamination

because of its position upstream of the HEPA filters. Therefore, the heater is designed to minimize and facilitate maintenance. The heater is also designed to minimize the possible retention of particulates. The heating elements are sheathed with heat conductive tubes to avoid exposure to the untreated emissions from fluidics equipment and siphon air ejectors.

The HEPA electric heater is made of stainless steel 316L (UNS S31603) with the plenum chamber made of stainless steel 304L (UNS S30403) to ensure a 40-year life.

#### 5.6.1.1 Design Standards

The HEPA electric heater is of a standard design used for the WTP PJV and HOP systems. The electric heater housing is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1; code stamping is not required. The thickness of the housing includes the minimum 0.040-inch standard corrosion allowance with no erosion allowance. The heater is a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.6.1.2 Characteristics of the Waste

The offgas from the HEPA electric heater is approximately 1.2 wt% water, 97.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PJV. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the heater is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in this miscellaneous unit.

### 5.6.2 HEPA Filters (PJV-HEPA-00004A/B and PJV-HEPA-00005A/B)

The HEPA filters (PJV-HEPA-00004A/B and PJV-HEPA-00005A/B) are miscellaneous units located in room H-0104. This room has a radiological area classification of R5/C5 (Table 6).
The main function of the HEPA filters is to remove radioactive particulates from the offgas before discharging to the atmosphere through the HLW vitrification facility stack. There are four PJV filter banks with five HEPA filters per bank. Emissions flow through a bank's HEPA filters at the same time in parallel. Two HEPA filter banks are used in series to meet ALARA guidelines and to provide redundant protection in case the first bank of HEPA filters fails. In addition, two standby and redundant banks of HEPA filters are installed in parallel to the two operating banks to enable continuous operation of the PJV. The standby HEPA filters banks also allow operation of the system when the filters in the active banks need to be replaced.

The HEPA housings are made of stainless steel 304L (UNS S30403) to ensure a 40-year life. The HEPA filters are to be replaced when needed.

#### 5.6.2.1 Design Standards

The HEPA filters are of a standard design used for the WTP PJV, HOP, and HVAC systems. The HEPA filters are a vendor package. The HEPA filter inserts are a radial flow type, meeting the performance requirements of ASME AG-1. The HEPA housings are designed in accordance with ASME AG-1.

#### 5.6.2.2 Characteristics of the Waste

The offgas from the HEPA filters is approximately 1.2 wt% water, 97.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the PJV. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEPA filter units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

### 5.6.3 Pulse Jet Fans (PJV-FAN-00002A/B)

The pulse jet fans are miscellaneous units located in room H-0424. This room has a radiological area classification of R2/C2/C3 (Table 6). The PJV requires extraction fans to remove emissions from fluidics equipment and siphon air ejectors, to draw emissions through the HEPA filters, to maintain a vacuum in the PJV, and to discharge treated emissions to the atmosphere through the HLW vitrification facility exhaust stack. The fans are designed to move the maximum quantity of fluidics equipment and siphon air ejector emissions through the system while maintaining a vacuum in the system. Exhaust fans are equipped with adjustable speed drives to allow adjustment of the fan speed to respond to variations in flow rates of emissions. A backup extraction fan is installed in parallel to the operating fan to allow continuous operation of the PJV in case the primary fan fails or requires maintenance.

The pulse jet fans are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

#### 5.6.3.1 Design Standards

The pulse jet fans are of a standard design used for the WTP PJV and HOP systems. The fans are fabricated in accordance with the ASME AG-1. The fans are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.6.3.2 Characteristics of the Waste

The offgas from the pulse jet fans is approximately 1.2 wt% water, 97.6 wt% gases (primarily $N_2$, $O_2$, and $CO_2$), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the PJV. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the pulse jet fans are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

## 5.7 Radioactive Liquid Disposal System

The RLD receives radioactive effluents from the HOP and HDH tanks, out-of-specification process streams, and periodic plant and tank washes within the HLW vitrification facility. The purpose of the RLD is to handle liquid waste for interim storage before transferring the effluents to the PTF where the

waste is recycled to the process. Various operations such as neutralization, mixing, and sampling of the waste are performed in the RLD.

The DWP-regulated plant items associated with the RLD include the offgas drains collection vessel (RLD-VSL-00002), acidic waste vessel (RLD-VSL-00007), and plant wash and drains vessel (RLD-VSL-00008). These tanks are located in room H-B014 at the -21-ft elevation level.

### 5.7.1 Offgas Drains Collection Vessel (RLD-VSL-00002)

The offgas drains collection vessel (RLD-VSL-00002) is located in black cell room H-B014, which is equipped with a stainless steel liner, a sump (RLD-SUMP-00001), and two sump ejectors (RLD-EJCTR-00052A/B). This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The offgas drains collection vessel receives little or no transfer of effluent during normal operations. It can receive condensate from the low points in the main offgas ducts downstream of the HEMEs (HOP-HEME-00001A/2A and HOP-HEME-00001B/2B), condensate from the low points in the main PJV header, and plant wash. Since the contents of RLD-VSL-00002 are mostly water and have very low solids, the contents do not require mixing. The tank contents are transferred to the plant wash and drains vessel (RLD-VSL-00008). The contents of RLD-VSL-00002 are sampled along with the rest of the contents of RLD-VSL-00008 before being transferred to the PTF.

The offgas drains collection vessel is equipped with pressure, level, and temperature instruments, and vessel-emptying ejectors (RLD-EJCTR-00020A/B).

The offgas drains collection vessel, its internal components, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

#### 5.7.1.1 Design Standards

The offgas drains collection vessel is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. It has ASME flanged and dished heads with an approximate 3-ft, 6-inch inside diameter and a 4-ft tangent to tangent length. The shell and head thicknesses are 0.375-inch (shell) and 0.250-inch minimum (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.7.1.2 Characteristics of the Waste

The offgas drains collection vessel receives plant wash and condensate from the low points in the main offgas ducts downstream of the HEMEs and main PJV header. The blended contents are mostly water with negligible solids by volume (approximately 0.07 wt% solids). The contents have a pH ranging from less than 2.5 to 6.5 (24590-HLW-N1D-RLD-00013).

The materials of the offgas drains collection vessel and ancillary equipment are compatible with the waste managed in the RLD. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a lower

potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 5.7.2 Acidic Waste Vessel (RLD-VSL-00007) and Breakpots (RLD-BRKPT-00007 and RLD-BRKPT-00009)

The acidic waste vessel (RLD-VSL-00007) is located in the black cell room H-B014, which is equipped with a stainless steel liner, a sump (HCP-SUMP-00001), and two sump ejectors (RLD-EJCTR-00049A/B). This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The acidic waste vessel receives liquid from the SBSs (HOP-SCB-00001 and HOP-SCB-00002), SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904), and waste neutralization vessel (HDH-VSL-00003). The collected waste consists of SBS purge, WESP and HEME drainage, and neutralized canister decontamination waste. The PJMs mix the tank contents in order to collect a representative sample. Sodium hydroxide is added to the tank based on the sample analysis and the volume of effluent in the tank. The tank contents are sampled to measure the final pH before each transfer to PWD-VSL-00043. The acidic waste vessel has a maximum capacity of 18,145 gallons.

The acidic waste vessel is equipped with the following:

- pressure, level, and temperature instruments
- RFDs (RLD-RFD-00162A/B)
- RFD ejectors (RLD-EJCTR-00004 and RLD-EJCTR-00057)
- RFD charge vessels (RLD-VSL-00015A/B)
- PJMs (RLD-PJM-00005 through 00008)
- PJM ejectors (RLD-EJCTR-00001 through 00003 and RLD-EJCTR-00016)
- transfer breakpots (RLD-BRKPT-00007 and RLD-BRKPT-00009), each with a total volume of 82 gallons
- vessel-emptying ejectors (RLD-EJCTR-00008, RLD-EJCTR-00050, RLD-EJCTR-00056, and RLD-EJCTR-00059)

The acidic waste vessel is made of 6% molybdenum alloy (UNS N08367 or N08926) to ensure a 40-year life. The head on the inside of the tank under several nozzles has a band of Hastelloy C-276 clad layer for additional protection. Process piping is made of Alloy C-22 (UNS N06022) to ensure a 40-year life. The transfer breakpots are made of stainless steel 316L (UNS S31603).

#### 5.7.2.1 Design Standards

The acidic waste vessel and transfer breakpots are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. Vessel RLD-VSL-00007 has ASME flanged and dished heads with an approximate 13-ft inside diameter and a 15-ft, 6-inch tangent to tangent length. The shell and head thicknesses are 0.748-inch (shell) and 0.748-inch minimum (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for this tank. An additional erosive wear allowance of at least a 0.027-inch thickness of 6% molybdenum is provided as localized protection for the applicable portions of the bottom head to accommodate erosive wear due to

the PJM discharges. The RFDs, RFD charge vessels, PJMs, and ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.7.2.2 Characteristics of the Waste

The acidic waste vessel receives waste that consists of SBS purge, WESP and HEME drainage, and neutralized canister decontamination waste. The blended contents are approximately 98.8 wt% water and 1.2 wt% solids. The contents are neutralized to a pH of 8 or greater before transferring to PWD-VSL-00043 (24590-HLW-N1D-RLD-00001, 24590-HLW-3YD-RLD-00001).

The materials of construction for the acidic waste vessel and ancillary equipment are compatible with the waste managed in the RLD. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 5.7.3 Plant Wash and Drains Vessel (RLD-VSL-00008) and Breakpot (RLD-BRKPT-00004)

The plant wash and drains vessel (RLD-VSL-00008) is located in the southern section of black cell room H-B014, which is equipped with a stainless steel liner, a sump (HCP-SUMP-00001), and two sump ejectors (RLD-EJCTR-00049A/B). This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The plant wash and drains vessel receives tank, sump, and plant washes from C3 and C5 areas within the HLW vitrification facility. The tank also collects wash water from cell walls, equipment exterior surfaces, stainless steel cladding, and racks. The PJMs mix the tank contents in order to collect a representative sample. Sodium hydroxide is added to the tank based on the sample analysis and the volume of effluent in the tank. The tank receives intermittent flows; its contents are transferred to PWD-VSL-00043. The tank contents are sampled to measure the final pH before each transfer to the PTF tank. RLD-VSL-00008 has a maximum capacity of 13,774 gallons.

The plant wash and drains vessel is equipped with the following:

- pressure, level, and temperature instruments
- RFDs (RLD-RFD-00163A/B)
- RFD ejectors (RLD-EJCTR-00006 and RLD-EJCTR-00058)
- RFD charge vessels (RLD-VSL-00016A/B)
- PJMs (RLD-PJM-00001 through 00004)
- PJM ejectors (RLD-EJCTR-00009 through 00011 and RLD-EJCTR-00017)
- transfer breakpot (RLD-BRKPT-00004) with a total volume of 82 gallons.
- vessel-emptying ejectors (RLD-EJCTR-00007, RLD-EJCTR-00038, and RLD-EJCTR-00018A/B).

The plant wash and drains vessel is made of stainless steel 316L (UNS S31603) to ensure a 40-year life. The inside of the tank's head, at several nozzle locations, has a band of Hastelloy C-276 clad layer for

additional protection. Process piping is made of Alloy C-22 (UNS N06022) to ensure a 40-year life. The transfer breakpot is made of stainless steel 304L (UNS S30403).

#### 5.7.3.1 Design Standards

The plant wash and drains vessel and transfer breakpot are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. RLD-VSL-00008 has an approximate inside 13-ft diameter and a 9-ft, 9-inch tangent to tangent length. The shell and head thicknesses are 0.748-inch (shell) and 0.748-inch minimum (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.016-inch erosion allowance required for this tank. An additional erosive wear allowance of at least a 0.014-inch thickness of stainless steel 316L (UNS S31603) is provided as localized protection for the applicable portions of the bottom head to accommodate erosive wear due to the PJM discharges. The RFDs, RFD charge vessels, PJMs, and ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

#### 5.7.3.2 Characteristics of the Waste

The plant wash and drains vessel receives various tank, sump, and plant washes. The blended contents are approximately 99.97 wt% water and 0.03 wt% solids. The contents are neutralized to a pH of 8 or greater before transferring to PWD-VSL-00043 (24590-HLW-N1D-RLD-00006, 24590-HLW-3YD-RLD-00001).

The materials of the plant wash and drains vessel and ancillary equipment are compatible with the waste managed in the RLD. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

### 5.7.4 Secondary Containment (RLD-SUMP-00001, HCP-SUMP-00001, HPH-SUMP-00001, HPH-SUMP-00003, and HPH-SUMP-00005)

The RLD tank systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The RLD tanks described above are located in stainless steel-lined room H-B014 with sumps RLD-SUMP-00001 and HCP-SUMP-00001 embedded in the floor. This room is a black cell, has a radiological area classification of R5/C5, and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

In addition to sumps RLD-SUMP-00001 and HCP-SUMP-00001, there are two sumps (HPH-SUMP-00001 and HPH-SUMP-00005) located in a stainless steel-lined room (H-0136, canister handling cave) and a sump (HPH-SUMP-00003) located in a stainless steel-lined room (H-B032, pour tunnel 1) that do not contain tanks or miscellaneous units. These rooms have a radiological area classification of R5/C5 (Table 6). Wastes in these sumps are transferred to the RLD plant wash and drains vessel (RLD-VSL-00008).

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary.

All sumps are equipped with radar-type level detectors and have ejectors. All sumps are also fabricated with 6% molybdenum alloy (UNS N08367).

If the capacity of the offgas drains collection vessel (RLD-VSL-00002) is exceeded or failure of the tank occurs, the waste flows to sump RLD-SUMP-00001, which is located in the same section of the room. Two ejectors (RLD-EJCTR-00052A/B) are provided to transfer the waste from the sump to RLD-VSL-00008.

If the capacity of the acidic waste vessel (RLD-VSL-00007) is exceeded, the excess overflows to RLD-VSL-00008. This sump is equipped with two ejectors (RLD-EJCTR-00049A/B). During normal operations, one of the ejectors transfers the waste to RLD-VSL-00008. If the capacity of RLD-VSL-00008 is exceeded, the excess flows into sump HCP-SUMP-00001. The second ejector transfers the waste to breakpot RLD-BRKPT-00004. From this breakpot, the waste flows by gravity to the PTF. Leaks from these two tanks flow into sump HCP-SUMP-00001.

Sumps HPH-SUMP-00001 and HPH-SUMP-00005 collect any liquids or decontamination solutions in the canister handling cave. An ejector (RLD-EJCTR-00051) transfers the wastes from HPH-SUMP-00001 to RLD-VSL-00008. The contents of sump HPH-SUMP-00005 are transferred by an ejector (RLD-EJCTR-00029) to RLD-VSL-00008.

Sump HPH-SUMP-00003 collects any leaks in the pour tunnel 1. An ejector (RLD-EJCTR-00014) transfers the wastes to RLD-VSL-00008.

### 5.7.4.1 Design Standards

All sumps are dry sumps, with dimensions of 30 inches in diameter by 18 inches deep. The sumps are fabricated in accordance with design methodology specified in ANSI/AISC N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

### 5.7.4.2 Characteristics of the Waste

During normal operations, the sumps are dry. The sumps, in combination with the stainless steel-lined rooms, provide secondary containment for wastes from the RLD tanks, canister handling cave, and pour tunnel 1.

The materials of construction for secondary containment system are compatible with the waste managed in the RLD, canister handling cave, and pour tunnel 1. Assessment for sumps located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each room is considered to have the same potential for corrosion and erosion as the tank that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

# 6 Underground Transfer Lines

This section provides descriptions of the underground transfer lines, including secondary containment, that are used to transfer wastes from the DOE Tank Farms to the WTP PTF and between the WTP facilities. Information is provided on the purpose of these underground transfer lines, and their design characteristics, including materials of construction and corrosion/erosion allowances. The design standards used for the transfer lines are also provided.

There are 21 underground transfer lines carrying dangerous waste that are connected to, or are within, the WTP facilities. The transfer lines are sloped, with eight of the transfer lines having a minimum slope of 1:50 and the remaining 13 lines having a minimum slope of 1:200. All lines, except the lines from the PTF to the LERF/ETF, are sloped toward the PTF, where the outer jacket pipe terminates in leak detection boxes located within the PTF pipe tunnels. The PTF to LERF/ETF lines are sloped toward the LERF/ETF facility, and the leak detection boxes are located at the WTP boundary.

All underground transfer lines are double-walled, with a 3-inch-diameter nominal stainless steel primary pipe and a 6-inch-diameter nominal carbon steel secondary pipe. The secondary encasement pipe has a fusion bounded epoxy coating with shrink wrap sleeves covering the clamshell welds and a cathodic protection system using an impressed current system. The epoxy coating provides corrosion protection and reduces the current requirement of the cathodic protection system.

Several secondary containment pipes are surrounded by a layer of insulation (1 to 2 inches thick) and a protective polymer outer shell (e.g., secondary pipe from the DOE Tank Farm to the WTP PTF). Because of its isolation from the surrounding soil and groundwater intrusion, the secondary pipe does not need to be cathodically protected; however, it is connected to cathodically protected piping at both ends and therefore may receive some cathodic protection within those areas.

Primary transfer lines are flushed after each use to minimize the accumulation of waste material and prevent corrosion of the line. Flushing capabilities for removing leaks or accumulated liquid from the secondary containment pipe are also provided.

The leak detection system of the underground transfer pipes employs leak detection boxes at the low points of the pipes so that in the event that the primary pipe leaks, the leak is contained by the secondary pipe and drains into the leak detection boxes. In each of the leak detection boxes, there is a level switch to detect leaks. Once the sensing element of the switch detects a leak, the switch sends a signal to activate a leak detection alarm.

For leak detection boxes installed inside the PTF (PWD-LDB-00001 through PWD-LDB-00019), the box is a horizontal stainless steel pipe with capped ends, drain, overflow drain, and weir. The drain located between the weir and the closest end cap (which is called the containment side of the weir), is normally closed by a plug attached to a rod extending to an accessible area above the leak detection boxes. The overflow drain, located in the non-containment side of the weir, has a similar apparatus, but remains open. The level switch is located in the containment side of the weir. The design of the leak detection boxes is provided in 24590-WTP-PER-J-02-002 (*Low-Point Leak Detection in Secondary Containment Systems Including Buried Co-Axial Transfer Lines*) and 24590-BOF-CS-80-00102 (*RAD Transfer Lines, Miscellaneous Details*, Sheet 3).

The leak detection boxes located at the WTP boundary (RLD-LDB-00012 and RLD-LDB-00013) have a similar design as the leak detection boxes installed inside a building. However, the overflow drain remains closed and is opened only after the placement of an appropriate overflow containment receptacle.

Prior to installation in the leak detection boxes, the leak detection level switches are tested for functionality. The leak detection system is periodically self-tested in-situ, to facilitate continuous operability. The design of the underground transfer lines provides quick connections to allow pneumatic tests of the leak detection boxes and secondary containment pipes of the transfer lines.

The underground transfer lines are covered with bedding and backfill materials consisting of granular material or controlled density fill as specified in 24590-BOF-3PS-CE01-T0001, *Engineering Specification for Excavation and Backfill.* The bedding material at the building interfaces consists of an expansion absorbing cushion made of mineral inorganic glass fiber material and a dry, free-flowing granular product formulated from select inert, inorganic materials as specified in 24590-BOF-3PS-C000-T0002, *Engineering Specification for Excavation and Backfill of Underground Radioactive Waste Transfer Lines.*

## 6.1 Design Standards

The primary containment pipe for the underground transfer lines between the WTP facilities is stainless steel 316L (UNS S31603). The secondary containment pipe is made of carbon steel. It has an epoxy-coating and cathodic protection system to be corrosion resistant during its 40-year design life. The pipes are designed in accordance with ASME B31.3-96, Process Piping.

The 3-inch-diameter nominal primary pipe has a 0.216-inch wall thickness. The 6-inch-diameter nominal secondary pipe has a 0.280-inch wall thickness. The primary pipe from the DOE Tank Farm to the PTF has 0.0160-inch corrosion and erosion allowances. The primary pipes between the WTP facilities have from 0.0425-inch to 0.0937-inch corrosion and erosion allowances. There are no corrosion and erosion allowances specified for the secondary pipe because of the epoxy-coating, the cathodic protection system, and for some of the lines, the insulation and protective polymer outer shell around the pipe.

The likelihood of corrosion of the secondary containment pipe of the transfer lines due to liquid in the annular space is small because any leak from the primary pipe is quickly contained and directed to the leak detection boxes, reducing exposure time. In addition, corrosion of the secondary containment pipe is not expected to occur due to the epoxy coating and cathodic protection system. The use of the tertiary barrier (insulation and protective polymer outer shell) for some of the pipes also isolates the secondary containment pipe from external sources of moisture, which eliminates the occurrence of corrosion.

## 6.2 Characteristics of the Waste

The PTF receives LAW and HLW waste feeds from the DOE Tank Farms through three transfer lines. The LAW waste feed is approximately 63.7 wt% water, 35.5 wt% dissolved solids, and 0.78 wt% solids with a pH of 14. The HLW waste feed is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids with a pH of 13 (24590-WTP-M4C-V11T-00010).

The PTF pretreats the feeds and transfers them to the LAW vitrification facility through three transfer lines or to the HLW vitrification facility through four transfer lines. The treated LAW feed is approximately 57.9 wt% water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of approximately

12.0 to 14 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-TLP-P0005). The treated HLW feed is approximately 76.1 wt% water, 5.6 wt% dissolved solids, and 18.3 wt% solids with a pH of 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-HLP-P0007).

Secondary waste from the analytical laboratory is transferred to the PTF for treatment and disposal through one transfer line. Waste includes contents of the hot cell drain collection vessel (RLD-VSL-00165) that are discharged to the PTF plant wash vessel PWD-VSL-00044. The contents of RLD-VSL-00165 are 92.33% water by volume, 6.94% chemical source by volume, 0.73% sample source by volume, and negligible solids by volume (24590-LAB-MVC-RLD-00003).

Secondary waste from the LAW vitrification facility is returned to the PTF for treatment and disposal through four transfer lines. Waste includes contents of the LAW caustic collection tank (LVP-TK-00001), plant wash vessel (RLD-VSL-00003), and SBS condensate collection vessel (RLD-VSL-00005). Tank LVP-TK-00001 receives scrub solution from the caustic scrubber and recirculates the solution back to the caustic scrubber or, periodically, discharges scrubber bottoms that are approximately 90.1 wt% water and 9.8 wt% dissolved solids with a pH of 9.0 to 9.5 to the PTF (24590-WTP-M4C-V11T-00010, 24590-QL-POA-MKAS-00003-08-00003). RLD-VSL-00003 is normally empty, but can receive plant wash that may be corrosive (24590-WTP-M4C-V11T-00010). RLD-VSL-00005 receives recirculation from the SBS condensate collection vertical pumps or transfers from the plant wash vertical pumps. SBS condensate has a pH of 1 to 7.83 (24590-LAW-N1D-RLD-00002).

Secondary waste from the HLW vitrification facility is returned to the PTF through four transfer lines. Waste includes contents of the acidic waste vessel (RLD-VSL-00007) and plant wash and drains vessel (RLD-VSL-00008) described in Sections 5.7.2.2 and 5.7.3.2.

Secondary waste generated within the PTF is transferred through two transfer lines to the LERF/ETF. Waste includes contents of the alkaline effluent vessels (RLD-VSL-00017A/B) and process condensate tanks (RLD-TK-00006A/B). These tanks receive condensate/effluent that is 100 wt% water and has a pH ranging from approximately 11.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-RLD-00001, 24590-PTF-N1D-RLD-P0002).

The materials of construction for the underground transfer lines are compatible with the waste carried by the lines provided that they are flushed as required (24590-PTF-PER-M-02-003). The transfer lines are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, corrosion prevention methods such as epoxy coating and cathodic protection system, and nature of the waste managed in the tank. The underground transfer lines are not accessible for inspection without excavation.

# 7 Assessment Approach and Schedule

This section presents the integrity assessment approach and schedule for the DWP-regulated plant items in the PTF, HLW vitrification facility, and for underground transfer lines.

## 7.1 Assessment Approach

This section presents information on the integrity assessments to assure DWP-regulated plant items retain their structural integrity. These activities include routine inspections, operating history reviews, static liquid volume tests, NDEs, and visual inspections.

### 7.1.1 Routine Inspections

Routine inspections (such as visual inspections, camera inspections, and instrumentation inspections) to check for leaks from tanks, miscellaneous units, breakpots, bulges, sumps, and piping are performed and recorded where design features are provided for that purpose to ensure waste has not leaked from a tank, miscellaneous unit, breakpot, bulge, sump, or pipe. Routine inspections are a part of normal plant operations and contribute to an understanding of the current operating conditions. Routine inspections are performed in accordance with the requirements of Chapter 6.0 of the WTP DWP as specified in WTP DWP condition III.10.C.5.c, WAC 173-303-640(6) and WAC 173-303-680(3). For equipment in accessible areas, routine inspections include visual inspections and/or instrumentation inspections. For equipment in hard-to-reach areas or black cells where visual inspections are not possible, monitoring via instrumentation inspections is used to perform the routine inspections. The data from these routine inspections is considered in scheduling periodic integrity assessments.

### 7.1.2 Integrity Assessments

Periodic integrity assessments are performed over the life of the DWP-regulated plant items to assure they retain their structural integrity and will not collapse, rupture, or fail. All regulated plant items are categorized into different classes. The classification system allows extra assessment efforts to be focused on regulated plant items that may have the highest potential consequences if failure or loss of containment should occur.

Tanks, miscellaneous units, breakpots, bulges, sumps, and piping with a design life of 40 years are adequately designed and fabricated to last for 40 years without in-service replacement in accordance with the controls and materials of construction described in Section 2 and the design standards described in Sections 4 through 6. For the purpose of scheduling periodic assessments, a DWP-regulated plant item is considered to have a lower potential for corrosion and erosion or a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed.

Most equipment is considered to have a lower potential for corrosion and erosion for assessment scheduling. Tanks in which erosion due to higher velocities may occur are considered to have a higher potential for corrosion and erosion. Specifically, tanks with mixers that result in higher velocities are considered to have a higher potential for corrosion and erosion for assessment purposes, even though they are designed with additional thickness to compensate for additional erosion.

The following provides the frequency of assessments for regulated plant items located in accessible areas or hot cells.

- **Frequency of Assessments for Equipment with Lower Potential for Corrosion and Erosion.** Assessment of equipment with lower potential for corrosion and erosion within accessible areas or hot cells is made during routine or maintenance outages and within 10 years after start of hot

commissioning at selected accessible points where baseline NDE measurements had been taken. Subsequent integrity assessments will be based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 10 years between integrity assessments. Ten years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated wear due to corrosion or erosion, adequate wall thickness would still remain to prevent failure and corrective actions taken if required.

- **Frequency of Assessment for Equipment with Higher Potential for Corrosion and Erosion.** Assessment of equipment with higher potential for corrosion and erosion within accessible areas or hot cells is made during routine or maintenance outages and within 7 years after start of hot commissioning at selected accessible points where baseline NDE measurements had been taken. Subsequent integrity assessments will be based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 7 years between integrity assessments. Because of the potential for increased corrosion and erosion, 7 years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated wear due to corrosion or erosion, adequate wall thickness would still remain to prevent failure and corrective actions taken if required.

Baseline NDE measurements as described in Section 2.3 are conducted to establish the baseline condition of equipment prior to start of dangerous waste operations. Vendor-provided weld and NDE inspection records and associated quality control documents may also be used to supplement the baseline NDE measurements to establish the baseline condition of equipment prior to start-up and operations. Results of future integrity assessments will be compared to the baseline condition to evaluate the structural integrity of equipment and to determine whether the schedule of future assessments should be adjusted.

Where corrosion and/or erosion rates can be determined, the maximum assessment interval is the smaller of:

Remaining Corrosion Allowance/2N years (where remaining corrosion allowance is the difference between the measured shell thickness and the minimum required thickness in mils, and N is the corrosion rate in mils per year);

or:

Seven and 10 years, respectively, for equipment with higher or lower potential for corrosion and erosion.

With no access into the black cells during the 40-year life of the WTP, direct visual or physical inspections of equipment are not possible. Since hard-to-reach areas are designed for no equipment access and maintenance, direct visual or physical inspections of equipment located in these areas are also not possible. For these regulated plant items, instead of performing physical inspections as described above, operating history reviews and static liquid volume leak tests as specified in Sections 7.1.3 and 7.1.4 are conducted. In addition, surrogate equipment for NDE measurements has been selected for these inaccessible plant items as described in Section 7.1.5.

The underground transfer lines are not accessible for direct visual or physical inspections without excavation. For these lines, instead of performing inspections as described above, operating history reviews and pneumatic leak tests as specified in Sections 7.1.3 and 7.1.6 are conducted.

### 7.1.3 Operating History Reviews

The operating and maintenance history of tanks, miscellaneous units, bulges, sumps, and piping are evaluated to verify that the regulated plant items have been operating within the process envelope used to determine the material of construction and corrosion and erosion allowances. This assessment will include reviewing the process chemistry and parameters such as pH, temperature, and pressure, where available, over the period of assessment. Table 8 provides a summary of the process chemistry and parameters that are generally monitored and evaluated during the operating history reviews. A description of the detailed process chemistry sampling and analysis conducted on dangerous waste managed in the PTF and HLW vitrification facility is provided in 24590-WTP-RPT-ENV-01-003, *Waste Treatment Plant Waste Analysis Plan*. For cases where the process conditions deviate from the design conditions, the data are evaluated to determine potential effects on the regulated plant item corrosion and erosion allowances.

These reviews of operating and maintenance conditions and process chemistry for tanks, miscellaneous units, breakpots, bulges, sumps, and piping are done at least every 2 years, or whenever operating parameters are known to have been outside of the specified process and operating limitations, or when the process chemistry data identified on the respective Corrosion Evaluation Reports/Material Selection Data Sheets, which were used for initial material selection, are revised to incorporate new process information.

Process monitoring is facilitated by a facility-wide autosampling system. The WTP Autosampling System consists of the following major components:

- Ten Autosampler Units - Five located in the PTF, three located in the HLW vitrification facility and two located in the LAW vitrification facility.
- Each sampler is connected to several components that require sampling of their contents. At each autosampler unit, sample bottles are received from a sample container magazine, filled with a sample from the waste stream, and dispatched to the analytical laboratory.
- Pneumatic Transfer System - A network of transport tubes, diverters, exhausters, HEPA filters, and controlled arrival facilities work concurrently to transfer the sample bottles to the analytical laboratory.
- Hot Cell Receipt Station - This is the analytical laboratory receipt station for HLW vitrification facility and PTF samples.

Each autosampling unit consists of a main glovebox with a robotic arm and sample retrieval mechanism. A sample container magazine is positioned locally at each autosampler unit for dispatching new sample bottles into the main glovebox. Table 9 provides a summary of the PTF and HLW tanks monitored by sampling and analysis.

The autosampling system does not sample the contents of all tanks and miscellaneous units located in black cells or hard-to-reach areas. The following tank and miscellaneous unit contents are not sampled by the autosampling system:

- In the HLW vitrification facility, HOP-VSL-00903 and HOP-VSL-00904 (which are considered to have a higher potential for corrosion and erosion) are in black cells and are not monitored by the facility sampling system. The contents of these tanks are transferred to RLD-VSL-00007, which is monitored by the facility sampling system.
- In the HLW vitrification facility, HOP-WESP-00001 and HOP-WESP-00002 are located in hard-to-reach areas and are not monitored by the facility sampling system. The WESPs drain directly into HOP-VSL-00903 and HOP-VSL-00904.
- In the PTF, CNP-VSL-00003 (which is considered to have a higher potential for corrosion and erosion) is in a black cell and is not monitored by the facility sampling system. However, this tank receives waste only in off-normal operations.
- In the PTF, PWD-VSL-00033 and PWD-VSL-00043 are located in hard-to-reach areas and are not monitored by the facility sampling system. The contents of these tanks are transferred to PWD-VSL-00044, which is monitored by the facility sampling system.

The HLW melters and film coolers, which are designed to be replaced at the end of their 5-year design life, have replaceable melter components (e.g., bubblers, thermowells, glass level detectors) that have a design life of 6 months or 12 months. Review of melter operations and maintenance records at the time of component replacements form the basis for the assessment for the melters.

Operating history review is the only other assessment method suitable for use on underground transfer lines in addition to pneumatic leak tests. Records of waste transfers, transfer line flushes, and leak detections and confirmation of process chemistry conditions assure the integrity of these lines.

### 7.1.4 Static Liquid Volume Tests

Static liquid volume leak tests are made periodically to ensure that there is no leakage by demonstrating that a tank can maintain its liquid level over a period of time when fluid flow into and out of the tank is stopped. Static liquid tests are performed in accordance with procedures described in API 334 or equivalent guidance documents for tanks.

Static liquid volume leak tests are conducted for tanks located in accessible areas, hot cells, hard-to-reach areas, and black cells. For tanks located in accessible areas and hot cells, these tests are performed as part of the integrity assessment. For tanks located in hard-to-reach areas and black cells, these tests, plus the operating history reviews, are the integrity assessment.

For tanks considered to have a lower potential for corrosion and erosion, static liquid volume leak tests are performed during routine or maintenance outages and within 10 years after start of hot commissioning. Subsequent static liquid volume leak tests will be based on the results of previous leak tests, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 10 years between tests.

For tanks considered to have a higher potential for corrosion and erosion, the tests are made during routine or maintenance outages and within 7 years after start of hot commissioning. Subsequent static liquid volume leak tests will be based on the results of previous leak tests, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 7 years between tests.

### 7.1.5 Non-Destructive Examinations

Pre-operational baseline NDE measurements are performed on DWP regulated plant items before the initial receipt of dangerous waste as described in Section 2.3. Subsequent NDE measurements for accessible regulated plant items are conducted as part of the integrity assessments. The objective of the NDE measurements is to determine the remaining corrosion and erosion allowances of regulated plant items. Results of subsequent NDE measurements on accessible equipment collected during routinely-scheduled integrity assessments will be compared to the baseline NDE measurements to evaluate the structural integrity of equipment and to determine whether the schedule of future assessments should be adjusted. Thickness measurements allow for confirmation that the expected corrosion and erosion rates at the designed operating conditions (including temperature, pH, and chemistry) and erosive conditions (e.g., in discharge and suction path of the PJMs) have not been exceeded and that the equipment-specific corrosion/erosion allowances continue to be adequate to maintain structural integrity for the design life of the equipment.

NDE measurements are to be conducted as part of the integrity assessments for tanks and other regulated plant items designed to pressure vessel standards, for other tanks and miscellaneous units, for piping connected to regulated plant items, and for in-line components. Bulges, sumps, and stainless steel liners do not receive dangerous waste unless there is a leak from a tank, miscellaneous unit, breakpot, piping, or in-line component. For bulges, sumps, and stainless steel liners, NDE measurements are to be conducted as part of the integrity assessments only when the operating history reviews indicate that a leak traveled to and entered these plant items. Operating history reviews and pneumatic leak tests are the only assessment methods suitable for use on underground transfer lines.

DWP-regulated plant items in black cells and hard-to-reach areas in the PTF and HLW vitrification facility are not accessible for NDE measurements following the pre-operational baseline measurements. Where possible, NDE measurements on similar accessible equipment are used as surrogates for NDE measurements on equipment in black cells and hard-to-reach areas. Table 10 provides a summary of accessible equipment in the PTF, LAW vitrification facility, and analytical laboratory that are used as surrogates for NDE measurements for regulated equipment in black cells and hard-to-reach areas in the PTF and HLW vitrification facility, and for the inaccessible hot cell drain collection vessel (RLD-VSL-00165) in the analytical laboratory.

The following criteria were used to identify accessible DWP-regulated equipment for use as surrogates for NDE measurements on inaccessible equipment (in hard-to-reach areas and black cells). In all cases, the surrogate plant item is of the same material as the inaccessible plant item(s).

- Direct correspondence – surrogate receives the same waste, has the same or comparable corrosion allowances, and has the same or similar potential for erosion. For example, the two accessible melter concentrate receipt vessels (LCP-VSL-00001 and LCP-VSL-00002) in the LAW vitrification facility that receive treated LAW from the inaccessible treated LAW concentrate storage vessel (TCP-VSL-00001) located in a black cell in the PTF are direct correspondence surrogates for tank TCP-VSL-00001 (same waste as well as same material and corrosion allowance and similar potential for erosion).
- Similar attributes - surrogate receives similar waste, has similar corrosion allowances, and has similar potential for erosion. For example, the two accessible melter concentrate receipt vessels (LCP-VSL-00001 and LCP-VSL-00002) in the LAW vitrification facility that receive treated LAW are similar attribute surrogates for tanks that are part of the LAW pretreatment process immediately upstream

from TCP-VSL-00001. Although inaccessible tanks that receive LAW undergoing pretreatment (CXP-VSL-00001, CXP-VSL-00026A/B/C, and UFP-VSL-00062A/B/C located in black cells in the PTF) do not contain the same waste as LCP-VSL-00001 and LCP-VSL-00002, it is similar waste, while tank materials and corrosion allowance are the same. As a conservative surrogate attribute, the LCP tanks have greater potential for erosion such that if erosion rates in the LCP tanks do not exceed design criteria, erosion rates in similar inaccessible tanks do not exceed design criteria.

- Limited similarity – surrogate receives waste streams different from inaccessible plant items, but has a similar higher potential for corrosion/erosion based on similar pH conditions or mixing process/erosive conditions. For example, the accessible MFVs and MFPVs (LFP-VSL-00001, LFP-VSL-00002, LFP-VSL-00003, and LFP-VLS-00004) in the LAW vitrification facility, which receive treated LAW and glass formers, are potential surrogates for inaccessible tanks with the highest erosion potential due to contents and/or mixing operations. Due to the high potential for erosion, the LAW vitrification facility MFVs and MFPVs are also equipped with increased bottom head and shell thicknesses similar to inaccessible tanks with PJMs. Therefore, LFP-VSL-00001, LFP-VSL-00002, LFP-VSL-00003, and LFP-VSL-00004 are potential surrogates for PTF feed receipt vessels (FRP-VSL-00002A/B/C/D), PTF HLW lag storage vessels (HLP-VSL-00027A/B), and other PTF tanks that have a higher potential for erosion due to contents and/or mixing operations and/or a higher potential for corrosion due to process chemistry.

For accessible equipment, the integrity assessment thickness measurements are conducted at the same locations as the pre-operational baseline thickness measurements. By taking repeated measurements at the same points, the expected remaining corrosion and erosion allowances of the regulated plant items can be more accurately calculated. NDE measurement locations for welds or wall thicknesses are illustrated in Appendix B. These drawings are provided as information becomes available and are to be included in future revisions of this document; a set of drawings will be made available no later than 6 months prior to cold commissioning.

Similar to the baseline thickness measurements, integrity assessment thickness measurements are made in accordance with written procedures implementing the requirements of ASTM E 797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method. Section 9 of ASTM E 797 provides the requirements for developing a detailed written procedure.

### 7.1.6 Pneumatic Leak Tests of Underground Transfer Lines

Pneumatic tests of secondary containment pipes of the underground transfer lines are made periodically to ensure that there is no leakage by demonstrating that the secondary containment pipes can maintain the test pressure over a period of time. Pneumatic leak tests are performed in accordance with procedures described in ASME B31.3-96 or equivalent guidance documents.

Since the underground transfer lines are not accessible for visual or physical inspections without excavation, the pneumatic leak tests, with the operating history reviews, are the integrity assessment. The underground transfer lines are considered to have a lower potential for corrosion and erosion (Section 6.2). The leak tests are performed during routine or maintenance outages and within 10 years after start of hot commissioning. Subsequent pneumatic leak tests will be based on the results of previous leak tests, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 10 years between tests.

### 7.1.7 Visual Examinations

Visual examinations (conducted with, or without, the assistance of CCTV) are conducted in accordance with written procedures that conform to the requirements of ASME Section V, Article 9. Visual examinations include:

- Evidence of excessive or uneven settlement of the tank foundation such as distortion and cracks around anchor bolts attaching a tank to an underlying foundation
- Rust, pitting, and other visual evidence of corrosion on the exterior of metal tanks, miscellaneous units, and ancillary equipment (including sumps and stainless steel cell liners in accessible cells), especially at grade level and connections
- Evidence of deterioration of exterior coatings such as rust spots and blisters
- Damage to any insulation being used
- Evidence of possible leaks around the tank, miscellaneous units, or ancillary equipment such as discoloration of coatings
- Cracks or evidence of leaks at joints and welds, especially at connections
- Apparent loss of metal thickness on the tank bottom and sides
- Condition of tank and miscellaneous unit system coatings and linings (including sumps and stainless steel cell liners in accessible cells) including cracks, gaps, swelling, blistering, and crinkling

Visual examinations of accessible piping include:

- Sufficient materials and components, selected at random, to satisfy the examiner that they are free from defects
- At least 5% of welds
- Random examination of threaded, bolted or other joints

A process and mechanical handling monitoring CCTV system provides for remote visual examination of equipment and operations within specified cave and hot cell areas and where the radiation levels are too high for personnel access. Cameras are located to give optimum viewing angles and distance to suit the process where required. Cameras used for process functions can be used to view some regulated equipment but the capability is limited by their locations.

In the PTF, CCTV systems are installed in the following rooms:

- P-0123, hot cell vessels CXP-IXC-00001 through CXP-IXC-00004, UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, and UFP-FILT-00005A/B; and miscellaneous units CNP-HX-00001, FEP-RBLR-00001A/B, and TLP-RBLR-00001
- P-0123A, RDMC area tank PIH-TK-00001
- P-0335, filter cave miscellaneous units PJV-DMST-00002A/B/C, PJV-HEPA-00001A/B/C/D/E/F/G, PVP-HEME-00001A/B/C, and PVV-HEPA-00001A/B

In the PTF, to meet in-cell sump inspection requirements, all black cell sumps are equipped with 2-inch diameter guide lines (wall penetrations) for TV camera access.

In the HLW vitrification facility, CCTV systems are installed in the following rooms:

- H-0304A and H-0310A, accessible area tanks HSH-TK-00001 and HSH-TK-00002
- H-0106 and H-0117, melter cave vessels HFP-VSL-00001, HFP-VSL-00002, HFP-VSL-00005, and HFP-VSL-00006
- H-0106 and H-0117, melter cave miscellaneous units HMP-MLTR-00001, HMP-MLTR-00002, HOP-FCLR-00001, HOP-FCLR-00002, HOP-FCLR-00003, HOP-FCLR-00004, HOP-HEME-00001A/B, HOP-HEME-00002A/B, HOP-SCB-00001, and HOP-SCB-00002

### 7.1.8 Rigid Process Jumpers

The PTF and HLW vitrification facility include equipment referred to as rigid process "jumpers". By definition, this equipment consists of a remotely handled piece of equipment that provides a bridge for service and process lines from either a black cell or hard-to-reach area service or process pipe to a vessel or piece of equipment which is located in a hot cell or melter cave. Within the hot cells and melter caves, most items are designed to be removed and installed using an overhead crane, impact wrenches, and a power manipulator. Operations are monitored using remote cameras and local task lighting deployed on the crane. These limited access operations are facilitated by the connection of all components by the remotely-removable jumpers, which have remotely-manipulated connector heads at either end.

Jumpers are installed as part of the process piping connecting selected regulated plant items, which allows for direct NDE measurements of the jumper piping wall thickness and inspection for corrosion or erosion of piping systems. NDE measurements of remotely-accessible process jumpers may also provide surrogate information for regulated units in black cells that are part of the process stream that flows through the jumpers.

Systems in the PTF with process jumpers include:

- FRP, HLP, RDP, and UFP – jumpers connect black cell tanks and piping to pumps in the hot cell
- FEP and TLP – jumpers connect black cell tanks, miscellaneous units, and piping to pumps in the hot cell
- CNP – jumpers connect black cell tanks and piping to vessel-emptying ejectors and a black cell miscellaneous unit and piping to a pump in the hot cell
- CXP – jumpers connect black cell tanks and piping to vessel-emptying ejectors and pumps in the hot cell

In the PTF, systems with tanks in black cells for which there are no jumpers located in the hot cell include TCP, PVP, and PWD. The TCP tank and piping located in a black cell is connected to a pump in an accessible area. The PVP tank and miscellaneous unit and piping located in a black cell are connected to pumps in bulges. The PWD tanks and piping located in black cells are connected directly to other tanks in black cells or have piping that can be connected by jumper to a vessel-emptying ejector on an as needed basis.

In the HLW, the HOP has process jumpers that connect black cell tanks and piping to miscellaneous units in a hot cell. The RLD tanks and piping located in a black cell are connected directly to breakpots or other tanks in the black cell.

Specific jumpers that may be examined as part of integrity assessment activities are illustrated in Appendix B. These drawings are provided as information becomes available and are to be included in future revisions of this document; a set of drawings will be made available no later than 6 months prior to cold commissioning.

## 7.2 Assessment Schedule

This section presents the integrity assessment schedule for the regulated plant items in the PTF and HLW vitrification facility. Figure 1 presents a schedule for initial integrity assessments at 7 and 10 years assuming completion of facility construction by 2016.

### 7.2.1 Frequency of Assessments for Equipment with Lower Potential for Corrosion and Erosion

Assessment of equipment considered to have a lower potential for corrosion and erosion in accessible areas or hot cells is made during routine or maintenance outages and within 10 years after start of hot commissioning at selected accessible points where baseline NDE measurements had been taken. Subsequent integrity assessments will be based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 10 years between integrity assessments. Ten years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated wear due to corrosion or erosion, adequate wall thickness would still remain to prevent failure and corrective actions taken if required. Table 7 presents the schedule for conducting periodic assessments of regulated plant items located in the PTF and HLW vitrification facility.

With no access into the hard-to-reach areas and black cells during the 40-year life of the WTP, direct visual or physical inspection of equipment considered to have a lower potential for corrosion and erosion are not possible. For these regulated plant items, operating history reviews are performed every 2 years. Static liquid volume leak tests of tanks considered to have a lower potential for corrosion and erosion are performed during routine or maintenance outages and within 10 years after start of hot commissioning. Additionally, NDE measurements conducted on surrogate equipment (see Section 7.1.5) provide information that is representative of corrosion and erosion rates for the inaccessible equipment. Subsequent static liquid volume leak tests will be based on the results of previous leak tests, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 10 years between tests.

### 7.2.2 Frequency of Assessment for Equipment with Higher Potential for Corrosion and Erosion

Assessment of equipment that is considered to have a higher potential for corrosion and erosion in accessible areas or hot cells is made during routine or maintenance outages and within 7 years after start of hot commissioning at selected accessible points where baseline NDE measurements had been taken.

Subsequent integrity assessments are based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 7 years between integrity assessments. Because of the potential for increased corrosion and erosion, 7 years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated wear due to corrosion or erosion, adequate wall thickness would still remain to prevent failure and corrective actions taken if required. The schedule for conducting periodic assessments of regulated plant items located in the PTF and HLW vitrification facility is provided in Table 7.

With no access into the hard-to-reach areas and black cells during the 40-year life of the WTP, direct visual or physical inspections of equipment considered to have a higher potential for corrosion and erosion are not possible. For these regulated plant items, operating history reviews are performed every 2 years. Static liquid volume leak tests of tanks with higher potential for corrosion and erosion are performed during routine or maintenance outages and within 7 years after start of hot commissioning. Additionally, NDE measurements conducted on surrogate equipment (see Section 7.1.5) provide information that is representative of corrosion and erosion rates for the inaccessible equipment. Subsequent static liquid volume leak tests are based on the results of previous leak tests, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 7 years between tests.

### 7.2.3 Potential Access Impacts on the Assessment Schedule

The majority of the regulated plant items in the PTF and HLW vitrification facility are located in cells that are designated R5/C5 (Table 6). Personnel access is not normally permitted inside these R5/C5 areas. There is no access into R5/C5 areas in hard-to-reach areas and black cells during the 40-year life of the WTP. As conditions allow, and subject to an approval process, R5/C5 areas in accessible areas and hot cells may be downposted to permit access for offnormal conditions and/or equipment maintenance, or for integrity assessments. For example, for accessible areas and hot cells containing tanks, downposting occurs after source term reduction by emptying and flushing the tanks and after contamination reduction inside the accessible areas and hot cells.

The tanks, pumps, and valves in R5/C5 areas located in accessible areas and hot cells receive in-service inspection and surveillance. The tanks, pumps, and valves may be flushed prior to maintenance to reduce radiation fields (dose to personnel).

## 7.3 Adjustment of Periods Between Assessments

Subsequent assessment intervals may be reduced based on abnormal events (e.g., seismic event resulting in the category III loads [as defined in Section 5 of 24590-WTP-3PS-FB01-T0001] and the design basis events for the PTF and HLW vitrification facility described in 24590-PTF-RPT-ESH-02-002 and 24590-HLW-RPT-ENS-08-002, respectively), process conditions, operating histories, routine inspection results, and corrosion and erosion allowances of the regulated plant item. Adjustment of the period between assessments may be based on the inspection interval calculation(s) described in Section 7.1.2 above.

## 7.4 Prioritization of Equipment Assessments

Due to the large number of DWP-regulated tanks and miscellaneous units and their associated ancillary equipment, prioritization of the order in which integrity assessments for DWP-regulated items are

conducted is required. Figure 1 presents the overall schedule for DWP-regulated equipment integrity assessments, which are to be conducted at intervals of either 7 years or 10 years after hot commissioning as designated in Table 7. Appendix C provides a prioritized contingent schedule for assessment of DWP-regulated equipment in the PTF and HLW vitrification facility. The prioritization is contingent upon the as-built layout of the facilities and actual operation requirements.

In general, the order for equipment to undergo integrity assessments follows the waste treatment process, with the following considerations:

- equipment in black cells and hard-to-reach areas is assessed first
- equipment used as NDE surrogates is assessed before or at the same time as corresponding equipment in black cells or hard-to-reach areas
- equipment containing LAW or HLW is assessed before equipment containing condensate or offgases
- process equipment is assessed before PWD equipment
- larger tanks are assessed before small tanks or breakpots
- sumps in rooms with no DWP-regulated tanks or miscellaneous units are assessed last unless they are used as NDE surrogates

For example, for the PTF equipment designated for initial assessment 7 years after hot commissioning (Table 7), the contingent priority order follows the waste treatment process with the first equipment undergoing assessment consisting of the FRP tanks in black cells, which receive untreated waste from the tank farms and which are also the largest tanks. The last equipment undergoing assessment consists of sumps in black cells that contain no tanks or equipment being assessed at 7 years; sumps in the hot cell; and tank RDP-VSL-00004, which is located in an accessible area.

The LAW vitrification facility and PTF equipment that is used as NDE surrogates (Table 10) undergo integrity assessments before or at the same time as the corresponding equipment in black cells or hard-to-reach areas.

## 7.5 Reporting

Upon completion of a periodic integrity assessment, the IQRPE reviews the data obtained from routine inspections, operating history reviews, static liquid volume tests, ultrasonic thickness testing, pneumatic leak testing, and visual examinations. The IQRPE prepares a report of assessment results. The report of assessment results is reviewed and certified. The certification includes the following statement from WAC 173-303-810(13)(a): "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The report of assessment results includes: an introduction describing the scope and objectives of the assessment; the methods used to conduct the assessment; the results of the assessment; and the

conclusions of the assessment including recommendations regarding the time interval before the next integrity assessment.

Reports of the results of operating history reviews include the following information:

- Date of the examination
- Procedure and revision used
- Technique used
- Results of the examination
  - minimum
  - maximum
  - average
  - standard deviation
- Examination personnel identity and qualifications

The reports of results of static liquid volume tests include:

- Date of the examination
- Procedure and revision used
- Technique used
- Results of the examination
  - minimum
  - maximum
  - average
  - standard deviation
- Examination personnel identity and qualifications

Reports of the results of ultrasonic thickness testing include the following information:

- Date of the examination
- Examination procedure
- Type of instrument
- Standardization blocks, size and material type
- Size, frequency and type of search unit
- Scanning method
- Results
- Maximum and minimum thickness measurements
- Location of measurements
- Personnel data, certification level

Reports of the results of pneumatic leak testing of underground transfer lines include the following information:

- Date of the examination
- Procedure and revision used
- Type of instrument
- Test medium
- Location of measurements
- Start and finish times, temperatures, and pressures
- Results of the examination
- Examination personnel identity and qualifications

The reports of results of visual (conducted with or without use of CCTV) examinations include:

- Date of the examination
- Procedure and revision used
- Technique used
- Results of the examination
- Examination personnel identity and qualifications

Reports of assessment results are collected, maintained, and stored in accordance with 24590-WTP-GPP-PADC-002, *Project Records Management*.

### 7.6 Contingency Action

If the integrity assessment program detects problems with a regulated plant item, the contingency plan will be followed. The contingency plan provides a detailed description of procedures that will be implemented for compliance with WAC 173-303-640(7) as required by Dangerous Waste Permit Condition III.10.C.6.b.

# 8 References for Applicable Codes and Regulations

10 CFR 835, Occupational Radiation Protection, Code of Federal Regulations, as amended

American Bearing Manufacturers Association (ABMA) Standard 7, Shaft and Housing Fits for Metric Radial Ball and Roller Bearings

ABMA 9, Load Ratings and Fatigue Life for Ball Bearings

ABMA Standard 11, Load Ratings and Fatigue Life for Roller Bearings

ABMA Standard 20, Radial Bearings of Ball, Cylindrical Roller, and Spherical Roller Types Metric Design

American Institute for Steel Construction Inc. (AISC) M016-89, Manual of Steel Construction

Air Movement and Control Association (AMCA) 201, Fans and Systems

AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

AMCA 300, Reverberant Room Methods for Sound Testing of Fans

American National Standards Institute/American Institute for Steel Construction Inc. (ANSI/AISC) N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities

American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) B15.1, Safety Standard for Mechanical Power Transmission Apparatus

ANSI/ASME B16.1, Cast Iron Pipe Flanges and Flanged Fittings

ANSI/ASME B16.5, Pipe Flanges and Flanged Fittings

American National Standards Institute/Hydraulic Institute Standards (ANSI/HI) 9.6.4, Centrifugal/Vertical Vibration

American Petroleum Institute (API) 334, A Guide to Leak Detection for Aboveground Storage Tanks

API 610, Centrifugal Pumps for General Refinery Service

API 650, Welded Steel Tanks for Oil Storage

API 676, Positive Displacement Pumps - Rotary

API 685, Sealless Centrifugal Pumps for Petroleum, Heavy Duty Chemical, and Gas Industry Services

American Society of Mechanical Engineers (ASME) AG-1, Code on Nuclear Air and Gas Treatment

ASME B31.3-96, Process Piping

ASME B73.1M, Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process

ASME B73.2M, Specifications for Vertical In-Line Centrifugal Pumps for Chemical Process

ASME Section V Boiler and Pressure Vessel Code, Nondestructive Examination

ASME Section VIII Boiler and Pressure Vessel Code, Division 1, Pressure Vessels

ASME Section IX Boiler and Pressure Vessel Code, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

American Society of Mechanical Engineers/American National Standards Institute (ASME/ANSI) Y14.5M, Dimensioning and Tolerancing

American Society for Nondestructive Testing, Inc. (SNT), Recommended Practice No. SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing

ASTM E 165-02 Standard Test Method for Liquid Penetrant Examination

ASTM E 797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method

Hydraulic Institute Standards (HI) 2.6, American National Standard for Vertical Pump Tests

Washington Administrative Code (WAC) 173-303, Dangerous Waste Regulations, as amended

**Table 1 Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| **PTF Tanks** | | |
| Cesium Evaporator Eluant Lute Pot | CNP-VSL-00001 | ASME Section VIII Division 1 |
| Eluate Contingency Storage Vessel | CNP-VSL-00003 | ASME Section VIII Division 1 |
| Cesium Evaporator Recovered Nitric Acid Vessel | CNP-VSL-00004 | ASME Section VIII Division 1 |
| Cesium Ion Exchange Columns | CXP-IXC-00001<br>CXP-IXC-00002<br>CXP-IXC-00003<br>CXP-IXC-00004 | ASME Section VIII Division 1 |
| Cesium Ion Exchange Feed Vessel | CXP-VSL-00001 | ASME Section VIII Division 1 |
| Ion Exchange Caustic Rinse Collection Vessel | CXP-VSL-00004 | ASME Section VIII Division 1 |
| Cesium Ion Exchange Reagent Vessel | CXP-VSL-00005 | ASME Section VIII Division 1 |
| Ion Exchange Treated LAW Collection Vessels | CXP-VSL-00026A/B/C | ASME Section VIII Division 1 |
| Waste Feed Evaporator Feed Vessels | FEP-VSL-00017A/B | ASME Section VIII Division 1 |
| Waste Feed Evaporator Condensate Vessel | FEP-VSL-00005 | ASME Section VIII Division 1 |
| Waste Feed Receipt Vessels | FRP-VSL-00002A/B/C/D | ASME Section VIII Division 1 |
| HLW Feed Blend Vessel | HLP-VSL-00028 | ASME Section VIII Division 1 |
| HLW Lag Storage Vessels | HLP-VSL-00027A/B | ASME Section VIII Division 1 |
| HLW Feed Receipt Vessel | HLP-VSL-00022 | ASME Section VIII Division 1 |
| Decontamination Soak Tank | PIH-TK-00001 | API 620 |
| Vessel Ventilation HEME Drain Collection Vessel | PVP-VSL-00001 | ASME Section VIII Division 1 |
| Ultimate Overflow Vessel | PWD-VSL-00033 | ASME Section VIII Division 1 |
| HLW Effluent Transfer Vessel | PWD-VSL-00043 | ASME Section VIII Division 1 |
| C3 Floor Drain Collection Vessel | PWD-VSL-00046 | ASME Section VIII Division 1 |
| Acidic/Alkaline Effluent Vessels | PWD-VSL-00015<br>PWD-VSL-00016 | ASME Section VIII Division 1 |
| Plant Wash Vessel | PWD-VSL-00044 | ASME Section VIII Division 1 |
| Spent Resin Slurry Vessels | RDP-VSL-00002A/B/C | ASME Section VIII Division 1 |
| Spent Resin Dewatering Moisture Sep. Vessel | RDP-VSL-00004 | ASME Section VIII Division 1 |
| Process Condensate Tanks | RLD-TK-00006A/B | API 650 |
| Alkaline Effluent Vessels | RLD-VSL-00017A/B | ASME Section VIII Division 1 |
| Treated LAW Concentrate Storage Vessel | TCP-VSL-00001 | ASME Section VIII Division 1 |
| Treated LAW Evaporator Condensate Vessel | TLP-VSL-00002 | ASME Section VIII Division 1 |
| LAW SBS Condensate Receipt Vessels | TLP-VSL-00009A/B | ASME Section VIII Division 1 |
| Ultrafilter Permeate Vessels | UFP-VSL-00062A/B/C | ASME Section VIII Division 1 |
| Ultrafiltration Feed Preparation Vessels | UFP-VSL-00001A/B | ASME Section VIII Division 1 |
| Ultrafiltration Feed Vessels | UFP-VSL-00002A/B | ASME Section VIII Division 1 |
| Ultrafilters | UFP-FILT-00001A/B<br>UFP-FILT-00002A/B<br>UFP-FILT-00003A/B<br>UFP-FILT-00004A/B<br>UFP-FILT-00005A/B | ASME Section VIII Division 1 |
| **PTF Miscellaneous Units** | | |
| Cesium Evaporator Separator Vessel | CNP-EVAP-00001 | ASME Section VIII Division 1 |
| Cesium Evaporator Concentrate Reboiler | CNP-HX-00001 | ASME Section VIII Division 1 |

**Table 1 (cont'd) Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| Cesium Nitric Acid Rectifier | CNP-DISTC-00001 | ASME Section VIII Division 1 |
| Cesium Evaporator Primary Condenser | CNP-HX-00002 | ASME Section VIII Division 1 |
| Cesium Evaporator Intercondenser | CNP-HX-00003 | ASME Section VIII Division 1 |
| Cesium Evaporator Aftercondenser | CNP-HX-00004 | ASME Section VIII Division 1 |
| Waste Feed Evaporator Separator Vessels | FEP-SEP-00001A/B | ASME Section VIII Division 1 |
| Waste Feed Evaporator Reboilers | FEP-RBLR-00001A/B | ASME Section VIII Division 1 |
| Waste Feed Evaporator Primary Condensers | FEP-COND-00001A/B | ASME Section VIII Division 1 |
| Waste Feed Evaporator Intercondensers | FEP-COND-00002A/B | ASME Section VIII Division 1 |
| Waste Feed Evaporator Aftercondensers | FEP-COND-00003A/B | ASME Section VIII Division 1 |
| PJV Primary Exhaust HEPA Filters | PJV-HEPA-00001A/B/C/D/E/F/G | ASME AG-1 |
| PJV Secondary Exhaust HEPA Filters | PJV-HEPA-00002A/B/C/D/E/F | ASME AG-1 |
| PJV Exhaust Fans | PJV-FAN-00001A/B/C | ASME AG-1 |
| PJV Demisters | PJV-DMST-00002A/B/C | ASME Section VIII Division 1 |
| Carbon Bed Adsorbers | PVP-ADBR-00001A/B | ASME Section VIII Division 1 |
| After Cooler | PVP-CLR-00001 | ASME Section VIII Division 1 |
| VOC Oxidizer Unit | PVP-OXID-00001 | NA |
| Adsorber Outlet Filter | PVP-FILT-00001 | ASME Section VIII Division 1 |
| HEME Filters | PVP-HEME-00001A/B/C | ASME Section VIII Division 1 |
| Scrubbing Liquid Cooler | PVP-HX-00002 | ASME Section VIII Division 1 |
| Caustic Scrubber | PVP-SCB-00002 | ASME Section VIII Division 1 |
| Primary HEPA Filters | PVV-HEPA-00001A/B | ASME AG-1 |
| Secondary HEPA Filters | PVV-HEPA-00002A/B | ASME AG-1 |
| Exhaust Fans | PVV-FAN-00001A/B | ASME AG-1 |
| Treated LAW Evaporator Separator Vessel | TLP-SEP-00001 | ASME Section VIII Division 1 |
| Treated LAW Evaporator Reboiler | TLP-RBLR-00001 | ASME Section VIII Division 1 |
| Treated LAW Evap. Primary Condenser | TLP-COND-00001 | ASME Section VIII Division 1 |
| Treated LAW Evaporator Intercondenser | TLP-COND-00002 | ASME Section VIII Division 1 |
| Treated LAW Evaporator Aftercondenser | TLP-COND-00003 | ASME Section VIII Division 1 |
| **PTF Breakpots and Pulsepots** | | |
| Cesium Concentrate Breakpot | CNP-BRKPT-00001 | ASME Section VIII Division 1 |
| Cesium Evaporator Eluate Breakpot | CNP-BRKPT-00002 | ASME Section VIII Division 1 |
| Cesium Concentrate Receipt Breakpots | HLP-BRKPT-00004<br>HLP-BRKPT-00006 | ASME Section VIII Division 1 |
| Plant Wash Breakpots | PWD-BRKPT-00007<br>PWD-BRKPT-00008<br>PWD-BRKPT-00009<br>PWD-BRKPT-00010<br>PWD-BRKPT-00017<br>PWD-BRKPT-00019 | ASME Section VIII Division 1 |
| Acidic/Alkaline Effluent Breakpots | PWD-BRKPT-00015<br>PWD-BRKPT-00016 | ASME Section VIII Division 1 |
| Ultrafiltration Recycle Breakpots | UFP-BRKPT-00001B | ASME Section VIII Division 1 |
| Ultrafiltration Pulsepots | UFP-PP-00001A/B<br>UFP-PP-00002A/B<br>UFP-PP-00003A/B | ASME Section VIII Division 1 |

**Table 1 (cont'd) Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| **PTF Bulges** | | |
| Cesium Resin Addition Bulge | CRP-BULGE-00001 | ANSI/AISC N690-94 |
| Cesium IX Process Bulge | CXP-BULGE-00004 | AISC M016-89 |
| Vessel Vent Caustic Scrubber Transfer Pump Bulge | PVP-BULGE-00001 | ANSI/AISC N690-94 |
| Vessel Vent HEME Drain Vessel Pump Bulge | PVP-BULGE-00002 | ANSI/AISC N690-94 |
| Vessel Vent Heat Exchanger Bulge | PVP-BULGE-00014 | AISC M016-89 |
| Process Bulge | TCP-BULGE-00004 | ANSI/AISC N690-94 |
| Ultrafiltration Reagent Bulges | UFP-BULGE-00001<br>UFP-BULGE-00002 | AISC M016-89 |
| Ultrafiltration Utility Bulges | UFP-BULGE-00005<br>UFP-BULGE-00006 | ANSI/AISC N690-94 |
| High Point Vent Bulges | PVP-BULGE-00019<br>PVP-BULGE-00020<br>PVP-BULGE-00021 | ANSI/AISC N690-94 |
| **PTF Sumps and Piping** | | |
| Black Cell Sumps | PWD-SUMP-00001<br>PWD-SUMP-00001A<br>PWD-SUMP-00002<br>PWD-SUMP-00002A<br>PWD-SUMP-00003<br>PWD-SUMP-00004<br>PWD-SUMP-00005<br>PWD-SUMP-00006<br>PWD-SUMP-00007<br>PWD-SUMP-00008<br>PWD-SUMP-00009<br>PWD-SUMP-00010<br>PWD-SUMP-00011<br>PWD-SUMP-00012<br>PWD-SUMP-00013 | ANSI/AISC N690<br>AISC M016-89 |
| Hot Cell Sumps | PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029 | ANSI/AISC N690<br>AISC M016-89 |
| Maintenance Cave Sumps | PWD-SUMP-00032<br>PWD-SUMP-00033 | ANSI/AISC N690<br>AISC M016-89 |
| Other PWD Sumps | PWD-SUMP-00034<br>PWD-SUMP-00035 | ANSI/AISC N690<br>AISC M016-89 |
| Alkaline Effluent Collection Area Sump | PWD-SUMP-00036 | ANSI/AISC N690<br>AISC M016-89 |
| -45-ft Pit Sump | PWD-SUMP-00040 | ANSI/AISC N690<br>AISC M016-89 |
| C2/C3 Drains Pit Sump | PWD-SUMP-00071 | NA |
| RLD Containment Area Sump | RLD-SUMP-00003 | NA |

**Table 1 (cont'd) Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| Piping | NA | ASME B31.3-96 |
| **PTF Pumps** | | |
| Cesium Nitric Acid Recovery Process Recirculation Pump | CNP-PMP-00001 | API 610, 8th Edition |
| Process Condensate Return Pump | CNP-PMP-00002 | manufacturer standard |
| Cesium Ion Exchange Feed Pumps | CXP-PMP-00001A/B | API 685<br>ASME Section VIII, Division I<br>ASME Section IX<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0003) |
| Treated LAW Feed Pumps | CXP-PMP-00002A/B | API 685<br>ASME Section VIII, Division I<br>ASME Section IX<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0003) |
| Waste Feed Evaporator Process Condensate Pumps | FEP-PMP-00006A/B | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002) |
| Waste Feed Evaporator Feed Pumps | FEP-PMP-00007A/B | API 610, 8th Edition<br>ASME Section VIII Division 1<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>AISC M016-89, 9th Edition<br>ANSI/HI 9.6.4, 2000<br>(and other requirements specified in 24590-PTF-3PS-MPC0-T0001) |
| Waste Feed Evaporator Concentrate Pumps | FEP-PMP-00008A/B | API 610, 8th Edition<br>ASME Section VIII Division 1<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>AISC M016-89, 9th Edition<br>ANSI/HI 9.6.4, 2000<br>(and other requirements specified in 24590-PTF-3PS-MPC0-T0001) |
| Waste Feed Evaporator System Recirculation Pumps | FEP-PMP-00009A/B | API 610, 8th Edition |

**Table 1 (cont'd) Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| Waste Feed Return Pump | FRP-PMP-00001 | API 610, 8th Edition<br>ASME Section VIII Division 1<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>AISC M016-89, 9th Edition<br>ANSI/HI 9.6.4, 2000<br>(and other requirements specified in 24590-PTF-3PS-MPC0-T0001) |
| Waste Feed Transfer Pump | FRP-PMP-00002A | API 610, 8th Edition<br>ASME Section VIII Division 1<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>AISC M016-89, 9th Edition<br>ANSI/HI 9.6.4, 2000<br>(and other requirements specified in 24590-PTF-3PS-MPC0-T0001) |
| HLW Solids Transfer Pumps | HLP-PMP-00017A/B | API 610, 8th Edition<br>ASME Section VIII Division 1<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>AISC M016-89, 9th Edition<br>ANSI/HI 9.6.4, 2000<br>(and other requirements specified in 24590-PTF-3PS-MPC0-T0001) |
| HLW Melter Feed Pumps | HLP-PMP-00019A/B | API 610, 8th Edition<br>ASME Section VIII Division 1<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>AISC M016-89, 9th Edition<br>ANSI/HI 9.6.4, 2000<br>(and other requirements specified in 24590-PTF-3PS-MPC0-T0001) |
| HLW Feed Receipt Transfer Pump | HLP-PMP-00021 | API 610, 8th Edition<br>ASME Section VIII Division 1<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>AISC M016-89, 9th Edition<br>ANSI/HI 9.6.4, 2000<br>(and other requirements specified in 24590-PTF-3PS-MPC0-T0001) |

**Table 1 (cont'd) Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| Vessel Vent Scrubber Recirculating Pumps | PVP-PMP-00001A/B | API 685<br>ASME Section VIII, Division I<br>ASME Section IX<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0003) |
| HEME Drain Collection Vessel Pumps | PVP-PMP-00002A/B | API 685<br>ASME Section VIII, Division I<br>ASME Section IX<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0003) |
| C3 Area Floor Drains Transfer Pumps | PWD-PMP-00024A/B | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002) |
| Spent Resin Slurry Pumps | RDP-PMP-00008A/B | API 610, 8th Edition<br>ASME Section VIII Division 1<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>AISC M016-89, 9th Edition<br>ANSI/HI 9.6.4, 2000<br>(and other requirements specified in 24590-PTF-3PS-MPC0-T0001) |
| Spent Resin Dewatering Pump | RDP-PMP-00011 | manufacturer standard |
| Alkaline Effluent Pumps | RLD-PMP-00005A/B | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002) |

**Table 1 (cont'd) Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| Process Condensate Pumps | RLD-PMP-00011A/B | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002) |
| Process Condensate Recirculation Pumps | RLD-PMP-00012A/B | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002) |
| Process Condensate Distribution Pumps | RLD-PMP-00014A/B | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002) |
| Treated LAW Concentrate Transfer Pumps | TCP-PMP-00001A/B | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002)<br>vendor design |
| Treated LAW Evaporator System Recirculation Pump | TLP-PMP-00001 | API 610, 8th Edition |
| Treated LAW Evaporator Process Condensate Pumps | TLP-PMP-00002A/B | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002) |

**Table 1 (cont'd) Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| Treated LAW Evaporator System Feed Pumps | TLP-PMP-00005A/B | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002) |
| Treated LAW Evaporator System Concentrate Pumps | TLP-PMP-00011A/B | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002) |
| Concentrate Transfer Pumps | UFP-PMP-00041A/B | API 610, 8th Edition<br>ASME Section VIII Division 1<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>AISC M016-89, 9th Edition<br>ANSI/HI 9.6.4, 2000<br>(and other requirements specified in 24590-PTF-3PS-MPC0-T0001) |
| Ultrafiltration Recirculation Pumps | UFP-PMP-00042A/B<br>UFP-PMP-00043A/B | API 610, 8th Edition<br>ASME Section VIII Division 1<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>AISC M016-89, 9th Edition<br>ANSI/HI 9.6.4, 2000<br>(and other requirements specified in 24590-PTF-3PS-MPC0-T0001) |
| Progressive Cavity Pumps | UFP-PMP-00044A/B | API 676 |
| **HLW Tanks** | | |
| Rinse Tunnel Canister Rinse Vessel | HDH-VSL-00001 | ASME Section VIII Division 1 |
| Waste Neutralization Vessel | HDH-VSL-00003 | ASME Section VIII Division 1 |
| Canister Decon Vessel 1 | HDH-VSL-00002 | ASME Section VIII Division 1 |
| Canister Decon Vessel 2 | HDH-VSL-00004 | ASME Section VIII Division 1 |
| Melter 1 Feed Preparation Vessel | HFP-VSL-00001 | ASME Section VIII Division 1 |
| Melter 1 Feed Vessel | HFP-VSL-00002 | ASME Section VIII Division 1 |
| Melter 2 Feed Preparation Vessel | HFP-VSL-00005 | ASME Section VIII Division 1 |
| Melter 2 Feed Vessel | HFP-VSL-00006 | ASME Section VIII Division 1 |
| SBS Condensate Receiver Vessel No. 1 | HOP-VSL-00903 | ASME Section VIII Division 1 |

**Table 1 (cont'd) Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| SBS Condensate Receiver Vessel No. 2 | HOP-VSL-00904 | ASME Section VIII Division 1 |
| Decontamination Tank Melter Cave 1 | HSH-TK-00001 | API 620 |
| Decontamination Tank Melter Cave 2 | HSH-TK-00002 | API 620 |
| Acidic Waste Vessel | RLD-VSL-00007 | ASME Section VIII Division 1 |
| Plant Wash and Drains Vessel | RLD-VSL-00008 | ASME Section VIII Division 1 |
| Offgas Drains Collection Vessel | RLD-VSL-00002 | ASME Section VIII Division 1 |
| **HLW Miscellaneous Units** | | |
| Melter 1 | HMP-MLTR-00001 | ASME Section VIII<br>ASME B31.3-96 |
| Melter 2 | HMP-MLTR-00002 | ASME Section VIII<br>ASME B31.3-96 |
| Wet Electrostatic Precipitators | HOP-WESP-00001<br>HOP-WESP-00002 | ASME Section VIII Division 1 |
| Thermal Catalytic Oxidizers | HOP-SCO-00001<br>HOP-SCO-00004 | ASME Section VIII<br>ASME B31.3-96<br>AISC M016-89 |
| $NO_x$ Selective Catalytic Reducers | HOP-SCR-00001<br>HOP-SCR-00002 | ASME Section VIII<br>ASME B31.3-96<br>AISC M016-89 |
| Silver Mordenite Columns | HOP-ABS-00002<br>HOP-ABS-00003 | ASME Section VIII Division 1;<br>ASME AG-1/1a |
| Film Coolers | HOP-FCLR-00001<br>HOP-FCLR-00002<br>HOP-FCLR-00003<br>HOP-FCLR-00004 | NA |
| HEPA Filters | HOP-HEPA-00001A/B<br>HOP-HEPA-00002A/B<br>HOP-HEPA-00007A/B<br>HOP-HEPA-00008A/B | ASME AG-1 |
| HEPA Electric Preheaters | HOP-HTR-00001B<br>HOP-HTR-00002A | ASME Section VIII Division 1;<br>ASME AG-1 |
| HEPA Electric Preheaters, Melter 2 | HOP-HTR-00005A/B | ASME Section VIII Division 1;<br>ASME AG-1 |
| Catalyst Skid Electric Heaters | HOP-HTR-00001<br>HOP-HTR-00007 | NA |
| Catalyst Skid Preheaters | HOP-HX-00001<br>HOP-HX-00003 | NA |
| Silver Mordenite Preheaters | HOP-HX-00002<br>HOP-HX-00004 | ASME Section VIII Division 1 |
| Booster Extraction Fans | HOP-FAN-00001A/B/C<br>HOP-FAN-00009A/B/C | ASME AG-1 |
| Stack Extraction Fans | HOP-FAN-00008A/B/C<br>HOP-FAN-00010A/B/C | ASME AG-1 |
| Activated Carbon Adsorbers | HOP-ADBR-00001A/B<br>HOP-ADBR-00002A/B | ASME Section VIII Division 1;<br>ASME AG-1 |
| HEMEs | HOP-HEME-00001A/B<br>HOP-HEME-00002A/B | ASME Section VIII Division 1 |

**Table 1 (cont'd) Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| Submerged Bed Scrubbers | HOP-SCB-00001<br>HOP-SCB-00002 | ASME Section VIII Division 1 |
| HEPA Filters | PJV-HEPA-00004A/B<br>PJV-HEPA-00005A/B | ASME AG-1 |
| Electric Heater | PJV-HTR-00002 | ASME Section VIII Division 1 |
| Pulse Jet Fans | PJV-FAN-00002A/B | ASME AG-1 |
| **HLW Breakpots** | | |
| Plant Wash and Drains Vessel Transfer Breakpot | RLD-BRKPT-00004 | ASME Section VIII Division 1 |
| Acidic Waste Vessel Transfer Breakpots | RLD-BRKPT-00007<br>RLD-BRKPT-00009 | ASME Section VIII Division 1 |
| **HLW Sumps and Piping** | | |
| Sumps | HFP-SUMP-00001<br>HFP-SUMP-00004<br>HFP-SUMP-00002<br>HFP-SUMP-00005<br>HOP-SUMP-00003<br>HOP-SUMP-00008<br>HSH-SUMP-00003<br>HSH-SUMP-00007<br>HSH-SUMP-00008<br>HSH-SUMP-00009<br>HDH-SUMP-00001<br>HDH-SUMP-00002<br>HDH-SUMP-00003<br>RLD-SUMP-00001<br>HCP-SUMP-00001<br>HPH-SUMP-00001<br>HPH-SUMP-00003<br>HPH-SUMP-00005 | ANSI/AISC N690<br>AISC M016-89 |
| Piping | NA | ASME B31.3-96 |
| **HLW Pumps** | | |
| Canister Rinse Bogie Pump | HDH-PMP-00001 | ASME Section VIII, Division I<br>ASME Section IX<br>ANSI/ABMA 9 and 11<br>ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M<br>ASME/ANSI Y14.5M<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0002) |
| Feed Air Displacement Slurry Pumps | HFP-PMP-00001<br>HFP-PMP-00002<br>HFP-PMP-00014<br>HFP-PMP-00015 | manufacturer standard |

**Table 1 (cont'd) Summary of Design Codes**

| Plant Item Name | Plant Item Number | Design Code |
|---|---|---|
| Melters 1 and 2 Feed Preparation Vessels Sample/Transfer Pumps | HFP-PMP-00005A/B<br>HFP-PMP-00018A/B | ABMA 7, 9, and 20<br>API 610, 8th Edition<br>ASME Section V<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>HI 2.6<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0009) |
| Melters 1 and 2 Feed Vessels Sample/Recirculation Pumps | HFP-PMP-00007<br>HFP-PMP-00017 | ABMA 7, 9, and 20<br>API 610, 8th Edition<br>ASME Section V<br>ASME Section IX<br>ASME/ANSI Y14.5M<br>HI 2.6<br>(and other requirements specified in 24590-WTP-3PS-MPC0-T0009) |
| Decontamination Tank Recirculation Pumps | HSH-PMP-00001<br>HSH-PMP-00002 | manufacturer standard |
| Bogie Decon Room Sump Pump | RLD-PMP-00023 | manufacturer standard |
| **Underground Transfer Lines** | | |
| Piping | NA | ASME B31.3-96 |

Acronyms:

ABMA – American Bearing Manufacturers Association
AISC – American Institute of Steel Construction
ANSI – American National Standards Institute
API - American Petroleum Institute
ASME - American Society of Mechanical Engineers
HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
HI – Hydraulic Institute Standards
HLW - high-level waste
LAW – low-activity waste
NA – not applicable
$NO_x$ - nitrogen oxides
PJV – pulse jet ventilation system
PTF - pretreatment facility
SBS - submerged bed scrubber
VOC - volatile organic compound

**Table 2 Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| **PTF Tanks** | | | |
| CNP-VSL-00001 | radioactive liquid | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| CNP-VSL-00003 | Cs eluant / concentrate | vessel: 316L (S31603) (max 0.030% C; dual certified[2]), or better;<br>jacket: 304L (S30403) (max 0.030% C; dual certified), or better | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.016-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| CNP-VSL-00004 | recovered nitric acid | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| CXP-IXC-00001<br>CXP-IXC-00002<br>CXP-IXC-00003<br>CXP-IXC-00004 | LAW and resin | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| CXP-VSL-00001 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| CXP-VSL-00004 | sodium hydroxide rinse | 304L (S30403) (max 0.030% C; dual certified) | 0.40 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| CXP-VSL-00005 | sodium hydroxide/ water/ nitric acid | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| CXP-VSL-00026A/B/C | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| FEP-VSL-00017A/B | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes no erosion allowance; additional 0.094-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| FEP-VSL-00005 | process condensate | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| FRP-VSL-00002A/B/C/D | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes no erosion allowance; additional 0.044-inch localized protection required for bottom head to accommodate PJM discharge velocities) |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| HLP-VSL-00028 | radioactive slurry | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (additional 0.434-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| HLP-VSL-00027A/B | radioactive slurry | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.436-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| HLP-VSL-00022 | radioactive slurry | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.398-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| PIH-TK-00001 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes no erosion allowance) |
| PVP-VSL-00001 | radioactive liquid | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| PWD-VSL-00033 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.083-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| PWD-VSL-00043 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.080 inch |
| PWD-VSL-00046 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| PWD-VSL-00015 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.093-inch localized protection required for bottom head to accommodate PJM discharge velocities) |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| PWD-VSL-00016 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.077-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| PWD-VSL-00044 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.067-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| RDP-VSL-00002A/B/C | spent CXP ion exchange resin | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.060-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| RDP-VSL-00004 | radioactive water | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes no erosion allowance) |
| RLD-TK-00006A/B | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| RLD-VSL-00017A/B | radioactive liquid | 304L (S30403) (max 0.030% C; dual certified) | 0.080 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| TCP-VSL-00001 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.164-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| TLP-VSL-00002 | radioactive liquid | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| TLP-VSL-00009A/B | radioactive liquid | 6% molybdenum alloy (N08367/N08926) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.056-inch localized protection required for bottom head to accommodate PJM discharge velocities) |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| UFP-VSL-00062A/B/C | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| UFP-VSL-00001A/B | radioactive slurry | vessel: 316L (S31603) (max 0.030% C; dual certified) steam ejector/high temp components located inside vessel: Alloy C-22 (N06022) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.129-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| UFP-VSL-00002A/B | radioactive slurry | vessel: 304L (S30403) (max 0.030% C; dual certified); steam ejector/high temp components located inside vessel: Alloy C-22 (N06022) | 0.040 inch (includes no erosion allowance; additional 0.517-inch localized protection required for bottom head to accommodate PJM discharge velocities) |
| UFP-FILT-00001A/B<br>UFP-FILT-00002A/B<br>UFP-FILT-00003A/B<br>UFP-FILT-00004A/B<br>UFP-FILT-00005A/B | radioactive slurry | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance) |
| **PTF Miscellaneous Units** | | | |
| CNP-EVAP-00001 | radioactive liquid | Alloy C-22 (N06022) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| CNP-HX-00001 | water and nitric acid | tube-side: Alloy C-22 (N06022); shell-side (steam): 316L (S31603) (max 0.030% C; dual certified) | shell side and tube side; 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| CNP-DISTC-00001 | water vapor and gases | 6% molybdenum alloy (N08367/N08926) | 0.040 inch (includes no erosion allowance) |
| CNP-HX-00002<br>CNP-HX-00003<br>CNP-HX-00004 | water vapor and gases | 304L (S30403) (max 0.030% C; dual certified) | shell side and tube side: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| FEP-SEP-00001A/B | radioactive slurry | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes no erosion allowance) |
| FEP-RBLR-00001A/B | LAW waste feed recirculation | shell: 304L (S30403) (max 0.030%C; dual certified ); tubes: Hastelloy G-30 Alloy (N06030) or equivalent | none on shell side<br>0.040 inch on tube side |
| FEP-COND-00001A/B<br>FEP-COND-00002A/B<br>FEP-COND-00003A/B | water vapor and gases | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| PJV-HEPA-00001A/B/C/D/E/F/G | PJV exhaust vapor | vendor package housing: 304L (S30403) | NA |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| PJV-HEPA-00002A/B/C/D/E/F | PJV exhaust vapor | vendor package housing: 304L (S30403) | NA |
| PJV-FAN-00001A/B/C | PJV exhaust vapor | vendor package housing: stainless steel | NA |
| PJV-DMST-00002A/B/C | PJV exhaust vapor | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch |
| PVP-ADBR-00001A/B | filtered vent gas | 316L (S31603) (max 0.030% C; dual certified) | NA |
| PVP-CLR-00001 | filtered vent gas from the oxidizer | housing: 304L (S30403) | 0.040 inch (shell side and tube side) (includes no erosion allowance) |
| PVP-OXID-00001 | vent gas from the HEPA filters | housing: 316L (S31603) | housing: 0.0625 inch |
| PVP-FILT-00001 | filtered vent gas from the carbon absorbers | housing: 316L (S31603) | 0.040 inch |
| PVP-HEME-00001A/B/C | caustic scrubber offgas | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| PVP-HX-00002 | scrubber solution and chilled water | 316L (S31603) | none required |
| PVP-SCB-00002 | radioactive liquid | column: 316L (S31603) (max 0.030% C; dual certified); column packing and demister packing: 6% molybdenum alloy (N08367) | column: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)<br>column packing and demister packing: none required |
| PVV-HEPA-00001A/B<br>PVV-HEPA-00002A/B | outlet vapors from the HEME filters | vendor package housing: 304L (S30403) | NA |
| PVV-FAN-00001A/B | filtered vent gas | stainless steel | NA |
| TLP-SEP-00001 | radioactive slurry | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| TLP-RBLR-00001 | steam and cooling water | shell: 304L (S30403) (max 0.030%C; dual certified ); tubes: Hastelloy G-30 Alloy (N06030) or equivalent | tube side: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)<br>shell side: none required |
| TLP-COND-00001<br>TLP-COND-00002<br>TLP-COND-00003 | water vapor and gases | 316L (S31603) (max 0.030% C; dual certified) | shell side: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)<br>tube side: none required |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| **PTF Breakpots and Pulsepots** | | | |
| CNP-BRKPT-00001<br>CNP-BRKPT-00002 | radioactive liquid | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| HLP-BRKPT-00004<br>HLP-BRKPT-00006 | cesium concentrate | Alloy C-22 (N06022) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance) |
| PWD-BRKPT-00007<br>PWD-BRKPT-00009<br>PWD-BRKPT-00008<br>PWD-BRKPT-00010 | water, possibly radioactive | 316L (S31603) (max 0.030% C, dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| PWD-BRKPT-00017<br>PWD-BRKPT-00019 | water, possibly radioactive | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| PWD-BRKPT-00015<br>PWD-BRKPT-00016 | acid/caustic effluent | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| UFP-BRKPT-00001B | radioactive liquid | 316L (S31603) (max 0.030% C, dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance) |
| UFP-PP-00001A/B<br>UFP-PP-00002A/B<br>UFP-PP-00003A/B | reagents and radioactive liquid | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance) |
| **PTF Bulges** | | | |
| CRP-BULGE-00001 | cesium resin | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| CXP-BULGE-00004 | spent resin and radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| PVP-BULGE-00001<br>PVP-BULGE-00002<br>PVP-BULGE-00014 | caustic radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| TCP-BULGE-00004 | treated LAW and radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| UFP-BULGE-00001<br>UFP-BULGE-00002 | reagents and water | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| UFP-BULGE-00005<br>UFP-BULGE-00006 | condensate | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| **PTF Sumps** | | | |
| PWD-SUMP-00001<br>PWD-SUMP-00001A<br>PWD-SUMP-00002<br>PWD-SUMP-00002A<br>PWD-SUMP-00003<br>PWD-SUMP-00004<br>PWD-SUMP-00005<br>PWD-SUMP-00006<br>PWD-SUMP-00007<br>PWD-SUMP-00008<br>PWD-SUMP-00009<br>PWD-SUMP-00010<br>PWD-SUMP-00011<br>PWD-SUMP-00012<br>PWD-SUMP-00013<br>PWD-SUMP-00031<br>PWD-SUMP-00034<br>PWD-SUMP-00035<br>PWD-SUMP-00036 | various | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch |
| PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029<br>PWD-SUMP-00032<br>PWD-SUMP-00033 | various | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch |
| PWD-SUMP-00040 | various | 6% molybdenum alloy (N08367) | 0.040 inch |
| PWD-SUMP-00071 | C2/C3 drains | epoxy SPC | NA |
| RLD-SUMP-00003 | water | epoxy SPC | NA |
| **PTF Piping** | | | |
| Systems with highly corrosive fluids in high active cells | nitric acid vapors | 6% molybdenum alloy (N08367) | 0.0425 inch |
| Systems with highly corrosive fluids in high active cells | Cs eluate | Alloy C-22 (N06022) | 0.040 inch |
| Systems with less than 2% solids and greater than 20% nitric acid | recovered nitric acid, C3 floor drains | 304L (S30403) | 0.040 inch |
| Systems with more than 2% solids and greater than 20% nitric acid | waste feed | 304L (S30403) | 0.0937 inch |
| Systems with high erosion solids | UFP concentrate recycle | 304L (S30403) | 0.125 inch |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| Systems with less than 2% solids and less than 20% nitric acid | waste feed, PVP exhaust, alkaline effluent, water vapor and condensate | 316L (S31603) | 0.040 inch |
| Systems with more than 2% solids and less than 20% nitric acid | waste feed | 316L (S31603) | 0.0937 inch |
| **PTF Pumps** | | | |
| CNP-PMP-00001 | radioactive liquid | housing, impeller, shaft, sleeve: Inconel 625 (N06625); non-wetted parts: 316L (S31603) | 0.040 inch |
| CNP-PMP-00002 | water vapor and gases | vendor package | manufacturer standard |
| CXP-PMP-00001A/B | radioactive liquid | housing/barrel, impeller: ASTM A351Gr CD4MCu (J93370); case/impeller wear rings: Nitronic 60 (Alloy 218) (S21800); shaft: ASTM A276 (Alloy 2205) (S31803); base: 316L (S31603) | 0.040 inch |
| CXP-PMP-00002A/B | radioactive liquid | housing, shaft, impeller, containment shell/stator liner, inner sheathing/rotor liner: 316L (S31603) | 0.125 inch |
| FEP-PMP-00006A/B | process condensate | housing, impeller, sleeve: 316L (S31603); shaft: SAE 4140 (G41400) (Cr-molybdenum steel) | 0.040 inch |
| FEP-PMP-00007A/B | radioactive liquid | housing, impeller: CD4MCu (J93370) or better | 0.040 inch |
| FEP-PMP-00008A/B | radioactive slurry | housing, impeller: CD4MCu (J93370) or better | 0.040 inch |
| FEP-PMP-00009A/B | LAW waste feed recirculation | housing: 316L (S31603); impeller: ASTM A351 CN3MN (J94651); shaft: 6% molybdenum alloy (N08367); flange studs: Nitronic 60 (Alloy 218) (S21800) | 0.040 inch |
| FRP-PMP-00001 | radioactive liquid | housing, impeller: CD4MCu (J93370) or better | 0.040 inch |
| FRP-PMP-00002A | radioactive liquid | housing, impeller: CD4MCu (J93370) or better | 0.040 inch |
| HLP-PMP-00017A/B | radioactive slurry | 316L (S31603) (max 0.030% C; dual certified); gaskets/seals: metal-graphite | 0.040 inch; 0.125 inch overlay of Stellite 12 or 712 |
| HLP-PMP-00019A/B | radioactive slurry | housing, impeller: CD4MCu (J93370) or better | 0.040 inch |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| HLP-PMP-00021 | radioactive slurry | housing, impeller: CD4MCu (J93370) or better | 0.040 inch |
| PVP-PMP-00001A/B | radioactive liquid | housing, shaft, impeller, containment shell/stator liner, inner sheathing/rotor liner: 316L (S31603) | 0.125 inch |
| PVP-PMP-00002A/B | radioactive liquid | housing, shaft, impeller, containment shell/stator liner, inner sheathing/rotor liner: 316L (S31603) | 0.125 inch |
| PWD-PMP-00024A/B | radioactive liquid | housing, shaft, impeller, sleeve: 316L (S31603) | 0.040 inch |
| RDP-PMP-00008A/B | spent CXP ion exchange resin | housing, impeller: 316L (S31603) | 0.125 inch |
| RDP-PMP-00011 | radioactive water | vendor package | manufacturer standard |
| RLD-PMP-00005A/B | radioactive liquid | housing, shaft, sleeve: 316L (S31603); impeller: CD4MCu (J93370) | 0.040 inch |
| RLD-PMP-00011A/B | radioactive liquid | housing, impeller, sleeve: 316L (S31603); shaft: carbon steel | 0.040 inch |
| RLD-PMP-00012A/B | radioactive liquid | housing, impeller, sleeve: 316L (S31603); shaft: carbon steel | 0.040 inch |
| RLD-PMP-00014A/B | radioactive liquid | housing, impeller, sleeve: 316L (S31603); shaft: carbon steel | 0.040 inch |
| TCP-PMP-00001A/B | radioactive liquid | housing, impeller: CD4MCu (J93370); shaft: 1144 steel; sleeve: Alloy 20 (N08020) | 0.040 inch (includes no erosion allowance) unless a larger corrosion allowance is recommended by the design code or standard |
| TLP-PMP-00001 | steam and cooling water | housing: 316L (S31603); impeller: ASTM A351 CN3MN (J94651); shaft: 6% molybdenum alloy (N08367); flange studs: Nitronic 60 (Alloy 218) (S21800) | 0.040 inch |
| TLP-PMP-00002A/B | radioactive liquid | housing, impeller, sleeve: 316L (S31603); shaft: SAE 4140 (G41400) (Cr-molybdenum steel) | 0.040 inch |
| TLP-PMP-00005A/B | radioactive liquid | housing, impeller, shaft, sleeve: 316L (S31603) | 0.040 inch |
| TLP-PMP-00011A/B | radioactive liquid | housing, impeller, sleeve: 316L (S31603); shaft: SAE 4140 (G41400) (Cr-molybdenum steel) | 0.040 inch |
| UFP-PMP-00041A/B | radioactive slurry | housing, impeller: CD4MCu (J93370) or better | 0.040 inch |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| UFP-PMP-00042A/B<br>UFP-PMP-00043A/B | radioactive slurry | 316L (S31603) (max 0.030% C; dual certified); gaskets/seals: metal-graphite; impeller and casing: Stellite 12 (R30012), duplex material, or equivalent | 0.040 inch |
| UFP-PMP-00044A/B | radioactive slurry | 316L (S31603) (max 0.030% C; dual certified); gaskets/seals: metal-graphite; impeller and casing: Stellite 12 (R30012), duplex material, or equivalent | 0.040 inch |
| **HLW Tanks** | | | |
| HDH-VSL-00001 | water, possibly radioactive | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| HDH-VSL-00003 | cerous nitrate, nitric acid, sodium hydroxide, hydrogen peroxide, water | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance) |
| HDH-VSL-00002<br>HDH-VSL-00004 | ceric nitrate, nitric acid, water | Ti-2 (R50400) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| HFP-VSL-00001<br>HFP-VSL-00002<br>HFP-VSL-00005<br>HFP-VSL-00006 | blended HLW slurry and glass formers | vessel: 316L (S31603) (max 0.030% C; dual certified); mixer: Ultimet, Stellite, or equivalent | 0.040 inch for top (includes no erosion allowance); 0.125 inch localized protection allowance for bottom and shell |
| HOP-VSL-00903<br>HOP-VSL-00904 | liquid acidic condensate | Alloy C-22 (N06022) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance); additional erosive wear allowance of at least 0.081 inch is required as localized protection for the applicable portions of the bottom head |
| HSH-TK-00001<br>HSH-TK-00002 | demineralized water, nitric acid, or other suitable decontamination solutions | 316L (S31603) | 0.040 inch (includes no erosion allowance) |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| RLD-VSL-00007 | radioactive liquid | vessel: 6% molybdenum alloy (N08367 or N08926); piping: Alloy C-22 (N06022) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance); additional erosive wear allowance of at least 0.027 inch is required as localized protection for the applicable portions of the bottom head |
| RLD-VSL-00008 | radioactive liquid | vessel: 316L (S31603) (max 0.030% C; dual certified); piping: Alloy C-22 (N06022) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance); additional erosive wear allowance of at least 0.014 inch is required as localized protection for the applicable portions of the bottom head |
| RLD-VSL-00002 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| **HLW Miscellaneous Units** | | | |
| HMP-MLTR-00001<br>HMP-MLTR-00002 | blended HLW slurry and glass formers | Inconel 690 (N06690) | none required; refractory corrosion rates are accounted for in the melter designs |
| HOP-WESP-00001<br>HOP-WESP-00002 | HLW melter offgas (post SBS) | 6% molybdenum alloy (N08367) | 0.040 inch (includes no erosion allowance) |
| HOP-SCO-00001<br>HOP-SCO-00004 | HLW melter offgas | 316L (S31603) (max 0.030% C; dual certified) | none required |
| HOP-SCR-00001<br>HOP-SCR-00002 | HLW melter offgas | 316L (S31603) (max 0.030% C; dual certified) | none required |
| HOP-ABS-00002<br>HOP-ABS-00003 | filtered radioactive gas | 316L (S31603) (max 0.030% C; dual certified) | NA |
| HOP-FCLR-00001<br>HOP-FCLR-00002<br>HOP-FCLR-00003<br>HOP-FCLR-00004 | HLW melter offgas | Inconel 690 (N06690) | NA |
| HOP-HEPA-00001A/B<br>HOP-HEPA-00002A/B<br>HOP-HEPA-00007A/B<br>HOP-HEPA-00008A/B | HLW melter offgas | 304L (S30403) | NA |
| HOP-HTR-00001B<br>HOP-HTR-00002A<br>HOP-HTR-00005A/B | HLW melter offgas | 316L (S31603) | 0.040 inch |
| HOP-HTR-00001<br>HOP-HTR-00007 | HLW melter offgas | 316L (S31603) | NA |
| HOP-HX-00001<br>HOP-HX-00003 | HLW melter offgas | cold side: 316L (S31603) (max 0.030% C; dual certified)<br>hot side: 347 (S34700) | 0.010 inch |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| HOP-HX-00002<br>HOP-HX-00004 | HLW melter offgas | 316L (S31603) (max 0.030% C; dual certified) | NA |
| HOP-FAN-00001A/B/C<br>HOP-FAN-00008A/B/C<br>HOP-FAN-00009A/B/C<br>HOP-FAN-00010A/B/C | HLW melter offgas | 316L (S31603) | NA |
| HOP-ADBR-00001A/B<br>HOP-ADBR-00002A/B | activated carbon for mercury abatement | 316L (S31603) (max 0.030% C; dual certified) | NA |
| HOP-HEME-00001A/B<br>HOP-HEME-00002A/B | radioactive mist and particulate | 6% molybdenum alloy (N08367) | 0.040 inch |
| HOP-SCB-00001<br>HOP-SCB-00002 | radioactive liquid | Alloy C-22 (N06022); packing can be an acid resistant ceramic such as aluminum oxide or equivalent | 0.080 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| PJV-HEPA-00004A/B<br>PJV-HEPA-00005A/B | HLW melter offgas | 304L (S30403) | NA |
| PJV-HTR-00002 | HLW melter offgas | 316L (S31603); plenum chamber made of 304L (S30403) | 0.040 inch (includes no erosion allowance) |
| PJV-FAN-00002A/B | HLW melter offgas | 316L (S31603) | NA |
| **HLW Breakpots** | | | |
| RLD-BRKPT-00004 | radioactive liquid | 304L (S30403) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| RLD-BRKPT-00007<br>RLD-BRKPT-00009 | radioactive liquid | 316L (S31603) (max 0.030% C; dual certified) | 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) |
| **HLW Sumps** | | | |
| HFP-SUMP-00001<br>HFP-SUMP-00004<br>HFP-SUMP-00002<br>HFP-SUMP-00005 | radioactive liquid | 6% molybdenum alloy (N08367) | 0.040 inch |
| HOP-SUMP-00003<br>HOP-SUMP-00008 | radioactive liquid | 6% molybdenum alloy (N08367) | 0.040 inch |
| HSH-SUMP-00003<br>HSH-SUMP-00007 | radioactive liquid | 6% molybdenum alloy (N08367) | 0.040 inch |
| HSH-SUMP-00008<br>HSH-SUMP-00009 | nitric acid | 6% molybdenum alloy (N08367) | 0.040 inch |
| HDH-SUMP-00001<br>HDH-SUMP-00002 | water, possibly radioactive | 6% molybdenum alloy (N08367) | 0.040 inch |
| HDH-SUMP-00003 | cerous nitrate, ceric nitrate, nitric acid, sodium hydroxide, hydrogen peroxide, water | 6% molybdenum alloy (N08367) | 0.040 inch |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| RLD-SUMP-00001<br>HCP-SUMP-00001 | radioactive liquid | 6% molybdenum alloy (N08367) | 0.040 inch |
| HPH-SUMP-00001<br>HPH-SUMP-00003<br>HPH-SUMP-00005 | water, possibly radioactive | 6% molybdenum alloy (N08367) | 0.040 inch |
| **HLW Piping** | | | |
| Systems with less than 2% solids | liquid acidic condensate, radioactive liquid | Alloy C-22 (N06022) | 0.040 inch |
| Systems with less than 2% solids | ceric nitrate, nitric acid, water | Ti-2 (R50400) | 0.040 inch |
| Systems with less than 2% solids | radioactive liquid, HLW melter offgas, radioactive mist and particulate | 6% molybdenum alloy (N08367/N08926) | 0.040 inch |
| Systems with less than 2% solids | HLW melter offgas | 304L (S30403) | 0.040 inch |
| Systems with less than 2% solids | radioactive liquid, nitric acid, HLW melter offgas | 316L (S31603) | 0.040 inch |
| Systems with more than 2% solids | HLW concentrate feed | 316L (S31603) | 0.0937 inch |
| Systems with glass formers | HLW melter feed | 316L (S31603) | 0.125 inch |
| **HLW Pumps** | | | |
| HDH-PMP-00001 | water, possibly radioactive | housing, shaft, impeller: 316L (S31603) | 0.040 inch |
| HFP-PMP-00001<br>HFP-PMP-00002<br>HFP-PMP-00014<br>HFP-PMP-00015 | blended HLW slurry and glass formers | vendor package | manufacturer standard |
| HFP-PMP-00005A/B<br>HFP-PMP-00018A/B | blended HLW slurry and glass formers | housing, impeller, sleeve, shaft busing deflector: Stellite 12 (R30012); shaft, suction pipe, discharge pipe: Zeron 100 (S32760); mounting flange/plate, primer pipe: 316L (S31603) | 0.125 inch for housing and impeller |
| HFP-PMP-00007<br>HFP-PMP-00017 | blended HLW slurry and glass formers | housing, impeller, sleeve, shaft busing deflector: Stellite 12 (R30012); shaft, suction pipe, discharge pipe: Zeron 100 (S32760); mounting flange/plate, primer pipe: 316L (S31603) | 0.125 inch for housing and impeller |

**Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances**

| Plant Item Number | Contents | Materials of Construction (UNS Number) | Corrosion and Erosion Allowances[1] |
|---|---|---|---|
| HSH-PMP-00001<br>HSH-PMP-00002 | demineralized water, nitric acid, or other suitable decontamination solutions | vendor package | manufacturer standard |
| RLD-PMP-00023 | water, possibly radioactive | housing, body, wetted components: 316L (S31603); mountings, hardware: 304L (S30403); shaft: 416 (S41600); diaphragm, check valve, check valve seats: santoprene, polyethelene | 0.040 inch |
| **Underground Transfer Lines** | | | |
| Piping | LAW and HLW feed; radioactive liquid | primary containment pipe: 316L (S31603); secondary containment pipe: carbon steel | primary containment pipe: 0.0160 to 0.0937 inch; secondary containment pipe: none required |

Notes:

1 See Appendix A for list of applicable Corrosion Evaluation Reports/Material Selection Data Sheets for DWP-regulated plant items. The corrosion allowance listed includes the erosion allowance.

2 dual certified = meets the mechanical and chemical requirements of more than one type of steel; e.g., has chemical and mechanical properties complying with both Type 316 and Type 316L, or both Type 304 and Type 304L, specifications. This ensures higher strength material with the chemical composition of the low carbon levels.

Acronyms:

ASTM – American Society for Testing and Materials
C – carbon
Cr – chromium
Cs – cesium
CRP – cesium resin addition process system
CXP – cesium ion exchange process system
HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
HLW - high-level waste
LAW – low-activity waste
NA – not applicable
$NO_x$ - nitrogen oxides
% - percent
PJM – pulse jet mixer
PJV – pulse jet ventilation system
PTF - pretreatment facility
PVP - pretreatment vessel vent process system
SAE – Society of Automotive Engineers
SBS - submerged bed scrubber
SPC - special protective coating
Ti - titanium
UFP - ultrafiltration process system

**Table 2 (cont'd)** **Summary of Materials of Construction and Corrosion Allowances**

UNS - unified numbering system
VOC - volatile organic compound

**Table 3 Materials of Construction Specification and Corrosion Potentials**

| Material | UNS Number Specification | Corrosion Potential | Applicable Plant Item Number |
|---|---|---|---|
| **Metals** | | | |
| Stainless steel 304L | S30403 | more resistant to corrosion in nitric acid, if no chlorides are present, than 316L and less prone to stress corrosion cracking than its higher carbon version (stainless steel 304) | Piping<br>HDH-VSL-00003<br>HOP-HEPA-00001A/B<br>HOP-HEPA-00002A/B<br>HOP-HEPA-00007A/B<br>HOP-HEPA-00008A/B<br>PJV-HEPA-00004A/B<br>PJV-HEPA-00005A/B<br>CNP-VSL-00004<br>CNP-VSL-00001<br>CXP-VSL-00004<br>CXP-VSL-00005<br>PVP-VSL-00001<br>RDP-VSL-00004<br>RLD-VSL-00017A/B<br>TLP-VSL-00002<br>UFP-VSL-00002A/B<br>CNP-HX-00002<br>CNP-HX-00003<br>CNP-HX-00004<br>FEP-SEP-00001A/B<br>PJV-DMST-00002A/B/C<br>PVP-HEME-00001A/B/C<br>TLP-SEP-00001<br>PVP-CLR-00001<br>FEP-RBLR-00001A/B<br>TLP-RBLR-00001<br>PJV-HEPA-00001A/B/C/D/E/F/G<br>PJV-HEPA-00002A/B/C/D/E/F<br>PVV-HEPA-00001A/B<br>PVV-HEPA-00002A/B<br>CNP-BRKPT-00001<br>CNP-BRKPT-00002<br>UFP-PP-00001A/B<br>UFP-PP-00002A/B<br>UPF-PP-00003A/B<br>PWD-SUMP-00001<br>PWD-SUMP-00001A<br>PWD-SUMP-00002<br>PWD-SUMP-00002A<br>PWD-SUMP-00003<br>PWD-SUMP-00004<br>PWD-SUMP-00005<br>PWD-SUMP-00006<br>PWD-SUMP-00007<br>PWD-SUMP-00008<br>PWD-SUMP-00009<br>PWD-SUMP-00010 |

Table 3 (cont'd) Materials of Construction Specification and Corrosion Potentials

| Material | UNS Number Specification | Corrosion Potential | Applicable Plant Item Number |
|---|---|---|---|
| | | | PWD-SUMP-00011<br>PWD-SUMP-00012<br>PWD-SUMP-00013<br>PWD-SUMP-00031<br>PWD-SUMP-00034<br>PWD-SUMP-00035<br>PWD-SUMP-00036<br>RLD-PMP-00023 |
| Stainless steel 316L | S31603 | more resistant to pitting corrosion, stress corrosion cracking, and crevice corrosion than its higher carbon version (stainless steel 316) | Piping (including underground transfer lines)<br>HDH-VSL-00001<br>HFP-VSL-00001<br>HFP-VSL-00002<br>HFP-VSL-00005<br>HFP-VSL-00006<br>HSH-TK-00001<br>HSH-TK-00002<br>RLD-VSL-00008<br>RLD-VSL-00002<br>HOP-SCO-00001<br>HOP-SCO-00004<br>HOP-SCR-00001<br>HOP-SCR-00002<br>HOP-ABS-00002<br>HOP-ABS-00003<br>HOP-HTR-00001B<br>HOP-HTR-00002A<br>HOP-HTR-00005A/B<br>HOP-HTR-00001<br>HOP-HTR-00007<br>HOP-HX-00001<br>HOP-HX-00002<br>HOP-HX-00003<br>HOP-HX-00004<br>HOP-FAN-00001A/B/C<br>HOP-FAN-00008A/B/C<br>HOP-FAN-00009A/B/C<br>HOP-FAN-00010A/B/C<br>HOP-ADBR-00001A/B<br>HOP-ADBR-00002A/B<br>PJV-HTR-00002<br>PJV-FAN-00002A/B<br>CXP-IXC-00001<br>CXP-IXC-00002<br>CXP-IXC-00003<br>CXP-IXC-00004<br>CXP-VSL-00001<br>CXP-VSL-00026A/B/C |

Table 3 (cont'd) Materials of Construction Specification and Corrosion Potentials

| Material | UNS Number Specification | Corrosion Potential | Applicable Plant Item Number |
|---|---|---|---|
| | | | FEP-VSL-00017A/B<br>FEP-VSL-00005<br>FRP-VSL-00002A/B/C/D<br>HLP-VSL-00028<br>HLP-VSL-00027A/B<br>HLP-VSL-00022<br>PIH-TK-00001<br>PWD-VSL-00033<br>PWD-VSL-00043<br>PWD-VSL-00046<br>PWD-VSL-00015<br>PWD-VSL-00016<br>PWD-VSL-00044<br>RDP-VSL-00002A/B/C<br>RLD-TK-00006A/B<br>TCP-VSL-00001<br>UFP-VSL-00062A/B/C<br>UFP-FILT-00001A/B<br>UFP-FILT-00002A/B<br>UFP-FILT-00003A/B<br>UFP-FILT-00004A/B<br>UFP-FILT-00005A/B<br>UFP-VSL-00001A/B<br>CNP-VSL-00003<br>PVP-HX-00002<br>FEP-COND-00001A/B<br>FEP-COND-00002A/B<br>FEP-COND-00003A/B<br>PVP-ADBR-00001A/B<br>TLP-COND-00001<br>TLP-COND-00002<br>TLP-COND-00003<br>PVP-SCB-00002<br>PVP-OXID-00001<br>PVP-FILT-00001<br>PWD-BRKPT-00007<br>PWD-BRKPT-00008<br>PWD-BRKPT-00009<br>PWD-BRKPT-00010<br>PWD-BRKPT-00015<br>PWD-BRKPT-00016<br>PWD-BRKPT-00017<br>PWD-BRKPT-00019<br>UFP-BRKPT-00001B<br>CRP-BULGE-00001<br>CXP-BULGE-00004<br>CXP-BULGE-00006<br>PVP-BULGE-00001 |

Table 3 (cont'd) Materials of Construction Specification and Corrosion Potentials

| Material | UNS Number Specification | Corrosion Potential | Applicable Plant Item Number |
|---|---|---|---|
| | | | PVP-BULGE-00002<br>PVP-BULGE-00014<br>TCP-BULGE-00004<br>UFP-BULGE-00001<br>UFP-BULGE-00002<br>UFP-BULGE-00005<br>UFP-BULGE-00006<br>PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029<br>PWD-SUMP-00032<br>PWD-SUMP-00033<br>CNP-PMP-00001<br>CXP-PMP-00001A/B<br>CXP-PMP-00002A/B<br>FEP-PMP-00006A/B<br>FEP-PMP-00009A/B<br>HLP-PMP-00017A/B<br>PVP-PMP-00001A/B<br>PVP-PMP-00002A/B<br>PWD-PMP-00024A/B<br>RDP-PMP-00008A/B<br>RLD-PMP-00005A/B<br>RLD-PMP-00011A/B<br>RLD-PMP-00012A/B<br>RLD-PMP-00014A/B<br>TLP-PMP-00001<br>TLP-PMP-00002A/B<br>TLP-PMP-00005A/B<br>TLP-PMP-00011A/B<br>UFP-PMP-00042A/B<br>UFP-PMP-00043A/B<br>UFP-PMP-00044A/B<br>HDH-PMP-00001<br>HFP-PMP-00005A/B<br>HFP-PMP-00007<br>HFP-PMP-00017<br>HFP-PMP-00018A/B<br>RLD-PMP-00023 |
| Stainless steel 347 | S34700 | suitable for high temperature applications where 316L is precluded and dry-air conditions are not conducive to general corrosion | HOP-HX-00001 (hot-side components)<br>HOP HX 00003 (hot-side components) |

**Table 3 (cont'd) Materials of Construction Specification and Corrosion Potentials**

| Material | UNS Number Specification | Corrosion Potential | Applicable Plant Item Number |
|---|---|---|---|
| 6% molybdenum alloy | N08367<br>N08925<br>N08926 | more resistant to acids and chlorides than the 300 series stainless steels | Piping<br>RLD-VSL-00007<br>HOP-WESP-00001<br>HOP-WESP-00002<br>HOP-HEME-00001A/B<br>HOP-HEME-00002A/B<br>TLP-VSL-00009A/B<br>CNP-DISTC-00001<br>PWD-SUMP-00040<br>HFP-SUMP-00001<br>HFP-SUMP-00002<br>HFP-SUMP-00004<br>HFP-SUMP-00005<br>HOP-SUMP-00003<br>HOP-SUMP-00008<br>HSH-SUMP-00003<br>HSH-SUMP-00007<br>HSH-SUMP-00008<br>HSH-SUMP-00009<br>HDH-SUMP-00001<br>HDH-SUMP-00002<br>HDH-SUMP-00003<br>RLD-SUMP-00001<br>HCP-SUMP-00001<br>HPH-SUMP-00001<br>HPH-SUMP-00003<br>HPH-SUMP-00005<br>FEP-PMP-00009A/B<br>TLP-PMP-00001 |
| Alloy C-22 or Hastelloy C-22 – Ni-Cr-molybdenum alloy | N06022 | more resistant to acids and chlorides than the 300 series stainless steels or 6% molybdenum alloy | Piping<br>HLP-BRKPT-00004<br>HLP-BRKPT-00006<br>HOP-VSL-00903<br>HOP-VSL-00904<br>HOP-SCB-00001<br>HOP-SCB-00002<br>CNP-EVAP-00001<br>CNP-HX-00001 |
| Inconel 690 (Alloy 690) – Ni-Cr alloy | N06900 | very resistant to attack from oxidizing chemicals or hot gases | HMP-MLTR-00001<br>HMP-MLTR-00002<br>HOP-FCLR-00001<br>HOP-FCLR-00002<br>HOP-FCLR-00003<br>HOP-FCLR-00004 |

**Table 3 (cont'd) Materials of Construction Specification and Corrosion Potentials**

| Material | UNS Number Specification | Corrosion Potential | Applicable Plant Item Number |
|---|---|---|---|
| Titanium | R50400 | more resistant to corrosion in oxidizing solutions than in non-oxidizing solutions; resistant to attack in mixtures of strong acids; generally more resistant to pitting corrosion, crevice corrosion, stress corrosion, and galvanic corrosion | Piping<br>HDH-VSL-00002<br>HDH-VSL-00004 |
| Duplex Stainless Steel (CD4MCu) | J93370 | moderately high strength and hardness combined with good ductility and impact properties, resulting in an alloy with superior resistance to abrasion or erosion-corrosion; highly resistant to stress-corrosion cracking in chloride environments; highly resistant to nitric and sulfuric acids | CXP-PMP-00001A/B<br>FEP-PMP-00007A/B<br>FEP-PMP-00008A/B<br>FRP-PMP-00001<br>FRP-PMP-00002A<br>HLP-PMP-00019A/B<br>HLP-PMP-00021<br>RLD-PMP-00005A/B<br>TCP-PMP-00001A/B<br>UFP-PMP-00041A/B |

Acronyms:

Cr - chromium
°F - degrees Fahrenheit
Ni - nickel
% - percent
UNS - unified numbering system

**Table 4 Radiological Area Classification Based on Dose Rate**

| Classification | Target Dose Equivalent Rate (mrem/hr) for Wide-Spread and Static Radiation Fields (Note 1) | Maximum Dose Equivalent Rate (mrem/hr) (see Notes 2 and 3) | Type of Access Control |
|---|---|---|---|
| R1 Radiological Controlled Area | 0.025 | 0.050 | General Employee Radiological Training (GERT) required to access. |
| R2 Radiological Buffer Area | 0.250 | 0.500 | No limit on occupancy for general employees. A TLD and Rad Worker I training required for entry. |
| R3 (Average Radiation Area) | See Note 1 | 10 | Entry only to carry out prescribed tasks in accordance with normal procedures and a Radiation Work Permit. TLD and Rad Worker I training required for entry into Radiation Areas. |
| R4 (Maximum Radiation Area) | See Note 1 | 100 | Entry only to carry out prescribed tasks in accordance with normal procedures and a Radiation Work Permit. TLD and Rad Worker I training required for entry into Radiation Areas. |
| R5 (High and Very High Radiation Area) | See Note 4 | no specific limit | Normally locked. Entry is unusual and requires management approval. Supplemental dosimetry, a specific RWP, and approved procedures are also required. |

Notes:

1. Occupational doses, and therefore, selection of an appropriate dose rate criterion is very sensitive to occupancy in R3, R4, and R5 areas. Hence, rather than set a specific dose rate target for any of these classifications, the appropriate value should be derived for each individual area by considering the respective contributions to the workers' annual doses and applying the ALARA principle. At early design stages, when insufficient information is available regarding worker occupancy, initial target radiation levels of 2.5 mrem/hr and 25 mrem/hr are to be used for the R3 and R4 classifications, respectively. However, these initial values should be reviewed and adjusted as appropriate, when sufficient occupancy data is available.
2. These maximum dose equivalent rate limits are set based on static whole-body radiation fields. Higher dose equivalent rates may be accepted for transient radiation fields (such as source movements), and for localized radiation fields (such as beams) that are unlikely to produce whole-body exposure, subject to an appropriate justification of the effect on annual dose and ALARA.
3. Notwithstanding the above dose rate equivalent targets and maximums, all radiation levels shall be within prescribed limits and ALARA.
4. When entry to an area that has been classified R5 is intended or anticipated by the design (frequency > 0.1[yr-1]), the design process is obligated to identify the means by which the dose rates in the affected area may be reduced to levels that are R3/R4 (less than 100 mrem/hr) prior to the entry. In any case, entry to all radiation areas is ALARA.

Acronyms:

ALARA - as low as reasonably achievable
mrem/hr - millirems per hour

**Table 4 (cont'd)** **Radiological Area Classification Based on Dose Rate**

RWP - radiological work permit
TLD - thermoluminescent dosimetry

**Table 5 Radiological Area Classification Based on Contamination**

| Classification | Typical Type of Control (see Note 1) | Surface Contamination Limit (dpm/100 cm2) (see Note 2) β/γ | Mean Airborne Contamination (Fraction of Exposure Standard; see Note 3) | Description |
|---|---|---|---|---|
| C1 Radiological Controlled Area | GERT | <1,000 | N/A | The C1 area means any area to which access is managed by or for DOE to protect individuals from exposure to radiation and/or radioactive material. For the WTP project, this includes all areas within the site security fence not assigned a higher radiological classification. The C1 area has low potential to be contaminated because there are no direct interfaces with contaminated areas. C1 areas are typically administrative offices, control rooms, conference rooms, locker rooms, restrooms, equipment rooms, truck bays, and non-contiguous support facilities. |
| C2 Radiological Buffer Area | Equipment and personnel are confirmed to be uncontaminated before exit to the uncontrolled C1 area is permitted. C2 areas may not be ventilated directly to the atmosphere. A TLD and Rad Worker I training are required for entry. | <1,000 | N/A | C2 areas are operating areas of the process buildings. C2 areas have direct interfaces with contaminated areas, and have the potential to be contaminated.<br><br>C2 contamination surveys are performed regularly with frequencies as determined by facility trends. |
| C3 Contamination Area | Work in a contaminated area requires protective clothing, a single set of coveralls, canvas booties, rubber shoe covers, appropriate gloves, and head covering. A TLD and Radworker II training are both required for entry. Respiratory protection may, on occasion, be required for specific tasks, but would not normally exceed the requirements for a full-face | ≥ 1,000 but <100,000 | < 40 DAC - hr year | C3 areas are the process areas where the potential for direct contact with radioactive material, contaminated systems and components, or both, exists.<br><br>These areas include the following: |

**Table 5 (cont'd) Radiological Area Classification Based on Contamination**

| Classification | Typical Type of Control (see Note 1) | Surface Contamination Limit (dpm/100 cm2) (see Note 2) β/γ | Mean Airborne Contamination (Fraction of Exposure Standard; see Note 3) | Description |
|---|---|---|---|---|
| | particulate respirator. The interface between a contamination area and the surrounding buffer area is typically a physical barrier; however, there will be maintenance evolutions requiring the temporary posting of contamination areas without the presence of a physical barrier (e.g., areas surrounding filter housings during filter changeout). | | | • maintenance shops<br>• laboratory fume hoods<br>• Cask handling areas<br>• sampling suites<br>• Contact areas where breaking of containment is possible |
| C4 High Contamination Area (Note 4) | Work in high contamination areas may require a double set of protective clothing and a multiple step-off pad exit configuration. Table 3-1 of 24590-WTP-MN-ESH-01-001, *Waste Treatment Plant Radiological Control Manual*, provides guidelines for selecting protective clothing and indicates double sets of protective clothing are selected based on the contamination level in the work area, the anticipated work activity, worker health considerations, and regard for nonradiological hazards that may be present. As indicated in Table 3-1, routine work in high contamination areas may not warrant a double set of protective clothing. Respiratory protection may be required on occasion for specific tasks, but would not normally exceed the requirements for a full-face particulate respirator. High contamination areas should be controlled through use of physical barriers, engineering controls, and/or containment devices, as appropriate, in accordance with Article 337 of 24590-WTP-MN-ESH-01-001, *Waste Treatment Plant Radiological Control Manual.* | ≥ 100,000 but < ≈ 500,000 | > 40 DAC-hr year but < 12 DAC-hr week or < 1 DAC | C4 areas are highly contaminated as a result of the breaching large, highly contaminated systems or components when use of a glove bag is impractical. |

**Table 5 (cont'd) Radiological Area Classification Based on Contamination**

| Classification | Typical Type of Control (see Note 1) | Surface Contamination Limit (dpm/100 cm2) (see Note 2) β/γ | Mean Airborne Contamination (Fraction of Exposure Standard; see Note 3) | Description |
|---|---|---|---|---|
| C5 Airborne Radioactivity Area | Access to C5 areas is not normally permitted. When access is required, protective clothing for these areas includes high-integrity clothing (plastic suit), and supplied air respirators.<br><br>Exiting into a contaminated area (C5 → C4, C3) requires removing the outer layer of protective clothing.<br><br>ARAs are normally accessed through a permanent or temporary containment structure (tent) provided with its own filtered exhaust. Because entry to an ARA requires the use of respirators, no personnel may perform routine or periodic work within an ARA. | ≥ ≈ 500,000 | >12 DAC-hr week or > 1 DAC | C5 areas are highly contaminated areas that require total enclosure to ensure contamination control. |

Notes:

1. The type of control listed in this column is subject to local variation and is defined by 24590-WTP-MN-ESH-01-001, *Waste Treatment Plant Radiological Control Manual*, and specified on the RWP. Control regimes shown are expected to be typical.
2. Values shown are for β/γ contamination only. Additional, radionuclide specific limits are provided in Appendix D to 10 CFR 835, Occupational Radiation Protection.
3. Exposure standards are those of Safety Criterion 2.0-1 of 24590-WTP-SRD-ESH-01-001-02 to the worker for normal events. The breathing zone levels of airborne contamination are order-of-magnitude estimates of long-term requirements. Maximum transient values of airborne contamination may be higher.
4. Use of additional controls and respiratory protection must be evaluated when working in areas or on equipment with removable contamination levels greater than 100,000 dpm/100 $cm^2$.

Acronyms:

ALARA - as low as reasonably achievable
ARA - Airborne Radioactivity Area

**Table 5 (cont'd) Radiological Area Classification Based on Contamination**

β - beta
CFR – Code of Federal Regulations
cm - centimeter
DAC - derived air concentration
DOE – United States Department of Energy
dpm – disintegrations per minute
γ - gamma
GERT - General Employee Radiological Training
hr - hour
mrem/hr - millirems per hour
N/A – not applicable
RWP - radiological work permit
TLD - thermoluminescent dosimetry
WTP - Hanford Tank Waste Treatment and Immobilization Plant

**Table 6 Summary of Radiological Area Classifications**

| Plant Item Name | Plant Item Number | Radiological Area Classification[1] |
|---|---|---|
| **PTF Tanks** | | |
| Cesium Evaporator Eluant Lute Pot | CNP-VSL-00001 | R5/C5 (in black cell) |
| Eluate Contingency Storage Vessel | CNP-VSL-00003 | R5/C5 (in black cell) |
| Cesium Evaporator Recovered Nitric Acid Vessel | CNP-VSL-00004 | R5/C5 (in black cell) |
| Cesium Ion Exchange Columns | CXP-IXC-00001<br>CXP-IXC-00002<br>CXP-IXC-00003<br>CXP-IXC-00004 | R5/C5 (in hot cell) |
| Cesium Ion Exchange Feed Vessel | CXP-VSL-00001 | R5/C5 (in black cell) |
| Ion Exchange Caustic Rinse Collection Vessel | CXP-VSL-00004 | R5/C5 (in black cell) |
| Cesium Ion Exchange Reagent Vessel | CXP-VSL-00005 | R5/C5 (in black cell) |
| Ion Exchange Treated LAW Collection Vessels | CXP-VSL-00026A/B/C | R5/C5 (in black cell) |
| Waste Feed Evaporator Feed Vessels | FEP-VSL-00017A/B | R5/C5 (in black cell) |
| Waste Feed Evaporator Condensate Vessel | FEP-VSL-00005 | R3/C3 |
| Waste Feed Receipt Vessels | FRP-VSL-00002A/B/C/D | R5/C5 (in black cell) |
| HLW Feed Blend Vessel | HLP-VSL-00028 | R5/C5 (in black cell) |
| HLW Lag Storage Vessels | HLP-VSL-00027A/B | R5/C5 (in black cell) |
| HLW Feed Receipt Vessel | HLP-VSL-00022 | R5/C5 (in black cell) |
| Decontamination Soak Tank | PIH-TK-00001 | R5/C5 |
| Vessel Ventilation HEME Drain Collection Vessel | PVP-VSL-00001 | R5/C5 (in black cell) |
| Ultimate Overflow Vessel | PWD-VSL-00033 | R5/C5 (in hard-to-reach area) |
| HLW Effluent Transfer Vessel | PWD-VSL-00043 | R5/C5 (in hard-to-reach area) |
| C3 Floor Drain Collection Vessel | PWD-VSL-00046 | R3/C3 |
| Acidic/Alkaline Effluent Vessels | PWD-VSL-00015<br>PWD-VSL-00016 | R5/C5 (in black cell) |
| Plant Wash Vessel | PWD-VSL-00044 | R5/C5 (in black cell) |
| Spent Resin Slurry Vessels | RDP-VSL-00002A/B/C | R5/C5 (in black cell) |
| Spent Resin Dewatering Moisture Sep. Vessel | RDP-VSL-00004 | R3/R5/C3/C5 |
| Process Condensate Tanks | RLD-TK-00006A/B | R2/C2 |
| Alkaline Effluent Vessels | RLD-VSL-00017A/B | R3/C3 |
| Treated LAW Concentrate Storage Vessel | TCP-VSL-00001 | R5/C5 (in black cell) |
| Treated LAW Evaporator Condensate Vessel | TLP-VSL-00002 | R3/C3 |
| LAW SBS Condensate Receipt Vessels | TLP-VSL-00009A/B | R5/C5 (in black cell) |
| Ultrafilter Permeate Vessels | UFP-VSL-00062A/B/C | R5/C5 (in black cell) |
| Ultrafiltration Feed Preparation Vessels | UFP-VSL-00001A/B | R5/C5 (in black cell) |
| Ultrafiltration Feed Vessels | UFP-VSL-00002A/B | R5/C5 (in black cell) |
| Ultrafilters | UFP-FILT-00001A/B<br>UFP-FILT-00002A/B<br>UFP-FILT-00003A/B<br>UFP-FILT-00004A/B<br>UFP-FILT-00005A/B | R5/C5 (in hot cell) |
| **PTF Miscellaneous Units** | | |
| Cesium Evaporator Separator Vessel | CNP-EVAP-00001 | R5/C5 (in black cell) |
| Cesium Evaporator Concentrate Reboiler | CNP-HX-00001 | R5/C5 |
| Cesium Nitric Acid Rectifier | CNP-DISTC-00001 | R3/C3 |

**Table 6 (cont'd) Summary of Radiological Area Classifications**

| Plant Item Name | Plant Item Number | Radiological Area Classification[1] |
|---|---|---|
| Cesium Evaporator Primary Condenser | CNP-HX-00002 | R3/C3 |
| Cesium Evaporator Intercondenser | CNP-HX-00003 | R3/C3 |
| Cesium Evaporator Aftercondenser | CNP-HX-00004 | R3/C3 |
| Waste Feed Evaporator Separator Vessels | FEP-SEP-00001A/B | R5/C5 (in black cell) |
| Waste Feed Evaporator Reboilers | FEP-RBLR-00001A/B | R5/C5 |
| Waste Feed Evaporator Primary Condensers | FEP-COND-00001A/B | R3/C3 |
| Waste Feed Evaporator Intercondensers | FEP-COND-00002A/B | R3/C3 |
| Waste Feed Evaporator Aftercondensers | FEP-COND-00003A/B | R3/C3 |
| PJV Primary Exhaust HEPA Filters | PJV-HEPA-00001A/B/C/D/E/F/G | R5/C5 |
| PJV Secondary Exhaust HEPA Filters | PJV-HEPA-00002A/B/C/D/E/F | R2/C3 |
| PJV Exhaust Fans | PJV-FAN-00001A/B/C | R2/C2 |
| PJV Demisters | PJV-DMST-00002A/B/C | R5/C5 |
| Carbon Bed Adsorbers | PVP-ADBR-00001A/B | R2/C2 |
| After Cooler | PVP-CLR-00001 | R2/C2 |
| VOC Oxidizer Unit | PVP-OXID-00001 | R2/C2 |
| Adsorber Outlet Filter | PVP-FILT-00001 | R2/C2 |
| HEME Filters | PVP-HEME-00001A/B/C | R5/C5 |
| Scrubbing Liquid Cooler | PVP-HX-00002 | R2/C3 |
| Caustic Scrubber | PVP-SCB-00002 | R5/C5 (in black cell) |
| Primary HEPA Filters | PVV-HEPA-00001A/B | R5/C5 |
| Secondary HEPA Filters | PVV-HEPA-00002A/B | R5/C5 |
| Exhaust Fans | PVV-FAN-00001A/B | R2/C2 |
| Treated LAW Evaporator Separator Vessel | TLP-SEP-00001 | R5/C5 (in black cell) |
| Treated LAW Evaporator Reboiler | TLP-RBLR-00001 | R5/C5 |
| Treated LAW Evap. Primary Condenser | TLP-COND-00001 | R3/C3 |
| Treated LAW Evaporator Intercondenser | TLP-COND-00002 | R3/C3 |
| Treated LAW Evaporator Aftercondenser | TLP-COND-00003 | R3/C3 |
| **PTF Breakpots and Pulsepots** | | |
| Cesium Concentrate Breakpot | CNP-BRKPT-00001 | R5/C5 (in black cell) |
| Cesium Evaporator Eluate Breakpot | CNP-BRKPT-00002 | R5/C5 (in black cell) |
| Cesium Concentrate Receipt Breakpots | HLP-BRKPT-00004<br>HLP-BRKPT-00006 | R5/C5 (in black cell) |
| Plant Wash Breakpots | PWD-BRKPT-00007<br>PWD-BRKPT-00008<br>PWD-BRKPT-00009<br>PWD-BRKPT-00010<br>PWD-BRKPT-00017<br>PWD-BRKPT-00019 | R5/C5 (in black cell) |
| Acidic/Alkaline Effluent Breakpots | PWD-BRKPT-00015<br>PWD-BRKPT-00016 | R5/C5 (in black cell) |
| Ultrafiltration Recycle Breakpot | UFP-BRKPT-00001B | R5/C5 (in black cell) |

**Table 6 (cont'd) Summary of Radiological Area Classifications**

| Plant Item Name | Plant Item Number | Radiological Area Classification[1] |
|---|---|---|
| Ultrafiltration Pulsepots | UFP-PP-00001A/B<br>UFP-PP-00002A/B<br>UFP-PP-00003A/B | R5/C5 (in hot cell) |
| **PTF Bulges and Sumps** | | |
| Cesium Resin Addition Bulge | CRP-BULGE-00001 | R3/C3 |
| Cesium IX Process Bulge | CXP-BULGE-00004 | R3/C3 |
| Vessel Vent Caustic Scrubber Transfer Pump Bulge | PVP-BULGE-00001 | R3/C3 |
| Vessel Vent HEME Drain Vessel Pump Bulge | PVP-BULGE-00002 | R3/C3 |
| Vessel Vent Heat Exchanger Bulge | PVP-BULGE-00014 | R3/C3 |
| Process Bulge | TCP-BULGE-00004 | R3/C3 |
| Ultrafiltration Reagent Bulges | UFP-BULGE-00001<br>UFP-BULGE-00002 | R3/C3 |
| Ultrafiltration Utility Bulges | UFP-BULGE-00005<br>UFP-BULGE-00006 | R3/C3 |
| Black Cell Sumps | PWD-SUMP-00001<br>PWD-SUMP-00001A<br>PWD-SUMP-00002<br>PWD-SUMP-00002A<br>PWD-SUMP-00003<br>PWD-SUMP-00004<br>PWD-SUMP-00005<br>PWD-SUMP-00006<br>PWD-SUMP-00007<br>PWD-SUMP-00008<br>PWD-SUMP-00009<br>PWD-SUMP-00010<br>PWD-SUMP-00011<br>PWD-SUMP-00012<br>PWD-SUMP-00013 | R5/C5 |
| Hot Cell and Maintenance Cave Sumps | PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029<br>PWD-SUMP-00032<br>PWD-SUMP-00033 | R5/C5 |
| Other PWD Sumps | PWD-SUMP-00034<br>PWD-SUMP-00035 | R3/C3/R5/C5 |
| Alkaline Effluent Collection Area Sump | PWD-SUMP-00036 | R3/C3 |
| -45-ft Pit Sump | PWD-SUMP-00040 | R5/C5 (in hard-to-reach area) |
| C2/C3 Drains Pit Sump | PWD-SUMP-00071 | R3/C3 |
| RLD Containment Area Sump | RLD-SUMP-00003 | none |
| **PTF Pumps** | | |
| Cesium Nitric Acid Recovery Process Recirculation Pump | CNP-PMP-00001 | R5/C5 |
| Process Condensate Return Pump | CNP-PMP-00002 | R3/C3 |
| Cesium Ion Exchange Feed Pumps | CXP-PMP-00001A/B | R5/C5 |
| Treated LAW Feed Pumps | CXP-PMP-00002A/B | R3/C3 |

**Table 6 (cont'd) Summary of Radiological Area Classifications**

| Plant Item Name | Plant Item Number | Radiological Area Classification[1] |
|---|---|---|
| Waste Feed Evaporator Process Condensate Pumps | FEP-PMP-00006A/B | R3/C3 |
| Waste Feed Evaporator Feed Pumps | FEP-PMP-00007A/B | R5/C5 |
| Waste Feed Evaporator Concentrate Pumps | FEP-PMP-00008A/B | R5/C5 |
| Waste Feed Evaporator System Recirculation Pumps | FEP-PMP-00009A/B | R5/C5 |
| Waste Feed Return Pump | FRP-PMP-00001 | R5/C5 |
| Waste Feed Transfer Pump | FRP-PMP-00002A | R5/C5 |
| HLW Solids Transfer Pumps | HLP-PMP-00017A/B | R5/C5 |
| HLW Melter Feed Pumps | HLP-PMP-00019A/B | R5/C5 |
| HLW Feed Receipt Transfer Pump | HLP-PMP-00021 | R5/C5 |
| Vessel Vent Scrubber Recirculating Pumps | PVP-PMP-00001A/B | R3/C3 |
| HEME Drain Collection Vessel Pumps | PVP-PMP-00002A/B | R3/C3 |
| C3 Area Floor Drains Transfer Pumps | PWD-PMP-00024A/B | R3/C3 |
| Spent Resin Slurry Pumps | RDP-PMP-00008A/B | R5/C5 |
| Spent Resin Dewatering Pump | RDP-PMP-00011 | R3/R5/C3/C5 |
| Alkaline Effluent Pumps | RLD-PMP-00005A/B | R3/C3 |
| Process Condensate Pumps | RLD-PMP-00011A/B | R2/C2 |
| Process Condensate Recirculation Pumps | RLD-PMP-00012A/B | R2/C2 |
| Process Condensate Distribution Pumps | RLD-PMP-00014A/B | R2/C2 |
| Treated LAW Concentrate Transfer Pumps | TCP-PMP-00001A/B | R3/C3 |
| Treated LAW Evaporator System Recirculation Pump | TLP-PMP-00001 | R5/C5 |
| Treated LAW Evaporator Process Condensate Pumps | TLP-PMP-00002A/B | R3/C3 |
| Treated LAW Evaporator System Feed Pumps | TLP-PMP-00005A/B | R3/C3 |
| Treated LAW Evaporator System Concentrate Pumps | TLP-PMP-00011A/B | R3/C3 |
| Concentrate Transfer Pumps | UFP-PMP-00041A/B | R5/C5 |
| Ultrafiltration Recirculation Pumps | UFP-PMP-00042A/B<br>UFP-PMP-00043A/B | R5/C5 |
| Progressive Cavity Pumps | UFP-PMP-00044A/B | R5/C5 |
| **HLW Tanks** | | |
| Rinse Tunnel Canister Rinse Vessel | HDH-VSL-00001 | R3/R5/C3/C5 |
| Waste Neutralization Vessel | HDH-VSL-00003 | R3/R5/C3/C5 |
| Canister Decon Vessel 1 | HDH-VSL-00002 | R3/R5/C3/C5 |
| Canister Decon Vessel 2 | HDH-VSL-00004 | R3/R5/C3/C5 |
| Melter 1 Feed Preparation Vessel | HFP-VSL-00001 | R5/C5 (in hot cell) |
| Melter 1 Feed Vessel | HFP-VSL-00002 | R5/C5 (in hot cell) |
| Melter 2 Feed Preparation Vessel | HFP-VSL-00005 | R5/C5 (in hot cell) |
| Melter 2 Feed Vessel | HFP-VSL-00006 | R5/C5 (in hot cell) |
| SBS Condensate Receiver Vessel No. 1 | HOP-VSL-00903 | R5/C5 (in black cell) |
| SBS Condensate Receiver Vessel No. 2 | HOP-VSL-00904 | R5/C5 (in black cell) |
| Decontamination Tank Melter Cave 1 | HSH-TK-00001 | R5/C5 |
| Decontamination Tank Melter Cave 2 | HSH-TK-00002 | R5/C5 |
| Acidic Waste Vessel | RLD-VSL-00007 | R5/C5 (in black cell) |

**Table 6 (cont'd) Summary of Radiological Area Classifications**

| Plant Item Name | Plant Item Number | Radiological Area Classification[1] |
|---|---|---|
| Plant Wash and Drains Vessel | RLD-VSL-00008 | R5/C5 (in black cell) |
| Offgas Drains Collection Vessel | RLD-VSL-00002 | R5/C5 (in black cell) |
| **HLW Miscellaneous Units** | | |
| Melter 1 | HMP-MLTR-00001 | R5/C5 (in hot cell) |
| Melter 2 | HMP-MLTR-00002 | R5/C5 (in hot cell) |
| Wet Electrostatic Precipitators | HOP-WESP-00001<br>HOP-WESP-00002 | R5/C5 (in hard-to-reach area) |
| Thermal Catalytic Oxidizers | HOP-SCO-00001<br>HOP-SCO-00004 | R3/C2/C3 |
| $NO_x$ Selective Catalytic Reducers | HOP-SCR-00001<br>HOP-SCR-00002 | R3/C2/C3 |
| Silver Mordenite Columns | HOP-ABS-00002<br>HOP-ABS-00003 | R2/C2 |
| Film Coolers | HOP-FCLR-00001<br>HOP-FCLR-00002<br>HOP-FCLR-00003<br>HOP-FCLR-00004 | R5/C5 (in hot cell) |
| HEPA Filters | HOP-HEPA-00001A/B<br>HOP-HEPA-00002A/B<br>HOP-HEPA-00007A/B<br>HOP-HEPA-00008A/B | R5/C5 (in hot cell) |
| HEPA Electric Preheaters | HOP-HTR-00001B<br>HOP-HTR-00002A | R5/C5 (in hot cell) |
| HEPA Electric Preheaters, Melter 2 | HOP-HTR-00005A/B | R5/C5 (in hot cell) |
| Catalyst Skid Electric Heaters | HOP-HTR-00001<br>HOP-HTR-00007 | R3/C2/C3 |
| Catalyst Skid Preheaters | HOP-HX-00001<br>HOP-HX-00003 | R3/C2/C3 |
| Silver Mordenite Preheaters | HOP-HX-00002<br>HOP-HX-00004 | R3/C2/C3 |
| Booster Extraction Fans | HOP-FAN-00001A/B/C<br>HOP-FAN-00009A/B/C | R2/C2 |
| Stack Extraction Fans | HOP-FAN-00008A/B/C<br>HOP-FAN-00010A/B/C | R2/C2/C3 |
| Activated Carbon Adsorbers | HOP-ADBR-00001A/B<br>HOP-ADBR-00002A/B | R3/C2/C3 |
| HEMEs | HOP-HEME-00001A/B<br>HOP-HEME-00002A/B | R5/C5 (in hot cell) |
| Submerged Bed Scrubbers | HOP-SCB-00001<br>HOP-SCB-00002 | R5/C5 (in hot cell) |
| HEPA Filters | PJV-HEPA-00004A/B<br>PJV-HEPA-00005A/B | R5/C5 |
| Electric Heater | PJV-HTR-00002 | R5/C5 |

**Table 6 (cont'd) Summary of Radiological Area Classifications**

| Plant Item Name | Plant Item Number | Radiological Area Classification[1] |
|---|---|---|
| Pulse Jet Fans | PJV-FAN-00002A/B | R2/C2/C3 |
| **HLW Breakpots** | | |
| Plant Wash and Drains Vessel Transfer Breakpot | RLD-BRKPT-00004 | R5/C5 (in black cell) |
| Acidic Waste Vessel Transfer Breakpots | RLD-BRKPT-00007<br>RLD-BRKPT-00009 | R5/C5 (in black cell) |
| **HLW Sumps** | | |
| Active Services Cell Melter Sumps | HFP-SUMP-00001<br>HFP-SUMP-00004 | R5/C5 (in hard-to-reach area) |
| Melter Cave Sumps | HFP-SUMP-00002<br>HFP-SUMP-00005 | R5/C5 (in hot cell) |
| SBS Drain Collection Cell Sumps | HOP-SUMP-00003<br>HOP-SUMP-00008 | R5/C5 (in black cell) |
| Melter Cave Sumps | HSH-SUMP-00003<br>HSH-SUMP-00007 | R5/C5 (in hot cell) |
| Decontamination Tank Melter Cave Sumps | HSH-SUMP-00008<br>HSH-SUMP-00009 | R5/C5 |
| Canister Rinse Tunnel Sump | HDH-SUMP-00001 | R3/R5/C3/C5 |
| Canister Rinse Bogie Maintenance Room Sump | HDH-SUMP-00002 | R3/C3 |
| Canister Decontamination Cave Sump | HDH-SUMP-00003 | R3/R5/C3/C5 |
| Wet Process Cell Sumps | RLD-SUMP-00001<br>HCP-SUMP-00001 | R5/C5 (in black cell) |
| Canister Handling Cave Sumps | HPH-SUMP-00001<br>HPH-SUMP-00003<br>HPH-SUMP-00005 | R5/C5 |
| **HLW Pumps** | | |
| Canister Rinse Bogie Pump | HDH-PMP-00001 | R3/R5/C3/C5 |
| Feed Air Displacement Slurry Pumps | HFP-PMP-00001<br>HFP-PMP-00002<br>HFP-PMP-00014<br>HFP-PMP-00015 | R5/C5 (in hot cell) |
| Melters 1 and 2 Feed Preparation Vessels Sample/Transfer Pumps | HFP-PMP-00005A/B<br>HFP-PMP-00018A/B | R5/C5 (in hot cell) |
| Melters 1 and 2 Feed Vessels Sample/Recirculation Pumps | HFP-PMP-00007<br>HFP-PMP-00017 | R5/C5 (in hot cell) |
| Decontamination Tank Recirculation Pumps | HSH-PMP-00001<br>HSH-PMP-00002 | R5/C5 |
| Bogie Decon Room Sump Pump | RLD-PMP-00023 | R3/C3 |

Note:

[1] Regulated plant items are accessible except for plant items located in hard-to-reach areas or black cells.

Acronyms:

HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
HLW - high-level waste
LAW – low-activity waste

**Table 6 (cont'd) Summary of Radiological Area Classifications**

$NO_x$ - nitrogen oxides
PJV – pulse jet ventilation system
PTF - pretreatment facility
SBS - submerged bed scrubber
UNS - unified numbering system
VOC - volatile organic compound

**Table 7 Assessment Schedule**

| Plant Item Name | Plant Item Number | Lower Potential for Corrosion and Erosion | Higher Potential for Corrosion and Erosion | Assessment Schedule[1] |
|---|---|---|---|---|
| **PTF Tanks** | | | | |
| Cesium Evaporator Eluant Lute Pot | CNP-VSL-00001 | X | | Located in a black cell. 10 years[3] |
| Eluate Contingency Storage Vessel | CNP-VSL-00003 | | X | Located in a black cell. 7 years[2] |
| Cesium Evaporator Recovered Nitric Acid Vessel | CNP-VSL-00004 | X | | Located in a black cell. 10 years[3] |
| Cesium Ion Exchange Columns | CXP-IXC-00001<br>CXP-IXC-00002<br>CXP-IXC-00003<br>CXP-IXC-00004 | X | | 10 years[3]; designed for remote removal and replacement after a 10-year design life. |
| Cesium Ion Exchange Feed Vessel | CXP-VSL-00001 | X | | Located in a black cell. 10 years[3] |
| Ion Exchange Caustic Rinse Collection Vessel | CXP-VSL-00004 | X | | Located in a black cell. 10 years[3] |
| Cesium Ion Exchange Reagent Vessel | CXP-VSL-00005 | X | | Located in a black cell. 10 years[3] |
| Ion Exchange Treated LAW Collection Vessels | CXP-VSL-00026A/B/C | X | | Located in a black cell. 10 years[3] |
| Waste Feed Evaporator Feed Vessels | FEP-VSL-00017A/B | | X | Located in a black cell. 7 years[2] |
| Waste Feed Evaporator Condensate Vessel | FEP-VSL-00005 | X | | 10 years[3] |
| Waste Feed Receipt Vessels | FRP-VSL-00002A/B/C/D | | X | Located in a black cell. 7 years[2] |
| HLW Feed Blend Vessel | HLP-VSL-00028 | | X | Located in a black cell. 7 years[2] |
| HLW Lag Storage Vessels | HLP-VSL-00027A/B | | X | Located in a black cell. 7 years[2] |
| HLW Feed Receipt Vessel | HLP-VSL-00022 | | X | Located in a black cell. 7 years[2] |
| Decontamination Soak Tank | PIH-TK-00001 | X | | 10 years[3] |
| Vessel Ventilation HEME Drain Collection Vessel | PVP-VSL-00001 | X | | Located in a black cell. 10 years[3] |
| Ultimate Overflow Vessel | PWD-VSL-00033 | | X | 7 years[2] |
| HLW Effluent Transfer Vessel | PWD-VSL-00043 | X | | 10 years[3] |
| C3 Floor Drain Collection Vessel | PWD-VSL-00046 | X | | 10 years[3] |
| Acidic/Alkaline Effluent Vessels | PWD-VSL-00015<br>PWD-VSL-00016 | | X | Located in a black cell. 7 years[2] |
| Plant Wash Vessel | PWD-VSL-00044 | | X | Located in a black cell. 7 years[2] |

**Table 7 (cont'd) Assessment Schedule**

| Plant Item Name | Plant Item Number | Lower Potential for Corrosion and Erosion | Higher Potential for Corrosion and Erosion | Assessment Schedule[1] |
|---|---|---|---|---|
| Spent Resin Slurry Vessels | RDP-VSL-00002A/B/C | | X | Located in a black cell. 7 years[2] |
| Spent Resin Dewatering Moisture Sep. Vessel | RDP-VSL-00004 | | X | 7 years[2,4] |
| Process Condensate Tanks | RLD-TK-00006A/B | X | | 10 years[3] |
| Alkaline Effluent Vessels | RLD-VSL-00017A/B | X | | 10 years[3] |
| Treated LAW Concentrate Storage Vessel | TCP-VSL-00001 | | X | Located in a black cell. 7 years[2] |
| Treated LAW Evaporator Condensate Vessel | TLP-VSL-00002 | X | | 10 years[3] |
| LAW SBS Condensate Receipt Vessels | TLP-VSL-00009A/B | | X | Located in a black cell. 7 years[2] |
| Ultrafilter Permeate Vessels | UFP-VSL-00062A/B/C | X | | Located in a black cell. 10 years[3] |
| Ultrafiltration Feed Preparation Vessels | UFP-VSL-00001A/B | | X | Located in a black cell. 7 years[2] |
| Ultrafiltration Feed Vessels | UFP-VSL-00002A/B | | X | Located in a black cell. 7 years[2] |
| Ultrafilters | UFP-FILT-00001A/B<br>UFP-FILT-00002A/B<br>UFP-FILT-00003A/B<br>UFP-FILT-00004A/B<br>UFP-FILT-00005A/B | X | | 10 years[3] |
| **PTF Miscellaneous Units** | | | | |
| Cesium Evaporator Separator Vessel | CNP-EVAP-00001 | X | | Located in a black cell. 10 years[3] |
| Cesium Evaporator Concentrate Reboiler | CNP-HX-00001 | X | | 10 years[3] |
| Cesium Nitric Acid Rectifier | CNP-DISTC-00001 | X | | 10 years[3] |
| Cesium Evaporator Primary Condenser | CNP-HX-00002 | X | | 10 years[3] |
| Cesium Evaporator Intercondenser | CNP-HX-00003 | X | | 10 years[3] |
| Cesium Evaporator Aftercondenser | CNP-HX-00004 | X | | 10 years[3] |
| Waste Feed Evaporator Separator Vessels | FEP-SEP-00001A/B | X | | Located in a black cell. 10 years[3] |
| Waste Feed Evaporator Reboilers | FEP-RBLR-00001A/B | X | | 10 years[3] |
| Waste Feed Evaporator Primary Condensers | FEP-COND-00001A/B | X | | 10 years[3] |
| Waste Feed Evaporator Intercondensers | FEP-COND-00002A/B | X | | 10 years[3] |

**Table 7 (cont'd) Assessment Schedule**

| Plant Item Name | Plant Item Number | Lower Potential for Corrosion and Erosion | Higher Potential for Corrosion and Erosion | Assessment Schedule[1] |
|---|---|---|---|---|
| Waste Feed Evaporator Aftercondensers | FEP-COND-00003A/B | X | | 10 years[3] |
| PJV Primary Exhaust HEPA Filters | PJV-HEPA-00001A/B/C/D/E/F/G | X | | HEPA filters to be replaced when needed; Housing: 10 years[3] |
| PJV Secondary Exhaust HEPA Filters | PJV-HEPA-00002A/B/C/D/E/F | X | | HEPA filters to be replaced when needed; Housing: 10 years[3] |
| PJV Exhaust Fans | PJV-FAN-00001A/B/C | X | | 10 years[3] |
| PJV Demisters | PJV-DMST-00002A/B/C | X | | 10 years[3] |
| Carbon Bed Adsorbers | PVP-ADBR-00001A/B | X | | 10 years[3] |
| After Cooler | PVP-CLR-00001 | X | | 10 years[3] |
| VOC Oxidizer Unit | PVP-OXID-00001 | X | | 10 years[3] |
| Adsorber Outlet Filter | PVP-FILT-00001 | X | | Filters to be replaced when needed; Housing: 10 years[3] |
| HEME Filters | PVP-HEME-00001A/B/C | X | | HEME filters to be replaced when needed; Housing: 10 years[3] |
| Scrubbing Liquid Cooler | PVP-HX-00002 | X | | 10 years[3] |
| Caustic Scrubber | PVP-SCB-00002 | X | | Located in a black cell. 10 years[3] |
| Primary HEPA Filters | PVV-HEPA-00001A/B | X | | HEPA filters to be replaced when needed; Housing: 10 years[3] |
| Secondary HEPA Filters | PVV-HEPA-00002A/B | X | | HEPA filters to be replaced when needed; Housing: 10 years[3] |
| Exhaust Fans | PVV-FAN-00001A/B | X | | 10 years[3] |
| Treated LAW Evaporator Separator Vessel | TLP-SEP-00001 | X | | Located in a black cell. 10 years[3] |
| Treated LAW Evaporator Reboiler | TLP-RBLR-00001 | X | | 10 years[3] |
| Treated LAW Evaporator Primary Condenser | TLP-COND-00001 | X | | 10 years[3] |

**Table 7 (cont'd) Assessment Schedule**

| Plant Item Name | Plant Item Number | Lower Potential for Corrosion and Erosion | Higher Potential for Corrosion and Erosion | Assessment Schedule[1] |
|---|---|---|---|---|
| Treated LAW Evaporator Intercondenser | TLP-COND-00002 | X | | 10 years[3] |
| Treated LAW Evaporator Aftercondenser | TLP-COND-00003 | X | | 10 years[3] |
| **PTF Breakpots and Pulsepots** | | | | |
| Cesium Concentrate Breakpot | CNP-BRKPT-00001 | X | | Located in a black cell. 10 years[3] |
| Cesium Evaporator Eluate Breakpot | CNP-BRKPT-00002 | X | | Located in a black cell. 10 years[3] |
| Cesium Concentrate Receipt Breakpots | HLP-BRKPT-00004<br>HLP-BRKPT-00006 | X | | Located in a black cell. 10 years[3] |
| Plant Wash Breakpots | PWD-BRKPT-00007<br>PWD-BRKPT-00008<br>PWD-BRKPT-00009<br>PWD-BRKPT-00010<br>PWD-BRKPT-00017<br>PWD-BRKPT-00019 | X | | Located in a black cell. 10 years[3] |
| Acidic/Alkaline Effluent Breakpots | PWD-BRKPT-00015<br>PWD-BRKPT-00016 | X | | Located in a black cell: 10 years[3] |
| Ultrafiltration Recycle Breakpot | UFP-BRKPT-00001B | X | | Located in a black cell: 10 years[3] |
| Ultrafiltration Pulsepots | UFP-PP-00001A/B<br>UFP-PP-00002A/B<br>UFP-PP-00003A/B | X | | 10 years[3] |
| **PTF Bulges** | | | | |
| Cesium Resin Addition Bulge | CRP-BULGE-00001 | | X | 7 years[2] |
| Cesium IX Process Bulge | CXP-BULGE-00004 | | X | 7 years[2] |
| Vessel Vent Caustic Scrubber Transfer Pump Bulge | PVP-BULGE-00001 | X | | 10 years[3] |
| Vessel Vent HEME Drain Vessel Pump Bulge | PVP-BULGE-00002 | X | | 10 years[3] |
| Vessel Vent Heat Exchanger Bulge | PVP-BULGE-00014 | X | | 10 years[3] |
| High Point Vent Bulges | PVP-BULGE-00019<br>PVP-BULGE-00020<br>PVP-BULGE-00021<br>DIW-BULGE-00001<br>DIW-BULGE-00002 | X | | 10 years[3] |
| Process Bulge | TCP-BULGE-00004 | | X | 7 years[2] |
| Ultrafiltration Reagent Bulges | UFP-BULGE-00001<br>UFP-BULGE-00002 | | X | 7 years[2] |

**Table 7 (cont'd) Assessment Schedule**

| Plant Item Name | Plant Item Number | Lower Potential for Corrosion and Erosion | Higher Potential for Corrosion and Erosion | Assessment Schedule[1] |
|---|---|---|---|---|
| Ultrafiltration Utility Bulges | UFP-BULGE-00005<br>UFP-BULGE-00006 | | X | 7 years[2] |
| **PTF Sumps** | | | | |
| Black Cell Sumps | PWD-SUMP-00001<br>PWD-SUMP-00001A<br>PWD-SUMP-00002<br>PWD-SUMP-00002A<br>PWD-SUMP-00003<br>PWD-SUMP-00004<br>PWD-SUMP-00005<br>PWD-SUMP-00006<br>PWD-SUMP-00007<br>PWD-SUMP-00008<br>PWD-SUMP-00009<br>PWD-SUMP-00010<br>PWD-SUMP-00011<br>PWD-SUMP-00012<br>PWD-SUMP-00013 | | X | Located in a black cell. 7 years[2] |
| Hot Cell Sumps | PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029 | | X | 7 years[2] |
| Maintenance Cave Sumps | PWD-SUMP-00032<br>PWD-SUMP-00033 | X | | 10 years[3] |
| Other PWD Sumps | PWD-SUMP-00034<br>PWD-SUMP-00035 | X | | 10 years[3] |
| Alkaline Effluent Collection Area Sump | PWD-SUMP-00036 | | X | 7 years[2,4] |
| -45-ft Pit Sump | PWD-SUMP-00040 | | X | 7 years[2] |
| C2/C3 Drains Pit Sump | PWD-SUMP-00071 | X | | 10 years[3] |
| RLD Containment Area Sump | RLD-SUMP-00003 | X | | 10 years[3] |
| **HLW Tanks** | | | | |
| Rinse Tunnel Canister Rinse Vessel | HDH-VSL-00001 | X | | 10 years[3] |
| Waste Neutralization Vessel | HDH-VSL-00003 | X | | 10 years[3] |
| Canister Decon Vessel 1 | HDH-VSL-00002 | X | | 10 years[3] |
| Canister Decon Vessel 2 | HDH-VSL-00004 | X | | 10 years[3] |
| Melter 1 Feed Preparation Vessel | HFP-VSL-00001 | | X | 7 years[2] |
| Melter 1 Feed Vessel | HFP-VSL-00002 | | X | 7 years[2] |

**Table 7 (cont'd) Assessment Schedule**

| Plant Item Name | Plant Item Number | Lower Potential for Corrosion and Erosion | Higher Potential for Corrosion and Erosion | Assessment Schedule[1] |
|---|---|---|---|---|
| Melter 2 Feed Preparation Vessel | HFP-VSL-00005 | | X | 7 years[2] |
| Melter 2 Feed Vessel | HFP-VSL-00006 | | X | 7 years[2] |
| SBS Condensate Receiver Vessel No. 1 | HOP-VSL-00903 | | X | Located in a black cell. 7 years[2] |
| SBS Condensate Receiver Vessel No. 2 | HOP-VSL-00904 | | X | Located in a black cell. 7 years[2] |
| Decontamination Tank Melter Cave 1 | HSH-TK-00001 | X | | 10 years[3] |
| Decontamination Tank Melter Cave 2 | HSH-TK-00002 | X | | 10 years[3] |
| Acidic Waste Vessel | RLD-VSL-00007 | | X | Located in a black cell. 7 years[2] |
| Plant Wash and Drains Vessel | RLD-VSL-00008 | | X | Located in a black cell. 7 years[2] |
| Offgas Drains Collection Vessel | RLD-VSL-00002 | X | | Located in a black cell. 10 years[3] |
| **HLW Miscellaneous Units** | | | | |
| Melter 1 | HMP-MLTR-00001 | NA | NA | NA[5] |
| Melter 2 | HMP-MLTR-00002 | NA | NA | NA[5] |
| Wet Electrostatic Precipitators | HOP-WESP-00001<br>HOP-WESP-00002 | X | | Located in a hard-to-reach area. 10 years[3] |
| Thermal Catalytic Oxidizers | HOP-SCO-00001<br>HOP-SCO-00004 | X | | 2 to 4-year design life for catalysts; Housing: 10 years[3] |
| $NO_x$ Selective Catalytic Reducers | HOP-SCR-00001<br>HOP-SCR-00002 | X | | 2 to 4-year design life for catalysts; Housing: 10 years[3] |
| Silver Mordenite Columns | HOP-ABS-00002<br>HOP-ABS-00003 | X | | 5-year design life for silver mordenite cartridges; Housing: 10 years[3] |
| Film Coolers | HOP-FCLR-00001<br>HOP-FCLR-00002<br>HOP-FCLR-00003<br>HOP-FCLR-00004 | NA | NA | NA[5] |
| HEPA Filters | HOP-HEPA-00001A/B<br>HOP-HEPA-00002A/B<br>HOP-HEPA-00007A/B<br>HOP-HEPA-00008A/B | X | | HEPA filters to be replaced when needed; Housing: 10 years[3] |
| HEPA Electric Preheaters | HOP-HTR-00001B<br>HOP-HTR-00002A | X | | 10 years[3] |

Table 7 (cont'd) Assessment Schedule

| Plant Item Name | Plant Item Number | Lower Potential for Corrosion and Erosion | Higher Potential for Corrosion and Erosion | Assessment Schedule[1] |
|---|---|---|---|---|
| HEPA Electric Preheaters, Melter 2 | HOP-HTR-00005A/B | X | | 10 years[3] |
| Catalyst Skid Electric Heaters | HOP-HTR-00001<br>HOP-HTR-00007 | X | | 10 years[3] |
| Catalyst Skid Preheaters | HOP-HX-00001<br>HOP-HX-00003 | X | | 10 years[3] |
| Silver Mordenite Preheaters | HOP-HX-00002<br>HOP-HX-00004 | X | | 10 years[3] |
| Booster Extraction Fans | HOP-FAN-00001A/B/C<br>HOP-FAN-00009A/B/C | X | | 10 years[3] |
| Stack Extraction Fans | HOP-FAN-00008A/B/C<br>HOP-FAN-00010A/B/C | X | | 10 years[3] |
| Activated Carbon Adsorbers | HOP-ADBR-00001A/B<br>HOP-ADBR-00002A/B | X | | 1-year design life for activated carbon media;<br>Housing: 10 years[3] |
| HEMEs | HOP-HEME-00001A/B<br>HOP-HEME-00002A/B | X | | 10 years[3] |
| Submerged Bed Scrubbers | HOP-SCB-00001<br>HOP-SCB-00002 | | X | 7 years[2] |
| HEPA Filters | PJV-HEPA-00004A/B<br>PJV-HEPA-00005A/B | X | | HEPA filters to be replaced when needed;<br>Housing: 10 years[3] |
| Electric Heater | PJV-HTR-00002 | X | | 10 years[3] |
| Pulse Jet Fans | PJV-FAN-00002A/B | X | | 10 years[3] |
| **HLW Breakpots** | | | | |
| Plant Wash and Drains Vessel Transfer Breakpot | RLD-BRKPT-00004 | | X | Located in a black cell. 7 years[2] |
| Acidic Waste Vessel Transfer Breakpot | RLD-BRKPT-00007<br>RLD-BRKPT-00009 | | X | Located in a black cell. 7 years[2] |
| **HLW Sumps** | | | | |
| Active Services Cell Melter Sumps | HFP-SUMP-00001<br>HFP-SUMP-00004 | X | | Located in a hard-to-reach area. 10 years[3] |
| Melter Cave Sumps | HFP-SUMP-00002<br>HFP-SUMP-00005 | | X | 7 years[2] |
| SBS Drain Collection Cell Sumps | HOP-SUMP-00003<br>HOP-SUMP-00008 | | X | Located in a black cell. 7 years[2] |

**Table 7 (cont'd) Assessment Schedule**

| Plant Item Name | Plant Item Number | Lower Potential for Corrosion and Erosion | Higher Potential for Corrosion and Erosion | Assessment Schedule[1] |
|---|---|---|---|---|
| Melter Cave Sumps | HSH-SUMP-00003<br>HSH-SUMP-00007 | NA | NA | NA[5] |
| Decontamination Tank Melter Cave Sumps | HSH-SUMP-00008<br>HSH-SUMP-00009 | X | | 10 years[3] |
| Canister Rinse Tunnel Sump | HDH-SUMP-00001 | X | | 10 years[3] |
| Canister Rinse Bogie Maintenance Room Sump | HDH-SUMP-00002 | X | | 10 years[3] |
| Canister Decontamination Cave Sump | HDH-SUMP-00003 | X | | 10 years[3] |
| Wet Process Cell Sump | RLD-SUMP-00001 | X | | Located in a black cell. 10 years[3] |
| Wet Process Cell Sump | HCP-SUMP-00001 | | X | Located in a black cell. 7 years[2] |
| Canister Handling Cave | HPH-SUMP-00001<br>HPH-SUMP-00003<br>HPH-SUMP-00005 | X | | 10 years[3] |
| **Underground Transfer Lines** | | | | |
| Piping | NA | X | | 10 years[3] |

Notes:

1 Includes piping associated with the regulated plant item.

2 Frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments; age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 7 years between integrity assessments.

For hard-to-reach areas and black cells, direct visual or physical inspections of equipment are not possible. Operating history reviews are performed at least every 2 years. Static liquid volume leak tests of tanks are conducted within 7 years after start of hot commissioning. Subsequent static liquid volume leak tests will be based on the results of previous leak tests; the age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 7 years between tests.

3 Frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments; age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 10 years between integrity assessments.

For hard-to-reach areas and black cells, direct visual or physical inspections of equipment are not possible. Operating history reviews are performed at least every 2 years. Static liquid volume leak tests of tanks are conducted within 10 years after start of hot commissioning. Subsequent static liquid volume leak tests will be based on the results of previous leak tests; the age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 10 years between tests.

For underground transfer lines, direct visual or physical inspections are not possible without excavation. Operating history reviews are performed at least every 2 years. Pneumatic leak tests are conducted within 10 years after start of hot commissioning. Subsequent pneumatic leak tests will be based on the results of previous leak tests; the age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 10 years between tests.

**Table 7 (cont'd) Assessment Schedule**

[4] For purposes of integrity assessment, this accessible regulated plant item is used as a surrogate for inaccessible equipment in the PTF or HLW vitrification facility. Therefore, the frequency of the integrity assessment is consistent with the frequency of the integrity assessment for the inaccessible equipment. See Table 10 for a list of surrogate equipment.

[5] Design life is 5 years. Assessment, other than review of operation and maintenance records on annual or semiannual basis, is not required if melter and melter coolers are replaced within less than 7 years. Otherwise, the initial integrity assessment will be conducted within 7 years after start of hot commissioning; frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments; age of the miscellaneous unit system; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 7 years between integrity assessments.

The integrity assessment schedule for the melter cave sumps (HSH-SUMP-00003 and HSH-SUMP-00007) corresponds to the integrity assessment schedule or replacement schedule for the melters and film coolers.

Acronyms:

HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
HLW - high-level waste
LAW – low-activity waste
$NO_x$ - nitrogen oxides
PJV – pulse jet ventilation system
PTF - pretreatment facility
SBS - submerged bed scrubber
UNS - unified numbering system
VOC - volatile organic compound

**Table 8** **Process Chemistry and Parameters Monitored for Operating History Reviews**

| | Aluminum | Chloride | Fluoride | Iron | Nitrate | Nitrite | Phosphate | Sulfate | Mercury | Carbonate | Undissolved solids | Lead | pH | Temperature | Cerium | Hydrogen peroxide | Sodium permanganate | Bromide | Hydroxide | Total organic carbon | Particle size/hardness | Dose rate, α, β/γ (inside) | Time of exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PTF** | | | | | | | | | | | | | | | | | | | | | | | |
| CNP-VSL-00003 | | | | | | | | | | | | | | | | | | | | | | | |
| CNP-VSL-00004 | | | | | | | | | | | | | | | | | | | | | | | |
| CNP-VSL-00001 | | | | | | | | | | | | | | | | | | | | | | | |
| CXP-IXC-00001<br>CXP-IXC-00002<br>CXP-IXC-00003<br>CXP-IXC-00004 | | | | | | | | | | | | | | | | | | | | | | | |
| CXP-VSL-00001 | | | | | | | | | | | | | | | | | | | | | | | |
| CXP-VSL-00004 | | | | | | | | | | | | | | | | | | | | | | | |
| CXP-VSL-00005 | | | | | | | | | | | | | | | | | | | | | | | |
| CXP-VSL-00026A/B/C | | | | | | | | | | | | | | | | | | | | | | | |
| FEP-VSL-00017A/B | | | | | | | | | | | | | | | | | | | | | | | |
| FEP-VSL-00005 | | | | | | | | | | | | | | | | | | | | | | | |
| FRP-VSL-00002A/B/C/D | | | | | | | | | | | | | | | | | | | | | | | |
| HLP-VSL-00028 | | | | | | | | | | | | | | | | | | | | | | | |
| HLP-VSL-00027A/B | | | | | | | | | | | | | | | | | | | | | | | |
| HLP-VSL-00022 | | | | | | | | | | | | | | | | | | | | | | | |
| PIH-TK-00001 | | | | | | | | | | | | | | | | | | | | | | | |
| PVP-VSL-00001 | | | | | | | | | | | | | | | | | | | | | | | |
| PWD-VSL-00033 | | | | | | | | | | | | | | | | | | | | | | | |

**Table 8 (cont'd)** **Process Chemistry and Parameters Monitored for Operating History Reviews**

| | Aluminum | Chloride | Fluoride | Iron | Nitrate | Nitrite | Phosphate | Sulfate | Mercury | Carbonate | Undissolved solids | Lead | pH | Temperature | Cerium | Hydrogen peroxide | Sodium permanganate | Bromide | Hydroxide | Total organic carbon | Particle size/hardness | Dose rate, α, β/γ (inside) | Time of exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PWD-VSL-00043 | | | | | | | | | | | | | | | | | | | | | | | |
| PWD-VSL-00046 | | | | | | | | | | | | | | | | | | | | | | | |
| PWD-VSL-00015<br>PWD-VSL-00016 | | | | | | | | | | | | | | | | | | | | | | | |
| PWD-VSL-00044 | | | | | | | | | | | | | | | | | | | | | | | |
| RDP-VSL-00002A/B/C | | | | | | | | | | | | | | | | | | | | | | | |
| RDP-VSL-00004 | | | | | | | | | | | | | | | | | | | | | | | |
| RLD-TK-00006A/B | | | | | | | | | | | | | | | | | | | | | | | |
| RLD-VSL-00017A/B | | | | | | | | | | | | | | | | | | | | | | | |
| TCP-VSL-00001 | | | | | | | | | | | | | | | | | | | | | | | |
| TLP-VSL-00002 | | | | | | | | | | | | | | | | | | | | | | | |
| TLP-VSL-00009A/B | | | | | | | | | | | | | | | | | | | | | | | |
| UFP-VSL-00062A/B/C | | | | | | | | | | | | | | | | | | | | | | | |
| UFP-VSL-00001A/B | | | | | | | | | | | | | | | | | | | | | | | |
| UFP-VSL-00002A/B | | | | | | | | | | | | | | | | | | | | | | | |
| UFP-FILT-00001A/B<br>UFP-FILT-00002A/B<br>UFP-FILT-00003A/B<br>UFP-FILT-00004A/B<br>UFP-FILT-00005A/B | | | | | | | | | | | | | | | | | | | | | | | |

**Table 8 (cont'd)** **Process Chemistry and Parameters Monitored for Operating History Reviews**

| | Aluminum | Chloride | Fluoride | Iron | Nitrate | Nitrite | Phosphate | Sulfate | Mercury | Carbonate | Undissolved solids | Lead | pH | Temperature | Cerium | Hydrogen peroxide | Sodium permanganate | Bromide | Hydroxide | Total organic carbon | Particle size/hardness | Dose rate, α, β/γ (inside) | Time of exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HLW Vitrification Facility** | | | | | | | | | | | | | | | | | | | | | | | |
| HDH-VSL-00001 | | | | | | | | | | | | | | | | | | | | | | | |
| HDH-VSL-00003 | | | | | | | | | | | | | | | | | | | | | | | |
| HDH-VSL-00002<br>HDH-VSL-00004 | | | | | | | | | | | | | | | | | | | | | | | |
| HFP-VSL-00001<br>HFP-VSL-00005 | | | | | | | | | | | | | | | | | | | | | | | |
| HFP-VSL-00002<br>HFP-VSL-00006 | | | | | | | | | | | | | | | | | | | | | | | |
| HOP-VSL-00903<br>HOP-VSL-00904 | | | | | | | | | | | | | | | | | | | | | | | |
| HSH-TK-00001<br>HSH-TK-00002 | | | | | | | | | | | | | | | | | | | | | | | |
| RLD-VSL-00007 | | | | | | | | | | | | | | | | | | | | | | | |
| RLD-VSL-00008 | | | | | | | | | | | | | | | | | | | | | | | |
| RLD-VSL-00002 | | | | | | | | | | | | | | | | | | | | | | | |

Note:

Shaded cells indicate parameter considered in corrosion and erosion evaluation. See Appendix A for list of applicable Corrosion Evaluation Reports/Material Selection Data Sheets.

**Table 9 Summary of Tanks Monitored by the Sampling System**

| Tank Name | Plant Item Number | Comments |
|---|---|---|
| **PTF** | | |
| Waste Feed Receipt Vessels | FRP-VSL-00002A/B/C/D | These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using FRP-PMP-00002A and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level. |
| Waste Feed Evaporator Feed Vessels | FEP-VSL-00017A/B | These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tanks using the feed pumps (FEP-PMP-00007A/B) and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level. |
| UFP Feed Preparation Vessels | UFP-VSL-00001A/B | These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tanks using the transfer pumps (UFP-PMP-00041A/B) and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level. |

**Table 9 (cont'd) Summary of Tanks Monitored by the Sampling System**

| Tank Name | Plant Item Number | Comments |
|---|---|---|
| UFP Feed Vessels | UFP-VSL-00002A/B | These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tanks using the transfer pumps (UFP-PMP-00042A/B) and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level. |
| UFP Permeate Vessels | UFP-VSL-00062A/B/C | These are tanks considered to have a lower potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tanks using the transfer ejectors and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level. |
| HLW Feed Receipt Vessel | HLP-VSL-00022 | This is a tank considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00021 and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level. |
| HLW Lag Storage Vessels | HLP-VSL-00027A/B | These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00017A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level. |

**Table 9 (cont'd) Summary of Tanks Monitored by the Sampling System**

| Tank Name | Plant Item Number | Comments |
|---|---|---|
| HLW Feed Blending Vessel | HLP-VSL-00028 | This is a tank considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00019A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level. |
| Cesium IX Treated LAW Vessels | CXP-VSL-00026A/B/C | These are tanks considered to have a lower potential for corrosion and erosion in a black cell. |
| Cesium Evaporator Recovered Nitric Acid Vessel | CNP-VSL-00004 | This is a tank considered to have a lower potential for corrosion and erosion in a black cell. To monitor halide, cesium and nitric acid concentrations, tank contents are routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level. |
| LAW SBS Condensate Receipt Vessels | TLP-VSL-00009A/B | These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using TLP-PMP-00005A/B and routed to a glovebox. The sampling device is located outside the cell in a shielded but accessible location. |
| Treated LAW Evaporator Condensate Vessel | TLP-VSL-00002 | This is a tank considered to have a lower potential for corrosion and erosion in an accessible location. To monitor process operating conditions, tank contents are pumped from the tank using TLP-PMP-00002A/B and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location. |

**Table 9 (cont'd) Summary of Tanks Monitored by the Sampling System**

| Tank Name | Plant Item Number | Comments |
|---|---|---|
| Treated LAW Concentrate Storage Vessel | TCP-VSL-00001 | This is a tank considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using TCP-PMP-00001A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level. |
| Spent Resin Slurry Vessels | RDP-VSL-00002A/B/C | These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using RDP-PMP-00008A/B and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location. |
| Spent Resin Dewatering Moisture Separation Vessel | RDP-VSL-00004 | This is a tank considered to have a lower potential for corrosion and erosion in an accessible location. Samples collected via the spent resin dewatering sample cylinder (RDP-SMPLR-00001). |
| Acidic/Alkaline Effluent Vessels | PWD-VSL-00015<br>PWD-VSL-00016 | These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tanks using the transfer ejectors and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location. |
| Plant Wash Vessel | PWD-VSL-00044 | This is a tank considered to have a higher potential for corrosion and erosion in a black cell. RFDs, located within the tank, are used to transfer samples to the ASX. |
| | | |

**Table 9 (cont'd) Summary of Tanks Monitored by the Sampling System**

| Tank Name | Plant Item Number | Comments |
|---|---|---|
| C3 Floor Drain Collection Vessel | PWD-VSL-00046 | This is a tank considered to have a lower potential for corrosion and erosion in an accessible location. |
| Alkaline Effluent Vessels | RLD-VSL-00017A/B | These are tanks considered to have a lower potential for corrosion and erosion in an accessible location. Tank contents are pumped from the tank using the alkaline effluent pumps (RLD-PMP-00005A/B) and routed to a sampler. |
| Process Condensate Tanks | RLD-TK-00006A/B | These are tanks considered to have a lower potential for corrosion and erosion in an accessible location. Tank contents are pumped from the tank using the process condensate transfer pumps (RLD-PMP-00011A/B) and routed to a manual sampler. |
| **HLW Vitrification Facility** | | |
| Melter Feed Preparation Vessels | HFP-VSL-00001<br>HFP-VSL-00005 | These are tanks considered to have a higher potential for corrosion and erosion in a hot cell. Two mechanical pumps (HFP-PMP-00005A/B or HFP-PMP-00018A/B) to transfer waste to the autosampler. |
| Melter Feed Vessels | HFP-VSL-00002<br>HFP-VSL-00006 | These are tanks considered to have a higher potential for corrosion and erosion in a hot cell. Sample pump to transfer waste to the autosampler (HFP-PMP-00007 or HFP-PMP-00017). |
| Plant Wash and Drains Vessel | RLD-VSL-00008 | This is a tank considered to have a higher potential for corrosion and erosion in a black cell. The tank contents are sampled to measure the final pH before each transfer to the PTF tank PWD-VSL-00013. |

**Table 9 (cont'd) Summary of Tanks Monitored by the Sampling System**

| Tank Name | Plant Item Number | Comments |
|---|---|---|
| Acidic Waste Vessel | RLD-VSL-00007 | This is a tank considered to have a higher potential for corrosion and erosion in a black cell. The tank contents are sampled to measure the final pH before each transfer to the PTF tank PWD-VSL-00043. |

Acronyms:

ASX – autosampling system
HLW - high-level waste
LAW – low-activity waste
PTF - pretreatment facility
RFD - reverse flow diverter
SBS - submerged bed scrubber
UFP - ultrafiltration process

**Table 10** **Accessible DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells**

| Possible Surrogate (Plant Item Number) | Attributes | Hard-to-Reach Area and Black Cell Equipment in Laboratory, PTF, or HLW Vitrification Facility | | |
|---|---|---|---|---|
| | | Direct Correspondence[1] | Similar Attributes[2] | Limited Similarity[3] – Use High Potential Scenario |
| **Laboratory Tanks** | | | | |
| RLD-VSL-00164 | 6% molybdenum alloy, receives radioactive liquid and discharges to RLD-VSL-00165, corrosion/erosion allowance specified[4] | LAB<br>RLD-VSL-00165[5] | | |
| **LAW Tanks** | | | | |
| LCP-VSL-00001<br>LCP-VSL-00002 | 316L (S31603), receives concentrated LAW, corrosion/erosion allowance specified[4] | PTF<br>TCP-VSL-00001 | PTF<br>CXP-VSL-00001<br>CXP-VSL-00026A/B/C<br>UFP-VSL-00062A/B/C | |
| LFP-VSL-00001<br>LFP-VSL-00002<br>LFP-VSL-00003<br>LFP-VSL-00004 | 316L (S31603), receives concentrated LAW plus glass formers, increased bottom head and shell thickness to provide erosion allowance<br>Represents highest potential scenario for erosion due to contents and from mixing process | | | PTF<br>FEP-VSL-00017A/B<br>FRP-VSL-00002A/B/C/D<br>HLP-VSL-00022<br>HLP-VSL-00027A/B<br>HLP-VSL-00028<br>PWD-VSL-00015<br>PWD-VSL-00016<br>PWD-VSL-00033[5]<br>PWD-VSL-00043[5]<br>RDP-VSL-00002A/B/C<br>UFP-VSL-00001A/B<br>UFP-VSL-00002A/B |
| LOP-VSL-00001<br>LOP-VSL-00002 | Alloy C-22 (N06022), receives SBS condensate, corrosion/erosion allowance specified | HLW<br>HOP-VSL-00903<br>HOP-VSL-00904 | PTF<br>CNP-EVAP-00001<br>HLP-BRKPT-00004<br>HLP-BRKPT-00006 | |

**Table 10 (cont'd)** **Accessible DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells**

| Possible Surrogate (Plant Item Number) | Attributes | Hard-to-Reach Area and Black Cell Equipment in Laboratory, PTF, or HLW Vitrification Facility | | |
|---|---|---|---|---|
| | | Direct Correspondence[1] | Similar Attributes[2] | Limited Similarity[3] – Use High Potential Scenario |
| LVP-TK-00001 | 316L (S31603), receives caustic solution, corrosion/erosion allowance specified | | PTF<br>CNP-VSL-00003<br>CXP-VSL-00004 | |
| RLD-VSL-00004 | 316L (S31603), receives radioactive drains, no corrosion/erosion allowance specified | | PTF<br>PWD-VSL-00044<br>PWD-BRKPT-00007<br>PWD-BRKPT-00008<br>PWD-BRKPT-00009<br>PWD-BRKPT-00010<br><br>HLW<br>RLD-VSL-00002<br>RLD-VSL-00008<br>RLD-BRKPT-00007<br>RLD-BRKPT-00009 | PTF<br>UFP-BRKPT-00001B |
| RLD-VSL-00005 | 6% molybdenum alloy (N08367/N08926), receives LAW SBS condensate, possible strongly acidic waste, standard corrosion allowance | PTF<br>TLP-VSL-00009A/B | HLW<br>RLD-VSL-00007 | |
| **PTF Tanks in Accessible Areas** | | | | |
| RDP-VSL-00004 | 304L (S30403), receives spent resin dewatering moisture, strongly acidic, standard corrosion allowance | | PTF<br>CNP-VSL-00001<br>CNP-VSL-00004<br>CXP-VSL-00005<br>PVP-VSL-00001<br>CNP-BRKPT-00001<br>CNP-BRKPT-00002 | HLW<br>RLD-BRKPT-00004 |

**Table 10 (cont'd)** **Accessible DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells**

| Possible Surrogate (Plant Item Number) | Attributes | Hard-to-Reach Area and Black Cell Equipment in Laboratory, PTF, or HLW Vitrification Facility | | |
|---|---|---|---|---|
| | | Direct Correspondence[1] | Similar Attributes[2] | Limited Similarity[3] – Use High Potential Scenario |
| TLP-VSL-00002 | 304L (S30403), receives evaporator condensate, pH neutral to alkaline, corrosion/erosion allowance specified | | PTF<br>FEP-SEP-00001A/B<br>TLP-SEP-00001 | |
| RLD-VSL-00017A/B | 304L (S30403), receives alkaline effluent, corrosion/erosion allowance specified | | PTF<br>PWD-BRKPT-00015<br>PWD-BRKPT-00016<br>PWD-BRKPT-00017<br>PWD-BRKPT-00019 | |
| **LAW Miscellaneous Units** | | | | |
| LVP-SCB-00001 | 316L (S31603), receives and scrubs vessel vent gases, corrosion/erosion allowance specified | PTF<br>PVP-SCB-00002 | | |
| LOP-WESP-00001<br>LOP-WESP-00002 | 6% molybdenum alloy (N08367), receive LAW melter offgas (post-scrubber) | HLW<br>HOP-WESP-00001<br>HOP-WESP-00002 | | |
| **LAW Sumps** | | | | |
| RLD-SUMP-00028 | 316L (S31603), receives radioactive liquid | | PTF[6]<br>PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029<br>PWD-SUMP-00032<br>PWD-SUMP-00033 | |

**Table 10 (cont'd)** **Accessible DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells**

| Possible Surrogate (Plant Item Number) | Attributes | Hard-to-Reach Area and Black Cell Equipment in Laboratory, PTF, or HLW Vitrification Facility | | |
|---|---|---|---|---|
| | | Direct Correspondence[1] | Similar Attributes[2] | Limited Similarity[3] – Use High Potential Scenario |
| RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 | 6% molybdenum alloy (N08367/N08926), receive radioactive drains, standard corrosion allowance | PTF<br>PWD-SUMP-00040<br><br>HLW<br>HOP-SUMP-00003<br>HOP-SUMP-00008<br>RLD-SUMP-00001<br>HCP-SUMP-00001 | | |
| **PTF Sumps in Accessible Areas** | | | | |
| PWD-SUMP-00036 | 304L (S30403), receives alkaline effluent, standard corrosion allowance | PTF<br>PWD-SUMP-00001<br>PWD-SUMP-00001A<br>PWD-SUMP-00002<br>PWD-SUMP-00002A<br>PWD-SUMP-00003<br>PWD-SUMP-00004<br>PWD-SUMP-00005<br>PWD-SUMP-00006<br>PWD-SUMP-00007<br>PWD-SUMP-00008<br>PWD-SUMP-00009<br>PWD-SUMP-00010<br>PWD-SUMP-00011<br>PWD-SUMP-00012<br>PWD-SUMP-00013 | | |

Notes:

1 Same materials of construction, same waste stream, same corrosion/erosion potential.

2 Same materials of construction, similar waste stream, similar corrosion/erosion potential.

3 Same materials of construction, waste streams different but similar high potential for corrosion/erosion potential based on similar pH conditions or mixing process.

**Table 10 (cont'd)** **Accessible DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells**

[4] In addition to standard 0.040-inch corrosion allowance, corrosion evaluation identified tank-specific corrosion/erosion allowances.

[5] One of the DWP-regulated tanks in hard-to-reach locations: RLD-VSL-00165 (analytical laboratory), PWD-VSL-00033 and PWD-VSL-00043 (PTF).

[6] Sumps located in the hot cell and RDMC.

Acronyms:

HLW – high-level waste
LAW – low-activity waste
NDE – non-destructive examination
% - percent
PTF – pretreatment facility
RDMC – remote decontamination maintenance cave
SBS - submerged bed scrubber

**Figure 1** **Integrity Assessment Schedule – PTF and HLW Vitrification Facility**

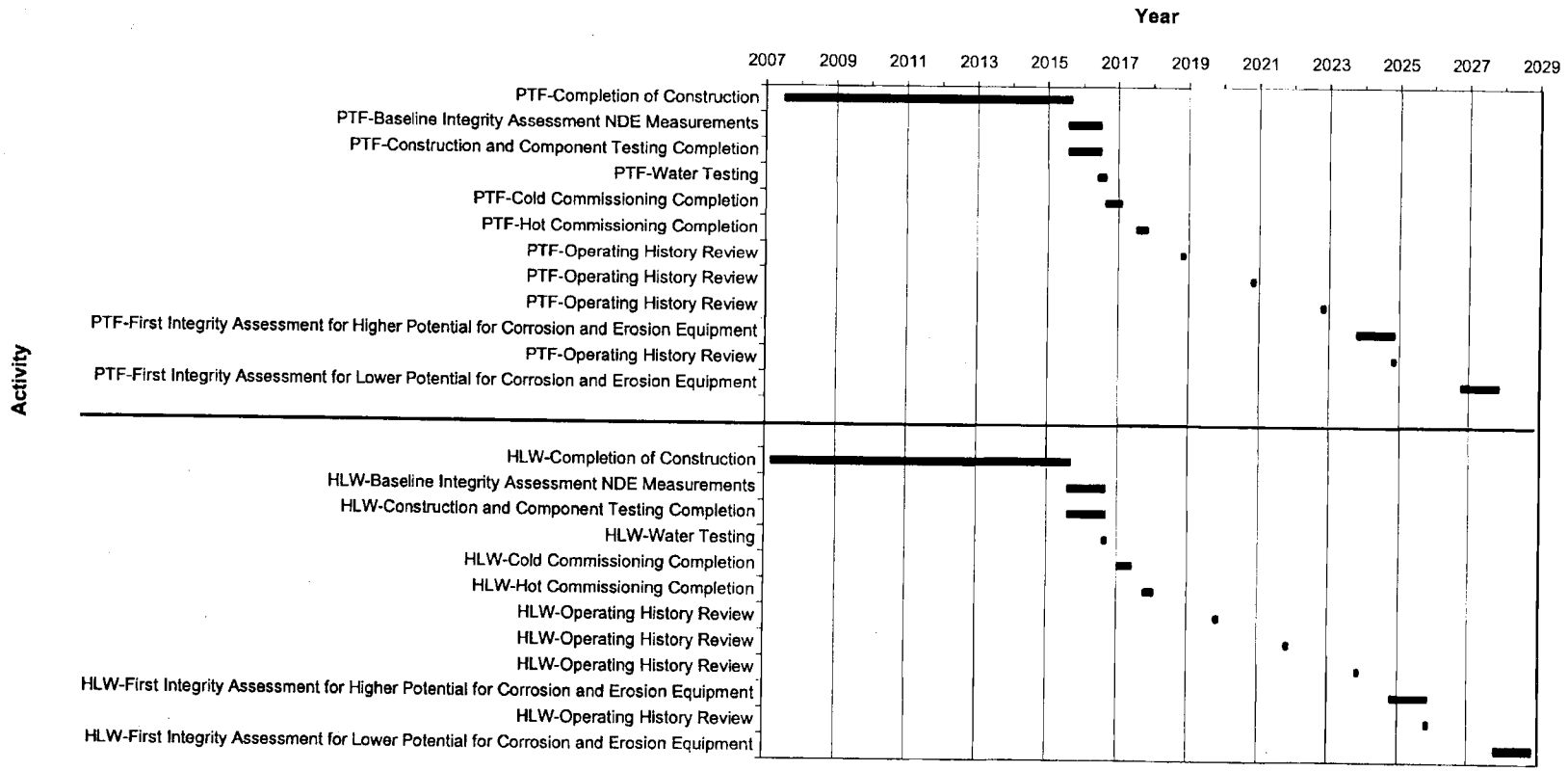

**Figure 1 (cont'd) Integrity Assessment Schedule – PTF and HLW Vitrification Facility**

Notes:

1 Information in 24590-WTP-RPT-MGT-08-011, dated November 2008, was used to prepare the integrity assessment schedule. This schedule is subject to change.

2 Baseline integrity assessment NDE measurements are to be performed before black cells or hard-to-reach-areas are completely sealed or inaccessible.

3 The schedule for the first few operating history reviews and first integrity assessments is shown. Operating history reviews are performed at least every 2 years. Frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments; age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors. See Table 7 for additional information.

Acronyms:

HLW - high-level waste
NDE – non-destructive examination
PTF - pretreatment facility

# Appendix A

# Applicable Design Documents

**Appendix A (cont'd) Applicable Design Documents**

24590-HLW-M0-HSH-00072, *HLW Vitrification System HSH, Design Proposal Drawing, Decontamination Tank*

24590-HLW-M5-V17T-00004, *Process Flow Diagram HLW Vitrification Melter 1 Secondary Offgas Treatment (System HOP)*

24590-HLW-M5-V17T-P0001, *Process Flow Diagram HLW Receipt & Feed Preparation (System HCP, GFR, & HFP)*

24590-HLW-M5-V17T-P0002, *Process Flow Diagram HLW Vitrification Melter 1 (Systems HMP and HOP)*

24590-HLW-M5-V17T-P0003, *Process Flow Diagram HLW VIT Primary Offgas Treatment (System HOP)*

24590-HLW-M5-V17T-P0005, *Process Flow Diagram HLW Vitrification Pulse Jet Ventilation Treatment (System PJV)*

24590-HLW-M6-HFP-00005, *P&ID – HLW Melter Feed Process System Melter 1 ADS Control Rack*

24590-HLW-M6-HFP-20005, *P&ID – HLW Melter Feed Process System Melter 2 ADS Control Rack*

24590-HLW-M6-HFP-P0001, *P&ID – HLW Melter Feed Process System Melter Feed Preparation Vessel HFP-VSL-00001*

24590-HLW-M6-HFP-P0002, *P&ID – HLW Melter Feed Process System Melter Feed Vessel HFP-VSL-00002*

24590-HLW-M6-HFP-P20001, *P&ID – HLW Melter Feed Process System Melter Feed Preparation Vessel HFP-VSL-00005*

24590-HLW-M6-HFP-P20002, *P&ID – HLW Melter Feed Process System Melter Feed Vessel HFP-VSL-00006*

24590-HLW-M6-HSH-P0004, *P&ID – HLW System HSH Melter Cave 1 Decontamination System*

24590-HLW-M6-HSH-P20004, *P&ID – HLW System HSH Melter Cave 2 Decontamination System*

24590-HLW-M6-HOP-00001, *P&ID HLW Melter Offgas System Melter 1 Primary Offgas Scrubber*

24590-HLW-M6-HOP-00002, *P&ID HLW Melter Offgas System Melter 1 Primary Offgas WESP*

24590-HLW-M6-HOP-20001, *P&ID HLW Melter Offgas System Melter 2 Primary Offgas Scrubber*

24590-HLW-M6-HOP-20002, *P&ID HLW Melter Offgas System Melter 2 Primary Offgas WESP*

24590-HLW-M6-PJV-00002, *P&ID HLW Pulse Jet Ventilation System Filtration & Monitoring*

24590-HLW-M6-RLD-00001, *P&ID – HLW Radioactive Liquid Waste Disposal System Active Effluent Collection*

24590-HLW-M6-RLD-00002, *P&ID – HLW Radioactive Liquid Waste Disposal System Plant Wash & Drains Vessel*

24590-HLW-M6-RLD-00014, *P&ID – HLW Radioactive Liquid Waste Disposal System Offgas Drains Collection Vessel*

24590-HLW-M6-RLD-00016, *P&ID – HLW Radioactive Liquid Waste Disposal System, Miscellaneous Sumps*

24590-HLW-MAD-HOP-00010, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00001A)*

**Appendix A (cont'd) Applicable Design Documents**

24590-HLW-MAD-HOP-00011, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00002A)*

24590-HLW-MAD-HOP-00012, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00001B)*

24590-HLW-MAD-HOP-00013, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00002B)*

24590-HLW-MAD-HOP-00014, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00007A)*

24590-HLW-MAD-HOP-00015, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00008A)*

24590-HLW-MAD-HOP-00016, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00007B)*

24590-HLW-MAD-HOP-00017, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00008B)*

24590-HLW-MAD-HOP-00018, *Centrifugal Blower Data Sheet (Plant Item No. 24590-HLW-HOP-FAN-00001A/B/C and HLW-HOP-FAN-00009A/B/C)*

24590-HLW-MAD-HOP-00038, *High-Pressure Centrifugal Blower Data Sheet (Plant Item No. 24590-HLW-HOP-FAN-00008A/B/C and HLW-HOP-FAN-00010A/B/C)*

24590-HLW-MAD-PJV-00004, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-PJV-HEPA-00004A)*

24590-HLW-MAD-PJV-00005, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-PJV-HEPA-00005A)*

24590-HLW-MAD-PJV-00006, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-PJV-HEPA-00004B)*

24590-HLW-MAD-PJV-00007, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-PJV-HEPA-00005B)*

24590-HLW-MAD-PJV-00008, *Centrifugal Blower Data Sheet, (Plant Item No. 24590-HLW-PJV-FAN-00002A and 24590-HLW-PJV-FAN-00002B)*

24590-HLW-MED-HOP-P0012, *Mechanical Data Sheet for Plate Heat Exchanger (Plant Item No. 24590-HLW-ME-HOP-HX-00002)*

24590-HLW-MED-HOP-P0013, *Mechanical Data Sheet for HEPA Preheater (Plant Item No. 24590-HLW-ME-HOP-HTR-00002A, 24590-HLW-ME-HOP-HTR-00001B, 24590-HLW-ME-HOP-HTR-00005A, and 24590-HLW-ME-HOP-HTR-00005B)*

24590-HLW-MED-HOP-P0017, *Mechanical Data Sheet for Plate Heat Exchanger (Plant Item No. 24590-HLW-ME-HOP-HX-00004)*

24590-HLW-MED-PJV-00002, *Mechanical Data Sheet for HEPA Preheater*

24590-HLW-MK-HOP-P0001001, *Equipment Assembly HLW Submerged Bed Scrubber, HOP-SCB-00001 (Q), Sheet 1 of 4*

24590-HLW-MKD-HOP-00016, *Mechanical Systems Data Sheet: SBS (Plant Item No. 24590-HLW-MK-HOP-SCB-00001 and 24590-HLW-MK-HOP-SCB-00002)*

**Appendix A (cont'd) Applicable Design Documents**

24590-HLW-MKD-HOP-P0014, *Mechanical Systems Data Sheet (Plant Item No. 24590-HLW-MV-HOP-ABS-00002)*

24590-HLW-MKD-HOP-P0017, *Mechanical Systems Data Sheet (Plant Item No. 24590-HLW-MV-HOP-ABS-00003)*

24590-HLW-MKD-HOP-P0019, *Mechanical Data Sheet for HLW Catalytic Oxidizer/Reducer (Plant Item No. 24590-HLW-MB-HOP-SCO-00002 and 24590-HLW-MB-HOP-SCO-00003)*

24590-HLW-MKD-HOP-P0020, *Mechanical Data Sheet for HLW Catalytic Oxidizer/Reducer (Plant Item No. 24590-HLW-MB-HOP-SCO-00003)*

24590-HLW-MPD-HDH-00001, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. HDH-PMP-00001*

24590-HLW-MPD-HFP-00007, *Mechanical Systems Data Sheet: Vertical Centrifugal Pump, Plant Item No. 24590-HLW-MP-HFP-PMP-00005A, 24590-HLW-MP-HFP-PMP-00005B, 24590-HLW-MP-HFP-PMP-00018A, 24590-HLW-MP-HFP-PMP-00018B*

24590-HLW-MPD-HFP-00009, *Mechanical Systems Data Sheet: Vertical Centrifugal Pump, Plant Item No. 24590-HLW-MP-HFP-PMP-00007, 24590-HLW-MP-HFP-PMP-00017*

24590-HLW-MPD-RLD-00021, *Mechanical Systems Data Sheet: Air Operated Diaphragm Pump, Plant Item No. 24590-HLW-MP-RLD-PMP-00023*

24590-HLW-MV-HFP-00001, *Equipment Assembly HLW Melter 1 Feed Preparation Vessel HFP-VSL-00001*

24590-HLW-MV-HFP-00002, *Equipment Assembly HLW Melter 1 Feed Vessel HFP-VSL-00002*

24590-HLW-MV-HFP-00009, *Equipment Assembly HLW Melter 2 Feed Preparation Vessel HFP-VSL-00005*

24590-HLW-MV-HFP-00010, *Equipment Assembly HLW Melter 2 Feed Vessel HFP-VSL-00006*

24590-HLW-MV-HOP-P0001, *Equipment Assembly Melter 2 SBS Condensate Receiver Vessel HOP-VSL-00903*

24590-HLW-MV-HOP-P0002001, *Equipment Assembly HLW Primary Offgas HEME, HOP-HEME-00001A/B (Q), Sheet 1 of 3*

24590-HLW-MV-HOP-P0003, *Equipment Assembly Melter 2 SBS Condensate Receiver Vessel HOP-VSL-00904*

24590-HLW-MV-RLD-00002, *Equipment Assembly HLW Offgas Drains Collection Vessel RLD-VSL-00002*

24590-HLW-MV-RLD-00007, *Equipment Assembly, HLW Radioactive Liquid Waste Disposal System, Acidic Waste Transfer Breakpot, RLD-BRKPT-00007*

24590-HLW-MV-RLD-00009, *Equipment Assembly, HLW Radioactive Liquid Waste Disposal System, Acidic Waste Transfer Breakpot, RLD-BRKPT-00009*

24590-HLW-MV-RLD-00012, *Equipment Assembly, HLW Radioactive Liquid Waste Disposal System, Wash Effluent Breakpot, RLD-BRKPT-00004*

24590-HLW-MV-RLD-P0003, *Equipment Assembly Acidic Waste Vessel RLD-VSL-00007*

24590-HLW-MV-RLD-P0004, *Equipment Assembly Plant Wash & Drains Vessel RLD-VSL-00008*

24590-HLW-MVD-HDH-P0003, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HDH-VSL-00003)*

**Appendix A (cont'd) Applicable Design Documents**

24590-HLW-MVD-HDH-P0006, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HDH-VSL-00002)*

24590-HLW-MVD-HDH-P0009, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HDH-VSL-00001)*

24590-HLW-MVD-HDH-P0012, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HDH-VSL-00004)*

24590-HLW-MVD-HFP-P0010, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HFP-VSL-00001)*

24590-HLW-MVD-HFP-P0011, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HFP-VSL-00002)*

24590-HLW-MVD-HFP-P0014, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HFP-VSL-00005)*

24590-HLW-MVD-HFP-P0015, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HFP-VSL-00006)*

24590-HLW-MVD-HOP-00007, *Mechanical Data Sheet for HEME (Plant Item No. 24590-HLW-MV-HOP-HEME-00001 [A&B]; 24590-HLW-MV-HOP-HEME-00002 [A&B])*

24590-HLW-MVD-HOP-00015, *Mechanical Data Sheet for Activated Carbon Adsorber (Plant Item No. 24590-HLW-MV-HOP-ADBR-00001A and 24590-HLW-MV-HOP-ADBR-00001B)*

24590-HLW-MVD-HOP-00016, *Mechanical Data Sheet for Activated Carbon Adsorber (Plant Item No. 24590-HLW-MV-HOP-ADBR-00002A and 24590-HLW-MV-HOP-ADBR-00002B)*

24590-HLW-MVD-HOP-P0001, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HOP-VSL-00903)*

24590-HLW-MVD-HOP-P0012, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HOP-VSL-00904)*

24590-HLW-MVD-RLD-P0005, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-RLD-VSL-00007)*

24590-HLW-MVD-RLD-P0007, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-RLD-VSL-00008)*

24590-HLW-MVD-RLD-P0008, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-RLD-VSL-00002)*

24590-HLW-N1D-HDH-P0003, *Plant Item Material Selection Data Sheet for HDH-VSL-00002 & HDH-VSL-00004*

24590-HLW-N1D-HDH-P0005, *Plant Item Material Selection Data Sheet for HDH-VSL-00003*

24590-HLW-N1D-HDH-P0007, *Plant Item Material Selection Data Sheet for HDH-VSL-00001*

24590-HLW-N1D-HFP-00002, *Corrosion Evaluation, HFP-PMP-00007 & HFP-PMP-00017 (HLW), Melter 1 & 2 Feed Vessel Sample/Recirc Pump*

24590-HLW-N1D-HFP-P0003, *Corrosion Evaluation for HFP-VSL-00001 & HFP-VSL-00005*

24590-HLW-N1D-HFP-P0004, *Plant Item Material Selection Data Sheet for HFP-VSL-00002 & HFP-VSL-00006 (HLW)*

24590-HLW-N1D-HOP-00001, *Corrosion Evaluation for HOP-HEME-00001A/B & 2A/B*

24590-HLW-N1D-HOP-00006, *Corrosion Evaluation for HOP-ABS-00002 & 3*

**Appendix A (cont'd) Applicable Design Documents**

24590-HLW-N1D-HOP-00008, *HOP-HX-00001 & HOP-HX-00003 (HLW) Catalyst Skid Preheater - Corrosion Evaluation*

24590-HLW-N1D-HOP-00010, *Corrosion Evaluation for HOP-SCB-00001/2*

24590-HLW-N1D-HOP-P0002, *Plant Item Material Selection Data Sheet for HOP-WESP-00001 & HOP-WESP-00002*

24590-HLW-N1D-HOP-P0003, *Plant Item Material Selection Data Sheet for HOP-ADBR-00001A/B & 2A/B*

24590-HLW-N1D-HOP-P0004, *Plant Item Material Selection Data Sheet for HOP-SCO-00001 & HOP-SCO-00004*

24590-HLW-N1D-HOP-P0005, *Plant Item Material Selection Data Sheet for* HOP-SCR-00001 and HOP-SCR-00002

24590-HLW-N1D-HOP-P0007, *Plant Item Material Selection Data Sheet for HOP-HX-00002 and HOP-HX-00004*

24590-HLW-N1D-HSH-P0001, *Plant Item Material Selection Data Sheet for HSH-TK-00001 & 2*

24590-HLW-N1D-RLD-00001, *Corrosion Evaluation for RLD-VSL-00007*

24590-HLW-N1D-RLD-00002, *Corrosion Evaluation for RLD-BRKPT-00007 & RLD-BRKPT-00009*

24590-HLW-N1D-RLD-00006, *Corrosion Evaluation for RLD-VSL-00008*

24590-HLW-N1D-RLD-00009, *Corrosion Evaluation for RLD-BRKPT-00004*

24590-HLW-N1D-RLD-00013, *Corrosion Evaluation for RLD-VSL-00002*

24590-HLW-P1-P01T-00001, *HLW Vitrification Building General Arrangement Plan at El -21 ft - 0 in*

24590-HLW-P1-P01T-00002, *HLW Vitrification Building General Arrangement Plan at El 0 ft - 0 in*

24590-HLW-P1-P01T-00003, *HLW Vitrification Building General Arrangement Plan at El 14 ft - 0 in*

24590-HLW-P1-P01T-00004, *HLW Vitrification Building General Arrangement Plan at El 37 ft - 0 in*

24590-HLW-P1-P01T-00005, *HLW Vitrification Building General Arrangement Plan at El 58 ft - 0 in*

24590-HLW-PER-M-02-001, *HLW Facility Sump Data*

24590-HLW-RPT-ENS-08-002, *Design Basis Event Selection for the High-Level Waste Vitrification Facility Preliminary Safety Analysis Report*

24590-LAB-MVC-RLD-00003, *Process and Materials Selection Data for Hot Cell Drain Collection Vessel (RLD-VSL-00165)*

24590-LAW-N1D-RLD-00002, *RLD-VSL-00005 (LAW) SBS Condensate Collection Vessel*

24590-PTF-3PS-MLFP-TP001, *Engineering Specifications for Ultrafilters*

24590-PTF-3PS-MPC0-T0001, *Engineering Specification for PTF Hot Cell Slurry Pumps to Meet Requirements of API Standard 610, Eighth Edition*

24590-PTF-3YD-CNP-00001, *System Description for Cesium Nitric Acid Recovery Process - System CNP*

24590-PTF-3YD-CXP-00001, *System Description for the Cesium Ion Exchange Process - System CXP*

24590-PTF-3YD-FEP-00001, *System Description for Waste Feed Evaporation Process (FEP)*

24590-PTF-3YD-FRP-00001, *System Description for Waste Feed Receipt Process (FRP)*

**Appendix A (cont'd) Applicable Design Documents**

24590-PTF-3YD-HLP-00001, *System Description for HLW Lag Storage and Feed Blending Process System (HLP)*

24590-PTF-3YD-PIH-00001, *System Description for Pretreatment In-Cell Handling System*

24590-PTF-3YD-PJV-00001, *System Description for PTF Pulse Jet Ventilation System (PJV)*

24590-PTF-3YD-PVP-00001, *System Description for Pretreatment Vessel Vent Process System, PVP*

24590-PTF-3YD-PVV-00001, *System Description for Pretreatment Vessel Vent Exhaust System (PVV)*

24590-PTF-3YD-PWD-00001, *System Description for Plant Wash and Disposal System PWD and Radioactive Liquid Waste Disposal System RLD*

24590-PTF-3YD-RDP-00001, *System Description for Spent Resin Collection and Dewatering Process - System RDP*

24590-PTF-3YD-TCP-00001, *System Description for Treated LAW Concentrate Storage Process System (TCP)*

24590-PTF-3YD-TLP-00001, *System Description for Treated LAW Concentrate Evaporation Process System (TLP)*

24590-PTF-3YD-UFP-00001, *System Description for Ultrafiltration Process (UFP)*

24590-PTF-A5-A19T-05201001, *Pretreatment Facility Architectural Room Finish Schedule, El 0'-0"*

24590-PTF-IBCE-AR-03-001, *International Building Code Evaluation for Pretreatment Facility (PTF)*

24590-PTF-M0-PIH-P00001900002, *PTF Vitrification System PIH Design Proposal Drawing Decon Tank Details*

24590-PTF-M0C-PVP-00001, *Duty of Pretreatment Thermal Oxidizer (PVP-OXID-00001)*

24590-PTF-M0D-PIH-P0015, *24590-PTF-MT-PIH-00001 – Pretreatment Facility Decontamination Tank*

24590-PTF-M2-FRP-P0001, *Equipment Assembly Waste Feed Receipt Vessel FRP-VSL-00002A*

24590-PTF-M2-FRP-P0002, *Equipment Assembly Waste Feed Receipt Vessel FRP-VSL-00002B*

24590-PTF-M2-FRP-P0003, *Equipment Assembly Waste Feed Receipt Vessel FRP-VSL-00002C*

24590-PTF-M2-FRP-P0004, *Equipment Assembly Waste Feed Receipt Vessel FRP-VSL-00002D*

24590-PTF-M6-CNP-00001, *P&ID – PTF Cesium Nitric Acid Recovery Process System Eluate Contingency Storage Vessel*

24590-PTF-M6-CNP-00002, *P&ID – PTF Cesium Nitric Acid Recovery Process System Recovered Nitric Acid Vessel*

24590-PTF-M6-CNP-00008, *P&ID – PTF Cesium Nitric Acid Recovery Process System Evaporator*

24590-PTF-M6-CNP-00010, *P&ID – PTF Cesium Nitric Acid Recovery Process System, Rectifier and Condensers*

24590-PTF-M6-CXP-00001001, *P&ID – PTF Cesium Ion Exchange Process System CXP-VSL-00001*

24590-PTF-M6-CXP-00001002, *P&ID – PTF Cesium Ion Exchange Process System CXP-PMP-00001B*

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24590-PTF-M6-CXP-00001003, *P&ID – PTF Cesium Ion Exchange Process System CXP-PMP-00001A*

24590-PTF-M6-CXP-00001004, *P&ID – PTF Cesium Ion Exchange Process System CXP-VSL-00004*

24590-PTF-M6-CXP-00001005, *P&ID – PTF Cesium Ion Exchange Process System CXP-VSL-00005*

24590-PTF-M6-CXP-00010001, *P&ID – PTF Cesium Ion Exchange Process System – Treated LAW Collection Vessel CXP-VSL-00026A*

24590-PTF-M6-CXP-00010002, *P&ID – PTF Cesium Ion Exchange Process System – Treated LAW Collection Vessel CXP-VSL-00026B*

24590-PTF-M6-CXP-00010003, *P&ID – PTF Cesium Ion Exchange Process System – Treated LAW Collection Vessel CXP-VSL-00026C*

24590-PTF-M6-CXP-00010004, *P&ID – PTF Cesium Ion Exchange Process System – Treated LAW Collection Pumps CXP-PMP-00002A/B*

24590-PTF-M6-FEP-00001001, *P&ID – PTF Waste Feed Evaporation Process System Evaporator Feed Vessel FEP-VSL-00017A*

24590-PTF-M6-FEP-00001002, *P&ID – PTF Waste Feed Evaporation Process System Evaporator Feed Vessel FEP-VSL-00017B*

24590-PTF-M6-FEP-00002001, *P&ID – PTF Waste Feed Evaporation Process System Separator FEP-SEP-00001A*

24590-PTF-M6-FEP-00004001, *P&ID – PTF Waste Feed Evaporation Process System Separator FEP-SEP-00001B*

24590-PTF-M6-FRP-00001, *P&ID – PTF Waste Feed Receipt Vessel FRP-VSL-00002A and FRP-VSL-00002B*

24590-PTF-M6-FRP-00002, *P&ID – PTF Waste Feed Receipt Vessel FRP-VSL-00002C and FRP-VSL-00002D*

24590-PTF-M6-FRP-00003, *P&ID – PTF Waste Feed Receipt Process System FRP-PMP-00001 and FRP-PMP-00002A*

24590-PTF-M6-HLP-00001001, *P&ID – PTF HLP Lag Storage and Feed Blending Process System Vessel HLP-VSL-00027A*

24590-PTF-M6-HLP-00001002, *P&ID – PTF HLP Lag Storage and Feed Blending Process System Vessel HLP-VSL-00027B*

24590-PTF-M6-HLP-00001003, *P&ID – PTF HLP Lag Storage and Feed Blending Process System Pumps HLP-PMP-00017A/B*

24590-PTF-M6-HLP-00002001, *P&ID – PTF HLP Feed Receipt Vessel HLP-VSL-00022*

24590-PTF-M6-HLP-00002002, *P&ID – PTF HLP Feed Receipt Transfer Pump HLP-PMP-00021*

24590-PTF-M6-PWD-00003, *P&ID – PTF, Plant Wash & Disposal System Effluent Collection PWD-VSL-00015 and 00016*

24590-PTF-M6-HLP-00003001, *P&ID – PTF HLP Lag Storage and Feed Blending Process System Vessel HLP-VSL-00028*

24590-PTF-M6-HLP-00003002, *P&ID – PTF HLP Lag Storage and Feed Blending Process System HLW Melter Feed Pump HLP-PMP-00019A*

24590-PTF-M6-HLP-00003003, *P&ID – PTF HLP Lag System Pump HLW Melter Feed HLP-PMP-00019B*

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24590-PTF-M6-PVP-00017001, *P&ID – PTF Pretreatment Vessel Vent Process System Caustic Scrubber PVP-SCB-00002*

24590-PTF-M6-PVP-00017002, *P&ID – PTF Pretreatment Vessel Vent Process System Caustic Scrubber PVP-BULGE-00001*

24590-PTF-M6-PVP-00018002, *P&ID – PTF Pretreatment Vessel Vent Process System HEME Drain Collection PVP-VSL-00001/PVP-BULGE-00002*

24590-PTF-M6-PWD-0002001, *P&ID – PTF, Plant Wash & Disposal System Effluent Collection PWD-VSL-00044*

24590-PTF-M6-PVP-00030, *P&ID – PTF Pretreatment Vessel Vent Process System High Point Vent Bulge (ITS) PVP-BULGE-00019*

24590-PTF-M6-PVP-00031, *P&ID – PTF Pretreatment Vessel Vent Process System High Point Vent Bulge (ITS) PVP-BULGE-00020*

24590-PTF-M6-PVP-00032, *P&ID – PTF Pretreatment Vessel Vent Process System High Point Vent Bulge (ITS) PVP-BULGE-00021*

24590-PTF-M6-PWD-00050, *P&ID – PTF, Plant Wash & Disposal System Secondary Containment Leak Detection System*

24590-PTF-M6-PWD-00051, *P&ID – PTF, Plant Wash & Disposal System Secondary Containment Leak Detection System*

24590-PTF-M6-PWD-00057, *PTF - P&ID, Plant Wash & Disposal System Underground Transfer Lines*

24590-PTF-M6-PWD-00058, *PTF - P&ID, Plant Wash & Disposal System Underground Transfer Lines*

24590-PTF-M6-RDP-00001, *P&ID – PTF Ion Exchange Spent Resin Collection and Dewatering Process*

24590-PTF-M6-RDP-00002, *P&ID – PTF Ion Exchange Spent Resin Collection and Dewatering*

24590-PTF-M6-TCP-00001001, *P&ID – PTF Treated LAW Concentrate Storage System TCP-VSL-00001*

24590-PTF-M6-TLP-00001, *P&ID – PTF Treated LAW Evaporation Process System LAW SBS Condensate Receipt TLP-VSL-00009A & 9B*

24590-PTF-M6-TLP-00003, *P&ID – PTF Treated LAW Evaporation Process System Separator TLP-SEP-00001*

24590-PTF-M6-UFP-00001001, *P&ID – PTF Ultrafiltration Process System Feed Preparation Vessel UFP-VSL-00001A*

24590-PTF-M6-UFP-00001003, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00041A and UFP-HX-00041A*

24590-PTF-M6-UFP-00001004, *P&ID – PTF Ultrafiltration Process System Feed Preparation Vessel UFP-VSL-00001B*

24590-PTF-M6-UFP-00001006, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00041B and UFP-HX-00041B*

24590-PTF-M6-UFP-00002001, *P&ID – PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002A*

24590-PTF-M6-UFP-00002003, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00042A and UFP-PMP-00043A*

24590-PTF-M6-UFP-00002008, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00044A*

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24590-PTF-M6-UFP-00003001, *P&ID – PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002B*

24590-PTF-M6-UFP-00003003, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00042B and UFP-PMP-00043B*

24590-PTF-M6-UFP-00003008, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00044B*

24590-PTF-M6-UFP-00004001, *P&ID – PTF Ultrafiltration Process System Permeate Collection Vessel UFP-VSL-00062A*

24590-PTF-M6-UFP-00004002, *P&ID – PTF Ultrafiltration Process System Permeate Collection Vessel UFP-VSL-00062B*

24590-PTF-M6-UFP-00004003, *P&ID – PTF Ultrafiltration Process System Permeate Collection Vessel UFP-VSL-00062C*

24590-PTF-M6-UFP-00031001, *P&ID – PTF Ultrafiltration Process System Utility Services UFP-BULGE-00005*

24590-PTF-M6-UFP-00032001, *P&ID – PTF Ultrafiltration Process System Utility Services UFP-BULGE-00006*

24590-PTF-M6D-PVP-00001, *PVP-FILT-00001 - In-Line Medium Efficiency Air Filter*

24590-PTF-M6E-10-00007, *Incorporating UFP-BULGE-00005/00006 to Calculation*

24590-PTF-M6N-PWD-00226, *Drawing Change Notice for P&ID 24590-PTF-M6-PWD-00011*

24590-PTF-MAD-PJV-00004, *24590-PTF-MA-PJV-FAN-00001A - PJV Exhaust Blower*

24590-PTF-MAD-PJV-00005, *24590-PTF-MA-PJV-FAN-00001B - PJV Exhaust Blower*

24590-PTF-MAD-PJV-00006, *24590-PTF-MA-PJV-FAN-00001C - PJV Exhaust Blower*

24590-PTF-MAD-PVV-00004, *24590-PTF-MA-PVV-FAN-00001A - PVV Exhaust Blower*

24590-PTF-MAD-PVV-00005, *24590-PTF-MA-PVV-FAN-00001B - PVV Exhaust Blower*

24590-PTF-MED-CNP- P0003, *24590-PTF-ME-CNP-HX-00002 - Shell and Tube Heat Exchanger*

24590-PTF-MED-CNP- P0004, *24590-PTF-ME-CNP-HX-00004 - Cesium Evaporator After-Condenser*

24590-PTF-MED-CNP- P0005, *24590-PTF-MB-CNP-HX-00001 - Shell and Tube Heat Exchanger*

24590-PTF-MED-CNP- P0010, *24590-PTF-ME-CNP-HX-00003 - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0003, *24590-PTF-MB-FEP-COND-00001A - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0004, *24590-PTF-MB-FEP-COND-00001B - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0005, *24590-PTF-MB-FEP-COND-00002A - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0006, *24590-PTF-MB-FEP-COND-00002B - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0007, *24590-PTF-MB-FEP-COND-00003A - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0008, *24590-PTF-MB-FEP-COND-00003B - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0009, *24590-PTF-MB-FEP-RBLR-00001A - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0010, *24590-PTF-MB-FEP-RBLR-00001B - Shell and Tube Heat Exchanger*

24590-PTF-MED-PVP-00001, *24590-PTF-MA-PVP-CLR-00001 – Shell and Tube Heat Exchanger*

24590-PTF-MED-PVP-00002, *24590-PTF-ME-PVP-HX-00002 – Vessel Vent Scrubbing Liquid Cooler*

24590-PTF-MED-TLP-P0001, *24590-PTF-ME-TLP-COND-00001 - Treated LAW Evaporator Primary Condenser*

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24590-PTF-MED-TLP-P0002, *24590-PTF-ME-TLP-COND-00002 - Treated LAW Evaporator Inter-Condenser*

24590-PTF-MED-TLP-P0003, *24590-PTF-ME-TLP-COND-00003 - Treated LAW Evaporator After-Condenser*

24590-PTF-MED-TLP-P0004, *24590-PTF-MB-TLP-RBLR-00001 - Treated LAW Evaporator Reboiler*

24590-PTF-MFC-RLD-00001, *Sizing Calculation for Radioactive Liquid Waste Disposal System (RLD) Jet Mixers (RLD-MXR-00001/2/3/4)*

24590-PTF-MKD-PJV-00001, *24590-PTF-MK-PJV-HEPA-00001-A – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00002, *24590-PTF-MK-PJV-HEPA-00002A – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00003, *24590-PTF-MK-PJV-HEPA-00002B – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00004, *24590-PTF-MK-PJV-HEPA-00002C – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00005, *24590-PTF-MK-PJV-HEPA-00002D – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00006, *24590-PTF-MK-PJV-HEPA-00002D – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00007, *24590-PTF-MK-PJV-HEPA-00002F – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00016, *24590-PTF-MK-PJV-HEPA-00001-B – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00017, *24590-PTF-MK-PJV-HEPA-00001-C – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00018, *24590-PTF-MK-PJV-HEPA-00001-D – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00019, *24590-PTF-MK-PJV-HEPA-00001-E – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00020, *24590-PTF-MK-PJV-HEPA-00001-F – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00021, *24590-PTF-MK-PJV-HEPA-00001-G – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PVP-00001, *24590-PTF-MS-PVP-OXID-00001 – Electrically Heated Regenerative Thermal Oxidizer Data Sheet*

24590-PTF-MKD-PVP-P0002, *24590-PTF-MK-PVP-SCB-00002 – PTF Vessel Vent Caustic Scrubber*

24590-PTF-MKD-PVV-00004, *24590-PTF-MK-PVV-HEPA-00002-A – PVV Secondary HEPA Exhaust Filter Housing*

24590-PTF-MKD-PVV-00005, *224590-PTF-MK-PVV-HEPA-00002B – PVV Secondary HEPA exhaust Filter Housing*

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24590-PTF-MKD-PVV-00007, *24590-PTF-MK-PVV-HEPA-00001-A – PVV Primary HEPA exhaust Filter Housing*

24590-PTF-MKD-PVV-00008, *24590-PTF- MK-PVV-HEPA-00001B – PVV Primary HEPA exhaust Filter Housing*

24590-PTF-MPC-HLP-00013, *Process Data Sheet Input for HLW Melter Feed Pumps HLP-PMP-00019A/B*

24590-PTF-MPC-UFP-00033, *Sizing of the Ultrafiltration Progressive Cavity Pump (UFP-PMP-00044A/B)*

24590-PTF-MPD-CNP-00030, *Mechanical Systems Data Sheet: API 610 Axial Flow Pump, Plant Item No. 24590-PTF-MP-CNP-PMP-00001*

24590-PTF-MPD-CXP-00009, *Mechanical Systems Data Sheet: Sealless Centrifugal Pump, Plant Item No. CXP-PMP-00002A/B*

24590-PTF-MPD-CXP-00010, *Mechanical Systems Data Sheet: Sealless Centrifugal Pump, Plant Item No. CXP-PMP-00001A/B*

24590-PTF-MPD-FEP-00005, *Mechanical Data Sheet: Centrifugal Pump, Plant Item No. FEP-PMP-00007A*

24590-PTF-MPD-FEP-00006, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. FEP-PMP-00006A*

24590-PTF-MPD-FEP-00007, *Mechanical Data Sheet: Centrifugal Pump, Plant Item No. FEP-PMP-00008A*

24590-PTF-MPD-FEP-00008, *Mechanical Systems Data Sheet: API 610 Axial Flow Pump, Plant Item No. FEP-PMP-00009A*

24590-PTF-MPD-FEP-00009, *Mechanical Data Sheet: Centrifugal Pump, Plant Item No. FEP-PMP-00007B*

24590-PTF-MPD-FEP-00010, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. FEP-PMP-00006B*

24590-PTF-MPD-FEP-00011, *Mechanical Data Sheet: Centrifugal Pump, Plant Item No. FEP-PMP-00008B*

24590-PTF-MPD-FEP-00012, *Mechanical Systems Data Sheet: API 610 Axial Flow Pump, Plant Item No. FEP-PMP-00009B*

24590-PTF-MPD-FRP-00003, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. FRP-PMP-00001*

24590-PTF-MPD-FRP-00004, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. FRP-PMP-00002A*

24590-PTF-MPD-HLP-00018, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. HLP-PMP-00017A*

24590-PTF-MPD-HLP-00019, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. HLP-PMP-00017B*

24590-PTF-MPD-HLP-00020, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. HLP-PMP-00019A*

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24590-PTF-MPD-HLP-00021, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. HLP-PMP-00019B*

24590-PTF-MPD-HLP-00022, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. HLP-PMP-00021*

24590-PTF-MPD-PVP-00003, *Mechanical Systems Data Sheet: Sealless Centrifugal Pump, Plant Item No. PVP-PMP-00002A/B*

24590-PTF-MPD-PVP-00009, *Mechanical Systems Data Sheet: Sealless Centrifugal Pump, Plant Item No. PVP-PMP-00001A/B*

24590-PTF-MPD-PWD-00003, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. PWD-PMP-00024A/B*

24590-PTF-MPD-RDP-00003, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. RDP-PMP-00008A/B*

24590-PTF-MPD-RLD-00009, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. RLD-PMP-00005A/B*

24590-PTF-MPD-RLD-00011, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. RLD-PMP-00011A/B*

24590-PTF-MPD-RLD-00012, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. RLD-PMP-00012A/B*

24590-PTF-MPD-RLD-00014, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. RLD-PMP-00014A/B*

24590-PTF-MPD-TCP-00006, *Mechanical Data Sheet: General Centrifugal Pump, Plant Item No. TCP-PMP-00001A/B*

24590-PTF-MPD-TLP-00005, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00005A*

24590-PTF-MPD-TLP-00006, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00002A*

24590-PTF-MPD-TLP-00007, *Mechanical Systems Data Sheet: API 610 Axial Flow Pump, Plant Item No. 24590-PTF-MP-TLP-PMP-00001*

24590-PTF-MPD-TLP-00008, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00011A*

24590-PTF-MPD-TLP-00009, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00005B*

24590-PTF-MPD-TLP-00010, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00002B*

24590-PTF-MPD-TLP-00011, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00011B*

24590-PTF-MPD-UFP-00022, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. UFP-PMP-00041A*

24590-PTF-MPD-UFP-00023, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. UFP-PMP-00041B*

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24590-PTF-MPD-UFP-00024, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. UFP-PMP-00042A*

24590-PTF-MPD-UFP-00025, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. UFP-PMP-00042B*

24590-PTF-MTD-RLD-00001, *24590-PTF-MT-RLD-TK-00006A/B – Process Condensate Tanks*

24590-PTF-MV-CNP-00001, *Equipment Assembly Eluate Contingency Storage Vessel CNP-VSL-00003*

24590-PTF-MV-CNP-00002, *Equipment Assembly Cs Evaporator Recovered Nitric Acid Vessel CNP-VSL-00004*

24590-PTF-MV-CNP-00005, *Equipment Assembly Cesium Evaporator Eluate Lute Pot CNP-VSL-00001*

24590-PTF-MV-CXP-00004, *Conceptual Design of Cesium Ion Exchange Column CXP-IXC-00001 (Q)*

24590-PTF-MV-CXP-00005, *Conceptual Design of Cesium Ion Exchange Column CXP-IXC-00002 (Q)*

24590-PTF-MV-CXP-00006, *Conceptual Design of Cesium Ion Exchange Column CXP-IXC-00003 (Q)*

24590-PTF-MV-CXP-00007, *Conceptual Design of Cesium Ion Exchange Column CXP-IXC-00004 (Q)*

24590-PTF-MV-CXP-P0001, *Equipment Assembly Cesium Ion Exchange Feed Vessel CXP-VSL-00001*

24590-PTF-MV-CXP-P0002, *Equipment Assembly Caustic Rinse Collection Vessel CXP-VSL-00004*

24590-PTF-MV-CXP-P0003, *Equipment Assembly Cesium Reagent Vessel CXP-VSL-00005*

24590-PTF-MV-CXP-P0008, *Equipment Assembly Cesium Ion Exchange Treated LAW Collection Vessel CXP-VSL-00026A*

24590-PTF-MV-CXP-P0009, *Equipment Assembly Cesium Ion Exchange Treated LAW Collection Vessel CXP-VSL-00026B*

24590-PTF-MV-CXP-P0010, *Equipment Assembly Cesium Ion Exchange Treated LAW Collection Vessel CXP-VSL-00026C*

24590-PTF-MV-FEP-P0001, *Equipment Assembly Waste Feed Evaporator Feed Vessel FEP-VSL-00017A*

24590-PTF-MV-FEP-P0002, *Equipment Assembly Waste Feed Evaporator Feed Vessel FEP-VSL-00017B*

24590-PTF-MV-HLP-P0003, *Equipment Assembly HLW Feed Receipt Vessel HLP-VSL-00022* 24590-PTF-MV-HLP-P0004, *Equipment Assembly HLW Feed Blending Vessel HLP-VSL-00028*

24590-PTF-MV-HLP-P0005, *Equipment Assembly HLW Lag Storage Vessel HLP-VSL-00027B*

24590-PTF-MV-HLP-P0006, *Equipment Assembly HLW Lag Storage Vessel HLP-VSL-00027A*

24590-PTF-MV-PJV-00002, *Equipment Assembly PTF Demister Vessel PJV-DMST-00001A/B/C Sheet 1 of 2*

24590-PTF-MV-PJV-00003, *Equipment Assembly PTF Demister Vessel PJV-DMST-00001A/B/C Sheet 2 of 2*

24590-PTF-MV-PVP-00003, *Equipment Assembly PTF Vessel Vent HEME PVP HEME 00001A/B/C Sheet 1 of 2*

24590-PTF-MV-PVP-00004, *Equipment Assembly PTF Vessel Vent HEME PVP-HEME-00001A/B/C Sheet2 of 2*

24590-PTF-MV-PVP-P0002, *Equipment Assembly HEME Drain Collection Vessel PVP-VSL-00001*

**Appendix A (cont'd) Applicable Design Documents**

24590-PTF-MV-PWD-P0001001, *Equipment Assembly Ultimate Overflow Vessel PWD-VSL-00033 (Q) Sheet 1 of 2*

24590-PTF-MV-PWD-P0001002, *Equipment Assembly Ultimate Overflow Vessel PWD-VSL-00033 (Q) Sheet 2 of 2*

24590-PTF-MV-PWD-P0003001, *Equipment Assembly HLW Effluent Transfer Vessel PWD-VSL-00043 (Q) Sheet 1 of 2*

24590-PTF-MV-PWD-P0003002, *Equipment Assembly HLW Effluent Transfer Vessel PWD-VSL-00043 (Q) Sheet 2 of 2*

24590-PTF-MV-PWD-P0005, *Equipment Assembly C3 Floor Drain Collection Vessel PWD-VSL-00046*

24590-PTF-MV-PWD-P0006, *Equipment Assembly Acidic Alkaline Effluent Vessel PWD-VSL-00016 (Q)*

24590-PTF-MV-PWD-P0007, *Equipment Assembly Acidic Alkaline Effluent Vessel PWD-VSL-00015 (Q)*

24590-PTF-MV-PWD-P0010, *Equipment Assembly Plant Wash Vessel PWD-VSL-00044 (Q)*

24590-PTF-MV-RDP-P0001, *Equipment Assembly Spend Resin Slurry Vessel RDP-VSL-00002A*

24590-PTF-MV-RDP-P0002, *Equipment Assembly Spend Resin Slurry Vessel RDP-VSL-00002B*

24590-PTF-MV-RDP-P0003, *Equipment Assembly Spend Resin Slurry Vessel RDP-VSL-00002C*

24590-PTF-MV-RLD-P0001, *Equipment Assembly Alkaline Effluent Vessel RLD-VSL-00017A*

24590-PTF-MV-RLD-P0002, *Equipment Assembly Alkaline Effluent Vessel RLD-VSL-00017B*

24590-PTF-MV-TCP-P0002, *Equipment Assembly Treated LAW Concentrate Storage Vessel TCP-VSL-00001*

24590-PTF-MV-TLP-P0001, *Equipment Assembly LAW SBS Condensate Receipt Vessel TCP-VSL-00009A*

24590-PTF-MV-TLP-P0002, *Equipment Assembly LAW SBS Condensate Receipt Vessel TCP-VSL-00009B*

24590-PTF-MV-UFP-P0001, *Equipment Assembly Ultrafiltration Feed Preparation Vessel UFP-VSL-00001A*

24590-PTF-MV-UFP-P0002, *Equipment Assembly Ultrafiltration Feed Preparation Vessel UFP-VSL-00001B*

24590-PTF-MV-UFP-P0003, *Equipment Assembly Ultrafiltration Feed Vessel UFP-VSL-00002A*

24590-PTF-MV-UFP-P0004, *Equipment Assembly Ultrafiltration Feed Vessel UFP-VSL-00002B*

24590-PTF-MV-UFP-P0005, *Equipment Assembly Ultrafilter Permeate Vessel UFP-VSL-00062A*

24590-PTF-MV-UFP-P0006, *Equipment Assembly Ultrafilter Permeate Vessel UFP-VSL-00062B*

24590-PTF-MV-UFP-P0007, *Equipment Assembly Ultrafilter Permeate Vessel UFP-VSL-00062C*

24590-PTF-MVC-HLP-00015, *Breakpot Sizing Calculation for the Cs Concentrate Receipt Breakpots (HLP-BRKPT-00004/6)*

24590-PTF-MVC-PWD-00003, *Breakpot Sizing for PTF Break Pots PWD-BRKPT-00015/16*

24590-PTF-MVC-PWD-00058, *Breakpot Sizing for PWD-BRKPT-00017, -00019, -00007, -00009, -00008, -00010*

24590-PTF-MVC-UFP-00010, *Vessel Sizing Calculation for Ultrafiltration Recycle Breakpot UFP-BRKPT-00001B*

**Appendix A (cont'd) Applicable Design Documents**

24590-PTF-MVD-CNP-00008, *24590-PTF-MVD-CNP-BRKPT-00002 – Cesium Eluate Breakpot*

24590-PTF-MVD-CNP-00009, *24590-PTF-MVD-CNP-BRKPT-00001 – Cesium Concentrate Breakpot*

24590-PTF-MVD-CNP-P0003, *24590-PTF-MV-CNP-VSL-00003 - Eluate Contingency Storage Vessel*

24590-PTF-MVD-CNP-P0006, *24590-PTF-ME-CNP-EVAP-00001 - Cesium Evaporator Separator Vessel CNP-EVAP-00001*

24590-PTF-MVD-CNP-P0007, *24590-PTF-MV-CNP-VSL-00004 - Cs Evaporator Recovered Nitric Acid Vessel*

24590-PTF-MVD-CNP-P0010, *24590-PTF-MV-CNP-VSL-00001 - Cesium Evaporator Eluate Lute Pot*

24590-PTF-MVD-CXP-00017, *24590-PTF-MW-CXP-IXC-00001 – Cesium Ion Exchange Column*

24590-PTF-MVD-CXP-00018, *24590-PTF-MW-CXP-IXC-00002 – Cesium Ion Exchange Column*

24590-PTF-MVD-CXP-00019, *24590-PTF-MW-CXP-IXC-00003 – Cesium Ion Exchange Column*

24590-PTF-MVD-CXP-00020, *24590-PTF-MW-CXP-IXC-00004 – Cesium Ion Exchange Column*

24590-PTF-MVD-CXP-P0007, *24590-PTF-MV-CXP-VSL-00001 – Cs IX Feed Vessel*

24590-PTF-MVD-CXP-P0015, *24590-PTF-MV-CXP-VSL-00004 – Cs IX Caustic Rinse Collection Vessel*

24590-PTF-MVD-CXP-P0016, *24590-PTF-MV-CXP-VSL-00005 – Cs Reagent Vessel*

24590-PTF-MVD-CXP-P0021, *24590-PTF-MV-CXP-VSL-00026A – Cesium Ion Exchange Treated LAW Collection Vessel*

24590-PTF-MVD-CXP-P0022, *24590-PTF-MV-CXP-VSL-00026B – Cesium Ion Exchange Treated LAW Collection Vessel*

24590-PTF-MVD-CXP-P0023, *24590-PTF-MV-CXP-VSL-00026C – Cesium Ion Exchange Treated LAW Collection Vessel*

24590-PTF-MVD-FEP-P0001, *24590-PTF-MV-FEP-VSL-00017A - Waste Feed Evaporator Feed Vessel*

24590-PTF-MVD-FEP-P0002, *24590-PTF-MV-FEP-VSL-00017B - Waste Feed Evaporator Feed Vessel*

24590-PTF-MVD-FEP-P0003, *24590-PTF-MV-FEP-VSL-00005 - Waste Feed Evaporator Condensate Vessel*

24590-PTF-MVD-FEP-P0006, *24590-PTF-MV-FEP-SEP-00001A - Waste Feed Evaporator Separator Vessel*

24590-PTF-MVD-FEP-P0007, *24590-PTF-MV-FEP-SEP-00001B - Waste Feed Evaporator Separator Vessel*

24590-PTF-MVD-FRP-P0005, *24590-PTF-MV-FRP-VSL-00002-A - Waste Feed Receipt Vessel Mechanical Data Sheet*

24590-PTF-MVD-FRP-P0006, *24590-PTF-MV-FRP-VSL-00002-B - Waste Feed Receipt Vessel Mechanical Data Sheet*

24590-PTF-MVD-FRP-P0007, *24590-PTF-MV-FRP-VSL-00002-C - Waste Feed Receipt Vessel Mechanical Data Sheet*

24590-PTF-MVD-FRP-P0008, *24590-PTF-MV-FRP-VSL-00002-D - Waste Feed Receipt Vessel Mechanical Data Sheet*

24590-PTF-MVD-HLP-00010, *24590-PTF-MV-HLP-BRKPT-00004 – HLP System Cs Concentrate Receipt Breakpot*

**Appendix A (cont'd) Applicable Design Documents**

24590-PTF-MVD-HLP-00011, *24590-PTF-MV-HLP-BRKPT-00006 – HLP System Cs Concentrate Receipt Breakpot*

24590-PTF-MVD-HLP-P0006, *24590-PTF-MV-HLP-VSL-00022 - HLW Feed Receipt Vessel Mechanical Data Sheet*

24590-PTF-MVD-HLP-P0007, *24590-PTF-MV-HLP-VSL-00027A - HLW Lag Storage Vessel Mechanical Data Sheet*

24590-PTF-MVD-HLP-P0008, *24590-PTF-MV-HLP-VSL-00027B - HLW Lag Storage Vessel Mechanical Data Sheet*

24590-PTF-MVD-HLP-P0009, *24590-PTF-MV-HLP-VSL-00028 - HLW Feed Blending Vessel Mechanical Data Sheet*

24590-PTF-MVD-PJV-00004, *24590-PTF-MV-PJV-DMST-00002A/B/C Demister*

24590-PTF-MVD-PJV-P0003, *PJV Drain Collection Vessel*

24590-PTF-MVD-PVP-00004, *24590-PTF-MV-PVP-ADBR-00001A 24590-PTF-MV-PVP-ADBR-00001B – Vessel Vent Carbon Bed Adsorber*

24590-PTF-MVD-PVP-00005, *24590-PTF-MV-PVP-HEME-00001A-00001B-00001C - Vessel Vent HEME – High Efficiency Mist Eliminator*

24590-PTF-MVD-PVP-P0001, *24590-PTF-MV-PVP-VSL-00001 - HEME Drain Collection Vessel*

24590-PTF-MVD-PWD-00015, *24590-PTF-MV-PWD-BRKPT-00015 – Acidic/Alkaline Effluent Breakpot*

24590-PTF-MVD-PWD-00016, *24590-PTF-MV-PWD-BRKPT-00016 – Acidic/Alkaline Effluent Breakpot*

24590-PTF-MVD-PWD-00017, *24590-PTF-MV-PWD-BRKPT-00017 – Breakpot*

24590-PTF-MVD-PWD-00022, *24590-PTF-MV-PWD-BRKPT-00007 – Plant Wash and Disposal System Breakpot*

24590-PTF-MVD-PWD-00023, *24590-PTF-MV-PWD-BRKPT-00008 – Plant Wash and Disposal System Breakpot*

24590-PTF-MVD-PWD-00024, *24590-PTF-MV-PWD-BRKPT-00009 – Plant Wash and Disposal System Breakpot*

24590-PTF-MVD-PWD-00025, *24590-PTF-MV-PWD-BRKPT-00010 – Plant Wash and Disposal System Breakpot*

24590-PTF-MVD-PWD-00026, *24590-PTF-MV-PWD-BRKPT-00019 – Plant Wash and Disposal System Breakpot*

24590-PTF-MVD-PWD-P0001, *24590-PTF-MV-PWD-VSL-00033 – Ultimate Overflow Vessel*

24590-PTF-MVD-PWD-P0002, *24590-PTF-MV-PWD-VSL-00044 – Plant Wash Vessel*

24590-PTF-MVD-PWD-P0003, *24590-PTF-MV-PWD-VSL-00043 - HLW Effluent Transfer Vessel*

24590-PTF-MVD-PWD-P0010, *24590-PTF-MV-PWD-VSL-00046 - C3 Floor Drain Collection Vessel*

24590-PTF-MVD-PWD-P0011, *24590-PTF-MV-PWD-VSL-00015 - Acidic/Alkaline Effluent Vessel*

24590-PTF-MVD-PWD-P0012, *24590-PTF-MV-PWD-VSL-00016 – Acidic/Alkaline Effluent Vessel*

24590-PTF-MVD-RDP-P0005, *24590-PTF-MV-RDP-VSL-00002A – Spent Resin Slurry Vessel Mechanical Data Sheet*

**Appendix A (cont'd) Applicable Design Documents**

24590-PTF-MVD-RDP-P0006, *24590-PTF-MV-RDP-VSL-00002B – Spent Resin Slurry Vessel Mechanical Data Sheet*

24590-PTF-MVD-RDP-P0007, *24590-PTF-MV-RDP-VSL-00002C – Spent Resin Slurry Vessel Mechanical Data Sheet*

24590-PTF-MVD-RDP-P0008, *24590-PTF-ME-RDP-VSL-00004 – Mechanical Data Sheet: Vessel*

24590-PTF-MVD-RLD-P0005, *24590-PTF-MV-RLD-VSL-00017A – Alkaline Effluent Vessel*

24590-PTF-MVD-RLD-P0006, *24590-PTF-MV-RLD-VSL-00017B – Alkaline Effluent Vessel*

24590-PTF-MVD-TCP-P0002, *24590-PTF-MV-TCP-VSL-00001 - Treated LAW Concentrate Storage Vessel*

24590-PTF-MVD-TLP-P0001, *24590-PTF-MV-TLP-VSL-00009A - LAW SBS Condensate Receipt Vessel*

24590-PTF-MVD-TLP-P0002, *24590-PTF-MV-TLP-VSL-00009B - LAW SBS Condensate Receipt Vessel*

24590-PTF-MVD-TLP-P0004, *24590-PTF-MV-TLP-VSL-00002 - Treated LAW Evaporator Condensate Vessel*

24590-PTF-MVD-TLP-P0005, *24590-PTF-MV-TLP-SEP-00001 - Treated LAW Evaporator Separator Vessel*

24590-PTF-MVD-UFP-00023, *24590-PTF-MV-UFP-BRKPT-00001B – Ultrafiltration Recycle Breakpot*

24590-PTF-MVD-UFP-P0001, *24590-PTF-MV-UFP-VSL-00001A – Ultrafiltration Feed Preparation Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0002, *24590-PTF-MV-UFP-VSL-00001B – Ultrafiltration Feed Preparation Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0005, *24590-PTF-MV-UFP-VSL-00062A – Ultrafilter Permeate Collection Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0006, *24590-PTF-MV-UFP-VSL-00062B – Ultrafilter Permeate Collection Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0007, *24590-PTF-MV-UFP-VSL-00062C – Ultrafilter Permeate Collection Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0014, *24590-PTF-MV-UFP-VSL-00002A – Ultrafiltration Feed Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0015, *24590-PTF-MV-UFP-VSL-00002B – Ultrafiltration Feed Vessel Mechanical Data Sheet*

24590-PTF-MWD-CNP-P0001, *24590-PTF-MV-CNP-DISTC-00001 - Cesium Evaporator Nitric Acid Rectifier CNP-DISTC-00001*

24590-PTF-MXD-CRP-00002, *24590-PTF-PY-CRP-BULGE-00001 – Cs Resin Addition Bulge*

24590-PTF-MXD-CXP-00011, *24590-PTF-PY-CXP-BULGE-00004 – Cesium Ion Exchange Process Bulge*

24590-PTF-MXD-PVP-00002, *24590-PTF-PY-PVP-BULGE-00001 - Vessel Vent Caustic Scrubber Transfer Pump Bulge*

24590-PTF-MXD-PVP-00003, *24590-PTF-PY-PVP-BULGE-00002 - Vessel Vent HEME Drain Vessel Pump Bulge*

24590-PTF-MXD-PVP-00015, *24590-PTF-PY-PVP-BULGE-00014 - Vessel Vent Heat Exchanger Bulge*

**Appendix A (cont'd) Applicable Design Documents**

24590-PTF-MXD-TCP-00001, *24590-PTF-PY-TCP-BULGE-00004 - Process Bulge*

24590-PTF-MXD-UFP-00001, *24590-PTF-PY-UFP-BULGE-00001 – Ultrafiltration Reagent Bulge*

24590-PTF-MXD-UFP-00002, *24590-PTF-PY-UFP-BULGE-00002 - Ultrafiltration Reagent Bulge*

24590-PTF-N1D-CNP-P0001, *CNP-DISTC-00001-(PTF) Cs Evaporator Nitric Acid Rectifier*

24590-PTF-N1D-CNP-P0002, *CNP-HX-00002 (PTF) Cs Evaporator Primary Condenser*

24590-PTF-N1D-CNP-P0003, *CNP-HX-00003 (PTF) Cs Evaporator Inter-Condenser*

24590-PTF-N1D-CNP-P0004, *CNP-HX-00001 (PTF) Cs Evaporator Concentrate Reboiler*

24590-PTF-N1D-CNP-P0005, *CNP-EVAP-00001 (PTF) Cs Evaporator Separator Vessel*

24590-PTF-N1D-CNP-P0006, *CNP-VSL-00004 PTF - Cs Evaporator Recovered Nitric Acid Vessel*

24590-PTF-N1D-CNP-P0008, *CNP-BRKPT-00002 (PTF) - Cs Eluate Breakpot*

24590-PTF-N1D-CNP-P0009, *CNP-VSL-00003 (PTF) - Eluate Contingency Storage Vessel*

24590-PTF-N1D-CNP-P0010, *CNP-BRKPT-00001, (PTF) - Cs Concentrate Breakpot*

24590-PTF-N1D-CNP-P0011, *CNP-VSL-00001, (PTF) - Cs Evaporator Eluate Lute Pot*

24590-PTF-N1D-CNP-P0012, *CNP-HX-00004 (PTF) - Cs Evaporator After-Condenser*

24590-PTF-N1D-CXP-00002, *CXP-IXC-00001/2/3/4 (PTF) Cs IX Column*

24590-PTF-N1D-CXP-00004, *CXP-HX-00001A/B (PTF) Cs Ion Exchange Feed Cooler*

24590-PTF-N1D-CXP-P0001, *CXP-VSL-00001 (PTF) Cs Ion Exchange Feed Vessel*

24590-PTF-N1D-CXP-P0003, *CXP-VSL-00026 A-B-C (PTF) IX Treated LAW Collection Vessel*

24590-PTF-N1D-CXP-P0007, *CXP-VSL-00004 (PTF) Cs IX Caustic Rinse Collection Vessel*

24590-PTF-N1D-CXP-P0008, *CXP-VSL-00005 (PTF) Cs IX Reagent Vessel*

24590-PTF-N1D-FEP-P0002, *FEP-VSL-00017A-B (PTF) Waste Feed Evaporator Feed Vessels Plant Item Material Selection Data Sheet*

24590-PTF-N1D-FEP-P0003, *FEP-VSL-00005 (PTF) Waste Feed Evaporator Condensate Vessel Plant Item Material Selection Data Sheet*

24590-PTF-N1D-FEP-P0007, *FEP-SEP-00001A-B (PTF) Waste Feed Evaporator Separator Vessels Plant Item Material Selection Data Sheet*

24590-PTF-N1D-FEP-P0008, *FEP-RBLR-00001A/B (PTF) Waste Feed Evaporator Reboilers Plant Item Material Selection Data Sheet*

24590-PTF-N1D-FEP-P0009, *FEP-COND-00002A/B (PTF) Waste Feed Evaporator Intercondensers Plant Item Material Selection Data Sheet*

24590-PTF-N1D-FEP-P0010, *FEP-COND-00003A/B (PTF) Waste Feed Evaporator Aftercondensers Plant Item Material Selection Data Sheet*

24590-PTF-N1D-FEP-P0013, *FEP-COND-00001A/B (PTF) Waste Feed Evaporator Primary Condenser Plant Item Material Selection Data Sheet*

24590-PTF-N1D-FRP-P0001, *FRP-VSL-00002A-D (PTF) Waste Feed Receipt Vessels Plant Item Material Selection Data Sheet*

24590-PTF-N1D-HLP-00002, *Corrosion Evaluation, HLP-PMP-00017A/B (PTF), HLW Solids Transfer Pumps*

**Appendix A (cont'd) Applicable Design Documents**

24590-PTF-N1D-HLP-P0001, *HLP-BRKPT-00004 & HLP-BRKPT-00006 (PTF) Cs Concentrate Receipt Breakpots*

24590-PTF-N1D-HLP-P0003, *HLP-VSL-00022 (PTF) HLW Feed Receipt Vessel*

24590-PTF-N1D-HLP-P0007, *HLP-VSL-00027A&B (PTF) HLP Lag Storage Vessels*

24590-PTF-N1D-HLP-P0010, *HLP-VSL-00028 (PTF) HLW Feed Blending Vessel*

24590-PTF-N1D-PIH-P0001, *P1H-TK-00001 (PTF) - Pretreatment Decontamination Tank Decon Soak Tank*

24590-PTF-N1D-PVP-00003, *Corrosion Evaluation, PVP-PMP-00001A/B (PTF), Vessel Vent Scrubber Recirculating Pump*

24590-PTF-N1D-PVP-00005, *PVP-ADBR-00001A/B (PTF) Vessel Vent Carbon Bed Adsorber*

24590-PTF-N1D-PVP-00006, *PVP-HEME-00001A/B (PTF) Vessel Vent HEME (Mist Eliminator)*

24590-PTF-N1D-PVP-P0001, *PVP-SCB-00002 (PTF) Vessel Vent Caustic Scrubber*

24590-PTF-N1D-PVP-P0002, *PVP-VSL-00001 (PTF) HEME Drain Collection Vessel*

24590-PTF-N1D-PWD-P0001, *PWD-VSL-00044 (PTF) – Plant Wash Vessel*

24590-PTF-N1D-PWD-P0002, *PWD-VSL-00043 (PTF) – HLW Effluent Collection Vessel*

24590-PTF-N1D-PWD-P0003, *PWD-VSL-00015 & PWD-VSL-00016 (PTF) - Acidic/Alkaline Effluent Vessel*

24590-PTF-N1D-PWD-P0005, *PWD-VSL-00033, (PTF) - Ultimate Overflow Vessel*

24590-PTF-N1D-PWD-P0006, *PWD-VSL-00046 (PTF) - C3 Floor Drain Collection Vessel*

24590-PTF-N1D-PWD-P0007, *PWD-BRKPT-00007/08/09/10/17/19 (PTF) - Breakpots*

24590-PTF-N1D-PWD-P0008, *PWD-BRKPT-00015 & PWD-BRKPT-00016 (PTF) - Acidic/Alkaline Effluent Breakpots*

24590-PTF-N1D-RDP-P0001, *RDP-VSL-00002A/B/C (PTF) Spent Resin Slurry Vessels*

24590-PTF-N1D-RDP-P0002, *RDP-VSL-00004 (PTF) Spent Resin Dewatering Moisture Separation Vessel*

24590-PTF-N1D-RLD-00001, *RLD-TK-00006-A/B (PTF) Process Condensate Tank*

24590-PTF-N1D-RLD-P0002, *RLD-VSL-00017-A/B (PTF) - Alkaline Effluent Vessels*

24590-PTF-N1D-TCP-00002, *Corrosion Evaluation, TCP-PMP-00001A/B (PTF), Treated LAW Concentrate Transfer Pumps*

24590-PTF-N1D-TCP-P0001, *TCP-VSL-00001 (PTF) Treated LAW Concentrate Storage Vessel*

24590-PTF-N1D-TLP-P0001, *TLP-VSL-00009A&B, (PTF) - LAW SBS Condensate Receipt Vessels*

24590-PTF-N1D-TLP-P0002, *TLP-COND-00001 (PTF) - Treated LAW Evaporator Primary Condenser*

24590-PTF-N1D-TLP-P0003, *TLP-COND-00002 & TLP-COND-00003 (PTF) - Treated LAW Evaporator Intercondenser & Aftercondenser*

24590-PTF-N1D-TLP-P0005, *TLP-SEP-00001 (PTF) - Treated LAW Evaporator Separator Vessel*

24590-PTF-N1D-TLP-P0006, *TLP-VSL-00002 (PTF) - Treated LAW Evaporator Condensate Vessel*

24590-PTF-N1D-TLP-P0011, *TLP-RBLR-00001 (PTF) - Treated LAW Evaporator Reboiler*

24590-PTF-N1D-UFP-00007, *Corrosion Evaluation, UFP-PMP-00042A/B (PTF), Ultrafiltration Recirculation Pumps*

**Appendix A (cont'd) Applicable Design Documents**

24590-PTF-N1D-UFP-P0001, *UFP-BRKPT-00001A/B (PTF) Ultrafiltration Recycle Breakpot Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0002, *UFP-PP-00001A/B, 2A/B, 3A/B (PTF) Ultrafilter Pulsepots Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0003, *UFP-VSL-00002A/B (PTF) - Ultrafiltration Feed Vessels Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0004, *UFP-FILT-00001A/B, 2A/B, 3A/B (PTF) - Ultrafilter Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0005, *UFP-VSL-00001A/B PTF - Ultrafiltration Feed Preparation Vessel Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0008, *UFP-VSL-00062-A B C PTF - Ultrafilter Permeate Collection Vessel Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0009, *UFP-HX-00001A/B PTF - UFP Slurry Cooler Plant Item Material Selection Data Sheet*

24590-PTF-P1-P01T-P0001, *Pretreatment Facility General Arrangement Plan at El.0 ft - 0 in*

24590-PTF-P1-P01T-P0002, *Pretreatment Facility General Arrangement Plan at El.28 ft - 0 in*

24590-PTF-P1-P01T-P0003, *Pretreatment Facility General Arrangement Plan at El.56 ft - 0 in*

24590-PTF-P1-P01T-P0004, *Pretreatment Facility General Arrangement Plan at El.77 ft - 0 in*

24590-PTF-P1-P01T-P0006, *Pretreatment Facility General Arrangement Plan at El.-45 ft - 0 in*

24590-PTF-PER-M-02-003, Underground Pipe Protection

24590-PTF-PER-M-02-005, *Flooding Volume for Below Grade and 0 Ft Level in PT Facility*

24590-PTF-PER-M-02-006, *Sump Data for PT Facility*

24590-PTF-PER-M-04-001, *Flooding Volume for 56 Ft Level in PT Facility*

24590-PTF-PER-M-04-002, *Sump and Drain Data at 56 Ft Level for PT Facility*

24590-PTF-PER-M-04-0003, *Flooding Volume for 77 Ft Level in PT Facility*

24590-PTF-PER-M-04-0004, *Sump and Drain Data at 77 Ft Level for PT Facility*

24590-PTF-PER-M-04-0005, *Flooding Volume for Room P-0119 in the PT Facility*

24590-PTF-PER-M-04-0006, *Leak Detection for Underground Transfer Lines*

24590-PTF-PER-M-04-0007, *Flooding Volume for Room P-0123A in the PT Facility*

24590-PTF-PER-M-04-0008, *Flooding Volume for Room P-0150 in the PT Facility*

24590-PTF-PER-M-04-0009, *Sump Data for PT Facility - Room P-0150*

24590-PTF-PER-M-04-0010, *Leak Detection Capability in the Pretreatment Facility*

24590-PTF-RPT-ESH-02-002, *Design Basis Event Selection for the Pretreatment Facility Preliminary Safety Analysis Report*

24590-QL-POA-MEVV-00002, *Drawing - Evaporator Project #2 Separator Vessel CNP-EVAP-00001*

24590-QL-POA-MKAS-00003-08-00003, *Instructions - LAW Off Gas Scrubber Operating Instructions*

24590-WTP-3PS-AFPS-TP006, *Field Applied Special Protective Coatings for Secondary Containment Areas*

**Appendix A (cont'd) Applicable Design Documents**

24590-WTP-3PS-FB01-T0001, *Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks*

24590-WTP-3PS-G000-T0001, *Engineering Specification for Supplier Quality Assurance Requirements*

24590-WTP-3PS-G000-T0002, *Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication*

24590-WTP-3PS-G000-T0010, *Engineering Specification for Positive Material Identification (PMI) for Construction*

24590-WTP-3PS-MACS-T0004, *Engineering Specification for High Integrity Centrifugal Blowers*

24590-WTP-3PS-MBTV-T0001, *Engineering Specification for Thermal Catalytic Oxidizers/Reducers*

24590-WTP-3PS-MKE0-TP001, *Engineering Specification for Wet Electrostatic Precipitators*

24590-WTP-3PS-MPC0-T0002, *General Centrifugal Pumps to Meet Requirements of ASME B73.1M-2001 and ASME B73.2M-2003 for Commercial (CM) Components*

24590-WTP-3PS-MPC0-T0003, *Sealless Centrifugal Pumps to Meet Requirements of API Standard 685, First Edition, for Quality Level Q*

24590-WTP-3PS-MPC0-T0009, *Engineering Specification for Vessel-Mounted Vertical Transfer Pumps-HLW Facility*

24590-WTP-3PS-MV00-T0001, *Pressure Vessel Design and Fabrication*

24590-WTP-3PS-MX00-T0001, *Engineering Specification for Process Bulge Design and Fabrication*

24590-WTP-3PS-P000-T0001, *Piping Material Classes General Description and Summary*

24590-WTP-3PS-PF00-T0001, *Engineering Specification for Rigid Process Jumper, Jumper Support Frame and Nozzle Frame Fabrication for PTF and HLW Facilities*

24590-WTP-3YD-50-00003, *System Description for Pulse Jet Mixer and Sparger Mixing Subsystems*

24590-WTP-DB-ENG-01-001, *Basis of Design*

24590-WTP-GPP-CON-4103, *Subcontractor Surveillance, Acceptance, and Closeout*

24590-WTP-GPP-CON-7101, *Construction Quality Control Program*

24590-WTP-GPP-PADC-002, *Project Records Management*

24590-WTP-GPP-PSQ-051, *Positive Material Identification*

24590-WTP-M4C-V11T-00010, *Process Engineering Mass Balance for WTP*

24590-WTP-MN-ESH-01-001, *Waste Treatment Plant Radiological Control Manual*

24590-WTP-ORC-HR-01-001, *WTP Project Organization Charts*

24590-WTP-PER-J-02-002, *Low-Point Leak Detection in Secondary Containment Systems Including Buried Co-Axial Transfer Lines*

24590-WTP-PER-M-02-003, *Underground Pipe Protection*

24590-WTP-PER-M-03-001, *Annotated Outline for Integrity Assessments of Regulated Plant Items*

24590-WTP-PER-M-03-002, *Tanks and Miscellaneous Units Regulated by the Dangerous Waste Permit*

24590-WTP-PER-M-08-001, *Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility*

24590-WTP-PSAR-ESH-01-002-01, *Preliminary Documented Safety Analysis to Support Construction Authorization; General Information*

**Appendix A (cont'd) Applicable Design Documents**

24590-WTP-PSAR-ESH-01-002-02, *Preliminary Documented Safety Analysis to Support Construction Authorization; PT Facility Specific Information*

24590-WTP-PSAR-ESH-01-002-04, *Preliminary Documented Safety Analysis to Support Construction Authorization, HLW Facility Specific Information*

24590-WTP-RPT-ENV-01-003, *Waste Treatment Plant Waste Analysis Plan*

24590-WTP-RPT-ENV-03-002, *Tanks and Miscellaneous Units Regulated by the Dangerous Waste Permit*

24590-WTP-RPT-M-01-001, *Material Selection Report*

24590-WTP-RPT-MGT-08-011, *Monthly Status Report - November 2008*

24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Volume II*

Document Number 141966, *Notice of Concerns for Clamshell Weld Requirements*, dated June 29, 2006

Document Number 144792, *Notice of Concerns for Clamshell Weld Requirements*, dated August 29, 2006

High-Level Waste (HLW) Vitrification Facility Fact Sheet dated May 2008

Titanium Metals Corporation, *Corrosion Resistance of Titanium*

WAC Dangerous Waste Permit WA7890008967, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant dated September 2007

# Appendix B

# NDE Measurement Locations

# Appendix B
# NDE Measurement Locations

[Drawings to be added following installation of regulated plant items]

# Appendix C
# Contingent Prioritized Integrity Assessment Schedules

# Appendix C
# Contingent Prioritized Integrity Assessment Schedules

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**Appendix C (cont'd) Contingent Prioritized Integrity Assessment Schedules**

**Table C-4b** **HLW Vitrification Facility** Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in **Remotely Accessible Cells** with Initial Assessment at **Ten Years** after Hot Commissioning

**Table C-4c** **HLW Vitrification Facility** Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in **Accessible Areas** with Initial Assessment at **Ten Years** after Hot Commissioning

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**Table C-1a PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Seven Years after Hot Commissioning[1,2,3]**

| Priority | Plant Item Name | Plant Item Number | Associated Sumps and Bulges | Integrity Assessment NDE Surrogate Candidates |
|---|---|---|---|---|
| 1 | Waste Feed Receipt Vessels | FRP-VSL-00002A/B/C/D | PWD-SUMP-00001<br>PWD-SUMP-00001A<br>PWD-SUMP-00002<br>PWD-SUMP-00002A<br>TCP-BULGE-00004 | LFP-VSL-00001<br>LFP-VSL-00002<br>LFP-VSL-00003<br>LFP-VSL-00004<br>PWD-SUMP-00036 |
| 2 | Waste Feed Evaporator Feed Vessels | FEP-VSL-00017A/B | PWD-SUMP-00003 | |
| 2 | HLW Feed Receipt Vessel | HLP-VSL-00022 | PWD-SUMP-00005 | |
| 2 | HLW Feed Blend Vessel | HLP-VSL-00028 | PWD-SUMP-00005 | |
| 2 | HLW Lag Storage Vessels | HLP-VSL-00027A/B | PWD-SUMP-00006 | |
| 2 | Ultrafiltration Feed Preparation Vessels | UFP-VSL-00001A/B | PWD-SUMP-00004 | |
| 2 | Ultrafiltration Feed Vessels | UFP-VSL-00002A/B | PWD-SUMP-00004<br>UFP-BULGE-00001<br>UFP-BULGE-00002<br>UFP-BULGE-00005<br>UFP-BULGE-00006<br>TCP-BULGE-00004 | |
| 3 | Spent Resin Slurry Vessels | RDP-VSL-00002A/B/C | PWD-SUMP-00009<br>CXP-BULGE-00004<br>CRP-BULGE-00001 | |
| 3 | Acidic/Alkaline Effluent Vessels | PWD-VSL-00015<br>PWD-VSL-00016 | PWD-SUMP-00007<br>CXP-BULGE-00004<br>CRP-BULGE-00001 | |
| 3 | Treated LAW Concentrate Storage Vessel | TCP-VSL-00001 | PWD-SUMP-00013<br>TCP-BULGE-00004 | LCP-VSL-00001<br>LCP-VSL-00002<br>PWD-SUMP-00036 |
| 3 | LAW SBS Condensate Receipt Vessels | TLP-VSL-00009A/B | PWD-SUMP-00012 | RLD-VSL-00005<br>PWD-SUMP-00036 |
| 3 | Eluate Contingency Storage Vessel | CNP-VSL-00003 | PWD-SUMP-00008 | LVP-TK-00001<br>PWD-SUMP-00036 |
| 3 | Ultimate Overflow Vessel | PWD-VSL-00033 | PWD-SUMP-00040<br>TCP-BULGE-00004<br>PVP-BULGE-00001<br>PVP-BULGE-00002 | LFP-VSL-00001<br>LFP-VSL-00002<br>LFP-VSL-00003<br>LFP-VSL-00004<br>RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 |
| 3 | Plant Wash Vessel | PWD-VSL-00044 | PWD-SUMP-00004<br>PVP-BULGE-00001<br>PVP-BULGE-00002 | RLD-VSL-00004<br>PWD-SUMP-00036 |
| 4 | Black Cell Sumps | PWD-SUMP-00011<br>PWD-SUMP-00010 | NA | PWD-SUMP-00036 |

## Table C-1a (cont'd) PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Seven Years after Hot Commissioning

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Evaluation of NDE surrogate results

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste
LAW – low-activity waste
NA – not applicable
NDE -- non-destructive examination
PTF – pretreatment facility
SBS - submerged bed scrubber

## Table C-1b PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Remotely Accessible Cells with Initial Assessment at Seven Years after Hot Commissioning[1,2,3]

| Priority | Plant Item Name | Plant Item Number | Associated Sumps and Bulges | Integrity Assessment NDE Surrogate Candidates |
|---|---|---|---|---|
| 4 | Hot Cell Sumps | PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029 | NA | LAW RLD-SUMP-00028 |

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Evaluation of NDE surrogate results
c) Remote NDE

Acronyms:

DWP – dangerous waste permit
NA – not applicable
NDE – non-destructive examination
PTF – pretreatment facility

## Table C-1c PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Seven Years after Hot Commissioning[1,2,3]

| Priority | Plant Item Name | Plant Item Number | Associated Sumps and Bulges | Integrity Assessment NDE Surrogate Status[4] |
|---|---|---|---|---|
| 1 | Alkaline Effluent Collection Area Sump | PWD-SUMP-00036 | NA | NDE SURROGATE SUMP |
| 4 | Spent Resin Dewatering Moisture Separation Vessel | RDP-VSL-00004 | PWD-SUMP-000031 | NDE SURROGATE TANK |

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) NDE

4 accessible equipment for which NDE measurements can be conducted and which have been identified for use as surrogates for NDE measurements on similar equipment in black cells and hard-to-reach areas, as described in Section 7.1.5

Acronyms:

DWP – dangerous waste permit
NA – not applicable
NDE – non-destructive examination
PTF – pretreatment facility

**Table C-2a PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]**

| Priority | Plant Item Name | Plant Item Number | Associated Sumps and Bulges | Integrity Assessment NDE Surrogate Candidates |
|---|---|---|---|---|
| 1 | Waste Feed Evaporator Separator Vessels | FEP-SEP-00001A/B | PWD-SUMP-00003 | TLP-VSL-00002<br>PWD-SUMP-00036 |
| 1 | Cesium Concentrate Receipt Breakpot | HLP-BRKPT-00004 | PWD-SUMP-00006 | LOP-VSL-00001<br>LOP-VSL-00002<br>PWD-SUMP-00036 |
| 1 | Cesium Concentrate Receipt Breakpot | HLP-BRKPT-00006 | PWD-SUMP-00005 | |
| 2 | Ultrafilter Permeate Vessels | UFP-VSL-00062A/B/C | PWD-SUMP-00004<br>PWD-SUMP-00003 | LCP-VSL-00001<br>LCP-VSL-00002<br>PWD-SUMP-00036 |
| 2 | Ultrafiltration Recycle Breakpots | UFP-BRKPT-00001A/B | PWD-SUMP-00004 | RLD-VSL-00004<br>PWD-SUMP-00036 |
| 2 | Cesium Ion Exchange Feed Vessel | CXP-VSL-00001 | PWD-SUMP-00008 | LCP-VSL-00001<br>LCP-VSL-00002<br>PWD-SUMP-00036 |
| 2 | Ion Exchange Caustic Rinse Collection Vessel | CXP-VSL-00004 | PWD-SUMP-00008<br>CXP-BULGE-00004 | LVP-TK-00001<br>PWD-SUMP-00036 |
| 2 | Cesium Ion Exchange Reagent Vessel | CXP-VSL-00005 | PWD-SUMP-00008 | RDP-VSL-00004<br>PWD-SUMP-00036 |
| 2 | Ion Exchange Treated LAW Collection Vessels | CXP-VSL-00026A/B/C | PWD-SUMP-00011 | LCP-VSL-00001<br>LCP-VSL-00002<br>PWD-SUMP-00036 |
| 3 | Cesium Evaporator Eluant Lute Pot | CNP-VSL-00001 | PWD-SUMP-00009 | RDP-VSL-00004<br>PWD-SUMP-00036 |
| 3 | Cesium Evaporator Recovered Nitric Acid Vessel | CNP-VSL-00004 | | |
| 3 | Cesium Evaporator Separator Vessel | CNP-EVAP-00001 | | LOP-VSL-00001<br>LOP-VSL-00002<br>PWD-SUMP-00036 |
| 3 | Treated LAW Evaporator Separator Vessel | TLP-SEP-00001 | PWD-SUMP-00012 | TLP-VSL-00002<br>PWD-SUMP-00036 |
| 3 | Cesium Concentrate Breakpot | CNP-BRKPT-00001 | PWD-SUMP-00008 | RDP-VSL-00004<br>PWD-SUMP-00036 |
| 3 | Cesium Evaporator Eluate Breakpot | CNP-BRKPT-00002 | | |
| 3 | Vessel Ventilation HEME Drain Collection Vessel | PVP-VSL-00001 | PWD-SUMP-00005<br>PVP-BULGE-00002 | |
| 3 | Caustic Scrubber | PVP-SCB-00002 | PWD-SUMP-00004<br>PVP-BULGE-00001<br>PVP-BULGE-00014 | LVP-SCB-00001<br>PWD-SUMP-00036 |

**Table C-2a (cont'd) PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Ten Years after Hot Commissioning**

| Priority | Plant Item Name | Plant Item Number | Associated Sumps and Bulges | Integrity Assessment NDE Surrogate Candidates |
|---|---|---|---|---|
| 3 | HLW Effluent Transfer Vessel | PWD-VSL-00043 | PWD-SUMP-00040 | LFP-VSL-00001<br>LFP-VSL-00002<br>LFP-VSL-00003<br>LFP-VSL-00004<br>RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 |
| 3 | Plant Wash Breakpot | PWD-BRKPT-00007 | PWD-SUMP-00010 | RLD-VSL-00004<br>PWD-SUMP-00036 |
| 3 | Plant Wash Breakpots | PWD-BRKPT-00008<br>PWD-BRKPT-00009<br>PWD-BRKPT-00010 | PWD-SUMP-00004 | |
| 3 | Plant Wash Breakpots | PWD-BRKPT-00017 | PWD-SUMP-00008 | RLD-VSL-00017A/B<br>PWD-SUMP-00036 |
| 3 | Plant Wash Breakpots | PWD-BRKPT-00019 | PWD-SUMP-00010 | |
| 3 | Acidic/Alkaline Effluent Breakpots | PWD-BRKPT-00015<br>PWD-BRKPT-00016 | PWD-SUMP-00007 | |

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Evaluation of NDE surrogate results

Acronyms:

DWP – dangerous waste permit
HEME - high efficiency mist eliminator
HLW - high-level waste
LAW – low-activity waste
NA – not applicable
NDE – non-destructive examination
PTF - pretreatment facility
HEPA - high efficiency particulate air
$NO_x$ - nitrogen oxides
PJV – pulse jet ventilation system
SBS - submerged bed scrubber

## Table C-2b PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Remotely Accessible Cells with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]

| Priority | Plant Item Name | Plant Item Number | Associated Sumps and Bulges | Integrity Assessment NDE Surrogate Candidates[4] |
|---|---|---|---|---|
| 1 | Waste Feed Evaporator Reboilers | FEP-RBLR-00001A/B | PWD-SUMP-00026 | NA |
| 2 | Ultrafilters | UFP-FILT-00001A/B<br>UFP-FILT-00002A/B<br>UFP-FILT-00003A/B<br>UFP-FILT-00004A/B<br>UFP-FILT-00005A/B | PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029 | NA |
| 2 | Ultrafiltration Pulsepots | UFP-PP-00001A/B<br>UFP-PP-00002A/B<br>UFP-PP-00003A/B | PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029<br>UFP-BULGE-00001<br>UFP-BULGE-00002 | NA |
| 2 | Cesium Ion Exchange Columns | CXP-IXC-00001<br>CXP-IXC-00002<br>CXP-IXC-00003<br>CXP-IXC-00004 | PWD-SUMP-00026<br>PWD-SUMP-00028<br>PWD-SUMP-00029<br>CRP-BULGE-00001 | NA |
| 2 | Cesium Evaporator Concentrate Reboiler | CNP-HX-00001 | PWD-SUMP-00026 | NA |
| 2 | Treated LAW Evaporator Reboiler | TLP-RBLR-00001 | PWD-SUMP-00029 | NA |
| 3 | PJV Primary Exhaust HEPA Filters | PJV-HEPA-00001A/B/C/D/E/F/G | NA | NA |
| 3 | PJV Demisters | PJV-DMST-00002A/B/C | NA | NA |
| 3 | Primary HEPA Filters | PVV-HEPA-00001A/B | NA | NA |
| 3 | HEME Filters | PVP-HEME-00001A/B/C | NA | NA |
| 4 | Decontamination Soak Tank | PIH-TK-00001 | PWD-SUMP-00032<br>PWD-SUMP-00033 | NA |
| 4 | RDMC Sumps | PWD-SUMP-00032<br>PWD-SUMP-00033 | NA | LAW RLD-SUMP-00028 |

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Remote NDE

4 NDE surrogates not identified for equipment that is designed for remote maintenance, can be driven under its own power to a maintenance area, or can be recovered remotely by external means.

Acronyms:

DWP – dangerous waste permit
HEME - high efficiency mist eliminator

**Table C-2b (cont'd) PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Remotely Accessible Cells with Initial Assessment at Ten Years after Hot Commissioning**

HLW - high-level waste
LAW – low-activity waste
NA – not applicable
NDE – non-destructive examination
PTF - pretreatment facility

**Table C-2c PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]**

| Priority | Plant Item Name | Plant Item Number | Associated Sumps and Bulges | Integrity Assessment NDE Surrogate Status[4] |
|---|---|---|---|---|
| 1 | Treated LAW Evaporator Condensate Vessel | TLP-VSL-00002 | PWD-SUMP-00036 | NDE SURROGATE TANK |
| 1 | Alkaline Effluent Vessels | RLD-VSL-00017A/B | PWD-SUMP-00036 | NDE SURROGATE TANK |
| 2 | Waste Feed Evaporator Condensate Vessel | FEP-VSL-00005 | NA | NA |
| 2 | Waste Feed Evaporator Primary Condensers | FEP-COND-00001A/B | NA | NA |
| 2 | Waste Feed Evaporator Intercondensers | FEP-COND-00002A/B | NA | NA |
| 2 | Waste Feed Evaporator Aftercondensers | FEP-COND-00003A/B | NA | NA |
| 3 | Cesium Nitric Acid Rectifier | CNP-DISTC-00001 | NA | NA |
| 3 | Cesium Evaporator Primary Condenser | CNP-HX-00002 | NA | NA |
| 3 | Cesium Evaporator Intercondenser | CNP-HX-00003 | NA | NA |
| 3 | Cesium Evaporator Aftercondenser | CNP-HX-00004 | NA | NA |
| 3 | Treated LAW Evaporator Primary Condenser | TLP-COND-00001 | NA | NA |
| 3 | Treated LAW Evaporator Intercondenser | TLP-COND-00002 | NA | NA |
| 3 | Treated LAW Evaporator Aftercondenser | TLP-COND-00003 | NA | NA |
| 3 | PJV Secondary Exhaust HEPA Filters | PJV-HEPA-00002A/B/C/D/E/F | NA | NA |
| 3 | PJV Exhaust Fans | PJV-FAN-00001A/B/C | NA | NA |
| 3 | Carbon Bed Adsorbers | PVP-ADBR-00001A/B | NA | NA |
| 3 | After Cooler | PVP-CLR-00001 | NA | NA |
| 3 | VOC Oxidizer Unit | PVP-OXID-00001 | NA | NA |
| 3 | Adsorber Outlet Filter | PVP-FILT-00001 | NA | NA |
| 3 | Scrubbing Liquid Cooler | PVP-HX-00002 | PVP-BULGE-00014 | NA |
| 3 | Secondary HEPA Filters | PVV-HEPA-00002A/B | NA | NA |

**Table C-2c (cont'd) PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Ten Years after Hot Commissioning**

| Priority | Plant Item Name | Plant Item Number | Associated Sumps and Bulges | Integrity Assessment NDE Surrogate Status[4] |
|---|---|---|---|---|
| 3 | Exhaust Fans | PVV-FAN-00001A/B | NA | NA |
| 4 | High Point Vent Bulges | PVP-BULGE-00019<br>PVP-BULGE-00020<br>PVP-BULGE-00021 | NA | NA |
| 4 | High Point Vent Bulges | DIW-BULGE-00001<br>DIW-BULGE-00002 | NA | NA |
| 4 | Process Condensate Tanks | RLD-TK-00006A/B | RLD-SUMP-00003 | NA |
| 4 | C3 Floor Drain Collection Vessel | PWD-VSL-00046 | PWD-SUMP-00071 | NA |
| 4 | Other PWD Sumps | PWD-SUMP-00034<br>PWD-SUMP-00035 | NA | NA |

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) NDE

4 accessible equipment for which NDE measurements can be conducted and which have been identified for use as surrogates for NDE measurements on similar equipment in black cells and hard-to-reach areas, as described in Section 7.1.5

Acronyms:

DWP – dangerous waste permit
HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
LAW – low-activity waste
NA – not applicable
NDE – non-destructive examination
PJV – pulse jet ventilation system
PTF - pretreatment facility
PWD – plant wash and disposal system

**Table C-3a HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Seven Years after Hot Commissioning[1,2,3]**

| Priority | Plant Item Name | Plant Item Number | Associated Sumps | Integrity Assessment NDE Surrogate Candidates |
|---|---|---|---|---|
| 1 | SBS Condensate Receiver Vessels | HOP-VSL-00903<br>HOP-VSL-00904 | HOP-SUMP-00003<br>HOP-SUMP-00008 | LOP-VSL-00001<br>LOP-VSL-00002<br>RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 |
| 2 | Acidic Waste Vessel | RLD-VSL-00007 | HCP-SUMP-00001 | RLD-VSL-00005<br>RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 |
| 2 | Plant Wash and Drains Vessel | RLD-VSL-00008 | | RLD-VSL-00004<br>RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 |
| 2 | Acidic Waste Vessel Transfer Breakpot | RLD-BRKPT-00007<br>RLD-BRKPT-00009 | | RLD-VSL-00004<br>RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 |
| 2 | Plant Wash and Drains Vessel Transfer Breakpot | RLD-BRKPT-00004 | | RDP-VSL-00004<br>RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 |

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Evaluation of NDE surrogate results

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste

**Table C-3a (cont'd) HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Seven Years after Hot Commissioning**

NA – not applicable
NDE – non-destructive examination
SBS - submerged bed scrubber

## Table C-3b HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Remotely Accessible Cells with Initial Assessment at Seven Years after Hot Commissioning[1,2,3]

| Priority | Plant Item Name | Plant Item Number | Associated Sumps | Integrity Assessment NDE Surrogate Candidates[4] |
|---|---|---|---|---|
| 3 | Melter 1 Feed Preparation Vessel<br>Melter 2 Feed Preparation Vessel | HFP-VSL-00001<br>HFP-VSL-00005 | HFP-SUMP-00002<br>HFP-SUMP-00005 | NA |
| 3 | Melter 1 Feed Vessel<br>Melter 2 Feed Vessel | HFP-VSL-00002<br>HFP-VSL-00006 | | NA |
| 4 | Submerged Bed Scrubbers | HOP-SCB-00001<br>HOP-SCB-00002 | HOP-SUMP-00003<br>HOP-SUMP-00008 | NA |
| 4 | Melter Cave Sumps[5] | HSH-SUMP-00003<br>HSH-SUMP-00007 | NA | NA |

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item. Assessment of sumps HOP-SUMP-00003 and HOP-SUMP-00008 conducted at the same time as the assessment of tanks HOP-VSL-00903 and HOP-VSL-00904 (see Table C-3a).

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Remote NDE

4 NDE surrogates not identified for equipment that is designed for remote maintenance, can be driven under its own power to a maintenance area, or can be recovered remotely by external means.

5 The integrity assessment schedule for the melter cave sumps corresponds to the integrity assessment schedule or replacement schedule for the melters and film coolers (see Table C-5).

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste
NA – not applicable
NDE – non-destructive examination

## Table C-3c HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Seven Years after Hot Commissioning[1,2]

| Priority | Plant Item Name | Plant Item Number | Associated Sumps | Integrity Assessment NDE Surrogate Status[3] |
|---|---|---|---|---|
| NA | NA | NA | NA | NA |

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 No DWP-regulated equipment in accessible areas of the HLW vitrification facility has been identified for assessment at 7 years.

3 accessible equipment for which NDE measurements can be conducted and which have been identified for use as surrogates for NDE measurements on similar equipment in black cells and hard-to-reach areas, as described in Section 7.1.5

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste
NA – not applicable
NDE – non-destructive examination

## Table C-4a HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells and Hard-to-Reach Areas with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]

| Priority | Plant Item Name | Plant Item Number | Associated Sumps | Integrity Assessment NDE Surrogate Candidates |
|---|---|---|---|---|
| 1 | Wet Electrostatic Precipitators | HOP-WESP-00001<br>HOP-WESP-00002 | HFP-SUMP-00001<br>HFP-SUMP-00004 | LOP-WESP-00001<br>LOP-WESP-00002 |
| 1 | Offgas Drains Collection Vessel | RLD-VSL-00002 | RLD-SUMP-00001 | RLD-VSL-00004<br>RLD-SUMP-00029<br>RLD-SUMP-00030<br>RLD-SUMP-00031<br>RLD-SUMP-00032<br>RLD-SUMP-00035<br>RLD-SUMP-00036 |

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Evaluation of NDE surrogate results

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste
NDE – non-destructive examination

## Table C-4b HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Remotely Accessible Cells with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]

| Priority | Plant Item Name | Plant Item Number | Associated Sumps | Integrity Assessment NDE Surrogate Candidates[4] |
|---|---|---|---|---|
| 2 | HEMEs | HOP-HEME-00001A/B<br>HOP-HEME-00002A/B | HOP-SUMP-00003<br>HOP-SUMP-00008 | NA |
| 2 | HEPA Electric Preheaters | HOP-HTR-00001B<br>HOP-HTR-00002A | NA | NA |
| 2 | HEPA Electric Preheaters, Melter 2 | HOP-HTR-00005A/B | NA | NA |
| 2 | HEPA Filters | HOP-HEPA-00001A/B<br>HOP-HEPA-00002A/B<br>HOP-HEPA-00007A/B<br>HOP-HEPA-00008A/B | NA | NA |

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item. Assessment of sumps HOP-SUMP-00003 and HOP-SUMP-00008 conducted at the same time as the assessment of tanks HOP-VSL-00903 and HOP-VSL-00904 (see Table C-3a).

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Remote NDE

4 NDE surrogates not identified for equipment that is designed for remote maintenance, can be driven under its own power to a maintenance area, or can be recovered remotely by external means.

Acronyms:

DWP – dangerous waste permit
HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
HLW - high-level waste
NA – not applicable
NDE – non-destructive examination

**Table C-4c HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]**

| Priority | Plant Item Name | Plant Item Number | Associated Sumps and Bulges | Integrity Assessment NDE Surrogate Status[4] |
|---|---|---|---|---|
| 3 | Rinse Tunnel Canister Rinse Vessel | HDH-VSL-00001 | HDH-SUMP-00001 | NA |
| 3 | Waste Neutralization Vessel | HDH-VSL-00003 | HDH-SUMP-00003 | NA |
| 3 | Canister Decon Vessel 1 | HDH-VSL-00002 | | NA |
| 3 | Canister Decon Vessel 2 | HDH-VSL-00004 | | NA |
| 3 | Decontamination Tank Melter Cave 1 | HSH-TK-00001 | HSH-SUMP-00008 | NA |
| 3 | Decontamination Tank Melter Cave 2 | HSH-TK-00002 | HSH-SUMP-00009 | NA |
| 3 | Booster Extraction Fans | HOP-FAN-00001A/B/C<br>HOP-FAN-00009A/B/C | NA | NA |
| 3 | Catalyst Skid Preheaters | HOP-HX-00001<br>HOP-HX-00003 | NA | NA |
| 3 | Catalyst Skid Electric Heaters | HOP-HTR-00001<br>HOP-HTR-00007 | NA | NA |
| 3 | Thermal Catalytic Oxidizers | HOP-SCO-00001<br>HOP-SCO-00004 | NA | NA |
| 3 | $NO_x$ Selective Catalytic Reducers | HOP-SCR-00001<br>HOP-SCR-00002 | NA | NA |
| 3 | Silver Mordenite Preheaters | HOP-HX-00002<br>HOP-HX-00004 | NA | NA |
| 3 | Silver Mordenite Columns | HOP-ABS-00002<br>HOP-ABS-00003 | NA | NA |
| 3 | Activated Carbon Adsorbers | HOP-ADBR-00001A/B<br>HOP-ADBR-00002A/B | NA | NA |
| 4 | Stack Extraction Fans | HOP-FAN-00008A/B/C<br>HOP-FAN-00010A/B/C | NA | NA |
| 4 | Electric Heater | PJV-HTR-00002 | NA | NA |
| 4 | HEPA Filters | PJV-HEPA-00004A/B<br>PJV-HEPA-00005A/B | NA | NA |
| 4 | Pulse Jet Fans | PJV-FAN-00002A/B | NA | NA |
| 4 | Canister Rinse and Bogie Maintenance area Sump | HDH-SUMP-00002 | NA | NA |
| 4 | Canister Handling Cave Sumps | HPH-SUMP-00001<br>HPH-SUMP-00003<br>HPH-SUMP-00005 | NA | NA |

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment

**Table C-4c (cont'd) HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Ten Years after Hot Commissioning**

b) Static level tests for tanks
c) NDE

[4] accessible equipment for which NDE measurements can be conducted and which have been identified for use as surrogates for NDE measurements on similar equipment in black cells and hard-to-reach areas, as described in Section 7.1.5

Acronyms:

DWP – dangerous waste permit
HEPA - high efficiency particulate air
HLW - high-level waste
NA – not applicable
NDE – non-destructive examination
$NO_x$ - nitrogen oxides

## Table C-5 HLW Vitrification Facility DWP-Regulated Equipment in Hot Cell Designed for Replacement within Seven Years after Hot Commissioning[1,2]

| Priority | Plant Item Name | Plant Item Number | Associated Sumps |
|---|---|---|---|
| NA | Melter 1<br>Melter 2 | HMP-MLTR-00001<br>HMP-MLTR-00002 | HSH-SUMP-00003<br>HSH-SUMP-00007 |
| NA | Film Coolers | HOP-FCLR-00001<br>HOP-FCLR-00002<br>HOP-FCLR-00003<br>HOP-FCLR-00004 | |

Notes:

1 Design life is 5 years for melters and melter film coolers.

2 Integrity assessment, other than review of operation and maintenance records on annual or semiannual basis, is not required if melter and melter coolers are replaced within 7 years.

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste
NA – not applicable

R11166268

ISSUED BY
RPP-WTP PDC

169564

AREVA

AFS-10-0049

February 24, 2010

Ms. Jennifer Broadbent
Subcontract Administrator
Bechtel National, Inc.
2435 Stevens Center Place
Richland, Washington 99354

RPP-WTP
RECEIVED
FEB 25 2010
BY PDC

Dear Ms. Broadbent:

**BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00211
IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW
SECONDARY CONTAINMENT (IA-3002605-000)**

The structural integrity assessment of the subject secondary containment has been completed per the contract requirements and is enclosed for your use. The assessment found that the design is sufficient to ensure that the secondary containment is adequately designed and has sufficient structural strength, compatibility with the waste(s) to be processed/stored/treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

If you have any questions, please contact Tarlok Hundal at (509) 371-1975, or via email at tarlok.hundal@areva.com.

Sincerely,

Fred R. Renz
Contract Management
AREVA Federal Services LLC
Richland Office

llm

Enclosure (1)

cc: D. C. Pfluger, MS 5-L w/enclosure (2)

IA-3002605-000

# IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW SECONDARY CONTAINMENT

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW SECONDARY CONTAINMENT

"I, Tarlok Hundal have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the LAW Secondary Containment, as required by the Washington Administrative Code, *Dangerous Waste Regulations*, Section WAC-173-303-640(3) (a) through (g) applicable components."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design fully satisfies the requirements of the WAC.

The attached review is forty-five (45) pages numbered one (1) through forty-five (45).

Signature

2/24/10
Date

| | | |
|---|---|---|
| **Scope** | Scope of this Integrity Assessment | This Integrity Assessment addresses the LAW Facility's Secondary Containment Cells/Rooms located at following floor elevations within the building:<br>1. Floor Elev. (-)21'-0" (Cell L-B001B), pp. 4 thru 16<br>2. Floor Elev. 3'-0 (@ Elev. 2'-0": Cells L-0123, L-0124, and L-0126), pp. 17 thru 26<br>3. Floor Elev. 28'-0 (Room L-0218), pp. 27 thru 36<br>4. Floor Elev. 48'-0 (Room L-0304F), pp. 37 thru 45 |
| **Summary of Assessment** | | For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information"* were reviewed and found to furnish adequate design requirements and controls to ensure that the design fully satisfies the requirements of Washington Administrative Code (WAC), Chapter 173-303 WAC, *Dangerous Waste Regulations,* WAC-173-303-640, *Tank Systems.* |

| | | |
|---|---|---|
| References | Drawings | 24590-LAW-P1-P01T-00001, Rev. 3, LAW Vitrification Building General Arrangement Plan at El. (-)21'-0";<br>24590-LAW-P1-P01T-00002, Rev. 5, LAW Vitrification Building General Arrangement Plan at El. 3'-0";<br>24590-LAW-P1-P01T-00003, Rev. 4, LAW Vitrification Building General Arrangement Plan at El. 22'-0";<br>24590-LAW-P1-P01T-00004, Rev. 4, LAW Vitrification Building General Arrangement Plan at El. 28'-0";<br>24590-LAW-P1-P01T-00005, Rev. 3, LAW Vitrification Building General Arrangement Plan at El. 48'-0";<br>24590-LAW-P1-P01T-00006, Rev. 1, LAW Vitrification Building General Arrangement Plan at El. 68'-0";<br>24590-LAW-P1-P01T-00007, Rev. 8, LAW Vitrification Building General Arrangement Section A-A, B-B, C-C, and S-S;<br>24590-LAW-P1-P01T-00008, Rev. 7, LAW Vitrification Building General Arrangement Section D-D, E-E, F-F, and T-T;<br>24590-LAW-P1-P01T-00009, Rev. 8, LAW Vitrification Building General Arrangement Section G-G, H-H, and J-J;<br>24590-LAW-P1-P01T-00010, Rev. 8, LAW Vitrification Building General Arrangement Section K-K, L-L, and M-M;<br>24590-LAW-P1-P01T-00011, Rev. 6, LAW Vitrification Building General Arrangement Section N-N, P-P, R-R, and U-U;<br>24590-WTP-FSK-CON-T-01-004, Rev. 7, Field Sketch HLW and LAW Excavation and Mudmat;<br>24590-LAW-D0-S13T-00002, Rev. 11, LAW Vitrification Building Main Building General Concrete Notes;<br>24590-LAW-DB-S13T-00003, Rev. 9, LAW Vitrification Building Main Building Concrete Key Plan at El. (-) 21'-0";<br>24590-LAW-DB-S13T-00004, Rev. 1, LAW Vitrification Building Main Building Concrete Key Plan at El. (+) 3'-0";<br>24590-LAW-DB-S13T-00005, Rev. 0, LAW Vitrification Building Main Building Concrete Key Plan at El. (+) 28'-0";<br>24590-LAW-DB-S13T-00006, Rev. 0, LAW Vitrification Building Main Building Concrete Key Plan at El. (+) 48'-0";<br>24590-LAW-DB-S13T-00007, Rev. 3, LAW Vitrification Building Main Building Conc. Forming Plan Zone 1 @ El. (-) 21'-0";<br>24590-LAW-DB-S13T-00020, Rev. 1, LAW Vitrification Building Main Building Partial Conc. Forming Plan Zone 7 @ El. (+) 2'-0, (Process Cells);<br>24590-LAW-DB-S13T-00021, Rev. 2, LAW Vitrification Building Main Building Partial Conc. Forming Plan Zone 8 @ El. (+) 2'-0, (Process and Effluent Cells);<br>24590-LAW-DB-S13T-00028, Rev. 4, LAW Vitrification Building Main Bldg. Partial Conc. Forming Plan Zone 5 @ El. (+) 28'-0";<br>24590-LAW-DB-S13T-00135, Rev. 8, LAW Vitrification Building Main Bldg. Partial Conc. Forming Plan Zone 5 @ El. (+) 48'-0";<br>24590-LAW-DD-S13T-00001, Rev. 6, LAW Vitrification Building Main Bldg. Liner Plate Grillage Details;<br>24590-LAW-DD-S13T-00002, Rev. 2, LAW Vitrification Building Main Bldg. Conc. Embedment C3/C5 Grillage at El. (-) 21'-0";<br>24590-LAW-DD-S13T-00004, Rev. 3, LAW Vitrification Building Main Bldg. Process Cell Melter #1 Support Ring & Grillage Sub-Assembly;<br>24590-LAW-DD-S13T-00005, Rev. 2, LAW Vitrification Building Main Bldg. Process Cell Melter #2 Support Ring & Grillage Sub-Assembly;<br>24590-LAW-DD-S13T-00006; Rev. 4, LAW Vitrification Building Main Bldg. Effluent Cell Ring Support Ring & Grillage Sub-Assembly;<br>24590-LAW-DD-S13T-00009, Rev. 5, LAW Vitrification Building Main Bldg. Process and Effluent Cell Vessel Anchorage/ Support Ring Schedule & Details;<br>24590-LAW-DD-S13T-00012, Rev. 1, LAW Vitrification Building Main Bldg. C3/C5 Collection Vessel Embed Assy;<br>24590-LAW-DD-S13T-00014, Rev. 5, LAW Vitrification Building Main Bldg. 24" and 30" Dia. Sump Details; |

| | | |
|---|---|---|
| References (cont'd) | Drawings | 24590-LAW-DG-S13T-00005, Rev. 2, LAW Vitrification Building Main Building Bot. Conc Reinf. Plan Zone 1 @ El. (-) 21'-0";<br>24590-LAW-DG-S13T-00012, Rev. 2, LAW Vitrification Building Main Building Top Conc Reinf. Plan Zone 1 @ El. (-) 21'-0";<br>24590-LAW-DG-S13T-00025, Rev. 2, LAW Vitrification Building Main Building Partial Reinf. Plan Zone 7 @ TOC El. (+) 2'-0";<br>24590-LAW-DG-S13T-00026, Rev. 2, LAW Vitrification Building Main Building Partial Reinf. Plan Zone 8 @ TOC El. (+) 2'-0";<br>24590-LAW-DG-S13T-00035, Rev. 4, LAW Vitrification Building Main Building Partial Reinf. Plan Zone 5 @ TOC El. (+) 28'-0";<br>24590-LAW-DG-S13T-00174, Rev. 3, LAW Vitrification Building Main Building Partial Reinf. Plan Zone 5 @ TOC El. (+) 48'-0";<br>24590-LAW-SS-S15T-00011, Rev. 4, LAW Vitrification Building Main Bldg. Structural Steel Partial Floor Plan Zone 7 @ TOS El. (+) 0'-4";<br>24590-LAW-SS-S15T-00012, Rev. 4, LAW Vitrification Building Main Bldg. Structural Steel Partial Floor Plan Zone 8 @ TOS El. (+) 0'-4";<br>24590-LAW-SS-S15T-00018, Rev. 7, LAW Vitrification Building Main Bldg. Structural Steel Partial Floor Plan Zone 5 @ TOS El. (+) 27'-0";<br>24590-LAW-SS-S15T-00027, Rev. 9, LAW Vitrification Building Main Bldg. Structural Steel Partial Floor Plan Zone 5 @ TOS El. (+) 47'-0". |

| | Information Assessed | Source of Information | Assessment |
|---|---|---|---|
| **Design** | Description of subsurface conditions and soil bearing capacity are adequate. | Drawings listed above under references;<br><br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>WTSC99-1036-42-17, RPP-WTP Final Report Geotechnical Investigation, Shannon & Wilson Inc. (H-1616-51), May 2000;<br>24590-BOF-3PS-CE01-T0001, Rev. 6, Engineering Specification for Excavation and Backfill;<br>24590-BOF-3PS-C000-T0001, Rev. 4, Engineering Specification for Material Testing Services;<br>24590-LAW-DBC-S13T-00001, Rev. 1, Foundation Wall Calculations for Lateral Soil Loads;<br>24590-LAW-DBC-S13T-00009, Rev. 2, Foundation Basemat Design (Calculations);<br>24590-WTP-3DP-G04B-00037, Rev. 15B, Engineering Calculations;<br>24590-LAW-S0C-S15T-00001, Rev. 0, GTStrudl Finite Element Analysis Model;<br>24590-LAW-S0C-S15T-00002, Rev. 1, LAW Floor Loading (Calculations);<br>24590-LAW-S0C-S15T-00003, Rev. 0, Spring Base Static Analysis (Calculations);<br>24590-LAW-DBC-S13T-00008, Rev. 1, Preliminary Foundation Sizing (Calculations). | The Structural Design Criteria provides adequate design guidance for both mat and spread footings based on the Geotechnical Investigation report for the facility. Bearing capacity and settlement design parameters are presented for the dense Hanford Upper and Lower Sand Units and Structural Fill. Use of the loose wind blown (dune) sands for foundations is precluded. The Specification for Excavation and Backfill provides structural backfill requirements based on the geotechnical report and current codes and standards for the selection, placing, compacting, and backfill testing of candidate fill materials and completed backfills. The Specification for Material Testing Services provides current adequate codes and standards for testing of the candidate structural fill materials and in-situ testing of structural fills as they are placed. The drawings show that appropriate foundation subsurface and backfill materials have been utilized and/or placed under and around the secondary containment structure. Review of the Concrete Reinforcing design calculations of the concrete cell L-B001B acting as secondary containment for the vessel (RLD-VSL-00004) located in this cell show that the subsurface conditions and bearing capacity are adequate to sustain the applicable loads. The methodology described in the Engineering Calculations document assures that the final secondary containment structure is designed to comply with all applicable requirements. Review of the design calculations shows that the allowable soil bearing capacity used is appropriate and adequate. |

| Information Assessed | | Source of Information | Assessment |
|---|---|---|---|
| Design (cont'd) | Foundation design loads (including full tanks) and estimated settlement are adequately considered. | Drawings listed above under references;<br><br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary, American Concrete Institute;<br>ACI 349-01, Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary, American Concrete Institute;<br>ASCE 7-98, Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers;<br>24590-LAW-DBC-S13T-00003, Rev. 1, Differential Settlement Effects on the Foundation (Calculations);<br>24590-LAW-DBC-S13T-00008, Rev. 1, Preliminary Foundation Sizing (Calculations);<br>24590-LAW-DBC-S13T-00009, Rev. 2, Foundation Basemat Design (Calculations);<br>24590-LAW-S0C-S15T-00002, Rev. 1, LAW Floor Loading (Calculations);<br>24590-LAW-DBC-S13T-00019, Rev. A, Elevation +3 Slab on Grade (Calculations);<br>24590-LAW-DBC-S13T-00005, Rev. 0, Thermal Analysis for the Basemat and Pour Cave Walls (Calculations). | The Structural Design Criteria uses current adequate standards to define design loads and load combinations (ACI 318-99, ACI 349-01, and ASCE 7-98). Dead and fluid loads are included in these loads and load combinations. Settlement design parameters are included in the Structural Design Criteria (Section 7.7, Geotechnical Design Parameters and Foundation Design). Review of the design calculations show that full load of the vessel, equipment, and other miscellaneous loads have been appropriately considered for the foundation design and the design drawings accurately reflect the detail as shown in the design calculations. |

| | Information Assessed | Source of Information | Assessment |
|---|---|---|---|
| Design (cont'd) | Design calculation approach and design basis of footings with design standard references (e.g., ACI) are adequate. | Drawings listed above under references;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary, American Concrete Institute;<br>24590-LAW-DBC-S13T-00009, Rev. 2, Foundation Basemat Design (Calculations);<br>24590-LAW-S0C-S15T-00001, Rev. 0, GTStrudl Finite Element Analysis Model;<br>24590-WTP-VV-ST-01-001, Rev. 5A, Verification and Validation Test Plan and Test Report for GTSTRUDL. | The Basis of Design document provides many fundamental general requirements for footing design. The Structural Design Criteria document references current adequate detailed design criteria for the design of concrete foundations and footings. ACI 318-99 code is referenced for the strength design of the secondary containment structures. Review of the Foundation Basemat Design calculations shows that design approach, basis, and methodology used for the design of the secondary containment foundations/footings is appropriate. And the conclusions of the design calculations are correctly shown in the design drawings. The above mentioned codes and standards, design approach, methodology, and basis delineated are appropriate and adequate for the foundation design. The input parameters used in the GTSTRUDL computer code utilized for this secondary containment design are appropriate and the output results have been appropriately validated via the Verification and Validation Test Plan and Test Report document. |

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| Foundation Design | Foundation material is compatible with the soil. | Drawings listed above under references;<br><br>24590-WTP-3PS-DB01-T0001, Rev. 8, Engineering Specification for Furnishing and Delivering Ready-Mix Concrete;<br>24590-BOF-3PS-C000-T0001, Rev. 4, Engineering Specification for Material Testing Services;<br>24590-BOF-3PS-CE01-T0001, Rev. 6, Engineering Specification for Excavation and Backfill;<br>24590-WTP-DB-ENG-01-001, Rev. 10, Basis of Design. | The materials for secondary containment structure and backfill used under it are consistently identified in the specifications, drawings, and calculations. The Specification for Furnishing and Delivering Ready-Mix Concrete provides adequate current testing requirements for the selection of coarse and fine aggregates and the procurement of cementitious materials. Adequate test procedures are provided in the Material Testing Services specification for testing candidate concrete aggregates for chemical reactivity. Instructions for mixing and delivering ready-mix concrete are adequate and current. The Specification for Excavation and Backfill provide adequate requirements for the material used under foundation. As noted in the Basis of Design document (Section 4.7), the groundwater table is more than 250 feet below the ground surface; therefore, no compatibility problem is expected between the concrete foundation and the surrounding backfill materials used under and around it. |
| | Foundation will withstand the effects of frost heave. | Drawings listed above under references;<br><br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria. | The Structural Design Criteria includes adequate provisions to preclude frost heave in the section addressing lateral earth pressure loads. All structural foundations are required to extend into the soil below the frost line to preclude frost heave. The frost line depth is 30 in. below the finished grade. The structural drawings show that bottom of the foundation basemat of secondary containment cell L-B001B is at Elev. (-) 26'-0", i.e., 26 ft below the finished grade elevation, therefore, it will not be subjected to frost heave effects. |

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| Seismic | Seismic considerations have been adequately addressed. | 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>24590-WTP-PSAR-ESH-01-002-03, Rev. 4I, Preliminary Documented Safety Analysis (PDSA) to Support Construction Authorization: LAW Facility Specific Information;<br>UBC 1997, Uniform Building Code;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary;<br>AISC M016-89, Manual of Steel Construction - Allowable Stress Design, Ninth Edition;<br>24590-LAW-DBC-S13T-00009, Rev. 2, Foundation Basemat Design (Calculations);<br>24590-LAW-DBC-S13T-00001, Rev. 1, Foundation Wall Calculations for Lateral Soil Loads;<br>24590-LAW-DBC-S13T-00011, Rev. 2C, Basement Wall Design (Calculations). | The Secondary Containment Design document describes and provides references for the design methodology, materials, loads, and load combinations (including seismic loads) for the LAW facility secondary containment components. The LAW Facility PDSA document designates the LAW facility Structures, Systems, and Components (SSCs) to be Seismic Category III (SC-III) and performance category 2 (PC-2) for other natural phenomenon hazards (NPH). The Structural Design Criteria document provides detailed discipline specific codes and standards for the design of SC-III LAW secondary containment foundations, structures, and liners by the design engineers. Design loads and analysis methods for SC-III secondary containments and liners are taken from the Uniform Building Code (UBC 1997). The ACI 318-99 code provides the design requirements and load combinations for the design of the secondary containment reinforced concrete foundations and structures. The AISC M016-89 code is used for the design of SC-III secondary containment stainless steel liners and all structural steel elements. The above listed codes, standards, and documents adequately address the applicable seismic requirement and review of the design calculations shows that these requirements are appropriately considered and met. |

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| **Compatibility** | The stored waste is compatible with its Secondary Containment and leak detection hardware based on a detailed chemical and physical analysis of the wastes used and other information sources. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection;<br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-PER-J-02-001, Rev. 4, Leak Detection – Sump Level Measurement in Secondary Containment Systems. | The Basis of Design document states tha: secondary containment structure is to be appropriately lined and any leaks or spills will be removed within 24 hours of a leak detection or in as timely a manner as possible. Based on a detailed chemical and physical analysis of the wastes and other process information sources; the Material Selections report identifies appropriate corrosion resistant materials for secondary containment liners and leak detection hardware. The Secondary Containment Design document provides adequate typical construction details for liners including tank anchorage details, sumps, and leak detection equipment to be used for secondary containment structures. Typical details are furnished for leak detection/sump level measurement systems equipment in the Leak Detection-Sump Level Measurement document. The above mentioned documents provide adequate information that the materials and hardware used are compatible with the waste and the design drawings show the appropriate required installation details. |

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| **Strength** | The design shows that the Secondary Containment has sufficient strength and thickness to prevent failure owing to pressure gradients, static head during a release, physical contact with the waste, climatic conditions, and the stress of daily operations (e.g., vehicular traffic). | Drawings listed above under References;<br><br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-LAW-DBC-S13T-00001, Rev. 1, Foundation Wall Calculations for Lateral Soil Loads;<br>24590-LAW-DBC-S13T-00009, Rev. 2, Foundation Basemat Design (Calculations);<br>24590-LAW-S0C-S15T-00002, Rev. 1, LAW Floor Loading (Calculations).<br>24590-LAW-PER-M-02-002, Rev. 6, Flooding Volume for LAW Facility (Calculations);<br>24590-LAW-DBC-S13T-00011, Rev. 2C, Basement Wall Design (Calculations). | The Structural Design Criteria document identifies adequate and appropriate design codes and standards and all applicable load cases from site specific conditions that must be considered in the design. Pressure gradients, static head during a release, physical contact with the waste, climatic conditions, and the stresses of daily operations are adequately stated as design goals in the Basis of Design document. The Secondary Containment Design document describes and provides references for the design methodology, materials, loads, and load combinations (including seismic loads) for the LAW facility secondary containment components. The secondary containments being considered is located in the below ground level cells (L-B100B) inside the LAW facility, therefore, is not subject to vehicular traffic. Applicable pressure gradient due to soil load are considered in the design calculations. The design calculations and drawings reviewed show that the foundation slab and the secondary containment walls are adequately designed to sustain the applicable loads imposed by vessel, liner plate and equipment, and that of the soil around the secondary containment cell and that it will not fail due to these loads. |

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| **Strength (cont'd)** | The Secondary Containment system has sufficient strength in the presence of operational stresses from site-specific conditions (i.e., traffic, heavy equipment, precipitation, frost). | Drawings listed above under References;<br><br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-3PS-NLLR-T0002, Rev. 1, Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates;<br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection;<br>24590-LAW-DBC-S13T-00001, Rev. 1, Foundation Wall Calculations for Lateral Soil Loads;<br>24590-LAW-DBC-S13T-00011, Rev. 2C, Basement Wall Design (Calculations);<br>24590-LAW-DBC-S13T-00009, Rev. 2, Foundation Basemat Design (Calculations). | The LAW drawings show secondary containment being considered is installed below grade inside the building. Because it is located inside the building, traffic, heavy equipment, precipitation and frost are not applicable load cases. The Secondary Containment Design document identifies the applicable load cases (operational stresses) from site specific conditions that must be considered in the design. The Engineering Specification for Furnishing Stainless Steel Liner Plates includes specific provisions for protection and repair of completed liners during the construction process. The Material Selections for Building Secondary Containment document addresses the potential effects of operations conditions on liner integrity and the associated maintenance requirements. The design calculations and drawings show that the secondary containment structure has sufficient strength to sustain loads from applicable operational loads. |

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| **Foundation Integrity** | The Secondary Containment is properly supported by a foundation or base in order to prevent failure from settlement, compression, or uplift, including the residual effects of installation. | Drawings listed above under References;<br><br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>24590-BOF-3PS-CE01-T0001, Rev. 6, Engineering Specification for Excavation and Backfill;<br>24590-WTP-3PS-DB01-T0001, Rev. 8, Engineering Specification for Furnishing and Delivering Ready-Mix Concrete;<br>24590-BOF-3PS-C000-T0001, Rev. 4, Engineering Specification for Material Testing Services;<br>24590-LAW-DBC-S13T-00001, Rev. 1, Foundation Wall Calculations for Lateral Soil Loads;<br>24590-LAW-DBC-S13T-00009, Rev. 2, Foundation Basemat Design (Calculations);<br>24590-LAW-S0C-S15T-00002, Rev. 1, LAW Floor Loading (Calculations);<br>24590-LAW-DBC-S13T-00003, Rev. 1, Differential Settlement Effects on the Foundation (Calculations). | Settlement, compression, or uplift including the residual effects of installation, are addressed in the Secondary Containment Design and the Structural Design Criteria documents. The design requirements and the codes and standards specified are adequate to satisfy these performance goals. The design and related specifications adequately provide for proper foundation construction and installation of the secondary containment. The reference documents and general arrangement drawings provide adequate description of the secondary containment being considered. Review of the design calculations and drawings shows that the design process appropriately considered all applicable load factors for the foundation design to prevent its failure. |

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| **Foundation Integrity (cont'd)** | The placement, structural support, and type of material used for backfill around and below the Secondary Containment are appropriate. | Drawings listed above under References;<br><br>24590-BOF-3PS-CE01-T0001, Rev. 6, Engineering Specification for Excavation and Backfill;<br>24590-BOF-3PS-C000-T0001, Rev. 4, Engineering Specification for Material Testing Services;<br>24590-WTP-PER-CON-02-001, Rev. 6, Installation of Tank Systems and Miscellaneous Unit Systems. | The drawings and Specification for Excavation and Backfill provide specific material to be used under and around the secondary containment foundations and contain placing and backfilling requirements. The Material Testing specifications contain current adequate industry standards for selecting and testing fill materials, and testing not less than once each lift to ensure adequate compaction. Requirements for testing and record keeping are current and adequate for the backfill around and below the secondary containment. Furthermore, the Certification of Construction by an independent, qualified, installation inspector or an independent, qualified, registered professional engineer (IQRPE) as required by the Installation of Tank System document will ensure that all vessel system units including secondary containment structural support and backfill placement comply with the applicable documents. |

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| **Infiltration** | The design or operation (e.g., diking & curbing) prevents run-on or infiltration of precipitation into the Secondary Containment system unless the collection system has sufficient excess capacity (25 yr rainfall) to contain the run-on precipitation. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-LAW-PER-M-02-002, Rev. 6, Flooding Volume for LAW Facility (Calculations);<br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design. | The Basis of Design document requires that secondary containment structure shall be capable to contain 100% liquid volume of the largest tank in the group of tanks plus the precipitation from a 25-year, 24-hour rainfall event. The secondary containment cell L-B001B is located inside the LAW facility where it is protected from direct precipitation by the building structure as shown in the general arrangement drawings, therefore, will not be subjected to precipitation effects. Since the vessel (RLD-VSL-00004) is completely enclosed inside the secondary containment structure (cell L-B001B), therefore, 100% liquid volume containment requirement is automatically satisfied. The Flooding Volume and Secondary Containment Design documents show that the entire cell floor and walls up to a height of 9'-6" are also lined with stainless steel plate which further ensures containment of the entire volume of RLD-VSL-00004 vessel. |

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| **Infiltration (cont'd)** | The design includes an external moisture barrier or other means to prevent moisture from entering the room. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-3PS-NLLR-T0002, Rev. 1, Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates. | The Basis of Design document requires the design include provisions to prevent external moisture intrusion. The secondary containment cell L-B001B shown in the general arrangement drawings is located inside the LAW building which shields it from precipitation and surface water percolation. As noted in the Basis of Design document, the ground water table is located about 250 feet below the ground surface, therefore, ground water infiltration is precluded. However, as a good engineering practice, the drawings show that the secondary containment structure has the bituminous damp-proofing material applied to the external faces of its concrete walls which also mitigates moisture infiltration. The drawings also show stainless steel liner plate installed at the inside face of the cell walls and floor which provide added measure to prevent moisture from entering the cell. The Engineering Specifications for Stainless Steel Liner Plates provide adequate testing and inspection details to ensure quality installation. |

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| Liner System | The containment area is free of cracks or gaps and the design discusses methods of their minimization. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-3PS-NLLR-T0002, Rev. 1, Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates. | The Basis of Design document requires the liner system to be installed must be free of deficiencies such as cracks and gaps and its installation should be inspected and documented by an independent qualified installation inspector or independent qualified professional engineer trained and experienced in installation of tank systems. The Secondary Containment Design document provides current adequate design requirements and codes and standards to design leak tight stainless steel liners. This document includes appropriate details for installation of stainless steel liners free of cracks and gaps. The procurement specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates provides adequate requirements and standards for furnishing stainless steel liners free of cracks and gaps. The design drawings and Secondary Containment Design document show the liner installation details. The installation completion, testing and examination techniques, and inspection requirements per Engineering Specification document further ensure their quality installation. |
| | The design has considered the compatibility of the concrete liner or coatings and waste and presents information on coatings planning to be used from the manufacturer addressing compatibility with the stored waste. The lining or coating must prevent the waste from migrating into the concrete. | Drawings listed above under References;<br><br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection;<br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design. | The Material Selections document contains general information on the compatibility of planned secondary containment stainless steel liners with the waste. The drawings and Secondary Containment Design document provide standard installation details for liners that will ensure leak-tight liners which will prevent the migration of the waste into the concrete. |

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| **Design** | Description of subsurface conditions and soil bearing capacity are adequate. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria; WTSC99-1036-42-17, RPP-WTP Final Report Geotechnical Investigation, Shannon & Wilson Inc. (H-1616-51), May 2000; 24590-BOF-3PS-CE01-T0001, Rev. 6, Engineering Specification for Excavation and Backfill; 24590-BOF-3PS-C000-T0001, Rev. 4, Engineering Specification for Material Testing Services. | The Structural Design Criteria provides adequate design guidance for both mat and spread footings based on the Geotechnical Investigation report for the facility. Bearing capacity and settlement design parameters are presented for the dense Hanford Upper and Lower Sand Units and Structural Fill. Use of the loose wind blown (dune) sands for foundations is precluded. The Specification for Excavation and Backfill provides structural backfill requirements based on the geotechnical report and current codes and standards for the selection, placing, compacting, and backfill testing of candidate fill materials and completed backfills. The Specification for Material Testing Services provides current adequate codes and standards for testing of the candidate structural fill materials, and in-situ testing of structural fills as they are placed. The secondary containment cells L-0123, L-0124, and L-0126 are at located at Elev. 3'-0" level inside the building; the subsurface and soil related items do not directly associate with them but do have an overall effect on their structural strength from the foundations below at Elev. (-) 21'-0" which have been appropriately addressed in the section above at Elev. (-) 21'-0". |

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| Design (cont'd) | Foundation design loads (including full tanks) and estimated settlement are adequately considered. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>ASCE 7-98, Minimum Design Loads for Buildings and Other Structures;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary;<br>ACI 349-01, Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary;<br>24590-LAW-DBC-S13T-00015, Rev. B, Elevated Slab Design + 3 ft. (Calculations);<br>24590-LAW-SSC-S15T-00023, Rev. A, Process Cell Steel Framing (Calculations);<br>24590-WTP-3DP-G04B-00037, Rev. 15B, Engineering Calculations. | The Structural Design Criteria uses current adequate standards to define design loads and load combinations (ASCE 7-98, ACI 318-99, and ACI 349-01). Dead and fluid loads are included in these loads and load combinations. Settlement design parameters are included in the Structural Design Criteria (Section 7.7, Geotechnical Design Parameters and Foundation Design). The secondary containment cells identified herein (L-0123, L-0124, and L-0126) are located inside the building at Elev. 3'-0" level. The subsurface and soil related items such as settlement do not directly associate with them but do have an overall effect on their structural strength from the foundation below at Elev. (-) 21'-0", which has been addressed in the previous section above. However, the review of the design calculations of the immediate slab and steel framing members that support the vessels and liners located on the floor in the subject process cells (L-0123, L-0124, and L-0126) show that full weights of the vessels have been appropriately considered. The methodology described in the Engineering Calculations document assures that the final secondary containment structure is designed to comply with all applicable requirements. |
| | Design calculation approach and design basis of footings with design standard references (e.g., ACI) are adequate. | 24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary.<br>24590-LAW-DBC-S13T-00015, Rev. B, Elevated Slab Design + 3 ft. (Calculations);<br>24590-LAW-SSC-S15T-00023, Rev. A, Process Cell Steel Framing (Calculations). | The Basis of Design provides many fundamental general requirements for footing design. The Structural Design Criteria document references current adequate detailed design criteria for the design of concrete foundations and footings. ACI 318-99 is referenced for the strength design of secondary structures. The design calculations reviewed show that these codes and standards have been appropriately invoked in the design process for the secondary containment cells footings. |

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| **Foundation Design** | Foundation material is compatible with the soil. | 24590-WTP-3PS-DB01-T0001, Rev. 8, Engineering Specification for Furnishing and Delivering Ready-Mix Concrete; 24590-BOF-3PS-C000-T0001, Rev. 4, Engineering Specification for Material Testing Services; 24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design. | The specification for Furnishing and Delivering Ready-Mix Concrete provides adequate current requirements for the selection of coarse and fine aggregates, and the procurement of cementitious materials. The specification for Material Testing Services provides adequate test procedures for testing the candidate aggregates to ensure adequate concrete durability. As noted in the Basis of Design document (Section 4.7), the groundwater table is more than 250 feet below the ground surface; therefore, no compatibility problem is expected between the concrete foundation and the surrounding backfill materials used under and around it. The secondary containment cells identified herein (L-0123, L-0124, and L-0126) are located inside the building at Elev. 3'-0" level. The subsurface and soil related items such as settlement do not directly associate with them but do have an overall effect on their structural strength from the foundation below at Elev. (-) 21'-0", which has been addressed in the previous section above. |
| | Foundation will withstand the effects of frost heave. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria. | The Structural Design Criteria requires all structural foundations for outdoor components to extend below the 30" frost line from the finished grade (Elev. 0'-0"). The secondary containment cells L-0123, L-0124, and L-0126 are located inside the building at Elev. 3'-0", therefore, they are not subjected to the detrimental effects of frost heave. |

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| **Seismic** | Seismic considerations have been adequately addressed. | 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-PSAR-ESH-01-002-03, Rev. 4I, Preliminary Documented Safety Analysis to Support Construction Authorization: LAW Facility Specific Information;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>UBC 1997, Uniform Building Code;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary;<br>AISC M016-89, Manual of Steel Construction - Allowable Stress Design, Ninth Edition;<br>24590-LAW-DBC-S13T-00015, Rev. B, Elevated Slab Design + 3 ft. (Calculations);<br>24590-LAW-SSC-S15T-00023, Rev. A, Process Cell Steel Framing (Calculations). | The Secondary Containment Design document describes and provides references for the design methodology, materials, loads, and load combinations (including seismic loads) for the LAW facility secondary containment components. The LAW Facility PDSA document shows that the cells in this integrity assessment to be Seismic Category-III (SC-III) components. The Structural Design Criteria document provides detailed discipline specific codes and standards for the design of SC-III LAW secondary containment foundations, structures, and liners by the design engineers. Design loads and analysis methods for SC-III secondary containments and liners are taken from the Uniform Building Code (UBC 1997). The ACI 318-99 code provides the design requirements and load combinations for the design of the secondary containment reinforced concrete foundations and structures. The AISC M016-89 code is used for the design of SC-III secondary containment stainless steel liners and building structural steel. The above listed code and standards adequately address the consideration of the requirements of the applicable seismic loads. Review of the design calculations show that the seismic loads have been appropriately considered in the design process of the secondary containment elements. |

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| **Compatibility** | The stored waste is compatible with its Secondary Containment and leak detection hardware based on a detailed chemical and physical analysis of the wastes used and other information sources. | 24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design; 24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection; 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design; 24590-WTP-PER-J-02-001, Rev. 4, Leak Detection – Sump Level Measurement in Secondary Containment Systems; 24590-LAW-PER-M-02-002, Rev. 6, Flooding Volume for LAW Facility; 24590-LAW-PER-M-02-001, Rev. 5, LAW Facility Sump Data. | The Basis of Design document states that the secondary containment cells are to be appropriately lined and any leaks or spills will be removed within 24 hours of a leak detection or in as timely a manner as possible. Based on a detailed chemical and physical analysis of the wastes and other process information sources, the Material Selections document identifies appropriate corrosion resistant materials for secondary containment liners, and leak detection hardware. The Secondary Containment Design document provides adequate typical construction details for liners as well as vessel anchorage details, sumps, and leak detection equipment to be used for secondary containment where required. The typical details are furnished for leak detection/sump level measurement systems equipment in the Leak Detection-Sump Level Measurement document. The Flooding Volume and LAW Facility Sump Data documents provide compatible liner material and other applicable installation details for the secondary containment cell structures. |

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| **Strength** | The design shows that the Secondary Containment has sufficient strength and thickness to prevent failure owing to pressure gradients, static head during a release, physical contact with the waste, climatic conditions, and the stress of daily operations (e.g., vehicular traffic). | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-LAW-DBC-S13T-00015, Rev. B, Elevated Slab Design + 3 ft. (Calculations);<br>24590-LAW-DBC-S13T-00023, Rev. A, Upper Process Shearwall Design, (Calculations);<br>24590-LAW-SSC-S15T-00023, Rev. A, Process Cell Steel Framing (Calculations). | The LAW general arrangement drawings show the location of the secondary containment cells (L-0123, L-0124, and L-0126) at floor elevation 3'-0"in the building. Pressure gradients, static head during a release, physical contact with the waste, climatic conditions, and the stresses of daily operations are adequately stated as design goals in the Basis of Design document. The Secondary Containment Design document describes and provides references for the design methodology, materials, loads, and load combinations (including seismic loads) for the LAW facility secondary containment components. The secondary containment cells being considered are located inside the LAW Vitrification Building, therefore, climatic condition or vehicular traffic are not considered applicable load cases. However, daily operational loads, static head, and pressure gradient due to liquid release inside the cells are considered adequately in the design calculations which show that the secondary containment cells have sufficient strength to prevent their failure. |

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| Strength (cont'd) | The Secondary Containment system has sufficient strength in the presence of operational stresses from site-specific conditions (i.e., traffic, heavy equipment, precipitation, frost). | Drawings listed above under References;<br><br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-3PS-NLLR-T0002, Rev. 1, Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates;<br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection;<br>24590-LAW-DBC-S13T-00015, Rev. B, Elevated Slab Design + 3 ft. (Calculations);<br>24590-LAW-DBC-S13T-00023, Rev. A, Upper Process Shearwall Design, (Calculations);<br>24590-LAW-SSC-S15T-00023, Rev. A, Process Cell Steel Framing (Calculations). | The LAW facility drawings show secondary containment cells being considered are located inside the building at Elev. 3'-0". Because they are located inside the building, traffic, heavy equipment, precipitation, and frost are not applicable load cases. The Secondary Containment Design document identifies the applicable load cases including operational stresses from site specific conditions that must be considered in the design. The Engineering Specification for Furnishing Stainless Steel Liner Plates includes specific provisions for protection of and repair of completed liners during the construction process. The Material Selections for Building Secondary Containment document addresses the potential effects of operations conditions on steel liner integrity and the associated maintenance requirements. The requirements identified in the above listed documents adequately address the site-specific conditions and the review of the design calculations also shows that secondary containment cells have sufficient strength to sustain the applicable loading conditions. |

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| Foundation Integrity | The Secondary Containment is properly supported by a foundation or base in order to prevent failure from settlement, compression, or uplift, including the residual effects of installation. | 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design; 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria. | Settlement, compression, or uplift including the residual effects of installation, are addressed in the Secondary Containment Design document and the Structural Design Criteria. The design requirements and codes and standards specified in these documents are adequate to satisfy these performance goals. The subject secondary containment cells L-0123, L-0124, and L-0126 are located at floor Elev. + 3'-0" which are not directly subjected to foundation settlement, compression or uplift including residual effects. Their effect has been appropriately considered on the foundation of the structures at Elev. (-) 21'-0" which support the subject secondary containment elements. It is contained in the section above for Elev. (-) 21'-0" level. |
| | The placement, structural support, and type of material used for backfill around and below the Secondary Containment are appropriate. | Drawings listed above under References; 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria; 24590-BOF-3PS-CE01-T0001, Rev. 6, Engineering Specification for Excavation and Backfill; 24590-BOF-3PS-C000-T0001, Rev. 4, Engineering Specification for Material Testing Services. | The LAW facility drawings show the secondary containment being considered are located inside the building. Because the subject cells L-0123, L-0124, and L-0126 are located inside the building at Elev. 3'-0", the backfill material requirements are not applicable. However, the design requirements for foundations and structure that support the secondary containment components are adequately addressed in the Structural Design Criteria, Excavation and Backfill, and Material Testing documents. These documents contain adequate industry standards for designing, selecting and testing fill materials, placing and compacting backfills, and testing to ensure adequate compaction below and around the foundations of the structures. The foundations evaluation is included above in the section for Elev. (-) 21'-0". |

| | Information Assessed | Source of Information | Assessment |
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| Infiltration | The design or operation (e.g., diking & curbing) prevents run-on or infiltration of precipitation into the Secondary Containment system unless the collection system has sufficient excess capacity (25 yr rainfall) to contain the run-on precipitation. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-3PS-NLLR-T0002, Rev. 1, Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates. | The Basis of Design document requires the design to provide adequate measures to prevent run-on or infiltration of precipitation. The secondary containment cell components are located inside the LAW Vitrification Building where they are protected from the direct precipitation by the building structure as shown in the general arrangement drawings, therefore, run-on precipitation is precluded. The drawings also show stainless steel liner plate installed at the inside face of all cell walls and floor which provide added measure to prevent moisture from entering the cells. The Engineering Specifications for Stainless Steel Liner Plates provide adequate testing and inspection details to ensure quality installation. |
| | The design includes an external moisture barrier or other means to prevent moisture from entering the room. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-3PS-NLLR-T0002, Rev. 1, Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates. | The Basis of Design document requires the design include provisions to prevent external moisture intrusion. The secondary containment cells L-0123, L-0124, and L-0126 shown in the general arrangement drawings are located inside the LAW building which shields them from precipitation and surface water percolation, therefore, ground water infiltration is precluded. The drawings also show stainless steel liner plate installed at the inside face of all cell walls and floor which provide added measure to prevent moisture from entering the cells. The Engineering Specifications for Stainless Steel Liner Plates provide adequate testing and inspection details to ensure quality installation. |

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| Liner System | The containment area is free of cracks or gaps and the design discusses methods of their minimization. | 24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design; 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design; 24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection; 24590-WTP-3PS-NLLR-T0002, Rev. 1, Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates. | The Basis of Design document requires the liner system to be installed must be free of deficiencies such as cracks and gaps and its installation should be inspected and documented by an independent qualified installation inspector or independent qualified professional engineer trained and experienced in installation of tank systems. The Secondary Containment Design document provides current adequate design requirements and codes and standards to design leak tight liners. This document includes appropriate details for installation of stainless steel liners to be free of cracks and gaps. The Material Selections and Stainless Steel Liner Plates documents provide adequate requirements for the secondary containment liners. |
| | The design has considered the compatibility of the concrete liner or coatings and waste and presents information on coatings planning to be used from the manufacturer addressing compatibility with the stored waste. The lining or coating must prevent the waste from migrating into the concrete. | 24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection; 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design; 24590-WTP-3PS-NLLR-T0002, Rev. 1, Engineering Specification for Furnishing, Detailing, Fabrication, Delivery and Installation of Stainless Steel Liner Plates. | The Material Selections and Special Protective Coating documents contain general information on the compatibility of planned secondary containment stainless steel liners (SST) with the waste. The SST lining material used in cells L-0123, L-0124, and L-0126 prevent the waste from migrating into the concrete. The Secondary Containment Design and Stainless Steel Liners documents provide standard installation details for liners that will ensure leak-tight liners that prevent the migration of the waste into the concrete. |

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| **Design** | Description of subsurface conditions and soil bearing capacity are adequate. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>WTSC99-1036-42-17, RPP-WTP Final Report Geotechnical Investigation, Shannon & Wilson Inc. (H-1616-51), May 2000;<br>24590-BOF-3PS-CE01-T0001, Rev. 6, Engineering Specification for Excavation and Backfill;<br>24590-BOF-3PS-C000-T0001, Rev. 4 Engineering Specification for Material Testing Services. | The Structural Design Criteria provides adequate design guidance for both mat and spread footings based on the Geotechnical Investigation report for the facility. Bearing capacity and settlement design parameters are presented for the dense Hanford Upper and Lower Sand Units and Structural Fill. Use of the loose wind blown (dune) sands for foundations is precluded. The Specification for Excavation and Backfill provides structural backfill requirements based on the geotechnical report and current codes and standards for the selection, placing, compacting, and backfill testing of candidate fill materials and completed backfills. The Specification for Material Testing Services provides current adequate codes and standards for testing of the candidate structural fill materials, and in-situ testing of structural fills as they are placed. Room L-0218 identified in the scope is at Elev. 28'-0" level inside the building; the subsurface and soil related items do not directly associate with it but do have an overall effect on its structural strength from the foundation below at Elev. (-) 21'-0" which has been discussed in the section above. |

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| **Design (cont'd)** | Foundation design loads (including full tanks) and estimated settlement are adequately considered. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>ASCE 7-98, Minimum Design Loads for Buildings and Other Structures;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary;<br>ACI 349-01, Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary;<br>24590-LAW-SSC-S15T-00032, Rev. A, Steel Framing Elevation +28' Non Process and Effluent Cells (Calculations);<br>24590-LAW-DBC-S13T-00028, Rev. A, Elevated Floor Slab Design @ El. +28'-0";<br>24590-WTP-3DP-G04B-00037, Rev. 15B, Engineering Calculations. | The Structural Design Criteria uses current adequate standards to define design loads and load combinations (ASCE 7-98, ACI 318-99, and ACI 349-01). Dead and fluid loads are included in these loads and load combinations. Settlement design parameters are included in the Structural Design Criteria (Section 7.7, Geotechnical Design Parameters and Foundation Design). The secondary containment room L-0218 is located at Elev. 28'-0" level inside the building. The subsurface and soil related items do not directly associate with it but do have an overall effect on its structural strength from the foundation below. However, the review of the design calculations of the immediate slab and steel framing members which support the secondary containment structure, equipment, and coatings around tank (LVP-TK-00001) located on the floor in the subject room (L-0218) show that appropriate design loads including full weight of the tank have been considered. The methodology described in the Engineering Calculations document assures that the final secondary containment structure is designed to comply with all applicable requirements. |

| Information Assessed | | Source of Information | Assessment |
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| Design (cont'd) | Design calculation approach and design basis of footings with design standard references (e.g., ACI) are adequate. | 24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design; 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria; ACI 318-99, Building Code Requirements for Structural Concrete and Commentary; AISC M016-89, Manual of Steel Construction, Allowable Stress Design, Ninth Edition; 24590-LAW-SSC-S15T-00032, Rev. A, Steel Framing Elevation +28' Non Process and Effluent Cells (Calculations); 24590-LAW-DBC-S13T-00028, Rev. A, Elevated Floor Slab Design @ El. +28'-0". | The Basis of Design provides many fundamental general requirements for footing design. The Structural Design Criteria document references current adequate detailed design criteria for the design of concrete foundations and footings. ACI 318-99 is referenced for the strength design of the concrete structures and AISC M016-89 for the structural steel framing elements of the facility. The design calculations reviewed show that the approach and basis used for design are adequately utilized per the required codes and standards and the requirements have been appropriately met in the design process of the secondary containment room footings. |
| Foundation Design | Foundation material is compatible with the soil. | 24590-WTP-3PS-DB01-T0001, Rev. 8, Engineering Specification for Furnishing and Delivering Ready-Mix Concrete; 24590-BOF-3PS-C000-T0001, Rev. 4 Engineering Specification for Material Testing Services. | The specification for Furnishing and Delivering Ready-Mix Concrete provides adequate current requirements for the selection of coarse and fine aggregates, and the procurement of cementitious materials. The specification for Material Testing Services provides adequate test procedures for testing the candidate aggregates to ensure adequate concrete durability. The secondary containment room L-0218 is located at Elev. 28'-0" level inside the building. The subsurface and soil related items do not directly associate with it but do have an overall effect on its structural elements from the foundations below which has been appropriately addressed above in section at Elev. (-) 21'-0". |

| Information Assessed | | Source of Information | Assessment |
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| **Foundation Design (cont'd)** | Foundation will withstand the effects of frost heave. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria. | The Structural Design Criteria requires all structural foundations for outdoor components to extend below the 30" frost line from the finished grade (Elev. 0'-0"). Room L-0218 is located inside the building at Elev. 28'-0", therefore, it is not subjected to the detrimental effects of frost heave. |
| **Seismic** | Seismic considerations have been adequately addressed. | 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-PSAR-ESH-01-002-03, Rev. 4I, Preliminary Documented Safety Analysis to Support Construction Authorization: LAW Facility Specific Information;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>UBC 1997, Uniform Building Code;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary;<br>AISC M016-89, Manual of Steel Construction - Allowable Stress Design, Ninth Edition;<br>24590-LAW-SSC-S15T-00032, Rev. A, Steel Framing Elevation +28' Non Process and Effluent Cells (Calculations);<br>24590-LAW-DBC-S13T-00028, Rev. A, Elevated Floor Slab Design @ El. +28'-0". | The Secondary Containment Design document describes and provides references for the design methodology, materials, loads, and load combinations (including seismic loads) for the LAW facility secondary containment components. The LAW Facility PDSA document shows the room in this integrity assessment to be Seismic Category-III (SC-III) component. The Structural Design Criteria document provides detailed discipline specific codes and standards for the design of SC-III LAW secondary containment foundations, structures, and liners by the design engineers. Design loads and analysis methods for SC-III secondary containments and liners are taken from the Uniform Building Code (UBC 1997). The ACI 318-99 code provides the design requirements and load combinations for the design of the secondary containment reinforced concrete foundations and structures. The AISC M016-89 code is used for the design of SC-III secondary containment stainless steel liners and building structural steel. The above listed code and standards adequately address the consideration of the requirements of the applicable seismic loads. Review of the design calculations show that the seismic loads have been appropriately considered in the design process of the secondary containment elements. |

| | Information Assessed | Source of Information | Assessment |
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| **Compatibility** | The stored waste is compatible with its Secondary Containment and leak detection hardware based on a detailed chemical and physical analysis of the wastes used and other information sources. | 24590-WTP-DB-ENG-01-001, Rev. 10, Basis of Design; 24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection; 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design; 24590-WTP-PER-J-02-001, Rev. 4, Leak Detection – Sump Level Measurement in Secondary Containment Systems; 24590-LAW-PER-M-02-002, Rev. 6, Flooding Volume for LAW Facility; 24590-LAW-PER-M-02-001, Rev. 5, LAW Facility Sump Data. | The Basis of Design document states that the secondary containment rooms are to be appropriately lined and any leaks or spills will be removed within 24 hours of a leak detection or in as timely a manner as possible. Based on a detailed chemical and physical analysis of the wastes and other process information sources, the Material Selections document identifies appropriate corrosion resistant materials for secondary containment special protective coatings and leak detection hardware. The Secondary Containment Design document provides adequate typical construction details for special protective coatings including tank anchorage details, sumps, and leak detection equipment to be used for secondary containment where required. The typical details are furnished for leak detection/sump level measurement systems equipment in the Leak Detection - Sump Level Measurement document. The Flooding Volume and LAW Facility Sump Data documents provide compatible liner material and other applicable installation details for the secondary containment room structures. |

| Information Assessed | | Source of Information | Assessment |
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| **Strength** | The design shows that the Secondary Containment has sufficient strength and thickness to prevent failure owing to pressure gradients, static head during a release, physical contact with the waste, climatic conditions, and the stress of daily operations (e.g., vehicular traffic). | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-LAW-SSC-S15T-00032, Rev. A, Steel Framing Elevation +28' Non Process and Effluent Cells (Calculations);<br>24590-LAW-DBC-S13T-00028, Rev. A, Elevated Floor Slab Design @ El. +28'-0". | The LAW general arrangement drawings show the location of the secondary containment room L-0218 in the building. Pressure gradients, static head during a release, physical contact with the waste, climatic conditions, and the stresses of daily operations are adequately stated as design goals in the Basis of Design document. The Secondary Containment Design document describes and provides references for the design methodology, materials, loads, and load combinations (including seismic loads) for the LAW facility secondary containment components. The secondary containment room L-0218 being considered is located inside the LAW Vitrification Building, therefore, vehicular traffic is not considered an applicable load case. However, daily operational loads, static head, and pressure gradient due to liquid release inside the secondary containment room walls are considered adequately in the design calculations which show that the secondary containment has sufficient strength to prevent its failure. |

| Information Assessed | | Source of Information | Assessment |
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| Strength (cont'd) | The Secondary Containment system has sufficient strength in the presence of operational stresses from site-specific conditions (i.e., traffic, heavy equipment, precipitation, frost). | Drawings listed above under References;<br><br>24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-3PS-AFPS-T0006, Rev. 1, Specification for Field Applied Special Protective Coatings for Secondary Containment Areas;<br>24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection.<br>24590-LAW-SSC-S15T-00032, Rev. A, Steel Framing Elevation +28' Non Process and Effluent Cells (Calculations);<br>24590-LAW-DBC-S13T-00028, Rev. A, Elevated Floor Slab Design @ El. +28'-0". | The LAW facility drawings show secondary containment room L-0218 being considered is located inside the building. Because it is located inside the building, traffic, heavy equipment, precipitation and frost are not applicable load cases. The Secondary Containment Design document identifies the applicable load cases (operational stresses) from site specific conditions that must be considered in the design. The Engineering Specification for Field Applied Special Protective Coating includes specific provisions for protection of and repair of completed special protective coating material. The Material Selections for Building Secondary Containment document addresses the potential effects of operations conditions on special protective coating integrity and the associated maintenance requirements. Daily operational loads, static head, and pressure gradient due to liquid release inside the secondary containment room are considered adequately in the design calculations which show that it has sufficient strength to sustain the applicable loads. |

| | Information Assessed | Source of Information | Assessment |
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| Foundation Integrity | The Secondary Containment is properly supported by a foundation or base in order to prevent failure from settlement, compression, or uplift, including the residual effects of installation. | 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>24590-LAW-SSC-S15T-00032, Rev. A, Steel Framing Elevation +28' Non Process and Effluent Cells (Calculations);<br>24590-LAW-DBC-S13T-00028, Rev. A, Elevated Floor Slab Design @ El. +28'-0". | Settlement, compression, or uplift including the residual effects of installation, are addressed in the Secondary Containment Design document and the Structural Design Criteria. The requirements identified in the codes and standards specified in these design documents are adequate to satisfy the performance goals. The subject secondary containment room L-0218 is located at floor Elev. 28'-0" which is not directly subjected to foundation settlement, compression or uplift including residual effects. Their effect has been appropriately considered on the foundation of the structures at Elev. (-) 21'-0" which support the subject secondary containment elements. It is contained in the section above for Elev. (-) 21'-0" level. |
| | The placement, structural support, and type of material used for backfill around and below the Secondary Containment are appropriate. | Drawings listed above under References;<br><br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>24590-BOF-3PS-CE01-T0001, Rev. 6, Engineering Specification for Excavation and Backfill;<br>24590-BOF-3PS-C000-T0001, Rev. 4, Engineering Specification for Material Testing Services. | The LAW facility drawings show the secondary containment room L-0218 being considered is located inside the building at Elev. 28'-0". Because the subject room is located at Elev. 28'-0", the backfill material requirements are not applicable. However, the design requirements for foundations and structure that support the secondary containment components are adequately addressed in the Structural Design Criteria, Excavation and Backfill, and Material Testing documents. These documents contain adequate industry standards for designing, selecting and testing fill materials, placing and compacting backfills, and testing to ensure adequate compaction below and around the foundations of the structures. The foundations evaluation is included above in the section for Elev. (-) 21'-0" level. |

| | Information Assessed | Source of Information | Assessment |
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| **Infiltration** | The design or operation (e.g., diking & curbing) prevents run-on or infiltration of precipitation into the Secondary Containment system unless the collection system has sufficient excess capacity (25 yr rainfall) to contain the run-on precipitation. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design. | The Basis of Design document requires the design to provide adequate measures to prevent run-on or infiltration of precipitation. The secondary containment room L-0218 is located inside the LAW Vitrification Building where it is protected from direct precipitation by the building structure as shown in the general arrangement drawings, therefore, this requirement does not apply. |
| | The design includes an external moisture barrier or other means to prevent moisture from entering the room. | Drawings listed above under References;<br><br>24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design. | The Basis of Design document requires the design to include provisions to prevent external moisture intrusion. The secondary containment room L-0218 shown in the general arrangement drawings is inside the LAW Vitrification Building which shields it from precipitation and surface water percolation, therefore, this requirement does not apply to this secondary containment. |

| | Information Assessed | Source of Information | Assessment |
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| Liner System | The containment area is free of cracks or gaps and the design discusses methods of their minimization. | 24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design; 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design; 24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection; 24590-WTP-3PS-AFPS-T0006, Rev. 1, Specification for Field Applied Special Protective Coatings for Secondary Containment Areas. | The Basis of Design document requires the liner system to be installed must be free of deficiencies such as cracks and gaps and its installation should be inspected and documented by an independent qualified installation inspector or independent qualified professional engineer trained and experienced in installation of tank systems. The Secondary Containment Design document provides current adequate design requirements, and codes and standards to design leak tight liners. This document includes appropriate details for installation of the special protective coatings free of cracks and gaps. The Material Selections and Special Protective Coatings documents provide adequate requirements for the secondary containment protective coating material. |
| | The design has considered the compatibility of the concrete liner or coatings and waste and presents information on coatings planning to be used from the manufacturer addressing compatibility with the stored waste. The lining or coating must prevent the waste from migrating into the concrete. | 24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection; 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design; 24590-WTP-3PS-AFPS-T0006, Rev. 1, Specification for Field Applied Special Protective Coatings for Secondary Containment Areas; 24590-LAW-PER-M-02-002, Rev. 6, Flooding Volume for LAW Facility. | The Material Selections and Special Protective Coating documents contain general information on the compatibility of planned secondary containment special protective coatings with the waste. The secondary containment room L-0218 has special protective coating applied to the floor and its containment walls. The Flooding Volume document provides the height of the secondary containment wall. The Secondary Containment Design and Special Protective Coatings documents provide standard installation details for the special protective coatings. Surface preparations and applicable details such as corner coving on floor/wall and wall/wall joints as described and/or shown in the aforementioned documents will ensure leak-tight protective coating layer that will stop the migration of the waste into the concrete. |

| | Information Assessed | Source of Information | Assessment |
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| **Design** | Description of subsurface conditions and soil bearing capacity are adequate. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>WTSC99-1036-42-17, RPP-WTP Final Report Geotechnical Investigation, Shannon & Wilson Inc. (H-1616-51), May 2000;<br>24590-BOF-3PS-CE01-T0001, Rev. 6, Engineering Specification for Excavation and Backfill;<br>24590-BOF-3PS-C000-T0001, Rev. 4 Engineering Specification for Material Testing Services. | The Structural Design Criteria provides adequate design guidance for both mat and spread footings based on the Geotechnical Investigation report for the facility. Bearing capacity and settlement design parameters are presented for the dense Hanford Upper and Lower Sand Units and Structural Fill. Use of the loose wind blown (dune) sands for foundations is precluded. The Specification for Excavation and Backfill provides structural backfill requirements based on the geotechnical report and current codes and standards for the selection, placing, compacting, and backfill testing of candidate fill materials and completed backfills. The Specification for Material Testing Services provides current adequate codes and standards for testing of the candidate structural fill materials, and in-situ testing of structural fills as they are placed. Room L-0304F identified in the scope is located at Elev. 48'-0" level inside the building. The subsurface and soil related items do not directly associate with it but do have an overall effect on its structural strength from the foundation below at Elev. (-) 21'-0" which has been discussed in the section above. |

| | Information Assessed | Source of Information | Assessment |
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| Design (cont'd) | Foundation design loads (including full tanks) and estimated settlement are adequately considered. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>ASCE 7-98, Minimum Design Loads for Buildings and Other Structures;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary;<br>ACI 349-01, Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary;<br>24590-LAW-DBC-S13T-00034, Rev. A, Elevated Floor Slab Design @ +48'-0" (Calculations);<br>24590-LAW-SSC-S15T-00049, Rev. A, Steel Framing at EL. +48' (Calculations);<br>24590-WTP-3DP-G04B-00037, Rev. 15B, Engineering Calculations. | The Structural Design Criteria uses current adequate standards to define design loads and load combinations (ASCE 7-98, ACI 318-99, and ACI 349-01). Dead and fluid loads are included in these loads and load combinations. Settlement design parameters are included in the Structural Design Criteria (Section 7.7, Geotechnical Design Parameters and Foundation Design). The room L-0304F identified in the scope is located at Elev. 48'-0" level inside the building. The subsurface and soil related items do not directly associate with it but do have an overall effect on its structural strength from the foundation below. However, the review of the design calculations of the immediate slab and steel framing members that support the scrubber (LVP-SCB-00001) located on the floor in the bermed section of room (L-0304F) show that full weight of the scrubber has been appropriately considered. The methodology described in the Engineering Calculations document assures that the final secondary containment structure is designed to comply with all applicable requirements. |
| | Design calculation approach and design basis of footings with design standard references (e.g., ACI) are adequate. | 24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary;<br>AISC M016-89, Manual of Steel Construction, Allowable Stress Design, Ninth Edition;<br>24590-LAW-DBC-S13T-00034, Rev. A, Elevated Floor Slab Design @ +48'-0" (Calculations);<br>24590-LAW-SSC-S15T-00049, Rev. A, Steel Framing at EL. +48' (Calculations). | The Basis of Design provides many fundamental general requirements for footing design. The Structural Design Criteria document references current adequate detailed design criteria for the design of concrete foundations and footings. ACI 318-99 is referenced for the strength design of the concrete structures and AISC M016-89 for the structural steel framing elements of the facility. The design calculations reviewed show that the approach and basis used for design are adequately utilized per the required codes and standards and the requirements have been appropriately met in the design process of the secondary containment room footings. |

| | Information Assessed | Source of Information | Assessment |
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| **Foundation Design** | Foundation material is compatible with the soil. | 24590-WTP-3PS-DB01-T0001, Rev. 8, Engineering Specification for Furnishing and Delivering Ready-Mix Concrete; 24590-BOF-3PS-C000-T0001, Rev. 4, Engineering Specification for Material Testing Services. | The specification for Furnishing and Delivering Ready-Mix Concrete provides adequate current requirements for the selection of coarse and fine aggregates, and the procurement of cementitious materials. The specification for Material Testing Services provides adequate test procedures for testing the candidate aggregates to ensure adequate concrete durability. The room L-0304F identified in the scope is located at Elev. 48'-0" level inside the building. The subsurface and soil related items do not directly associate with it but do have an overall effect on its structural elements from the foundations below which has been appropriately addressed in the section above for Elev.(-) 21'-0" level. |
| | Foundation will withstand the effects of frost heave. | 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria. | The Structural Design Criteria requires all structural foundations for outdoor components to extend below the 30" frost line from the finished grade (Elev. 0'-0"). Room L-0304F is located inside the building at Elev. 48'-0", therefore, it is not subjected to the detrimental effects of the frost heave. |

| Information Assessed | | Source of Information | Assessment |
|---|---|---|---|
| **Seismic** | Seismic considerations have been adequately addressed. | 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design;<br>24590-WTP-PSAR-ESH-01-002-03, Rev. 4I, Preliminary Documented Safety Analysis to Support Construction Authorization: LAW Facility Specific Information;<br>24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria;<br>UBC 1997, Uniform Building Code;<br>ACI 318-99, Building Code Requirements for Structural Concrete and Commentary;<br>AISC M016-89, Manual of Steel Construction - Allowable Stress Design, Ninth Edition;<br>24590-LAW-DBC-S13T-00034, Rev. A, Elevated Floor Slab Design @ +48'-0" (Calculations);<br>24590-LAW-SSC-S15T-00049, Rev. A, Steel Framing at EL. +48' (Calculations). | The Secondary Containment Design document describes and provides references for the design methodology, materials, loads, and load combinations (including seismic loads) for the LAW facility secondary containment components. The LAW Facility PDSA document shows the room in this integrity assessment to be Seismic Category-III (SC-III) components. The Structural Design Criteria document provides detailed discipline specific codes and standards for the design of SC-III LAW secondary containment foundations, structures, and liners by the design engineers. Design loads and analysis methods for SC-III secondary containments and liners are taken from the Uniform Building Code (UBC 1997). The ACI 318-99 code provides the design requirements and load combinations for the design of the secondary containment reinforced concrete foundations and structures. The AISC M016-89 code is used for the design of SC-III secondary containment structural steel elements. The above listed code and standards adequately address the consideration of the requirements of the applicable seismic loads. Review of the design calculations show that the seismic loads have been appropriately considered in the design process of the secondary containment elements. |

| | Information Assessed | Source of Information | Assessment |
|---|---|---|---|
| **Liner System** | The containment area is free of cracks or gaps and the design discusses methods of their minimization. | 24590-WTP-DB-ENG-01-001, Rev. 1O, Basis of Design; 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design; 24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection; 24590-WTP-3PS-AFPS-T0006, Rev. 1, Specification for Field Applied Special Protective Coatings for Secondary Containment Areas. | The Basis of Design document requires the liner system to be installed must be free of deficiencies such as cracks and gaps and its installation should be inspected and documented by an independent qualified installation inspector or independent qualified professional engineer trained and experienced in installation of tank systems. The Secondary Containment Design document provides current adequate design requirements and codes and standards to design leak tight liners. This document includes appropriate details for installation of special protective coatings free of cracks and gaps. The Material Selections and Special Protective Coatings documents provide adequate requirements for the secondary containment protective coating materials. |
| | The design has considered the compatibility of the concrete liner or coatings and waste and presents information on coatings planning to be used from the manufacturer addressing compatibility with the stored waste. The lining or coating must prevent the waste from migrating into the concrete. | 24590-WTP-PER-M-02-001, Rev. 3, Material Selections for Building Secondary Containment/Leak Detection; 24590-WTP-3PS-AFPS-T0006, Rev. 1, Specification for Field Applied Special Protective Coatings for Secondary Containment Areas; 24590-WTP-PER-CSA-02-001, Rev. 8, Secondary Containment Design. | The Material Selections and Special Protective Coating documents contain general information on the compatibility of planned secondary containment special protective coatings with the waste. The Secondary Containment Design and Special Protective Coatings documents provide standard installation details for the special protective coatings. Surface preparations and applicable details such as corner coving on floor/wall and wall/wall joints as described and/or shown in the aforementioned documents will ensure leak-tight protective coating layer that will stop the migration of the waste into the concrete. |

# Master Distribution Schedule for WTP Project Subcontract Management Group



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| **Subcontract Title:** | Tank Integrity Design Assessments |
| **Subcontractor Name:** | AREVA Federal Services LLC |
| **Subcontract Administrator:** | Jennifer Broadbent |

| PDC Document Number | Rev | Document Title | Rev |
|---|---|---|---|
| CCN #169564 | | IQRPE Structural Integrity Assessment Report For LAW Secondary Containment (IA-3002605-000) | |
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# Leak Detection Capability in the Pretreatment Facility

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*Signature* *Date*

This bound document contains a total of 20 sheets

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# Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# History Sheet

| Rev | Reason for revision | Revised by |
|---|---|---|
| 0 | Issued for Permitting Use | G. Chiaramonte |
| 1 | Correct permit condition reference to III.10.G.10.e.ii in Sections 1 and 3 | G. Chiaramonte |
| 2 | Updated to include current design | P. Rajagopalan |

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# Acronyms

| | |
|---|---|
| AEA | Atomic Energy Act of 1954 |
| C2 | contamination control zone 2 |
| C3 | contamination control zone 3 |
| DOE | US Department of Energy |
| DWP | Dangerous Waste Permit |
| FRP | Feed Receipt Process |
| LAW | low activity waste |
| PIH | Pretreatment In-cell Handling |
| PT | pretreatment |
| PTF | pretreatment facility |
| PWD | Plant Wash and Disposal |
| RDMC | Remote Decontamination Maintenance Cave |
| RFD | reverse flow diverter |
| RDP | Resin Disposal Process |
| RLD | Radioactive Liquid Disposal |
| TLP | Treated LAW Evaporation Process |
| WAC | Washington Administrative Code |
| WTP | Hanford Tank Waste Treatment and Immobilization Plant |

- leaks from vessels, equipment and/or piping containing DWP regulated waste that flow by gravity directly to sumps containing leak detection instrumentation
- leaks that flow by gravity to floor drains that are routed to another cell that contains a sump with leak detection instrumentation.

Leaks collected in drain systems that flow to vessels or tanks are not in scope. Areas within the PTF that employ open floor drains for containment are routinely accessible and leak detection will be provided by daily visual inspection, or other approved method, and for that reason are not addressed in this report.

Leaks from ancillary equipment/piping that are detected by routine visual inspection are not in scope.

# 3 Description

The PT facility secondary containment area sumps must satisfy the leak detection criteria of the WAC and DWP conditions for secondary containment systems. The regulatory requirements for leak detection are contained in WAC-173-303-640(4), Tank Systems, Containment and Detection of Releases (Ref. 1) and are stated as follows:

> "(b) Secondary Containment systems must be:
> (ii) Capable of detecting and collecting releases and accumulated liquids until the collected material is removed.
> (c) To meet the requirements of (b) of this subsection, secondary containment systems must be at a minimum:
> (iii) Provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of dangerous waste or accumulated liquid in the secondary containment system within twenty-four hours, or at the earliest practicable time if the owner or operator can demonstrate to the department that the existing detection technologies or site conditions will not allow detection of a release within twenty-four hours."

In addition, the Waste Treatment Plant Dangerous Waste Permit (Ref. 2), , Conditions III.10.E.9.e.ii and III.10.G.10.e.ii require submittal of:

> "Detailed plans and descriptions, demonstrating the leak detection system is operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of dangerous and/or mixed waste, or accumulated liquid in the secondary containment system within twenty-four (24) hours. Detection of a leak of at least 0.1 gallons per hour within twenty-four (24) hours is defined as being able to detect a leak within twenty-four (24) hours. Any exceptions to this criteria must be approved by Ecology." [WAC 173-303-640(4)(c)(iii), WAC 173-303-806(4)(c)(vii)];

# 4 Inputs and Assumptions

## 4.1 Inputs

1. Sump type, leak detection type, and nominal sump dimensions are derived from "Sump Data for PT Facility" (Ref. 3).

2. The stainless steel liners in the vessel cells, filter cave (P-0335), and in the hot cell are sloped at a minimum slope of 1:100 (1 %) to direct potential leakage in these areas to their respective sump.

## 4.2 Evaluation Assumptions

1. The following group of assumptions were used to determine leak detection capability (Ref 4).
   a. The liquid leaking is water at a temperature of 100 °F.
   b. The leak is at a constant rate over the twenty-four hour period.
   c. The leak is assumed to occur at the farthest point from the sump.
   d. No evaporation will occur.
   e. The liquid does not foam in the sumps.
   f. Hold-up will be considered. Hold-up is defined as wetting of the surface.
   g. Level detection instruments will be properly installed and calibrated upon installation. Periodic, normal maintenance and calibration will be performed on level instruments during operation of the facility and the instruments will be maintained in an operable condition.
2. The furthest point from the sump is assumed to be bounded by the furthest corner of the cell which contains the sump with exception of the sump in the minus 45 ft elevation pit (PWD-SUMP-00040). The flow path for each cell is conservatively considered to be along the straight walls rather than diagonally across the cell.
3. For the minus 45 ft elevation pit, the furthest point from the sump is considered to be the furthest horizontal leak path via the pipe tunnels. The vertical drop from the tunnel to the pit floor is neglected.
4. There are no obstructions in the flow path. Leaks from any equipment or piping fall directly to the floor at the point of leakage and do not travel along pipes or other equipment.
5. The floor is uniformly sloped and the flow path is in straight lines (no meandering flow).
6. Radar leak detection is stated by the radar instrument supplier to be accurate within ±10 mm, i.e., the minimum level of liquid in the sump must rise to at least 10 mm before it is detected by the radar instrument. The radar guide tube is located 1/2 inch from the bottom of the sump. It is not necessary for the liquid level to be within the guide tube before the radar will detect it. However, because the bottom of the sump is dished (it is formed from an ellipsoidal head) and because the radar guide tube is offset from the center of the sump by no more than 8 inches, the level as measured from the center of the sump must rise slightly higher in the sump to be within the radar's 10 mm detection specification. Therefore, for conservatism, a 10% contingency is added to the vertical distance from the bottom of the sump to point of measurement, to bound the height requirement. It is assumed that all sumps listed in table 7.2 (except PWD-SUMP-00040) have level indicators located within 8" from the centerline; this dimension provides a bounding value to simplify calculations while demonstrating that the current design exceeds leak detection requirements.
7. The pneumatic bubbler leak detection instrument in the minus 45 ft elevation pit sump (PWD-SUMP-00040) uses a 1/2 inch Sch 40 pipe dip pipe with a straight end (not slanted). The bottom of the dip pipe is located 1/4 inch from the bottom of the sump. The leak detection instrumentation includes a pneumatic level transmitter that can detect a level that is 1 inch above the bottom of the dip tube. Therefore, added to the 1/4 inch dip tube clearance, the water must rise to a total depth in the sump of at least 1.25 inches before it can be detected.
8. The thermal conductivity switch in PWD-SUMP-00035 in Room P-0122A can detect liquid as soon as it reaches the level of the contacts. The switch will be located within 1/2 inch of the sump bottom, but the switch will be assumed offset from the center by up to 4 inches. Therefore, for conservatism,

it is assumed that the detectable level in this sump is one inch from the bottom of the sump measured in the center.

9. Sump PWD-SUMP-00040 has a "trough" in the bottom of the sump that is 30 inches long, 10 inches wide, and at least 1.25 inches deep. Leaks collected in the sump trough will meet the DWP leak detection requirements. This trough will be placed across the 30 inch width of the sump and is to be 10 inches wide. The minimum 1.25 inch depth is the minimum level the leak detection instrumentation can detect. The bottom of leak detection instrument is located 0.25 inches above the bottom of the trough in the sump.

# 5 Analysis

The PT facility contains 25 DWP-regulated sumps (Ref. 3). All sumps are dry type, that is, the sumps are dry unless there is a leak or condensation that reaches the sump. All sumps except one are the same size (nominally 30 inches O.D. x about 28 inches deep, hereinafter referred to as "round" sumps). The exception is the sump in the minus 45 ft elevation pit which is much larger and rectangular in shape (60 in x 30 in x 30 in deep). All sumps except the minus 45 ft elevation pit sump (PWD-SUMP-00040) and PWD-SUMP-00035 in Room P-0122A are provided with radar type leak detection. The pit sump (PWD-SUMP-00040) uses a conventional pneumatic bubbler and level transmitter to detect leaks. PWD-SUMP-00035 in Room P-0122A (Waste Packaging Area) uses a thermal conductivity switch.

Leaks in the remote filter cave (P-0335) would flow along the floor of the cave through the openings in the cave floor to PWD-SUMP-00005 or PWD-SUMP-00006 directly below the filter cave (P-0335) in a black cell (rooms P-0102A and P-0102, respectively).

Leaks from vessels or ancillary equipment/piping within the cells will flow along the floor and will be collected in a sump and detected with level instrumentation.

# 6 Detectable Leak Rates

Minimum 24-hour leak detection rates are evaluated for each of the secondary containment sumps in the PT facility. The leak detection rate varies with the travel distance of the leak, the longer the travel distance, the greater is the 24-hour leak detection rate. The bounding case for the 30-inch diameter round sump indicates a maximum leak travel distance of 137 ft which corresponds to PWD-SUMP-00026. The minimum 24 hour leak detection rate for this sump is 0.09 gal/hr. Leak detection rates for all 30-inch diameter sumps range from 0.05 to 0.09 gal/hr.

For the larger sump located in the minus 45 ft elevation pit (PWD-SUMP-00040), the maximum leak travel distance is 209 ft. The minimum 24 hour leak detection rate for this sump is 0.1 gal/hr.

Results of the evaluation for all PT facility sumps are provided in Table 6.1.

**Table 6.1 Minimum Leak Detection Rates for PT Facility Sumps**

| Sump PIN PWD-SUMP-000xx | Max. Leak Travel Distance ft | Volume of Leak to Reach Sump gal $V_r$ | Volume of Leak for Detection in Sump gal $V_s$ | Total Volume of Leak Detectable in 24 hours gal $V_t$ | 24-Hour Leak Rate Detected (rounded) gal/hr |
|---|---|---|---|---|---|
| 40 | 209 | 0.746 | 1.62 | 2.366 | 0.10 |
| 01 | 105 | 0.616 | 1.11 | 1.726 | 0.07 |
| 01A | 106 | 0.625 | 1.11 | 1.735 | 0.07 |
| 02 | 105 | 0.616 | 1.11 | 1.726 | 0.07 |
| 02A | 105 | 0.616 | 1.11 | 1.726 | 0.07 |
| 03 | 107 | 0.633 | 1.11 | 1.743 | 0.07 |
| 04 | 107 | 0.633 | 1.11 | 1.743 | 0.07 |
| 05 | 106* | 0.625 | 1.11 | 1.735 | 0.07 |
| 06 | 115* | 0.761 | 1.11 | 1.871 | 0.08 |
| 07 | 83 | 0.436 | 1.11 | 1.546 | 0.06 |
| 08 | 83 | 0.436 | 1.11 | 1.546 | 0.06 |
| 09 | 85 | 0.450 | 1.11 | 1.560 | 0.07 |
| 10 | 64 | 0.308 | 1.11 | 1.418 | 0.06 |
| 11 | 84 | 0.443 | 1.11 | 1.553 | 0.06 |
| 12 | 93 | 0.512 | 1.11 | 1.622 | 0.07 |
| 13 | 95 | 0.529 | 1.11 | 1.639 | 0.07 |
| 26 | 137 | 0.965 | 1.11 | 2.075 | 0.09 |
| 28 | 91 | 0.497 | 1.11 | 1.607 | 0.07 |
| 29 | 135 | 0.939 | 1.11 | 2.049 | 0.09 |
| 31 | 33 | 0.140 | 1.11 | 1.250 | 0.05 |
| 32 | 106 | 0.625 | 1.11 | 1.735 | 0.07 |
| 33 | 68 | 0.333 | 1.11 | 1.443 | 0.06 |
| 34 | 45 | 0.200 | 1.11 | 1.310 | 0.05 |
| 35 | 105 | 0.616 | 1.11 | 1.726 | 0.07 |
| 36 | 85 | 0.450 | 1.11 | 1.560 | 0.07 |
| | | | | | |

Note 1: PWD-SUMP-00005 (P-102A) and PWD-SUMP-00006 (P-102) consider distances traveled by leaks in the filter cave (P-0335) through the floor openings into the black cell rooms below and the distance in the black cells to the respective sumps.

* The distance traveled for PWD-SUMP-00005, is 90 ft in room P-0102A and 106 ft from P-0335 (Filter Cave Room). The bounding value of 106 ft is used. The distance traveled for PWD-SUMP-00006, is 82 ft in room P-102 and 115 ft from P-0335 (Filter Cave Room). The bounding value of 115 ft is used.

# 7 Bounding Calculations

## 7.1 Methodology

The minimum leak flow rate that can be detected in 24 hours is calculated by estimating the volumes of two components of the leak:

1. The minimum detectable quantity of liquid in the sump, $V_s$ (in gallons)
2. The volume associated with the leak "rivulet" as the leak flows along the floor to the sump, $V_r$ (in gallons)

The total volume of the leak is then $V_t = V_r + V_s$

The minimum detectable flow rate is then:

$Q = V_t/24$ hours, in units of gal/hr

### 7.1.1 Minimum Detectable Volume in the Sump

#### 7.1.1.1 Round Sumps

The round sumps are nominal 30 inches in diameter and about 28 inches in depth. The round sumps are formed from 30-inch Sch 10S pipe (I.D. = 29.376 in). The bottom consists of a 2:1 ellipsoidal head. The level indication for detecting a leak is not directly in the middle of the sump because of installation requirements. Off-center level indication means that the liquid level needs to rise up the curvature of the sump for detection.

$$y = \frac{1}{2}\sqrt{\frac{D^2}{4} - x^2}$$

Where, y = vertical distance from top of sump to off-center point, in
D = inside diameter of sump, in
x = horizontal distance from center of sump to off-center point, in

$$d = 0.25 * D$$

Where, d = height of ellipsoidal part of sump, in
D = inside diameter of sump, in

$$h = (d - y + z) * C$$

Where, h = minimum height of liquid for leak detection in sump, in
d = height of sump, in
y = vertical distance from top of sump to off-center point, in

z = instrument accuracy, in
C = margin, %

The minimum detectable volume in the sump is determined from the formula that relates depth in the ellipsoidal head to volume:

$$V_s = \pi D h^2 \left[1 - \frac{4h}{3D}\right]$$

Where $V_s$ = volume based on the liquid level h, cubic inches

h = height of liquid in the sump, inches
D = sump inside diameter, inches

$V_s$ in cubic inches is then converted to gallons with a conversion factor

#### 7.1.1.2 Rectangular Sump

The only rectangular sump in the PT facility is in the minus 45 ft elevation pit. This sump (PWD-SUMP-00040) is 60 in x 30 in x 30 inches deep (Ref. 3, Table 1).

The minimum detectable volume in the sump is

$V_s = L \times W \times h$

Where L = length, inches
W = width, inches
h = depth of liquid in sump, inches

$V_s$ in cubic inches is then converted to gallons with a conversion factor

### 7.1.2 Wetted Volume For Flow of Liquid Across the Floor of the Cell

When a liquid flows down an inclined surface at a low rate, separate rivulets form instead of a continuous film. The hydrodynamics of rivulet flow have been empirically measured and mathematically modeled (Ref. 5). The relationships provided in this reference are used to estimate the wetted volume for flow across the cell floor. In this reference, steady state theoretical solutions are developed for the laminar flow based on the reduced form of the Navier-Stokes equations using special boundary conditions that include contact angle (angle formed by the edge of the rivulet and the surface) and relations between the pressure inside and outside the curved interface. The shape of the interface and the velocity profile in the rivulet are obtained and an integration of this velocity profile gives a relation between the rivulet width and the flow rate. This relation contains the slope, contact angle of the liquid on the surface, and the fluid properties: viscosity, density and interfacial surface tension. In simpler terms, this analysis considers that the flow rate is a balance of gravitational forces which drive the flow and viscous forces which resist the flow.

In Ref. 5, experimental measurements consisting of rivulet width measurements as a function of rivulet flow rate were conducted for a variety of liquids including water. The data was checked against the models and found to be in good agreement.

Based on the information in Ref. 5, for the range of flow rates of interest in this calculation, the solution to the flow equations can be simplified by considering the rivulet as a relatively wide and flat rectangular shape. For this shape of rivulet, the maximum flow depth, $Y_o$ is given by:

$$Y_o = 2\sin\theta/2 \qquad \text{Equation 1}$$

Where θ = contact angle (angle formed at the edge of the rivulet where it contacts the surface)

The width of the rivulet, *l*, is determined by (see Equation 27 in Ref. 5) as follows:

$$\frac{\mu Q \tan\alpha}{l\gamma}\sqrt{\frac{\rho g \sin\alpha}{\gamma}} = \frac{8}{3}\sin^3\theta/2 \qquad \text{Equation 2}$$

Where:
α = angle of inclination (slope) between the surface and vertical (90° - slope in degrees)
γ = interfacial surface tension, dynes/cm = g/sec$^2$
μ = viscosity, g/cm sec
θ = contact angle (measured from the surface), degrees
ρ = density of liquid, g/cm$^3$
*l* = rivulet width, cm
Q = flow rate, cm$^3$/sec
g = acceleration of gravity, cm/sec$^2$

Note that centimeter, gram, second (CGS) units are used in this calculation for consistency with the reference. The volume and flow rate results then are converted to English units.

Rearranging and solving for *l* gives:

$$l = \frac{3\mu Q \tan\alpha}{8\gamma(\sin^3\theta/2)}\sqrt{\frac{\rho g \sin\alpha}{\gamma}} \qquad \text{Equation 3}$$

The contact angle, θ, is unknown, but according to Table 2, Ref. 5, at a flow rate of 6.3 cm$^3$/min (~0.1 gal/hr), the contact angle was measured experimentally at 9-12°. At lower flow rates, the measured contact angle varied from 3 to 8 degrees but did not show proportionality to flow rate possibly due to varying shape of the rivulet and/or the slope of the surface. Low contact angles applied in equations 1 and 3 yield results of disproportionately wide and shallow rivulets (*l* is very large compared to $Y_o$). In the experiments, rivulet width varied up to a maximum of about 4 cm with most of the widths in the range of 0.4 to 3 cm for the smallest incline tested. Rivulet widths below 3 cm correspond to a contact angle of about 6 degrees. Below 6 degrees, widths increase greatly and at contact angles of 4 degrees and lower, the solution does not converge. Therefore, for purposes of this calculation, for flow rates ~0.05 gal/hr, contact angles between 6 degrees and 12 degrees are considered bounding, with the lower of the two angles yielding the highest flow rate. For flow rates of 0.1 gal/hr and higher, a range of 9 degrees to 12 degrees is used; 9 degrees yields the highest flow rate, so it is the most conservative.

The remainder of the calculation procedure is now iterative by performing the following steps:

Step 1 - Assume a contact angle and assume a starting flow rate, Q
Step 2 - Calculate the volume of the rivulet as follows:

Since the rivulet is approximated as rectangular, the cross-sectional area, *A*, of the rivulet is:

$A = Y_o l$, where A is in the units of $cm^2$

The total volume of the rivulet, in $cm^3$, is $V_r$

$V_r$ = A x flow path length (in cm)

$V_r$ is then converted to gallons by dividing by 3785 $cm^3$/ gal.

Step 3 - Calculate a total volume of liquid collected in 24 hours:

Add the rivulet volume, $V_r$, (in gallons) to the volume of liquid collected in the sump to get $V_t$, the total volume of liquid leaked in a 24 hour period.

i.e., $V_t = V_r + V_s$

Step 4 - Calculate an adjusted total 24 hour flow rate, i.e.,

$Q_{adj} = V_t/24$

This new adjusted Q takes the total volume of liquid into account whereas the starting Q only considered the volume of the sump. Therefore, $Q_{adj}$, may differ from the initial estimate for Q if the volume of the rivulet is significant relative to the volume of the sump, so an iterative trial and error is performed by setting the new trial $Q = Q_{adj}$ from the first trial. This is continued until the starting Q matches the final $Q_{adj}$ (i.e., the iteration converges).

## 7.2 Bounding Calculations

### 7.2.1 Calculation for the Longest Leak Travel Distance for the Sumps

The maximum leak travel distances for each sump in the facility is derived from the cell dimensions and sump locations as provided in the facility general arrangement drawings (Ref. 6, 7). As indicated in Assumption 2, the maximum leak travel distance is computed by summing the distance along the walls from the furthest corner of the cell, i.e., adding the north-south wall distance to the east-west wall distance. For the minus 45 ft elevation pit, per Assumption 3, the furthest distance is derived by summing the distance from the furthest point in the pipe tunnel (in this case the north tunnel is the longest distance) with the east-west distance along the north wall of the pit. A summary of distance data for each sump is provided in Table 7.1.

**Table 7.1 Maximum Leak Distances for Each Sump**

| Elev. | Room Number | Room Name | Sump PIN PWD-SUMP-000xx | Sump Location in Cell | N-S Distance | E-W Distance | Total Distance, ft (rounded up) |
|---|---|---|---|---|---|---|---|
| 0'-0" | P-0108B | Feed Receipt Cell | 1 | NW corner | 52'-6" | 52'-4" | 105 |
| 0'-0" | P-0108C | Feed Receipt Cell | 1A | SW corner | 53'-6" | 52'-4" | 106 |
| 0'-0" | P-0108A | Feed Receipt Cell | 2 | SE corner | 52'-6" | 52'-4" | 105 |
| 0'-0" | P-0108 | Feed Receipt Cell | 2A | SW corner | 52'-0" | 52'-2" | 105 |
| 0'-0" | P-0106 | Feed Evaporator/Ultra-Filtration Cell | 3 | S wall | 52'-0" | 55'-0" | 107 |
| 0'-0" | P-0104 | Ultra Filtration Cell | 4 | S wall | 52'-0" | 55'-0" | 107 |
| 0'-0" | P-0102A | HLW Receipt/Storage/ Blending Cell | 5 | S wall | 52'-0" | 38'-0" | 90 |
| 56'-0" | P-0335 | Filter Cave Room | 5* | N/A | 52'-0" | 54'-0" | 106 |
| 0'-0" | P-0102 | HLW Receipt/Storage/ Blending Cell | 6 | S wall | 52'-0" | 30'-0" | 82 |
| 56'-0" | P-0335 | Filter Cave Room | 6* | N/A | 52'-0" | 63'-0" | 115 |
| 0'-0" | P-0109 | Acidic/Alkaline Effluent Collection Cell | 7 | NE corner | 54'-0" | 28'-6" | 83 |
| 0'-0" | P-0111 | Cs Ion Exchange Cell | 8 | NW corner | 34'-6" | 48'-0" | 83 |
| 0'-0" | P-0112 | Cesium Effluent Recovery Cell | 9 | NE corner | 34'-6" | 50'-6" | 85 |
| 0'-0" | P-0113 | Reserved Space (TBD) | 10 | NW corner | 34'-6" | 29'-6" | 64 |
| 0'-0" | P-0114 | Treated LA W Collection Cell | 11 | NE corner | 34'-6" | 49'-6" | 84 |
| 0'-0" | P-0117 | Treated LA W Feed Cell | 12 | NW corner | 34'-6" | 57'-8" | 93 |
| 0'-0" | P-0117A | Treated LAW Feed Cell | 13 | NE corner | 34'-6" | 59'-10" | 95 |
| 0'-0" | P-0123 | Hot Cell | 26 | S wall | 51'-0" | 86'-0" | 137 |
| 0'-0" | P-0123 | Hot Cell | 28 | S wall | 51'-0" | 40'-0" | 91 |
| 0'-0" | P-0123 | Hot Cell | 29 | S wall | 51'-0" | 84'-0" | 135 |
| 0'-0" | P-0119 | Spent Resin Receipt | 31 | SW corner | 18'-0" | 15'-0" | 33 |
| 0'-0" | P-0123A | Remote Decon Maintenance Cave | 32 | SW corner | 51'-0" | 54'-6" | 106 |
| 0'-0" | P-0123A | Remote Decon Maintenance Cave | 33 | S wall | 51'-0" | 17'-0" | 68 |
| 0'-0" | P-0121A | Spent Resin Dewatering | 34 | SW corner | 18'-0" | 27'-0" | 45 |
| 0'-0" | P-0122A | Waste Packaging Area | 35 | SW comer | 52'-0" | 53'-0" | 105 |

**Table 7.1 Maximum Leak Distances for Each Sump**

| Elev. | Room Number | Room Name | Sump PIN PWD-SUMP-000xx | Sump Location in Cell | N-S Distance | E-W Distance | Total Distance, ft (rounded up) |
|---|---|---|---|---|---|---|---|
| 19'-0" | PM-0124 | Crane Maintenance | 35 | Drain | 51'-0" | 24'-0" | 75 |
| 0'-0" | P-0118 | Alkaline Effluent Collection Cell | 36 | SE corner | 54'-4" | 30'-6" | 85 |
| -45'-0" | P-B002 | HLW Drain Vessel Pit | 40 | W wall | 132'-0" | 77'-0" | 209 |

* The total distance traveled includes the distance in the filter cave (room P-0335) and the distance traveled in the room P-0102 and P-0102A respectively.

Based on the estimate of travel distances for leaks in each cell, the longest leak flow distance to any round sump was determined to be 137 ft for sump PWD-SUMP-00026 in the hot cell. The calculation for this bounding case is provided below.

### 7.2.1.1 Minimum Detectable Volume in the Sump

The level indication for detecting a leak is not directly in the middle of the sump and has installation requirements. Off-center level indication means that the liquid level needs to rise higher than the curvature of the sump for detection. The height from the top of the semi-ellipsoidal head to a point 8" off-center is determined by:

$$y = \frac{1}{2}\sqrt{\frac{D^2}{4} - x^2}$$

D = 29.376 in = inside diameter of a 30 inch Sch 10S pipe.
x = 8 inches (Assumption 6)

$$y = \frac{1}{2}\sqrt{\frac{(29.376in)^2}{4} - (8in)^2}$$

y = 6.159 in

$$d = 0.25 * D$$

D = 29.376 in = inside diameter of a 30 inch Sch 10S pipe.

$$d = 0.25 * 29.376in$$

d = 7.344 in

$$h = (d - y + z) * C$$

d = 7.344 in
y = 6.159 in
z = 10 mm or 0.394 in (assumption 6)
C = 1.10 (assumption 6)

$$h = (7.344in - 6.159in + 0.394) * 1.1$$

h = 1.737 in

The minimum detectable volume in the sump is calculated by:

$$V_s = \pi D h^2 \left[1 - \frac{4h}{3D}\right]$$

D = 29.376 in = inside diameter of a 30 inch Sch 10S pipe.
h = 1.737 in

$$V_s = \pi(29.376in)(1.737in)^2\left[1 - \frac{4(1.737in)}{3(29.376in)}\right]$$

$V_s$ = 256.5 cu in

Multiply by 0.00433 to convert cu in to gallons

**$V_s$ = 1.11 gal**

### 7.2.1.2 Wetted Volume For Flow of Liquid Across the Floor of the Cell

Based on the methodology described in Section 7.1.2, the bounding contact angle ,θ, is assumed to be 6°

Using Equation 1 (Section 7.1.2), the depth of the rivulet, $Y_o$, is calculated

$$Y_o = 2\sin\theta/2$$

$$Y_o = 2\sin 6\ \text{deg}/2$$

$Y_o$ = 0.105 cm

Next, the width of the rivulet is calculated using Equation 3 (Section 7.1.2)

$$l = \frac{3\mu Q \tan\alpha}{8\gamma(\sin^3\theta/2)}\sqrt{\frac{\rho g \sin\alpha}{\gamma}} \qquad \text{Equation 3}$$

α = (90° - 0.563°) = 89.437 degrees
γ = 69.9 dynes/cm = 69.9 g/sec$^2$
μ = 0.00678 g/cm sec
ρ = 0.993 g/cm$^3$
g = 980.7 cm/sec$^2$

The remainder of the calculation procedure is now iterative by performing the following steps:

Step 1 - Assume a starting flow rate, Q, and calculate the rivulet width, *l*

As a first estimate for Q, use the sump volume $V_s$/24 = 1.11 gal/24 hr = 0.046 gal/hr = 0.048 cm$^3$/sec

$$l = \frac{3(0.00678\ g\ /\ cm\ \text{sec})\ (0.048\ cm^3\ /\ \text{sec})\ \tan 89.437\ \text{deg}}{8(69.9\ g\ /\ \text{sec}^2)(\sin^3\ (6\ \text{deg}/\ 2))} \sqrt{\frac{0.993\ g\ /\ cm^3(980.7\ cm\ /\ \text{sec}^2)\sin 89.437\ \text{deg}}{(69.9\ g\ /\ \text{sec}^2)}}$$

$l = 4.63$ cm

Step 2 - Calculate the volume of the rivulet as follows:

Since the rivulet is approximated as rectangular, the cross-sectional area, A, of the rivulet is:

$A = Y_o l$,

$A = 0.105$ cm x 4.63 cm = 0.486 $cm^2$

The total volume of the rivulet, in $cm^3$, is $V_r$

$V_r$ = A x flow path length, cm

Path length = 137 ft x 30.48 cm/ft = 4176 cm

$V_r = (0.486\ cm^2)(4176\ cm) = 2029.5\ cm^3$

$V_r$ is then converted to gallons by dividing by 3785 $cm^3$/gal.

$V_r = 0.54$ gal

Step 3 - Calculate a total volume of liquid collected in 24 hours:

Add the rivulet volume, $V_r$, (in gallons) to the volume of liquid collected in the sump to get $V_t$, the total volume of liquid leaked in a 24 hour period.

i.e., $V_t = V_s + V_r$

$V_t = (1.11\ \text{gal} + 0.54\ \text{gal}) = 1.65$ gal

Step 4 - Calculate an adjusted total 24 hour flow rate, i.e.,

$Q_{adj} = V_t/24$

$Q_{adj} = (1.65\ \text{gal}/24\ \text{hr}) = 0.069$ gal/hr

The initial estimate for Q was 0.046 gal/hr so an iterative trial and error is performed until the starting Q matches the final $Q_{adj}$ (i.e., the iteration converges).

When the iterations converge, the flow rate is:

**Q = 0.09 gal/hr**

### 7.2.2 Calculation for the Longest Leak Travel Distance for the Rectangular Sump (Minus 45 ft Elevation Pit)

#### 7.2.2.1 Minimum Detectable Volume in the Sump

Minimum detectable volume of the rectangular sump is determined from:

$V_s = L \times W \times h$

Where L = 30 in
W=10 in
h = 1.25 in (Assumption 7)
$V_s = (30 \text{ in})(10 \text{ in})(1.25 \text{ in}) = 375 \text{ in}^3 = 1.62$ gal

#### 7.2.2.2 Wetted Volume For Flow of Liquid Across the Floor of the Cell

The same calculation process as performed in Section 7.2.1.2 is used to calculate the wetted volume for flow of liquid across the floor of the cell.

All input parameters are the same except:

The longest flow path length is 209 ft which is the distance through the north pipe tunnel into the sump. Contact angle is 9 degrees and starting flow rate for the iterations is 1.62 gal/24 hr = 0.068 gal/hr

Q is iterated until convergence is achieved.
At convergence the following are determined:

$l$ = 2.820 cm
$Y_o$ =0.157 cm
A= 0.443 cm2
$V_r$ = 0.746 gal
$V_t$ = 2.366 gal
Q = 0.099 gal/hr

Therefore rounded to one significant figure:

**Q = 0.1 gal/hr**

### 7.2.3 Minimum Flow Rates for the Remaining Round Sumps

Calculations for the remaining 23 sumps in the PT facility are performed using the same methodology described in Section 7.1 The only variable is the leak travel distance to the sump. The results are summarized in Table 6.1.

# 8 References

1. WAC 173-303, *Dangerous Waste Regulations*, Washington Administrative Code

2. WA7890008967, "*Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant."
3. 24590-PTF-PER-M-02-006, Rev. 5, "Sump Data For PT Facility," January 14, 2003
4. CCN 097799, Leak Detection Capability Scope Statement, Revision 6, 8/19/04
5. Towell, G.D. and Rothfeld, L.B., "Hydrodynamics of Rivulet Flow," September, 1966, *AIChE Journal*, Vol. 12, No.5, Pages 972-980
6. Drawing 24590-PTF-PI-P01T-00001, Rev. 7, PT Facility General Arrangement Plan at El. 0'-0"
7. Drawing 24590-PTF-PI-P01T-00003, Rev. 4, PT Facility General Arrangement Plan at El. 56'-0"

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# Waste Removal Capability for the Pretreatment Facility

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# Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

# History Sheet

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# Acronyms

| | |
|---|---|
| AEA | Atomic Energy Act of 1954 |
| C2 | contamination control zone 2 |
| C3 | contamination control zone 3 |
| DOE | US Department of Energy |
| DWP | Dangerous Waste Permit |
| FRP | Feed Receipt Process |
| LAW | low activity waste |
| PIH | Pretreatment In-cell Handling |
| PT | pretreatment |
| PTF | pretreatment facility |
| PWD | Plant Wash and Disposal |
| RDMC | Remote Decontamination Maintenance Cave |
| RFD | reverse flow diverter |
| RDP | Resin Disposal Process |
| RLD | Radioactive Liquid Disposal |
| TLP | Treated LAW Evaporation Process |
| WAC | Washington Administrative Code |

# 1 Summary

The Pretreatment Facility must satisfy the waste removal criteria of Washington Administrative Code (WAC) 173-303-640(4)(c)(iv) and Dangerous Waste Permit (DWP Number WA7890008967, Permit Condition III.10.E.9.e.iii and III.10.G.10.e.iii for tank and miscellaneous unit system secondary containment areas. This report evaluates the capability for removing, within 24 hours, leaked waste that may accumulate within the regulated secondary containment areas within the facility.

The process cells within the PT facility are stainless steel lined except for the minus 19 ft elevation pit which is epoxy lined. The liners are sloped to direct liquids to dry sumps in the cells. The process containment area outside the building (containment for tanks RLD-TK-00006A/B) is epoxy lined and sloped to a sump. The sumps within the building, except the minus 19 ft elevation pit, are emptied by steam driven ejectors that can transfer accumulated liquids to process vessels for storage and subsequent processing. The sump in the minus 19 ft pit (which is accessible) contains an electric pump for removing liquids. The sump in the radioactive liquid disposal (RLD) tank containment area is emptied with an electric pump. However, because the area is accessible, larger leaks can be more quickly removed using additional portable pumping equipment.

Waste removal capability is estimated for seven containment areas listed as follows:

1. Elevation 0 Black Cells/Hot Cell/Minus 45 ft Elevation Pit - Contains 15 black cells, the hot cell, and the minus 45 ft elevation pit that are hydraulically connected to form one containment area. The flooding volume in this area includes the volume of the largest vessel (one of the LAW feed receipt FRP-VSL-00002A/B/C/D vessels).

   Ejectors in all the sumps in the hydraulically connected black cells and hot cell transfer exclusively to PWD-VSL-00044 in Room P-0104 except that room's sump, PWD-SUMP-00004, which has two ejectors. One ejector transfers to PWD-VSL-00044 and the other transfers to the Ultrafiltration Feed Preparation Vessel UFP-VSL-00001B in the event that PWD-VSL-00044 is the leaking vessel. A waste removal estimate for Room P-0104 is shown below as containment area number seven.

2. Room P-0118 - Includes the alkaline effluent vessel RLD-VSL-00017A/B and the treated LAW evaporator condensate vessel, TLP-VSL-00002. The largest vessel is one RLD-VSL-00017A/B vessel. This area is provided with fire protection sprinklers.

3. Room P-0119 - Includes the spent resin dewatering vessel, RDP-VSL-00004, as the only vessel in this cell. The room has fire protection sprinklers.

4. Room P-0123A- Includes the soak decontamination tank, PIH-TK-00001, as the only tank in this cell. The room does not have a fire protection sprinkler system.

5. Room P-B005 - Includes the C2 floor drain collection vessel, PWD-VSL-00045, and the C3 floor drain collection vessel, PWD-VSL-00046. The flooding volume is based on overflow of these vessels in the event of maximum fire water discharge.

6. Room P-0150 - Includes the process condensate tanks, RLD-TK-0006A/B. Maximum flood volume is based on the volume of one of these vessels and the accumulation of rainwater from a 25 year, 24 hour storm.

7. Room P-0104 - Includes the Plant Wash Vessel, PWD-VLS-00044, the Ultrafiltration Feed Vessels (UFP-VSL-00002A/B), the Ultrafilter Permeate Collection Vessel (UFP-VSL-00062C), the Ultrafiltration Feed Preparation Vessel (UFP-VSL-00001B) and the Vessel Vent Caustic Scrubber (PVP-SCB-00002). The largest vessel is PWD-VSL-00044. The containment area will be the same as containment area 1. A separate evaluation was done for this room due to the fact that black cells and the hot cell are hydraulically connected and all the sumps, except for PWD-SUMP-00004, pump only to PWD-VSL-00044.

The results of the evaluation of waste removal capability for each of the containment areas are summarized as follows:

1. Elevation 0 Black Cells/Hot Cell/Minus 45 ft Elevation Pit - Waste removal capability consists of 21 steam ejectors operating in 19 sumps for a total removal capability of 12.0 hours. However, the steam piping design in this containment area is configured such that not all the ejectors can be operated simultaneously. It is estimated that the steam piping will allow about 6 ejectors to be operated simultaneously. Thus, the waste removal capability for removal of the maximum flooding volume is 44.0 hours.

2. Room P-0118 - Waste removal is achieved by operation of one ejector in one sump. Total waste removal capability is 23.0 hours.

3. Room P-0119 - Waste removal is achieved by operation of one steam ejector in one sump. Total waste removal capability is 0.8 hours.

4. Room P-0123A - Waste removal is achieved by operation of two steam ejectors in two sumps. Total waste removal capability is 0.5 hours.

5. Room P-B005 - Waste removal is achieved by operation of one electric pump in one sump. Total waste removal capability is 21.9 hours.

6. Room P-0150 - Removal of accumulated rainwater is achieved by operation of one electric pump in one sump. Rainwater removal capability is 11.5 hours. Removal of waste spilled from the largest vessel is achieved by deployment of portable pumping equipment. Removal capability is 24 hours or less.

7. Room P-0104 - Removal of waste from PWD-VSL-00044 is achieved by operation of one steam ejector in one sump that transfers to UFP-VSL-00001B via UFP-BRKPT-00001B and one Reverse Flow Diverter (RFD) in PWD-VSL-00044 that transfers waste to either of the Waste Feed Evaporator Feed Vessels, FEP-VSL-00017A/B. Total waste removal capability is 15.33 hrs.

These waste removal capability values are based on consideration of the maximum operating volume of a single vessel in its respective containment area, plus the maximum anticipated volume of firewater (if applicable) that is postulated to accumulate in these cells and or the volume of rain water accumulated in a 25 year, 24 hour storm (if applicable).

# 2 Objective

The purpose of this report is to estimate and document the waste removal capabilities for the Pretreatment process cells and other secondary containment areas associated with tank systems and miscellaneous unit systems.

The Pretreatment Facility must satisfy the waste removal criteria of the WAC regulations and DWP Number WA7890008967, Permit Condition III.10.E.9.e.iii and III.10.G.10.e.iii for tank and miscellaneous unit system secondary containment areas. This report evaluates the capability for removing, within 24 hours, leaked waste that may accumulate within the regulated process cells within the facility.

Excluded from the scope of this report are:

- Transfer line containment systems
- Containment areas that do not include tank or miscellaneous unit systems, e.g., maintenance cells

# 3 Description

The regulatory requirements for the secondary containment areas are contained in WAC 173-303-640(4), Tank Systems, Containment and Detection of Releases (Ref. 1). The regulatory requirements are stated as follows:

> "(b) Secondary containment systems must be...designed or operated to drain and remove leaks, spills, or precipitation...from the secondary containment system within 24 hours or in as timely a manner as possible ..." [WAC 173-303-640(4)(c)(iv)].

In addition, the Waste Treatment Plant Dangerous Waste Permit (Ref. 2), Permit Condition III.10.E.9.e.iii and III.10.G.10.e.iii requires submittal of:

> "Detailed operational plans and descriptions, demonstrating that spilled or leaked waste and accumulated liquids can be removed from the secondary containment system within twenty-four (24) hours." [WAC 173-303-806(4)(c)(vii)].

# 4 Assumptions

Assumptions used in this evaluation of Pretreatment Facility (PTF) waste removal capabilities are listed as follows.

1. Nominal design flow rates for ejectors and sump pumps are used to estimate waste removal rates. Purchased equipment will have capacities equal to or exceeding the nominal design flow rates.

2. Operator response times needed for activating transfer ejectors or pumps, or time required for manual alignment of valves and pump priming are ignored for the purposes of this evaluation.

3. Waste removal rate is achieved by simultaneous operation of steam ejectors or pumps within a waste containment area, and operation of an RFD in PWD-VSL-00044 for Containment Area 7.

Up to six steam ejectors can be operated simultaneously within the hot cell/black cell/minus 45 ft elevation containment area because of steam supply piping configuration limitations.

4. The available volume of receipt and storage capacity for leaked waste that would be removed from secondary containment areas is not considered. Delays associated with creating adequate space or other potential operating delays are not considered. If the leak cannot be removed from the secondary containment areas within 24 hours, Ecology will be notified and actions taken as required under permit conditions III.10.E.5.j and III.10.G.5.k.

General guidance for scoping of this report is documented in Ref. 8. Sump data are provided in Ref. 7.

# 5 Analysis

## 5.1 Black Cell/Hot Cell/Minus 45 ft Elevation Pit Containment Area

The black cells and hot cell are located at the 0 ft elevation and are identified on the PT facility general arrangement drawings (Ref. 9). The black cells are located around the hot cell and provide enclosure for mixed waste vessels. Hydraulic connections between black cells, and between selected black cells and the hot cell, are used to cascade flow between cells once the black cell holdup volume is exceeded. The black cell floors and lower portions of the walls have stainless steel liners to provide secondary containment.

The maximum flooding volume scenario is the failure of the largest nozzle at the lowest point on the largest vessel in a containment area (Ref. 3). To accommodate the flood, black cell-to-black cell and the black cell-to-hot cell hydraulic connections are provided. Each black cell is provided with a level detection sump and an emptying ejector. Fluids from all black cell sumps are pumped by a steam ejector into the plant wash vessel (PWD-VSL-00044) located at the 0 ft elevation.

The hot cell floor liner is sloped toward three low-point sumps with level detection and steam ejectors. These ejectors discharge into the plant wash and disposal (PWD) plant wash vessel, PWD-VSL-00044. There are two access openings from the hot cell floor into the minus 45 ft elevation pit. Around the perimeter of the hot cell access opening to the minus 45 elevation pit is a curb and gutter arrangement. Drain lines in the curbs around the access openings allow liquid to drain from the hot cell floor into the HLW effluent transfer vessel, PWD-VSL-00043 and the PWD ultimate overflow vessel, PWD-VSL-00033.

The maximum postulated flood considered is the total volume of one FRP vessel (63,361 $ft^3$) (Ref 3) released to the associated black cell. After the liquid fills the cell, to the bottom of the hydraulic connections, it flows to the adjacent black cells and the hot cell. The liquid level in the hot cell, after reaching the top of the curb and gutter, cascades through the drain lines in the curbs around the access openings into the HLW effluent transfer vessel (PWD-VSL-00043) and the ultimate overflow vessel (PWD-VSL-00033) located in the minus 45 elevation pit. Once either vessel is full, liquid will flow into the other vessel through the common overflow line between the vessels. Once both these vessels are full, the liquid overflows into the pit.

The black cells consist of the following rooms: P-0102, P-0102A, P-0104, P-0106, P-0108, P-0108A, P-0108B, P-0108C, P-0109, P-0111, P-0112, P-0113, P-0114, P-0117, and P-0117A.

The hot cell consists of only one room: P-0123.

The minus 45 ft elevation pit consists of rooms P-B002 and P-B003. Connecting to rooms P-B002 and P-B003 are two pipe tunnels. The south tunnel (rooms P-B001 and P-B001A) is located at the minus 21 ft elevation while the north tunnel (room P-B004) is located at the minus 18 ft elevation.

Waste removal from the black cell/hot cell containment area is achieved by operating the sump steam ejectors to transfer removed waste to PWD-VSL-00044. If the waste leak is from PWD-VSL-00044, then PWD-SUMP-00004 is emptied with steam ejector PWD-EJCTR-00152 to UFP-VSL-00001B via UFP-BRKPT-00001B while also emptying PWD-VSL-00044 using an RFD to transfer waste to PWD-VSL-00016.

There are a total of 21 steam ejectors in 19 sumps (sumps [PWD-SUMP-00040] and [PWD-SUMP-00004] contain two ejectors) within this containment area. Sump and ejector data are summarized in the following table. However, it should be noted that steam piping to the ejector supply racks in this containment area is sized and configured such that only about 6 ejectors can be operated simultaneously.

| Sump Number | Ejector Number | Room No. | Ejector Design Flowrate (gpm) |
|---|---|---|---|
| PWD-SUMP-00001 | PWD-EJCTR-00054 | P-0108B | 30 |
| PWD-SUMP-00001A | PWD-EJCTR-00054A | P-0108C | 30 |
| PWD-SUMP-00002 | PWD-EJCTR-00055 | P-0108A | 30 |
| PWD-SUMP-00002A | PWD-EJCTR-00055A | P-0108 | 30 |
| PWD-SUMP-00003 | PWD-EJCTR-00056 | P-0106 | 30 |
| PWD-SUMP-00004 | PWD-EJCTR-00057 | P-0104 | 30 |
| PWD-SUMP-00004 | PWD-EJCTR-00152 | P-0104 | 30 |
| PWD-SUMP-00005 | PWD-EJCTR-00058 | P-0102A | 30 |
| PWD-SUMP-00006 | PWD-EJCTR-00059 | P-0102 | 30 |
| PWD-SUMP-00007 | PWD-EJCTR-00060 | P-0109 | 30 |
| PWD-SUMP-00008 | PWD-EJCTR-00061 | P-0111 | 30 |
| PWD-SUMP-00009 | PWD-EJCTR-00067 | P-0112 | 30 |
| PWD-SUMP-00010 | PWD-EJCTR-00068 | P-0113 | 30 |
| PWD-SUMP-00011 | PWD-EJCTR-00069 | P-0114 | 30 |
| PWD-SUMP-00012 | PWD-EJCTR-00070 | P-0117 | 30 |
| PWD-SUMP-00013 | PWD-EJCTR-00071 | P-0117A | 30 |
| PWD-SUMP-00026 | PWD-EJCTR-00078 | P-0123 | 30 |
| PWD-SUMP-00028 | PWD-EJCTR-00080 | P-0123 | 30 |
| PWD-SUMP-00029 | PWD-EJCTR-00081 | P-0123 | 30 |
| PWD-SUMP-00040 | PWD-EJCTR-00062 | P-B002 | 60 |
| PWD-SUMP-00040 | PWD-EJCTR-00063 | P-B002 | 60 |

## 5.2 Room P-0118 Containment Area

Room P-0118 is located in the northeast quadrant of the PT facility at elevation 0 ft. It contains three vessels and associated pumps. The three vessels are the radioactive liquid disposal (RLD) alkaline

effluent vessels (RLD-VSL-00017A/B) and the treated LAW evaporation process (TLP) condensate vessel (TLP-VSL-00002).

A stainless steel liner provides secondary containment to accommodate the total volume of the largest vessel in the area (5,741 cubic feet), plus 20 minutes of fire sprinkler water (711 cubic ft) for a total flooding volume of 6,452 cubic ft (Ref. 3).

Sump PWD-SUMP-00036, which is provided with a radar level detection instrument and an emptying ejector to remove the contained liquid, is located in room P-0118. The ejector, PWD-EJCTR-00073, has a nominal design flow rate of 35 gpm.

## 5.3 Room P-0119 Containment Area

Room P-0119 is located on the east side of the PT facility and houses the Spent Resin Dewatering Skid. The Spent Resin Dewatering Moisture Separator (RDP-VSL-00004) is the only vessel in the room. The secondary containment for Room P-0119 includes a low point sump (PWD-SUMP-00031) and a stainless steel liner. The floor of the room is sloped towards the sump. Room P-0119 does not have floor drains; in the event of flooding, the liquid is removed from the room through a steam ejector provided at the floor sump. The room has fire protection in the form of a sprinkler system.

The total flooding volume of 178 cubic feet (Ref. 4) is determined from the volume of the largest vessel within the containment (14 cu ft) plus the accumulation of 20 minutes of firewater from sprinkler discharge (164 cu ft). The ejector, PWD-EJCTR-00064, has a nominal design flow rate of 30 gpm.

## 5.4 Room P-0123A Containment Area

Room P-0123A is located on the east end of the hot cell (Room P-0123) in the PT facility and houses the Remote Decontamination Maintenance Cave (RDMC).

The entire cell floor of Room P-0123A is lined with stainless steel, and the walls are lined up to 18 ft . A stainless steel lined stub wall (4 ft 8 in high) on the west end of the RDMC separates the RDMC room from the hot cell. Two sumps (PWD-SUMP-00032 and PWD-SUMP-00033) are located in Room P-0123A and the floor of the room slopes toward the sumps. Room P-0123A does not have floor drains and in the event of flooding, the liquid is removed from the room via two steam ejectors located in the sumps. The room is not serviced by fire protection sprinklers.

The Soak Decontamination Area within the RDMC contains a Decontamination Tank (PIH-TK-00001). This is the only tank in Room P-0123A.

The flooding volume was determined to be 231 cubic feet based on the largest vessel within the containment (Ref. 5). Firewater discharge is not applicable to this room.

Each of the two steam ejectors, PWD-EJCTR-00065 and PWD-EJCTR-00066 have a nominal design capacity of 30 gpm.

## 5.5 Room P-B005 Containment Area

The C2 floor drain collection vessel (PWD-VSL-00045) and the C3 floor drain collection vessel (PWD-VSL-00046) are provided to collect water from fire fighting. During normal operating conditions, the floor drains collect other surface water such as from a safety shower. Both are located in the minus 19

ft elevation pit. During the design basis fire accident, the volume of fire water is estimated to be 35,000 gallons (Ref. 3). This exceeds the capacities of both vessels, therefore each vessel is provided with an overflow into the minus 19 ft, 0 in. elevation pit.

The flooding volume calculation (Ref. 3) assumed that these vessels would be full at the time of the event. The total volume of the flood (Ref. 3) was estimated to be 5,267 cubic feet.

The sump (PWD-SUMP-00071) contains an electric pump (PWD-PMP-00026) with a nominal design capacity of 30 gpm.

## 5.6 Room P-0150 Containment Area

Room P-0150 is a concrete containment area located outside the PT building on the northeast side of the building. It provides secondary containment for tanks RLD-TK-00006A/B which are the only tanks within this containment area. The secondary containment includes low point sump (RLD-SUMP-00003). The flooding volume was determined to be 45,871 cubic feet (Ref.6) based on the volume of the largest tank (44,950 cu ft) within the containment plus the accumulation of rainwater from a 25 year 24 hour storm (921 cu ft)(Ref. 6).

The sump in this containment area includes a nominal 10 gpm capacity electric pump (RLD-PMP-0191). This pump is designed to remove accumulated rainwater. A major flood of this containment area caused by a leak of the entire contents of a vessel would not be efficiently removed with this small pump. However, because this area is accessible, portable pumping equipment would be brought in to pump the waste out of the containment area.

## 5.7 Room P-0104 Containment Area

Room P-0104 contains PWD-VSL-00044, which is the receipt vessel of all the waste from the sump emptying ejectors. The flooding volume is 103,024 gallons based on the maximum volume of PWD-VSL-00044 (Ref 10). Even though the waste will cascade between cells once the room holdup volume is exceeded, the other vessel emptying ejectors are ineffective due to the fact that they empty into PWD-VSL-00044. Therefore, only one steam ejector and a Reverse Flow Diverter PWD-RFD-00124 (Reference 11) can be used effectively to empty the 103000 gallons.

# 6 Sump Removal Rates

The results of this evaluation are compiled in the table below based on calculations provided in Section 7.

Pretreatment Facility
Waste Removal Capability Over 24 Hours

| Containment Area Number | Containment Area Room Number | Sump PIN (PWD-SUMP-) | Sump Waste Removal Capacity, (US gal/h) | Largest Vessel in Containment Area (Vessel Number and Maximum Volume)[1] | Largest Vessel Waste Removal Capability[1], h | Fire Water Volume[2], (US gal) | Fire Water Removal Capability[1], h | Total Containment Area Waste Removal Capability[1], h |
|---|---|---|---|---|---|---|---|---|
| 1 | P-0108B<br>P-0108C<br>P-0108A<br>P-0108<br>P-0106<br>P-0104<br>P-0102A<br>P-0102<br>P-0109<br>P-0111<br>P-0112<br>P-0113<br>P-0114<br>P-0117<br>P-0117A<br>P-0123<br>P-0123<br>P-0123<br>P-B002 | 00001<br>00001A<br>00002<br>00002A<br>00003<br>00004<br>00005<br>00006<br>00007<br>00008<br>00009<br>00010<br>00011<br>00012<br>00013<br>00026<br>00028<br>00029<br>00040 | 1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>1800<br>7200 | FRP-VSL-00002, 473,940 gal | 44.0<br>Note 4 | Not applicable. Fire water is not collected in this containment area. | | 44.0<br>Note 4 |
| 2 | P-0118 | 00036 | 2100 | RLD-VSL-00017, 42,943 gal | 20.4 | 5,318 | 2.5 | 22.9 |
| 3 | P-0119 | 00031 | 1800 | RDP-VSL-00004, 105 gal | 0.1 | 1,227 | 0.7 | 0.8 |
| 4 | P-123A | 00032<br>00033 | 3600 | PIH-TK-00001, 1,728 gal | 0.5 | Not applicable. Fire water is not collected in this containment area. | | 0.5 |
| 5 | P-B005 | 00071 | 1800 | Not applicable. Flooding assumes overflow of firewater from PWD-VSL-00045, 46 | | 39,397 | 21.9 | 21.9 |
| 6 | P-0150 | RLD-SUMP-00003 | 600<br>Note 3 | RLD-TK-00006, 336,226 gal | Note 3 | (Rain-water) 6,889 | 11.5 | Note 3 |

| Containment Area Number | Containment Area Room Number | Sump PIN (PWD-SUMP-) | Sump Waste Removal Capacity, (US gal/h) | Largest Vessel in Containment Area (Vessel Number and Maximum Volume)[1] | Largest Vessel Waste Removal Capability[1], h | Fire Water Volume[2]. (US gal) | Fire Water Removal Capability[1], h | Total Containment Area Waste Removal Capability[1], h |
|---|---|---|---|---|---|---|---|---|
| 7 | P-0104 | 00004 | 1800 Note 5 | PWD-VSL-00044, 103,024 gal | 15.3 | Not applicable. Fire water is not collected in this containment area. | | 15.3 |

[1] Waste removal capability is based upon the combined sump removal capacity of all sumps in the containment area.
[2] Fire water (or rainwater) volume derived from flooding volume reports (Ref. 3-6)
[3] The design flow rate of the sump pump is specified for removal of rainwater only. Waste spilled from a large tank leak would be removed by deployment of portable pumps. Total pumping capacity for removal of the volume of the largest vessel in 24 hours is 233 gpm.
[4] Steam supply piping to the ejectors is sized and configured such that only about six 30 gpm ejectors can be operated simultaneously; thus the waste removal capability for this containment area is 44.0 hrs.
[5] It is assumed that a minimum of one RFD in PWD-VSL-00044 with a transfer capability of 4,920 gal/h is available in addition to the PWD-SUMP-00004 steam ejector to remove liquid in the event PWD-VSL-00044 is leaking.

# 7 Bounding Calculations

Waste removal capability is estimated for six containment areas based on the bounding calculations presented in this section. The seven containment areas are listed as follows:

1. Black Cell/Hot Cell/Minus 45 ft Elevation Pit
2. Room P-0118
3. Room P-0119
4. Room P-0123A
5. Room P-B005
6. Room P-0150
7. Room P-0104

## 7.1 Black Cell/Hot Cell/Minus 45 ft Elevation Pit Containment Area

This containment area consists of hydraulically connected black cells, hot cell, and minus 45 ft elevation pit. Each black cell contains one sump. There are three sumps in the hot cell and one sump in the minus 45 ft elevation pit.

The flooding volume is derived from the flooding volume report (Ref 3) and is based on the total volume of the largest vessel within this containment area which is one of the FRP-VSL-00002A/B/C/D vessels. There is no fire water discharge in this containment area. The total maximum flooding volume is 63,361 cu ft. Converted to gallons:

Maximum flooding volume = 63,361 cu ft x 7.48 gal/cu ft = 473, 940 gal

Eighteen sumps each contain one steam driven ejector with a nominal design capacity of 30 gpm (see Section 5.1). One sump (PWD-SUMP-00040) contains two steam driven ejectors with a nominal design capacity of 60 gpm each. Even though Sump (PWD-SUMP-00004) has two ejectors, only one ejector is accounted in this flooding scenario. The second ejector will be used if PWD-VSL-00044 leaks, to ensure that waste from PWD-SUMP-00004 is not routed back to PWD-VSL-00044. The total pumping capacity of these ejectors is:

Ejector capacity = (18 ejectors x 30 gpm/ejector) + (2 ejectors x 60 gpm/ejector) = 660 gpm

Converting to gallons/hour:

Ejector capacity = 660 gpm x 60 min/hr = 39,600 gal/hr

The waste removal capability is calculated by dividing the maximum flooding volume by the ejector capacity:

Waste removal capability = 473,940 gallons/39,600 gal/hr = 12.0 hours

Note that while ejector capacity exists to remove the waste at this rate, the steam piping design in this containment area is sized and configured such that not all the ejectors can be operated simultaneously. It is estimated that the steam piping will allow about 6 ejectors to be operated simultaneously.

Thus, limited to steam supply, actual waste removal capability is limited to 6 ejectors or 6 x 30 gpm/ejector x 60 min/hr = 10,800 gal/hr

Waste removal capability = 473,940 gal/10,800 gal/hr = 44.0 hr

## 7.2 Room P-0118 Containment Area

This containment area contains three vessels. The flooding volume (Ref 3) is based on the maximum volume of the largest vessel in this area (one of the RLD-VSL-00017A/B vessels) plus the volume of sprinkler water.

The maximum volume of the largest vessel is 5,741 cu ft.

The volume of sprinkler water based on 20 minutes of flow (Ref 3) is 711 cu ft.

Converted to gallons:

Maximum vessel volume = 5,741 cu ft x 7.48 gal/cu ft = 42,943 gal
Volume of fire water = 711 cu ft x 7.48 gal/cu ft = 5,318 gal

The sump in this containment area contains one steam driven ejector with a nominal design capacity of 35 gpm. The capacity in gallons/hr is:

Ejector capacity = 35 gpm x 60 min/hr = 2,100 gal/hr

Waste removal capability for the largest vessel is:

Vessel removal capability = 42,943 gal/2,100 gal/hr = 20.4 hours

Waste removal capability for the fire water is:

Fire water removal capability = 5,318 gal/2,100 gal/hr = 2.5 hours

Total containment area waste removal capability is 20.4 hours + 2.5 hours = 22.9 hours

## 7.3 Room P-0119 Containment Area

This containment area contains one vessel (RDP-VSL-00004) which has a maximum volume (Ref 4) of 14 cu ft. Accumulation of 20 minutes of fire water in this containment area totals 164 cu ft.

Converted to gallons:

Maximum volume of largest vessel = 14 cu ft x 7.48 gal/cu ft = 105 gal
Fire water volume = 164 cu ft x 7.48 gal/cu ft = 1,227 gal

The containment area contains one sump with a steam driven ejector that has a nominal design capacity of 30 gpm. Converting to gal/hr.

Ejector capacity = 30 gpm x 60 min/hr = 1,800 gal/hr

Waste removal capacities are then calculated as follows:

Vessel removal capability = 105 gal/1,800 gal/hr = 0.1 hr
Fire water removal capability = 1,227 gal/ 1,800 gal/hr = 0.7 hr
Total waste removal capability = 0.1 hr + 0.7 hr = 0.8 hr

## 7.4 Room P-0123A Containment Area

This containment area contains one tank (PIH-TK-00001) which has a maximum volume of 231 cu ft (Ref 5). This is no fire water discharge in this containment area.

Converted to gallons:

Maximum volume of largest vessel = 231 cu ft x 7.48 gal/cu ft = 1,728 gal

The containment area contains one sump with two steam driven ejectors that each have a nominal design capacity of 30 gpm. Converting to gal/hr.

Ejector capacity = 2 x 30 gpm x 60 min/hr = 3,600 gal/hr

Waste removal capacities are then calculated as follows:

Vessel removal capability = 1, 728 gal/3,600 gal/hr = 0.5 hr

## 7.5 Room P-B005 Containment Area

This containment area (the minus 19 ft elevation pit) contains the C2 floor drain collection vessel (PWD-VSL-00045) and the C3 floor drain collection vessel (PWD-VSL-00046). The C2 floor drain

collection vessel (PWD-VSL-00045) does not manage dangerous waste, and is discussed here for completeness only. These vessels collect water from fire fighting. During normal operating conditions, the floor drains collect other surface water such as from a safety shower. During the design basis fire accident, the volume of fire fighting water is estimated to be 35,000 gallons which exceeds the capacities of both vessels, therefore each vessel is provided with an overflow into the pit. The overflow volume rather than the volume of the largest vessel is used to estimate the flooding volume for this pit. The total volume of the flood (Ref. 3) was estimated to be 5,267 cu ft.

Converted to gallons:

Maximum volume of fire water flood = 5,267 cu ft x 7.48 gal/cu ft = 39,397 gal

The containment area contains one sump with an electric sump pump that has a nominal design capacity of 30 gpm. Converting to gal/hr.

Sump pump capacity = 30 gpm x 60 min/hr = 1,800 gal/hr

Fire water removal capability is then calculated as follows:

Fire water removal capability = 39,397 gal/1,800 gal/hr = 21.9 hr

## 7.6 Room P-0150 Containment Area

This containment area contains two tanks (RLD-TK-00006A/B). One of the two tanks has a maximum volume of 45,950 cu ft (Ref. 6). There are no fire water sprinklers in this area. However, the flooding volume includes the accumulation of rainwater from a 25 year 24 hour storm of 921 cu ft.

Converted to gallons:

Maximum volume of largest vessel =45,950 cu ft x 7.48 gal/cu ft = 343,706 gal
Rain water volume = 921 cu ft x 7.48 gal/cu ft = 6,889 gal

The containment area contains one sump with an electric sump that has a nominal design capacity of 10 gpm. Converting to gal/hr.

Sump pump capacity = 10 gpm x 60 min/hr = 600 gal/hr

This pump is designed to remove accumulated rainwater.

Therefore, rainwater removal capability is calculated as follows:

Rainwater removal capability = 6,889 gal/600 gal/hr = 11.5 hours

A major flood of this containment area caused by the leak of the entire contents of a vessel would not be efficiently removed with this small pump. However, because this area is accessible, portable pumping equipment would be brought in to pump the waste out of the containment area.

To remove the volume of the largest vessel in 24 hours the total pumping capacity of the portable equipment would be:

Portable pumping capacity = 343,706 gal/24 hours or 14,321 gal/hr
Converted to gpm, pumping capacity = 14,321 gal/hr / 60min/hr = 239 gpm

### 7.7 Room P-0104 Containment Area

The maximum volume of PWD-VSL-00044 is 103,024 gallons (Ref 10).

The containment area contains one sump with one effective steam driven ejector that has a nominal design capacity of 30 gpm and PWD-VSL-00044 has Reverse Flow Diverters (RFD) with the nominal design capacity of 82 gpm each. Calculate the total pumping capacity with the use of one steam ejector and one RFD.

Ejector capacity = 30 gpm x 60 min/hr = 1,800 gal/hr

RFD Capacity = 82 gpm x 60 min/hr = 4920 gal/hr

Waste removal capacities are then calculated as follows:

Vessel removal capability = 103,024 gal/(1,800 + 4920) gal/hr = 15.3 hrs

# 8 References

1. WAC 173-303, *Dangerous Waste Regulations*, Washington Administrative Code.
2. WA7890008967, "*Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant."
3. 24590-PTF-PER-M-02-005, Rev 8, Flooding Volume for Below Grade and 0 Ft Level in PT Facility
4. 24590-PTF-PER-M-04-0005, Rev 0, Flooding Volume for Room P-0119 in the PT Facility
5. 24590-PTF-PER-M-04-0007, Rev 0, Flooding Volume for Room P-0123A in the PT Facility
6. 24590-PTF-PER-M-04-0008, Rev 1, Flooding Volume for Room P-0150 in the PT Facility
7. 24590-PTF-PER-M-02-006, Rev 5, Sump Data for the PT Facility
8. CCN 097900, Waste Removal Capability Scoping Statement, , August 20, 2004
9. Drawing 24590-PTF-P1-P01T-P0001, Rev 5, PT Facility General Arrangement Plan at El. 0'-0"
10. 24590-PTF-MVD-PWD-00002, Rev 7, 24590-PTF-MV-PWD-VSL-00044 - PLANT WASH VESSEL
11. 24590-CM-POA-MPE0-00004-27-20, Rev 00B, DATA SHEET - RFD MECHANICAL DATASHEET PACK - PWD-RFD-00124 / PWD-EJCTR-00124

Quarter Ending 09/30/10 24590-WTP-PCN-ENV-10-002

# Hanford Facility RCRA Permit Modification Notification Form
## Part III, Operating Unit 10
## Waste Treatment and Immobilization Plant

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Page 2 of 2: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant
Revise reporting period specified in permit conditions III.10.C.9.d and III.10.C.9.h from 5 calendar days to 7 calendar days.

| Submitted by Co-Operator: | | Reviewed by ORP Program Office: | |
|---|---|---|---|
| D. M. Busche | Date | D. Knutson | Date |

Quarter Ending 09/30/10

24590-WTP-PCN-ENV-10-002

## Hanford Facility RCRA Permit Modification Notification Form

| Unit: | Permit Part: |
|---|---|
| **Waste Treatment and Immobilization Plant** | **Part III, Operating Unit 10** |

Description of Modification:

Revise permit conditions III.10.C.9.d and III.10.C.9.h to allow documentation identified in the permit conditions to be submitted every 7 calendar days.

Redline/Strikeout of modification:

III.10.C.9.d. The Permittees will submit a nonconformance report (NCR) or construction deficiency report (CDR) to the Ecology representative (s), as applicable, within ~~five (5)~~ seven (7) calendar days of the Permittees becoming aware of incorporation of minor nonconformance or construction deficiency from the approved designs, plans, and specifications into the construction of critical systems, as defined in the Hanford Site-wide Permit definition section. Such minor nonconformance or construction deficiency will be defined, for the purposes of this Permit Condition, as nonconformance or construction deficiency that is necessary to accommodate proper construction and the substitution or the use of equivalent or superior materials or equipment that do not substantially alter the Permit conditions or reduce the capacity of the facility to protect human health or the environment. Such minor nonconformance or construction deficiency will not be considered a modification of this Permit. If Ecology determines that the nonconformance or construction deficiency is not minor, it will notify the Permittees in writing that a permit modification is required for the deviation and whether prior approval is required from Ecology before work proceeds which affect the nonconforming or construction deficiency item.

III.10.C.9.h. The Permittees will formally document changes to approved designs, plans, and specifications with design change documentation [e.g., Design Change Notice (DCN), Field Change Request (FCR), Field Change Notice (FCN), Specification Change Notice (SCN), and Supplier Deviation Disposition Request (SDDR)]. All design change documentation will be maintained in the WTP Unit-specific Operating Record and will be made available to Ecology upon request or during the course of an inspection. For any design change documentation affecting any critical systems, the Permittees will provide copies to Ecology within ~~five (5) working~~ seven (7) calendar days. Identification of critical systems will be included by the Permittees in each WTP Unit-specific dangerous waste permit application, closure plan, or permit modification, as appropriate. If Ecology determines that the design change is not minor, it will notify the Permittees in writing that a permit modification is required for the design change and whether prior approval is required from Ecology before work affected by the design change may proceed.

| WAC 173-303-830 Modification Class: | Class 1 | Class [1]1 | Class 2 | Class 3 |
|---|---|---|---|---|
| Please mark the Modification Class: | X | | | |

Enter relevant WAC 173-303-830, Appendix I Modification citation number:

Enter wording of WAC 173-303-830, Appendix I Modification citation:

A. General Permit Provisions

1. Administrative and informational changes.

Modification Approved/Concur: ☐ Yes ☐ Denied (state reason below)

Reason for denial:

Reviewed by Ecology:

S. Dahl Date