U.S. Department of Energy
P.O. Box 450, MSIN H6-60
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MAR 3 0 2012

12-WTP-0124

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004-2901

TRANSMITTAL OF DEFENSE NUCLEAR FACILITIES SAFETY BOARD (DNFSB) RECOMMENDATION 2010-2 IMPLEMENTATION PLAN (IP) DELIVERABLE 5.6.3.1

Dear Mr. Chairman:

This letter provides you the deliverable responsive to Commitment 5.6.3.1 of the U.S. Department of Energy plan to address Waste Treatment and Immobilization Plant (WTP) Vessels Mixing Issues; IP for DNFSB 2010-2.

The attached document defines the preliminary design criteria for a heel management system. The design criteria establish performance capabilities for heel dilution, heel pump-out, and use of the access ports associated with the heel management system. This document updates requirements to include specific solids removal objectives relevant to particle size/density and across the range of initial waste rheology conditions that will exist in pulse jet mixer mixed vessels.

Specific testing performance ranges will be contained in Test Specifications for tests assessing heel management system performance capability. Heel management performance test objectives implemented in test planning documentation (including Test Specifications and Test Plans) will be documented in Requests for Technology Development. Tests to define limits of heel management system capability will consider input from the following documents:

- PNNL-20646 ESMP-RTP-006, *Hanford Waste Physical and Rheological Properties: Data and Gaps;*
- Tank farms evaluations of the most limiting particle that their delivery system is capable of retrieving and sending to WTP (Commitment *5.5.3.2); and*
- Results from RPP-RPT-50941 – Rev 00, *Review of Plutonium Oxide Receipts into Hanford Tank Farms*

Results from testing performed to define limits of heel management system capability (Commitment 5.6.3.6) will be used to support development of the final hazards analysis, functional criteria, and update to the Waste Acceptance Criteria (WAC) (Commitment 5.5.3.3). The updated WAC will be used in the gap analysis (Commitment 5.5.3.9). Gaps will be addressed to ensure waste is safely transferred from tank farms and processed in the WTP.

If you have any questions, please contact me at (509) 376-6727 or your staff may contact Ben Harp, WTP Start-up and Commissioning Integration Manager at (509) 376-1462.

Sincerely,

Dale E. Knutson, Federal Project Director
Waste Treatment and Immobilization Plant

WTP:WRW

Attachment

cc w/attach:
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Attachment
to
12-WTP-0124

TRANSMITTAL OF DEFENSE NUCLEAR FACILITIES SAFETY BOARD (DNFSB) RECOMMENDATION 2010-2 IMPLEMENTATION PLAN (IP) DELIVERABLE 5.6.3.1

24590-WTP-DC-ENG-12-001, Rev A,
Pulse Jet Mixed Vessel Heel Management System
Functional Design Criteria

(Total No. of Pages: 14)

Document title: **Pulse Jet Mixed Vessel Heel Management System Functional Design Criteria**

Contract number: DE-AC27-01RV14136

Department: Mechanical, Process, and Controls & Instrumentation

Author(s): Theresa Campbell

Principal author signature: Theresa Campbell

Document number: 24590-WTP-DC-ENG-12-001, Rev B

Checked by: John Julyk

Checker signature: John Julyk

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Approved by:	Russell Daniel	Robert Voke	Wayne Underhill
Approver's position:	VCT Technical Manager	M&PE Discipline Functional Lead	C&I Discipline Functional Lead
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E&NS Screening

E&NS Preliminary Input Included	E&NS Screening Not Required for Alpha Revision	
Print/Type Name	Signature	Date

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History Sheet

Rev	Date	Reason for revision	Revised by
A	3/29/12	Initial Issue Issue to support the Implementation Plan for Defense Nuclear Safety Board Recommendations 2010-2 Commitment 5.6.3.1	Theresa Campbell
B	3/29/12	Incorporate DOE directed changes to Section 1.1	Theresa Campbell

Contents

Tables

Acronyms

BOD	Basis of Design
CCN	Correspondence Control Number
DCD	Design Criteria Database
EFRT	External Flowsheet Review Team
FEP	Waste Feed Evaporation Process System
HLP	HLW Lag Storage and Feed Blending Process System
HLW	High-Level Waste
HPAV	Hydrogen in Piping and Ancillary Vessels
IRP	Issue Response Plan
ITS	Important to Safety
LAW	Low Activity Waste
LSIT	Large Scale Integrated Testing
NPSHr	Net Positive Suction Head Required
PDSA	Preliminary Documented Safety Analysis
PIBOD	Process Inputs Basis of Design
PJM	Pulse Jet Mixer
PTF	Pretreatment Facility
SC-I	Seismic Category I
SC-III	Seismic Category III
SRD	Safety Requirements Document
SS	Safety Significant
SSC	structure, system, and component
Q	Quality
UFP	Ultrafiltration Process System
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1 Introduction

This document presents the preliminary functional design criteria for the Waste Treatment Plant (WTP) heel management system. Heel management was created to provide the selected pulse-jet-mixed (PJM) vessels (see Table 1-1) with an alternative way to remove slurries. .

Contract Modification Number 221 (Ref. 4.16) requires WTP to define and detail the heel management system capability. Heel management was first evaluated in *Pretreatment Vessel Heel Dilution/Cleanout Feasibility Study* (Reference 4.1) and the *Pretreatment Vessel Heel Dilution/Cleanout Functional Requirements* report (Reference 4.3). The studies were performed as part of the PJM evaluation program to resolve open PJM issues (24590-WTP-PL-ENG-06-0013, *Issue Response Plan (IRP) for Implementations of External Flow sheet Review Team (EFRT) Recommendations - M3, Inadequate Mixing System Design*) (Ref. 4.12).

At the time of issuing this document, the heel management system has undergone a preliminary hazard analysis per CCN 244874 (Ref. 4.8). CCN 244874 provides the preliminary functional design criteria prior to issuance of the Hazard Analysis Report for the preliminary hazard analysis of the heel management system. The preliminary functional design criteria will be used as part of the basis information for the hazard analysis, which will confirm the safety functions for PJM vessel heel management. The hazard analysis will feed into an update of the Criticality Safety Evaluation Report (Ref. 4.4). This document will be updated to identify safety criteria from the hazard analysis.

Following heel management testing in Large Scale Integrated Testing (LSIT), this document will be updated, as required, to reflect additional information and controls that may be required. Other vessels (e.g., Waste Feed Receipt Process System, Plant Wash and Disposal System, and Radioactive Liquid Waste Disposal System) will be re-evaluated following LSIT testing and the Hazard Analysis development to determine if there is a need to add the heel management system to these vessels in accordance with the required response to the Implementation Plan for Defense Nuclear Safety Board Recommendation 2010-2 Commitment 5.6.3.9 (Ref. 4.13). In addition, the LSIT testing will confirm the performance capabilities of the Heel Management System. The Design Criteria Database (DCD) for beyond normal / non-routine operations will be updated as required to define the performance objectives based on waste feed analysis and LSIT testing results.

This document provides the required update to 24590-PTF-RPT-ENG-10-004 for the response to Commitment 5.6.3.1 of the Implementation Plan for Defense Nuclear Safety Board Recommendation 2010-2 (Ref. 4.13). The commitment states:

> *"Functional design criteria and performance capabilities of the heel dilution, heel pump-out, and use of the access ports will be established. WTP has completed an initial evaluation of a heel management system for selected vessels in 24590-WTP-RPT-PET-10-013, Pretreatment Vessel Heel Dilution/Cleanout Feasibility Study. The initial functional specifications were provided in 24590-PTF-RPT-ENG-10-004, Pretreatment Vessel Heel Dilution/Cleanout Functional Requirements. These requirements will be updated to include specific solids removal objectives relevant to particle size/density and across the range of initial waste rheology conditions that will exist in PJM-mixed vessels."*

The preliminary requirements contained in this document are in sections 2 and 3. All other information is not considered requirements but additional information. Deviations from the criteria called out in this document will be coordinated with and approved by the appropriate Functional Lead.

1.1 Purpose

The purpose of this document is to define the preliminary functional design criteria for the heel management system. This document presents initial functional design criteria to support initial development of the heel management design, system descriptions and hazards analysis. The design will be compliant with the Design Criteria Database and address additional safety functional requirements specified in Section 3 of this document.

Updates to this document will consider inputs from:

- Review of PNNL-20646, ESMP-RTP-006, "Hanford Waste Physical and Rheological Properties: Data and Gaps" (Ref. 4.22)
- Review of RPP-RPT-50941, "Review of Plutonium Oxide Receipts into Hanford Tank Farms" (Ref. 4.21), and
- Completion of DNFSB 2010-2, IP Commitment 5.5.3.2, "Evaluation of Waste Transferred to WTP".

The heel management system is designed to remove most of the remaining solids and liquid slurry (i.e., the heel) from specific vessels as part of normal process operations. The heel management system will be used to remove solids from a vessel to preclude the accumulation of solids over time. Because heel management allows removal of more material from a vessel than during normal operations, it also can be used for heel removal at the end of the plant life.

The tank farms may have the capability to transfer particles that exceed the current WTP design basis. The heel transfer capabilities require further testing to define performance capability as compared to the functional requirements. Accordingly, the preliminary heel removal system design shall use the DCD specified particle size and density for the preliminary equipment design.

1.2 Background

The heel management system is the result of a study performed in 2010, *Pretreatment Vessel Heel Dilution/Cleanout Feasibility Study* (Ref. 4.1). The study was in response to the External Flowsheet Review Team (EFRT) Recommendation M3, *Inadequate Mixing System Design.* The purpose of the study was to determine a method of removing solids from vessel heels with a potential for high solids content and a potential solids accumulation risk. The vessel's heel is defined as the slurry of solids and liquids in a vessel below the low operating level. In that study, heel management was subdivided into two operations: heel dilution and heel cleanout. Because heel dilution and heel cleanout performed essentially the same operations (with only the material added and the destination of the removed material being different), this document refers to both operations as heel management.

The WTP project has committed to testing the heel management system in LSIT to demonstrate a range of performance factors. The specific testing performance ranges will be contained in the testing plan which will test beyond the preliminary design criteria.

UFP-VSL-00002A/B is not included in Table 2-1 because the UFP-VSL-00002A/B uses reagent cleaning with a lowered pump suction and progressive cavity pump as a part of normal operation. Additionally Pretreatment Engineering Platform testing documented this capability in 24590-QL-HC9-WA49-00001-02-00010, Rev A (Ref. 4.20). This will also be performance tested in LSIT.

1.3 Scope

The vessels chosen for heel management are PJM vessels with the highest potential for solids accumulation (i.e., highest solids concentrations [both Newtonian and non-Newtonian] or lowest mixing power [see Table 1-1]).

These ten vessels were identified in the best value study (Ref. 4.1) as potentially benefiting from a heel management system. Normal process operation is not in the scope of this document. See the DCD for functional design requirements of the normal process operation for these vessels.

This document provides design requirements for the heel management equipment. Heel management consists of low pump suction lines in the vessels, addition of materials to the vessel heel, and transfer pump(s) with lower Net Positive Suction Head Required (NPSHr). Furthermore, access ports are used to provide operational flexibility.

Table 1-1 Vessels with Heel Management System

Newtonian Vessels	Non-Newtonian Vessels
PTF-HLP-VSL-00022 (HLP-22) [high solids]	PTF-UFP-VSL-00002A (UFP-02A)*
PTF-FEP-VSL-00017A (FEP-17A) [low power**]	PTF-UFP-VSL-00002B (UFP-02B)*
PTF-FEP-VSL-00017B (FEP-17B) [low power**]	PTF-HLP-VSL-00027A (HLP-27A)
PTF-UFP-VSL-00001A (UFP-01A) [high solids]	PTF-HLP-VSL-00027B (HLP-27B)
PTF-UFP-VSL-00001B (UFP-01B) [high solids]	PTF-HLP-VSL-00028 (HLP-28)

*UFP-02A/B receives Newtonian waste and processes it to a non-Newtonian waste.
**FEP-17A/B was identified as having low mixing power per volume in M3 testing. (Ref. 4.17)

1.4 Definitions

<u>Design Criteria Database</u> - A database maintained by Systems Engineering that contains criteria that meet the definition of design criteria. The DCD is searchable using text, document number, and document title search techniques, and contains links to design criteria source documents. Where appropriate the DCD also contains definitions of terms useful in implementing design criteria in the design.

<u>Diluent</u> - Fluid added to slurry to reduce concentration of solids. The fluid will be normally available plant liquids, such as process condensate, waste feed, demineralized water, and reagent streams.

<u>Heel</u> - Liquid and solids remaining in vessel after the vessel batch volume has been transferred. This level is typically described in design documents as low operating level.

<u>Heel management</u> - Act of pumping slurry out of the vessel heel to the lowest level possible. Heel dilution and Heel Cleanout were used in the study (Ref. 4.1) and the functional requirements report (Ref. 4.3) to describe the Heel management process. Heel Dilution was used to describe the process to remove a Newtonian heel or dilute a non-Newtonian heel and move it forward to the next processing vessel. Heel Cleanout was used to describe the process to remove a non-Newtonian heel and feed it to HLW for processing.

<u>Heel management System</u> - Components such as a pump and jumpers used to remove liquid and solids from the heel of a specific vessel on an as needed basis.

<u>Normal operations</u> - Routine processing of HLW and LAW feed without removing liquid and solids in the heel of a vessel.

<u>Normal pump</u> - Pump utilized for routine process operations.

2 Design Criteria

The following sections present the access port, process, mechanical, and controls and instrumentation preliminary design criteria for the heel management system. These design elements are based on the heel management conceptual design provided by representatives from Mechanical, Process, and Operations. Subsequent reviews of the basic concepts were completed to ensure that the concepts were sound and workable (Ref. 4.1 and 4.3). The heel management system design shall follow the WTP engineering process, including applicable project procedures and design guides.

2.1 Design Codes and Standards

The WTP is designed in accordance with national codes and standards, except where project specific requirements are not covered by consensus standards. Identification of applicable codes and standards is accomplished in accordance with engineering procedures and documented in the safety basis, *Basis of Design* (BOD), and applicable design documents. Components that are important to safety (ITS) are identified through process hazards and safety analyses as safety significant or safety class. Codes and standards applicable to the safety function of ITS components are selected through the hazard analysis and control selection process and are documented in the safety basis. The specific version of a standard (such as year of revision) that is identified for ITS components in the safety basis must be implemented unless revised through the hazard analysis process, with the safety basis revised as necessary. In addition, implementation in design documents of codes and standards invoked in the safety basis must incorporate the project-specific tailoring of *Safety Requirements Document* (SRD) Appendix C, if applicable.

Many codes and standards identified in the safety basis in turn reference additional codes and standards ("daughter codes and standards"). Changes to the versions of daughter codes and standards directly referenced by SRD-implementing codes and standards shall be made in accordance with the process described in 24590-WTP-3DP-G04B-00001, *Design Criteria.*

Standards are also identified in the *Basis of Design* (24590-WTP-DB-ENG-01-001). Where a specific version is identified, that version should be implemented unless the BOD is changed or an exception is approved. In case of a conflict between the BOD and the safety basis, the safety basis takes precedence for ITS structures, systems and components (SSCs). Exceptions to the BOD are addressed in procedure 24590-WTP-3DP-G04B-00001, *Design Criteria.*

When a specific version of a code or standard is not called out in the safety basis or BOD, the determination of the appropriate version should be reflected in design documents. (In cases where multiple versions are acceptable, a specific version may not be called out. An example is ASTM material standards, which typically do not change in a way that affects chemical and physical properties of interest to WTP applications.)

The following is a list of additional codes and standards that may be used as applicable for the design of the Heel management System SSCs:

API STD 676, *Positive Displacement Pumps - Rotary*

2.2 Process Design

The heel management system shall use the Basis of Design (Ref. 4.2) for initial equipment design. The slurry properties for critical velocity and pump design shall be in accordance with the Basis of Design, Section 6 (Ref. 4.2) and the Process Inputs Basis of Design (PIBOD), Appendix A (Ref. 4.15). Any updates to the Basis of Design shall be incorporated into the design. The heel management system performance capabilities shall meet the following requirements.

Design Requirement #1 - Heel management equipment (pumps, associated lines, and jumpers) shall be designed to transport solid particles as specified in the Basis of Design, Section 6 (Ref. 4.2).

Design Requirement #2 - New routes to support transfers from the heel management system between vessels shall be established as defined in Table 2-1.

Table 2-1 Heel Management System Routes

Heel Management Vessel	Destination Vessel or Facility
HLP-22	UFP-01A or UFP-01B
FEP-17A	UFP-01A or UFP-01B
FEP-17B	UFP-01A or UFP-01B
UFP-01A	UFP-02A or UFP-02B
UFP-01B	UFP-02A or UFP-02B
HLP-27A	UFP-02A
HLP-27A	HLW Facility
HLP-27B	UFP-02A
HLP-27B	HLW Facility
HLP-28	UFP-02A
HLP-28	HLW Facility

2.3 Mechanical Design

Mechanical design shall be in accordance with requirements identified in the Mechanical Systems Design Criteria (Ref. 4.11). The mechanical design is comprised of two parts: pump suction requirements and heel management pump requirements. Design considerations for erosion and corrosion shall use the same methodologies as normal operations. Each part is presented in the following subsections.

2.3.1 Pump Suction

Design Requirement #3 - The pump suction line entrance shall be as low as practical in the vessel and as close to the center of the vessel as practical.

2.3.2 Heel Management Pump(s)

Design Requirement #4 - The pump(s) selected for heel management shall have sufficiently low NPSHr, such that, they can pump the slurry out of the vessel down as low as practical. The intent of this design requirement is to minimize the heel remaining in the vessel.

Design Requirement #5 - The heel management system shall be designed with sufficient design margin and provide a robust pumping system with respect to slurry properties in accordance with the Basis of Design (Ref. 4.2) and the Process Inputs Basis of Design (Ref. 4.15).

Design Requirement #6 - The heel management pump shall have variable speed control to change the pump speed. This will allow flexibility to remove a variety of waste rheologies and maximize waste removal at low vessel levels.

2.4 Access Ports

Access ports are provided to allow operations to access the vessel's internals once the WTP has initiated radioactive operations. The access ports will be used by operations on an as needed basis. The access ports may be used to insert remotable equipment into the vessel headspace.

Manned access ports shall be located in rooms above the vessels that are accessible to personnel in accordance with the area classifications. Remote access ports shall be located in the C5 Filter Cave above the vessels.

Design Requirement #7 -Two access ports per vessel (FEP-17A/B, HLP-22, HLP-27A/B, HLP-28, UFP-01A/B, and UFP-02A/B) shall be supplied from an accessible location above the vessels.

Design Requirement #8 - The access ports shall be placed in the vessel such that a camera lowered through one of them can view both the pump suction and the point where the vessel wall meets the vessel bottom (i.e., knuckle).

Design Requirement #9 - The access ports shall be designed to allow camera or other equipment access. These access ports should have an un-obstructed path that extends from the vessel vapor space to the vessel floor to allow access.

Design Requirement #10 - The manned-access ports shall not exceed 300 degrees of total bends from the vessel to the point of origin. Manned-access ports shall be sloped in accordance with WTP sloping requirements, and provide a five diameter minimum bend for all bends. The preferred piping configuration for remote access is as straight and vertical run as possible while accounting for thermal expansion, shine, and piping interferences. Horizontal runs shall be minimized and avoided where possible. Spatial constraints shall be considered for the manned-access port shield plug or cap removal with respect to its location (i.e., around racks and other major pieces of equipment).

Design Requirement #11 - The remote-access ports shall not exceed 180 degrees of total bends. Remote-access ports shall be sloped in accordance with WTP sloping requirements and provide a five diameter minimum bend for all bends. The preferred piping configuration for remote access is as straight and vertical run as possible while accounting for thermal expansion, shine, and piping interferences. Spatial constraints shall be considered for the remote-access port shield plug or cap removal with respect to its location (i.e., around major pieces of equipment).

Design Requirement #12 - The access port shield plugs or caps shall be designed to meet the appropriate interfacing ventilation system(s) requirements.

Design Requirement #13 - The access ports in remote accessible areas shall be designed to allow for remote removal and installation of the shield plugs or caps. A single shield plug or cap per access port with guides shall be provided for access points in the filter cave. This cover shall meet ventilation requirements and be removed by the filter cell crane/manipulator setup.

Design Requirement #14 - Shield plugs shall be designed for lifting ease and designed for use with a mechanical device for access ports in remotely accessible areas and personnel accessible areas. Design of the shield plugs for removal shall consider constraints due to nearby equipment and room layout.

Design Requirement #15 - The access ports plugs/caps shall provide shielding in accordance with 24590-WTP-DC-M-06-001, *Mechanical System Design Criteria,* Section 6.1 (Ref. 4.11).

Design Requirement #16 - The access ports shall be part of the vessel headspace and shall be maintained at 25% of the lower flammability limit of hydrogen.

2.5 Controls and Instrumentation Design

This section contains both controls and instrumentation preliminary design criteria and electrical preliminary design criteria in addition to the following documents. Controls and instrumentation design shall be in accordance with the Basis of Design (Ref. 4.2). Electrical design shall also be in accordance with the Electrical Design Criteria (Ref. 4.18) and Design Criteria for Electrical Jumpers (Ref. 4.19).

Design Requirement #17 - Power for the heel management pumps shall be provided via a jumper designed to prevent reverse hook up.

Design Requirement #18 - All heel management pump controls will be temporarily located in an accessible manned area near the pump location. The heel management pump controls will not be accessible from the control room. The heel management pump controls will not have Integrated Control Network interface and are only manually controlled.

Design Requirement #19 - A dedicated power source shall be provided for each of the heel management pump operation locations to meet pump load and power requirements.

Design Requirement #20 - All heel management pump controls will be provided by a local Operator Console to be wheeled to the respective power sources that will be used to operate the pump. The Console will be plugged in to the respective power sources. Standard control features such as Start, Stop, and Speed Control shall be located on the Local Operator Console.

3 Safety Criteria

The safety requirements presented in this section are preliminary based on a preliminary hazard analysis (Ref. 4.7 and 4.8) being performed to support preliminary design. The preliminary Safety Requirements listed below are unique to heel management equipment and the access ports. A reference to an issued Hazard Analysis Report with Control Selection or Preliminary Documented Safety Analysis (PDSA) update will replace the CCNs when that becomes available for the heel management equipment and access ports. Refer to the PDSA (Ref. 4.5 and 4.6) for general safety basis requirements for PTF operations.

3.1 Heel Management Pump(s) and Associated Equipment Safety Requirements

The primary function of the heel management system (i.e., to remove heels from certain vessels in PTF) does not require the heel management system to be Safety Significant or Safety Class. The preliminary safety functions that require the heel management system to be Safety Significant is confinement. The preliminary safety functions identified below are subject to change with issuance of the Hazard Analysis Report and PDSA updates.

Safety Basis Requirement #1 - Heel management system pump and jumpers shall be designed and maintained to meet SC-III criteria for confinement during and after a seismic event. The confinement boundary must be designed, procured, installed and operated as a Quality system.

Safety Basis Requirement #2 - Heel management system jumpers shall be designed to be resistant to corrosion and erosion under design basis conditions expected in the process slurry vessel systems for which the heel management system could be used. Heel management system jumpers are not required to be designed for a 40 year life.

Safety Basis Requirement #3 - Heel management system jumpers shall be inspected prior to initial use and either inspected or tested prior to each new deployment (e.g., through a leak test).

Safety Basis Requirement #4 - The heel management system confinement boundary must be constructed of material shown to provide resistance to generation of high energy missiles in an HPAV event. The specific material of construction will be determined (and justified) in the detailed design.

Safety Basis Requirement #5 - The heel management system confinement boundary must be constructed of material shown to retain its integrity during and after explosions that could occur during detonation of hydrogen that could accumulate during a slurry transfer.

Safety Basis Requirement #6 - Dead legs in the heel management system transfer path shall be eliminated to the maximum extent practical. If a dead leg can not be eliminated, it shall meet one of the following requirements:

- Dead legs shall be too small to accumulate hydrogen in sufficient quantities to compromise the confinement boundary
- Dead legs shall be capable of being purged, flushed, or vented at an interval sufficient to remove hydrogen before it can accumulate in quantities that can compromise the transfer path confinement boundary.

Safety Basis Requirement #7 - Pressure pulses in the pump discharge shall not challenge the actuation of the pressure relief device.

Safety Basis Requirement #8 - Pressure relief device shall protect pump discharge line components from pressures that could cause the components to fail.

Safety Basis Requirement #9 - Jumpers shall be designed to accommodate leak testing after each connection. Jumpers shall also be designed to accommodate leak tests that will be performed remotely.

Safety Basis Requirement #10 - The heel management system transfer path is to be flushed after each transfer.

Safety Basis Requirement #11 - Prior to transfers from vessels typically used for processing Newtonian slurries, non-safety interlocks in all potential receipt vessels shall be disabled to prevent a valve in the discharge line from closing during a transfer.

3.2 Access Ports Safety Requirements

Safety Basis Requirement #12 - To ensure confinement, the access ports shall have the same seismic and quality requirements as the vessel (i.e., Q and SC-I).

Safety Basis Requirement #13 - The access port piping shall connect to the vessel headspace to mitigate HPAV by the active ventilation in the vessel headspace.

Safety Basis Requirement #14 - The access ports shall remain closed/plugged when not in use.

Safety Basis Requirement #15 - Shielding of the access ports in the manned C3 areas is required to prevent radiation exposure to facility workers during normal operations.

Safety Basis Requirement #16 - The access port piping shall be constructed of austenitic stainless steel to prevent fragmentation in the event of hydrogen deflagration.

4 References

4.1 24590-WTP-RPT-PET-10-013, Rev. 0, *Pretreatment Vessel Heel Dilution/Cleanout Feasibility Study*

4.2 24590-WTP-DB-ENG-01-001, *Basis of Design*

4.3 24590-PTF-RPT-ENG-10-004, Rev. 0, *Pretreatment Vessel Heel Dilution/Cleanout Functional Requirements*

4.4 24590-WTP-CSER-ENS-08-0001, *Preliminary Criticality Safety Evaluation Report for the WTP*

4.5 24590-WTP-PSAR-ESH-01-002-02, *Preliminary Documented Safety Analysis to Support Construction Authorization; PT Facility Specific Information*

4.6 24590-WTP-PSARA-ENS-09-001, *Preliminary Documented Safety Analysis - Control Strategy Changes for the PT Facility*

4.7 CCN 223268, *ISM III PTF - M3 Vessel Access Ports (camera[1])*

4.8 CCN 244874, *Results from the Heel Management System Hazards Analysis*[2]

4.9 24590-WTP-3DP-G04B-00001, *Design Criteria*

4.10 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document, Volume II*

4.11 24590-WTP-DC-M-06-001, *Mechanical Systems Design Criteria*

4.12 24590-WTP-PL-ENG-06-0013, Rev. 3, *Issue Response Plan for Implementation of External Flowsheet Review Team (EFRT) Recommendations - M3, Inadequate Mixing System Design*

4.13 CCN 242510, *Implementation Plan for Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2010-2, Pulse Jet Mixing at the Waste Treatment and Immobilization Plant (WTP)*[3]

4.14 API STD-676, *Positive Displacement Pumps - Rotary,* API Standard 676, Third Edition, November 2009, American Petroleum Institute, Washington, DC.

4.15 24590-WTP-DB-PET-09-001, Rev. 1, *Process Inputs Basis of Design (PIBOD)*

4.16 Contract Modification Number 221, *Modification of Contract Number DE-AC27-01RV14136.*

4.17 24590-PTF-ES-ENG-10-002, Rev. 0, *FEP-VSL-00017A/B - Waste Feed Evaporator Engineering Study for M3 (Closure Criterion 3)*

4.18 24590-WTP-DC-E-01-001, *Electrical Design Criteria*

4.19 24590-WTP-DC-E-07-001, *Design Criteria for Electrical Jumpers*

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[1] CCN 223268 is cited with preliminary information pending issuance of the Hazard Analysis Report with Control Selection or PDSA update..

[2] CCN 244874 is cited with preliminary information pending issuance of the Hazard Analysis Report with Control Selection or PDSA update.

[3] CCN 242510 is a letter from DOE providing direction to perform the work in the Implementation Plan attached to the CCN.

4.20 24590-QL-HC9-WA49-00001-02-00010, Rev A, Test Plan - Pretreatment Engineering Platform (PEP) Testing (Phase I)

4.21 RPP-RPT-50941, Rev. 0, *Review of Plutonium Oxide Receipts into Hanford Tank Farms*

4.22 PNNL-20646, EMSP-RPT-006, August 2011, *Hanford Waste Physical and Rheological Properties: Data and Gaps*