S

ENGINEERING CHANGE NOTICE

1. ECN 644520

Proj. ECN

2. ECN Category (mark one) Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	3. Originator's Name, Organization, MSIN, and Telephone No. CE Graves, Plant Support Engrg, R3-73, 376-5235	4. USQ Required? [] Yes [X] No	5. Date December 15, 2000
	6. Project Title/No./Work Order No. RPP/WFD	7. Bldg./Sys./Fac. No. Tank Farms	8. Approval Designator ESQ
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-4160, Rev. 0 and HNF-4161, Rev. 0	10. Related ECN No(s). NA	11. Related PO No. NA

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	NA	NA Design Authority/Cog. Engineer Signature & Date	NA Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? [X] Yes [] No

See page 3 for list of sections to be changed in each specification.

14a. Justification (mark one)	14b. Justification Details
Criteria Change [X] Design Improvement [] Environmental [] Facility Deactivation [] As-Found [] Facilitate Const. [] Const. Error/Omission [] Design Error/Omission []	This ECN incorporates DST Transfer Valving and Piping Subsystem specification changes detailed in RPP-7011, *DST Subsystem Specification/Project Media Baseline Comparison Summary Report*, as agreed to by the Baseline Comparison team. Pressure and flow rate values have been updated to the revised values in Rev. 1 of RPP-5346, *Waste Feed Delivery Transfer System Analysis*. Procedure references and boilerplate text are also updated.

15. Distribution (include name, MSIN, and no. of copies)	RELEASE STAMP
See Distribution List	DATE: JAN 17 2001 STA: 4 HANFORD RELEASE ID: 18

ENGINEERING CHANGE NOTICE	Page 2 of 3	1. ECN 644520

16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $ NA	Additional	[] $ NA	Improvement	[] NA
[X] No	Savings	[] $	Savings	[] $	Delay	[]

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]	None	[X]
Environmental Permit	[]	Inventory Adjustment Request	[]	______________	[]

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
NA		

21. Approvals

	Signature		Date		Signature	Date
Design Authority	RW Reed *RW Reed*	R3-83	16 Jan 2001	Design Agent		
Cog. Eng.	CE Graves *C E Graves*	R3-73	01/15/01	PE		
Cog. Mgr.	TJ Conrads *TJ Conrads*	R3-73	1/16/01	QA		
QA	WL Adams *WL Adams*	S5-11	1/17/01	Safety		
Safety/ Licensing	JP Harris *JP Harris*	R1-49	1-17-01	Design		
Environ.	KS Tollefson *KS Tollefson*	R1-51	1/17/01	Environ.		
Other				Other		
	CE Grenard *Charles C Grenard*	R3-73	1/15/01			

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

Changes to HNF-4160, *DST Transfer Valving Subsystem Specification*

Revise these Sections per Appendix L in RPP-7011:

3.1.2.1.1.a	3.1.2.1.7.a	3.2.1.7.1.a	3.3.1.e	3.5.1.f
3.1.2.1.2.a	3.1.2.1.8.a	3.2.1.7.2.a*	3.3.1.m	3.5.1.g
3.1.2.1.2.b	3.2.1.2.1.a	3.2.1.8.a	3.3.3.b	3.5.2.a
3.1.2.1.3.a	3.2.1.4.a*	3.2.1.9.b	3.3.3.d	
3.1.2.1.4.a	3.2.1.4.c*	3.2.1.11.a	3.3.6.1.c	
3.1.2.1.6.a	3.2.1.5.a*	3.2.2.b	3.4.a	

Delete these Sections per Appendix L in RPP-7011:

3.2.1.3.c	3.2.1.9.a	3.2.1.12.a	3.2.1.13.a	3.5.1.e

Update procedure references in Sections 3.3.6.1.a, 3.3.6.3.a, and 3.4.b.

Update boilerplate text (for consistency amongst Subsystem specifications).

Update Section 3.1 (including Table 3-1 and 3-2) to match subfunctions in Rev. 1 of HNF-4155.

Update Table 2-1, Table 2-2, Section 7.0, and Appendix A to reflect the above changes/deletions.

Changes to HNF-4161, *DST Transfer Piping Subsystem Specification*

Revise these Sections per Appendix L in RPP-7011:

3.1.2.1.1.a	3.2.1.1.a*	3.2.2.b	3.3.6.2.a	3.5.2.a
3.1.2.1.1.b	3.2.1.3.a	3.3.1.a	3.4.a	

Update procedure references in Sections 3.3.6.1.a, 3.3.6.3.a, and 3.4.b.

Update boilerplate text (for consistency amongst Subsystem specifications).

Update Table 2-1, Table 2-2, and Appendix A to reflect the above changes/deletions.

* Update to use new pressure and/or flow rate value(s) in Rev. 1 of RPP-5346.

DISTRIBUTION SHEET

To:	From:	Page 1 of 1
Distribution	Plant Support Engineering	Date January 15, 2001
Project Title/Work Order:		EDT No. ---
HNF-4160, Rev. 1, *Double-Shell Tank Transfer Valving Subsystem Specification*		ECN No. 644520

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Double-Shell Tank Transfer Valving Subsystem Specification

Carolyn E. Graves
Fluor Federal Services
Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-99RL-14047

EDT/ECN: 644520 UC: 721
Org Code: 7N700 Charge Code: 110302
B&R Code: Total Pages: 92

Key Words: privatization, double-shell tank, waste feed delivery, subsystem, specification

Abstract:

This specification establishes the performance requirements and provides references to the requisite codes and standards to be applied during design of the Double-Shell Tank (DST) Transfer Valving Subsystem that supports the first phase of Waste Feed Delivery.

1/17/01

Release Approval Date

DATE: JAN 17 2001
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APPROVED FOR PUBLIC RELEASE

HNF-4160
Revision 1

Double-Shell Tank Transfer Valving Subsystem Specification

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

CH2MHILL
Hanford Group, Inc.
Richland, Washington

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC06-99RL14047

HNF-4160
Revision 1

Double-Shell Tank Transfer Valving Subsystem Specification

Prepared by:
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Date Published
January 2001

Prepared for the U.S. Department of Energy
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Office of River Protection under Contract DE-AC06-99RL14047

RECORD OF REVISION

(1) Document Number
HNF-4160

Page 1

(2) Title
Double-Shell Tank Transfer Valving Subsystem Specification

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Initial Release by EDT #625314.	CE Graves	TJ Conrads
RS 1	Complete Revision incorporating ECNS #644464 and #644520.	CE Graves CC Graves	TJ Conrads TJ Conrads 1/16/01

A-7320-005 (10/97)

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CONTENTS

APPENDIX

FIGURES

TABLES

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1.0 SCOPE

1.1 DESCRIPTION

This specification establishes the performance requirements and provides references to the requisite codes and standards to be applied during design of the Double-Shell Tank (DST) Transfer Valving Subsystem that supports the first phase of Waste Feed Delivery (WFD). The DST Transfer Valving Subsystem routes waste and other media (e.g., diluent, flush water, filtered raw water) among DSTs and from the low-activity waste (LAW) and high-level waste (HLW) feed staging tanks to the River Protection Project (RPP)Waste Treatment Plant, where it will be processed into an immobilized waste form.

This specification is intended to be the basis for new projects/installations (W-521, etc.). This specification is not intended to retroactively affect previously established project design criteria without specific direction by the program.

1.2 CLASSIFICATION

Not applicable.

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2.0 APPLICABLE DOCUMENTS

Design requirements applicable to the DST Transfer Valving Subsystem come from government and non-government source documents and various codes and standards. Each document (of the exact revision identified) in this section is invoked by one or more requirements of this specification and represents a part of this specification to the extent specified.

2.1 GOVERNMENT DOCUMENTS

U.S. Department of Energy (DOE) orders and regulatory documents, including those promulgated by the Federal Government and Washington State, constitute a part of this specification to the extent specified herein. The regulatory documents that form a part of this specification are listed in Table 2-1.

Table 2-1. Government Documents.

Document Number	Title
10 CFR 835, 2000	"Occupational Radiation Protection," *Code of Federal Regulations*, as amended.
29 CFR 1910, 1999	"Occupational Safety and Health Standards," *Code of Federal Regulations*, as amended.
40 CFR 265, Subpart J, 1999	"Interim Status TSD Facility Standards, Tank Systems," *Code of Federal Regulations*, as amended.
DOE 5820.2A, 1988	*Radioactive Waste Management*, U.S. Department of Energy, Washington, D.C.
DOE 6430.1A, 1989	*General Design Criteria*, U.S. Department of Energy, Washington, D.C.
DOE/RL-92-36, 1993	*Hanford Site Hoisting and Rigging Manual,* U.S. Department of Energy, Richland Operations Office, Richland, Washington.
WAC 173-303-640, 1999	"Dangerous Waste Regulations," *Washington Administrative Code,* as amended.

2.2 NON-GOVERNMENT DOCUMENTS

National codes, standards, and the Hanford Site documents listed in Table 2-2 constitute a part of this specification to the extent specified herein. The RPP-PRO procedures implement Federal and state regulations and DOE orders. In addition, it should be noted that some requirements are based on the existing authorization basis documents (e.g., *Tank Waste Remediation System Final Safety Analysis Report*, HNF-SD-WM-SAR-067; *Tank Waste Remediation System Technical Safety Requirements*, HNF-SD-WM-TSR-006). The authorization basis requirements may be changed, if necessary, after the analysis and justification of the resulting risk have been outlined in a final safety analysis report amendment and approval is obtained from the DOE Office of River Protection (ORP).

Table 2-2. Non-Government Documents. (4 sheets)

Document Number	Title
ACI 318, 1995	*Building Code Requirements for Reinforced Concrete*, American Concrete Institute, Farmington Hills, Michigan.
ANS 6.4, 1997	*Guidelines on Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants*, American Nuclear Society, LeGrange Park, Illinois.
ANSI/AISC N690, 1994	*Specification for a Design, Fabrication and Erection of Steel Safety Related Structures for Nuclear Facilities*, American National Standard Institute/American Institute of Steel Construction, Chicago, Illinois.
ANSI/ASME B30.2, 1976	*Overhead and Gantry Cranes*, American National Standards Institute, New York, New York.
API 598, 1996, 7th Edition	*Valve Inspection and Testing*, American Petroleum Institute, Washington, D.C.
ASME B16.34, 1998	*Valves-Flanged, Threaded, and Welding End,* American Society of Mechanical Engineers, New York, New York.
ASME B31.3, 1999	*Process Piping,* American Society of Mechanical Engineers, New York, New York.
ASME NQA-1, 1994	*Quality Assurance Program Requirements for Nuclear Facilities,* American Society of Mechanical Engineers, New York, New York.
ASTM A312, 2000	*Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes*, American Society for Testing and Materials, West Conshohocken, Pennsylvania.
AWS D1.1, 1998	*Structural Welding Code-Steel,* American Welding Society, Miami, Florida.
H-2-32420, Rev. 10, 1963	*Assembly Horizontal and Vertical 2-Inch Connector.*
H-2-32430, Rev. 10, 1998	*Assembly Horizontal and Vertical 3-Inch Connector.*
H-2-821324, Rev. 0, 1995	*Integral Seal Block – 2-Inch Jumper Connector.*

Table 2-2. Non-Government Documents. (4 sheets)

Document Number	Title
H-2-821325, Rev. 0, 1995	*Integral Seal Block – 3-Inch Jumper Connector.*
HNF-2004, Rev. 1, 1999	*Estimated Dose to In-Tank Equipment and Ground-Level Transfer Equipment During Privatization*, COGEMA Engineering Corporation for Lockheed Martin Hanford, Richland, Washington.
HNF-2937, Rev. 0, 1999	*Estimated Maximum Concentration of Radionuclides and Chemical Analytes in Phase 1 and Phase 2 Transfers*, COGEMA Engineering Corporation for Lockheed Martin Hanford Corporation, Richland, Washington.
HNF-2962, Rev. 0, 1998	*A List of Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) Requirements*, Numatec Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.
HNF-4155, Rev. 1, 2000	*Double-Shell Tank Monitor and Control Subsystem Specification*, Numatec Hanford Corporation for CH2M HILL Hanford Group, Inc., Richland, Washington.
HNF-5183, Rev. 0, 2000	*Tank Farms Radiological Control Manual* (TFRCM), CH2M HILL Hanford Group, Inc., Richland, Washington.
HNF-IP-0842, Vol. II, Section 6.1, Rev. 0, 1999	*RPP Administration*, "Tank Farms Operations Equipment Labeling," Lockheed Martin Hanford Corporation, Richland, Washington.
HNF-IP-0842, Vol. IV, Section 5.4, Rev. 12, 1999	*RPP Administration*, "Unreviewed Safety Questions," Lockheed Martin Hanford Corporation, Richland, Washington.
HNF-IP-0842, Vol. IV, Section 6.9, Rev. 0, 2000	*RPP Administration,* "Hazard and Accident Analysis Process," CH2M HILL Hanford Group, Inc., Richland, Washington.
HNF-IP-0842, Vol. IV, Section 6.10, Rev. 0, 2000	*RPP Administration,* "Safety Analysis Process – New Project," CH2M HILL Hanford Group, Inc., Richland, Washington.
HNF-IP-0842, Vol. IV, Section 6.11, Rev. 0, 2000	*RPP Administration,* "Safety Analysis Process – Facility Change or Modification," CH2M HILL Hanford Group, Inc., Richland, Washington.
HNF-IP-0842, Vol. IV, Section 6.12, Rev. 0, 2000	*RPP Administration,* "Safety Analysis and Technical Safety Requirements," CH2M HILL Hanford Group, Inc., Richland, Washington.

Table 2-2. Non-Government Documents. (4 sheets)

Document Number	Title
HNF-IP-0842, Vol. V, Section 7.3, Rev. 4d, 2000	*RPP Administration,* "Preventive Maintenance Program," CH2M HILL Hanford Group, Inc., Richland, Washington.
HNF-IP-0842, Vol. VII, Section 12.4, Rev. 0, 2000	*RPP Administration,* "Radiological Design Review Process," CH2M HILL Hanford Group, Inc., Richland, Washington.
HNF-IP-0842, Vol. XI, Section 1.0, Rev. 2, 1999	*RPP Administration,* "Quality Assurance Program," Lockheed Martin Hanford Corporation, Richland, Washington.
HNF-IP-1266, Chapter 5.16, Rev. 2, 1999	*Tank Farms Operations Administrative Controls*, "Dome Loading Controls," DE&S Hanford, Incorporated, for Fluor Daniel Hanford, Inc., Richland, Washington.
HNF-PRO-224, Rev. 3, 2000	*Document Control Program Standards*, Fluor Hanford, Inc., Richland, Washington.
HNF-SD-GN-ER-501, Rev. 1, 1998	*Natural Phenomena Hazards, Hanford Site Washington*, Numatec Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.
HNF-SD-WM-SAR-067, Rev. 1, 1999	*Tank Waste Remediation System Final Safety Analysis Report,* Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.
HNF-SD-WM-TSR-006, Rev. 1-, 1999	*Tank Waste Remediation System Technical Safety Requirements,* Fluor Daniel Hanford, Inc., Richland, Washington.
HS-BS-0084, Rev. B, 1990	*Jumper Fabrication.*
NEMA ICS 6, 1993	*Industrial Controls and Systems,* National Electrical Manufacturers Association, Arlington, Virginia.
NFPA 70, 1999	*National Electric Code*, National Fire Protection Association, Quincy, Massachusetts.
RPP-5346, Rev. 1, 2001	*Waste Feed Delivery Transfer System Analysis,* CH2M HILL Hanford Group, Inc., Richland, Washington.
RPP-PRO-097, Rev. 0, 1999	*Engineering Design and Evaluation*, CH2M HILL Hanford Group, Inc., Richland, Washington.
RPP-PRO-222, Rev. 0, 1999	*Quality Assurance Records Standards*, CH2M HILL Hanford Group, Inc., Richland, Washington.

Table 2-2. Non-Government Documents. (4 sheets)

Document Number	Title
RPP-PRO-709, Rev. 0, 1999	*Preparation and Control Standard for Engineering Drawings*, CH2M HILL Hanford Group, Inc., Richland, Washington.
RPP-PRO-1819, Rev. 0, 1999	*Engineering Requirements*, CH2M HILL Hanford Group, Inc., Richland, Washington.

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3.0 REQUIREMENTS

3.1 SUBSYSTEM/COMPONENT DEFINITION

The DST System provides safe storage of waste products, serves as a waste processing system for waste pretreatment, and provides a staging system for delivery of waste feed to the RPP Waste Treatment Plant for waste treatment/immobilization.

The DST System includes six tank farms containing a total of 28 DSTs. Five of the DST farms are located in the 200 East Area (241-AN, 241-AP, 241-AW, 241-AY, and 241-AZ), and one is located in the 200 West Area (241-SY). The four tanks in the 241-AY and 241-AZ tank farms are designed to store high heat or "aging" waste and have a design storage capacity of 3,800 m^3 (1 Mgal) each. Each of the other DSTs has a design capacity of 4,390 m^3 (1.16 Mgal) per tank. Tank 241-AN-107, with a capacity of 4,390 m^3 (1.16 Mgal), could be used as an aging waste storage tank. The planned usage of the DSTs during Phase 1 Waste Feed Delivery is detailed in the *Tank Waste Remediation System Operation and Utilization Plan to Support Waste Feed Delivery*, HNF-SD-WM-SP-012. This specification's requirements are based on the Case 3, Project Planning, DST usage scenario documented therein. Notice that Case 3S6D, 2006 Hot Start, will be documented in Revision 2 of HNF-SD-WM-SP-012 and will serve as the baseline case for the Readiness to Proceed-2 (RTP-2) RPP milestone. Case 3S6D incorporates changes to Case 3 to resolve feed staging tank issues, reflect changes in the assumptions, and include additional programmatic constraints, as directed by DOE-ORP. Preliminary quantitative and qualitative assessments were performed to determine the impacts of these changes to the DST subsystem requirements. Generally, the DST subsystem requirements were determined to be insensitive to the aforementioned changes; that is, the fundamental system-level requirements remained constant between Cases 3 and 3S6D (e.g., the need to prepare and transfer AN Farm tank waste to the vitrification facility). In instances where quantitative assessments were performed, the enveloping case was selected to develop the DST subsystem requirements.

The DST System specification (*System Specification for the Double-Shell Tank System*, HNF-SD-WM-TRD-007) identifies several second-tier functions (Figure 3-1). The Transfer Waste to LAW Staging Tanks function has been further decomposed as shown. These are shown as third- and fourth-tier functions in Figure 3-1. *Functional Analysis for Double-Shell Tank Subsystems*, HNF-5136, allocates the shaded third- and fourth-tier functions of Figure 3-1 to the DST Transfer Valving Subsystem. Section 3.2.1 of this specification is organized to accommodate these shaded functions.

The Monitor Valve Position and Detect Leaks in Transfer-Associated Structures functions cannot be fully allocated to a single subsystem. Therefore, these functions have been decomposed into the subfunctions identified in Table 3-1.

Figure 3-1. Double-Shell Tank Transfer Valving Subsystem Functional Hierarchy for Waste Transfers.

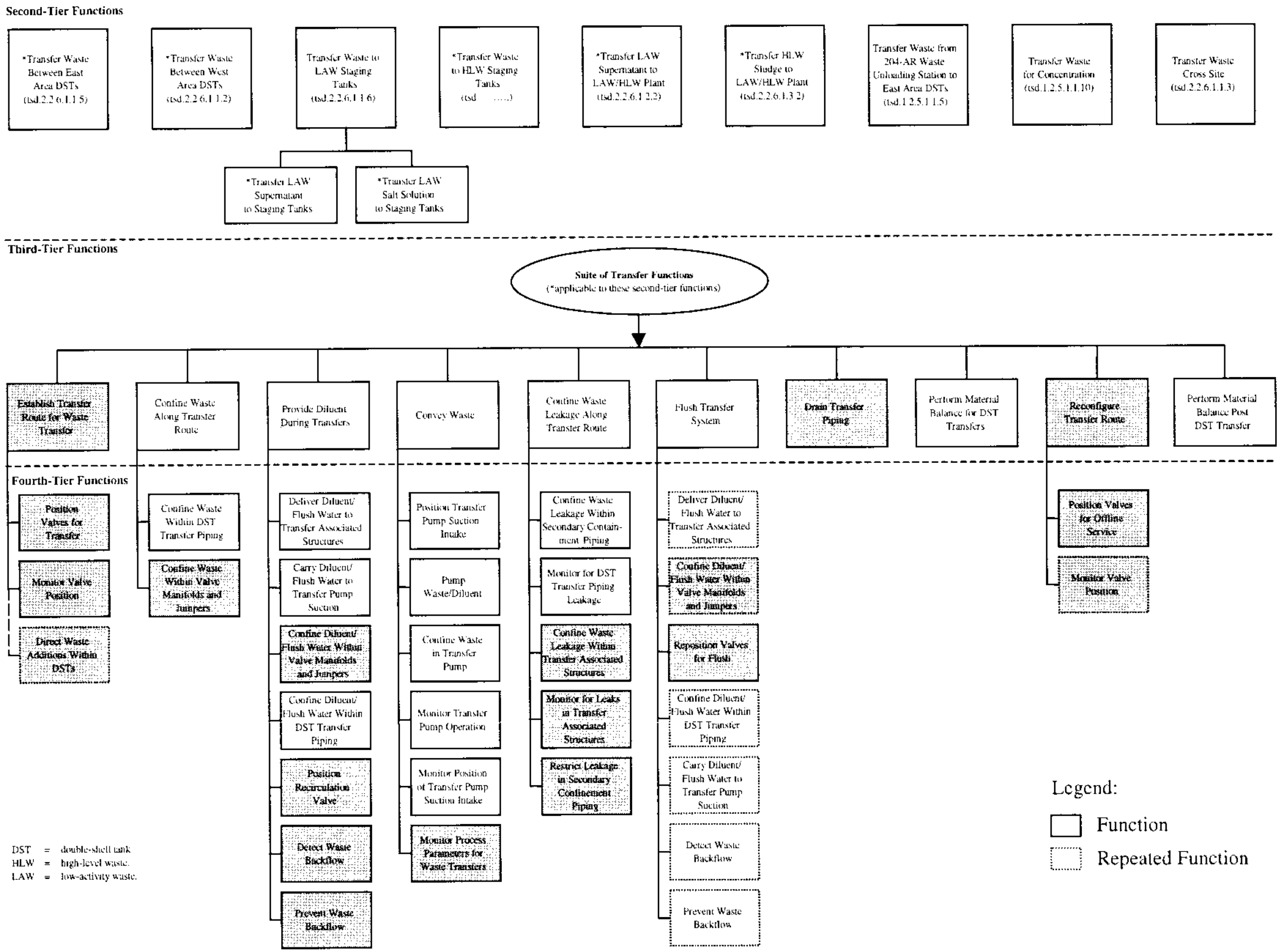


Table 3-1. Decomposition of Valve Position and Leak Detection Functions.

Monitor Valve Position	Monitor for Leaks in Transfer-Associated Structures
Measure Transfer Valve Position	Detect Leak in Transfer-Associated Structure
Transmit Transfer Valve Position	Transmit Transfer-Associated Structure Leak Data
Receive Transfer Valve Position	Receive Transfer-Associated Structure Leak Data
Compare Transfer Valve Position	Compare Transfer-Associated Structure Leak Data
Display Transfer Valve Position (Local)	Display Leak in Transfer-Associated Structure
Display Transfer Valve Position (Remote)	Record Transfer-Associated Structure Leak Data
Record Waste Transfer Valve Position	

Likewise, the Monitor Process Parameters for Waste Transfer function was decomposed two additional levels to identify functions that are fully allocable to this system. These subfunctions are identified in Table 3-2.

Table 3-2. Decomposition of Monitor Process Parameters for Waste Transfer Function.

Monitor Waste Transfer Flow	Monitor Transfer Pump Discharge Pressure	Monitor Waste Transfer Density
Measure Waste Transfer Flow Rate	Measure Transfer Pump Discharge Pressure	Measure Waste Transfer Density Measure Waste Transfer Temperature*
Transmit Waste Transfer Flow Rate	Transmit Transfer Pump Discharge Pressure Signal	Transmit Waste Transfer Density/Temp Data
Receive Waste Transfer Flow Rate	Receive Transfer Pump Discharge Pressure Signal	Receive Waste Transfer Density/Temp Data
Compare Waste Transfer Flow Rate	Compare Transfer Pump Discharge Pressure	Compare Waste Transfer Density/Temp Data
Record Waste Transfer Flow Rate	Record Transfer Pump Discharge Pressure	Record Waste Transfer Density/Temp Data
Display Waste Transfer Flow Rate	Display Transfer Pump Discharge Pressure	Display Waste Transfer Density/Temp Data
Respond to Abnormal Transfer Flow Rate	Respond to Abnormal Transfer Pump Discharge Pressure	Respond to Abnormal Waste Transfer Density

*Current densitometers incorporate temperature measurement, therefore this subfunction will not be developed here.

Functions allocated to the DST Transfer Valving Subsystem are as follows:

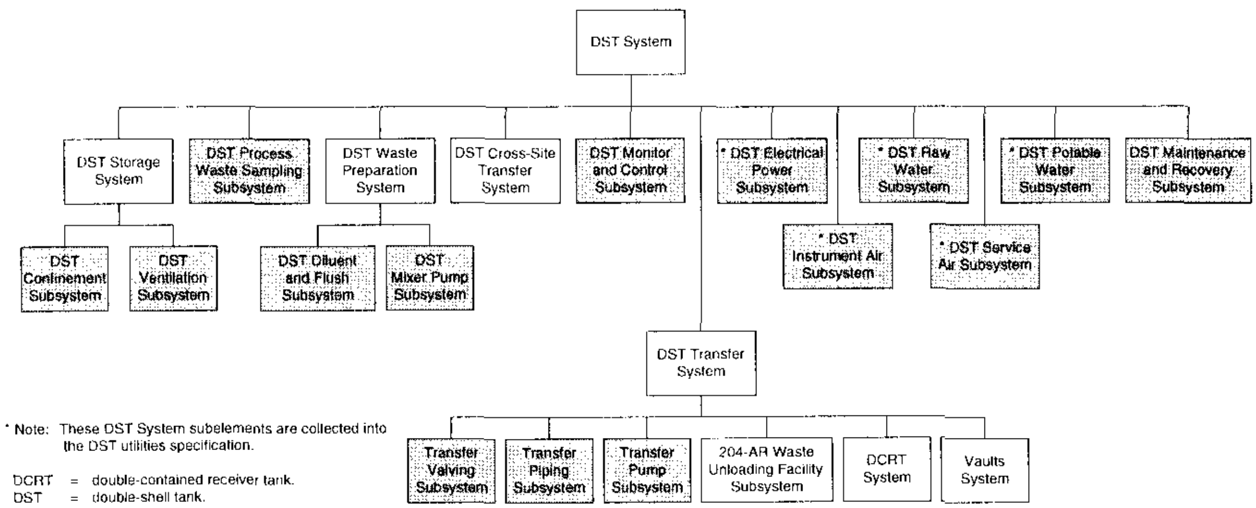
- Measure and Transmit Transfer Valve Position
- Display Waste Transfer Valve Position (Local)
- Detect Leak in Transfer-Associated Structure
- Detect Leak in Transfer Piping
- Measure and Transmit Waste Transfer Flow Rate

- Measure and Transmit Transfer Pump Discharge Pressure
- Measure and Transmit Waste Transfer Density/Temperature.

The other subfunctions are allocated to the DST Monitor and Control Subsystem (see HNF-4155).

The DST System consists of the 12 subsystems identified in Figure 3-2. Five of these subsystems (electrical, raw water, potable water, service air, and instrument air) will be collected into one specification for the DST Utilities System. Several of these subsystems have been further subdivided to identify lower level subsystem/components. Subsystem specifications will be prepared for the subsystems/components shaded in Figure 3-2, because they will be constructed or modified in support of Phase 1 Waste Feed Delivery.

Figure 3-2. Double-Shell Tank System Architecture Tree.



The primary interfaces between DST subsystems/components are shown in Figures 3-3 and 3-4. Figure 3-3 shows the primary DST mechanical system interfaces for eight subsystems. Different materials going between the subsystems are shown as different types of lines. For waste preparation, the mixer pump moves waste within the waste confinement subsystem (i.e., the tanks) at a high velocity to suspend undissolved solids and/or to mix supernatant. Once waste preparation is complete, waste is removed from the DST Confinement Subsystem source tank by the transfer pump and is routed by the valving subsystem through the piping subsystem toward its destination (i.e., another DST or the RPP Waste Treatment Plant). If the destination is another DST, the valving subsystem will direct the waste into the receiving DST. If the destination is the processing plant, the plant's waste receipt piping will route the waste into the plant.

The DST Confinement Subsystem must confine the tank waste during both in-tank waste processing (e.g., mixing, diluent addition) and in static storage. In either case, the DST Ventilation Subsystem draws air in from, and exhausts air out to, the external atmosphere to cool and to maintain confinement of the DST Confinement Subsystem vapors. Before exhausting the air from the primary and annulus tanks' vapor space to the environment, the DST Ventilation Subsystem HEPA filters remove radioactive particulates.

Figure 3-3. Subsystem for Double-Shell Tank Mechanical System Interfaces.

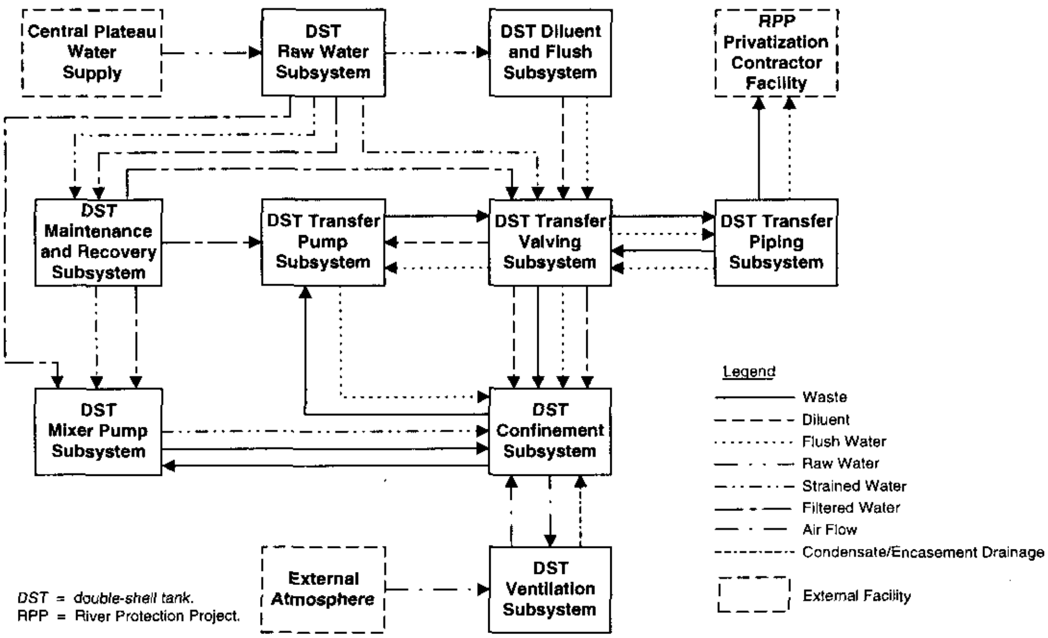
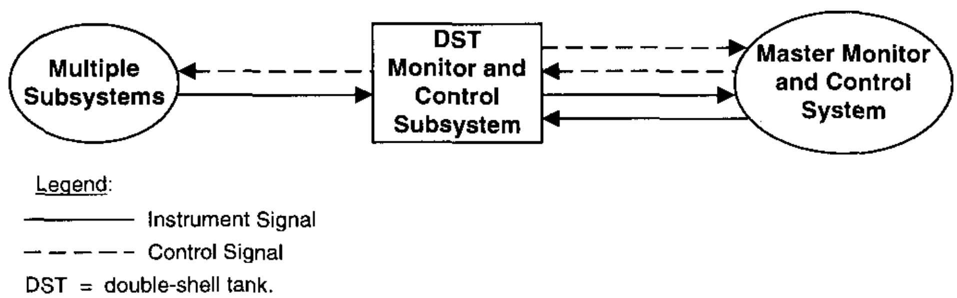


Figure 3-4. Interfaces for Double-Shell Tank Monitor and Control Subsystem.



The DST Raw Water Subsystem receives water from the Site Raw Water Distribution System, where it is strained to remove large particulates before being used by the DST Diluent and Flush Subsystem. The DST Diluent and Flush Subsystem chemically adjusts the water for dilution or for flushing. The degree of chemical adjustment of diluent will depend on the batch of waste being transferred. The raw water is heated to match the waste temperature (see *Waste Feed Delivery Technical Basis*, HNF-1939, Volume II, Revisions 0a [Addendum 1-1], 0b [Addendum 2-1], and 0c [Addendum 3-1]).

Diluent is routed by the valving subsystem either to the transfer pump for in-line dilution of the waste or to the confinement subsystem for in-tank dilution. When a transfer is complete, the transfer pump, valving, and piping subsystems are flushed with water.

The DST Raw Water Subsystem filters water to remove small particles before the water is piped directly to the mixer pump and transfer valving subsystems. Filtered water is routed to the confinement subsystem via the transfer valving subsystem. Filtered water also can be routed to the mixer pump, the transfer pump, and the valve pit via the DST Maintenance and Recovery Subsystem for infrequent needs. Infrequent needs may include filling a mixer pump drive shaft and providing water to the pump seals.

The DST Maintenance and Recovery Subsystem will be used for many other infrequent needs that were not shown on the diagram for reasons of clarity. For example, raw water will be used to decontaminate the pumps when they are removed from the tanks. It also will be used in decontaminating the valve and pump pits.

Figure 3-4 generically shows how the DST Monitor and Control Subsystem interfaces with other systems. All of the subsystems shown in Figure 3-3 provide instrument data signals to the DST Monitor and Control Subsystem. The DST Monitor and Control Subsystem transmits selected data to the Master Monitor and Control System. The DST Monitor and Control Subsystem also receives data and control signals from the Master Monitor and Control System. Based on the data and control signals received, the DST Monitor and Control Subsystem sends control signals to the multiple DST subsystems.

3.1.1 Subsystem/Component Diagrams

Major subsystems for the DST Transfer Valving Subsystem were chosen based on the subsystem's functional requirements and the DST System architecture. Figure 3-5 shows the architectural decomposition of the DST Transfer Valving Subsystem. The major subsystems that have been identified are:

- DST addition drop-leg
- Valve manifolds, nozzles, and jumpers
- Transfer-associated structures and cover blocks
- Pit leak detectors
- In-line sensors.

A general description of each subsystem and components is provided in Section 3.7. Figures 3-6 and 3-7 depict the general configuration of a typical valve pit and pump pit, respectively.

3.1.2 Interface Definition

This section identifies the major interfaces of the DST Transfer Valving Subsystem with other systems. The interface descriptions that follow are intended to help define the subsystem boundaries. These interface relationships are illustrated in Figure 3-8. This section discusses the inputs from these interfacing systems and facilities. Outputs from the DST Transfer Valving Subsystem to other systems and facilities are discussed in Section 3.2.1.

Figure 3-5. Architectural Decomposition of the Double-Shell Tank Transfer Valving Subsystem.

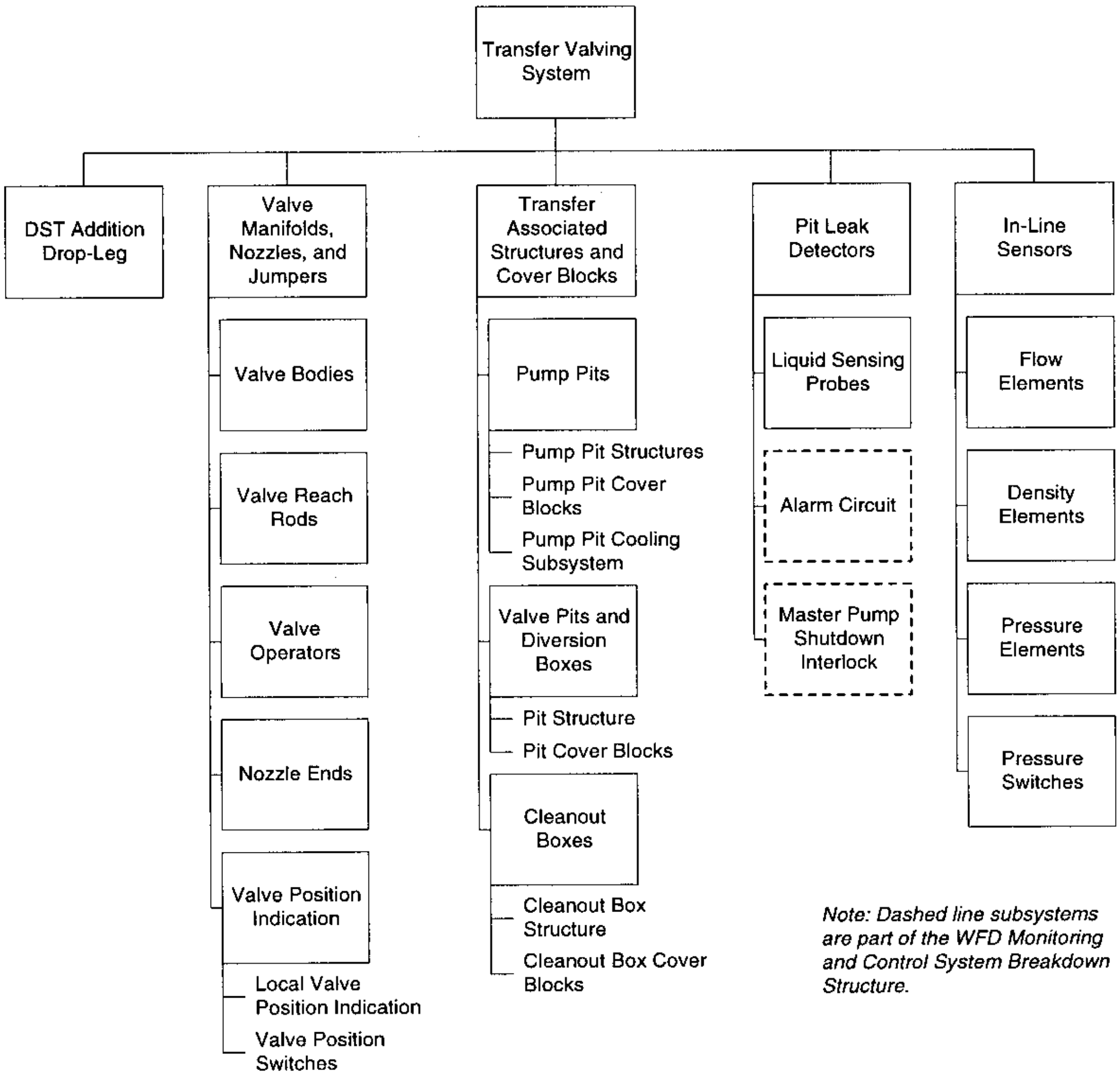


Figure 3-6. Typical Valve Pit Configuration.

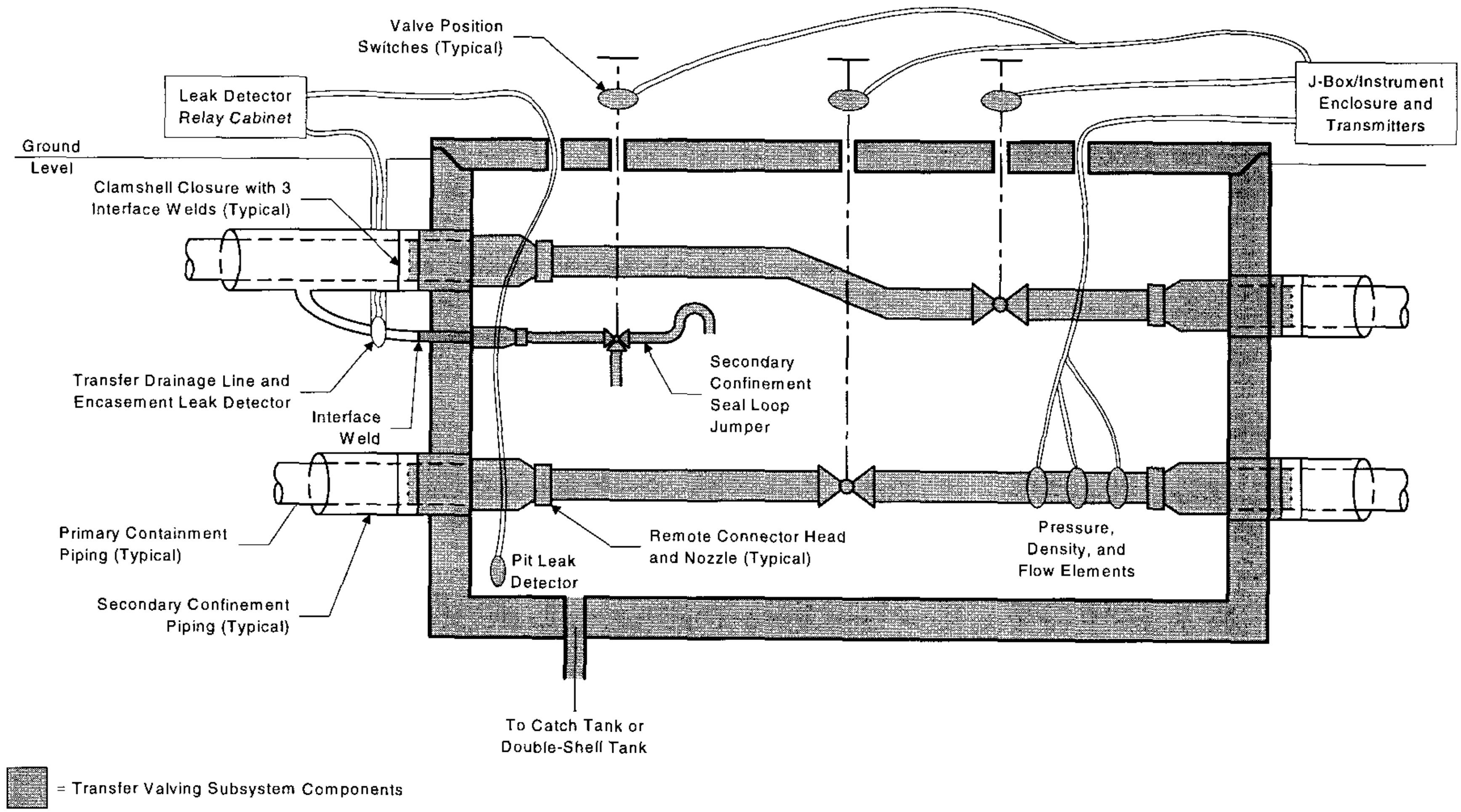


Figure 3-7. Typical Pump Pit Configuration.

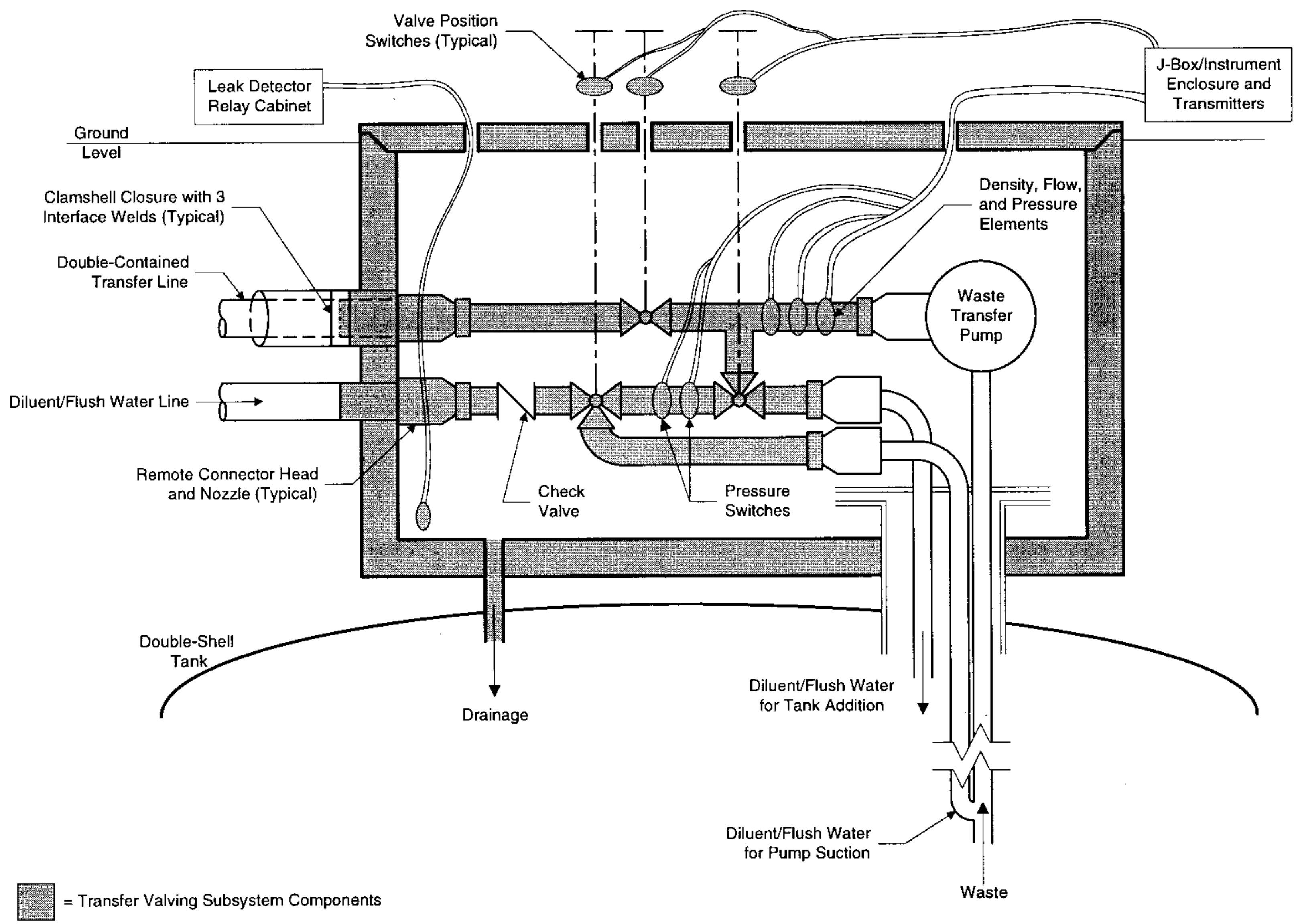
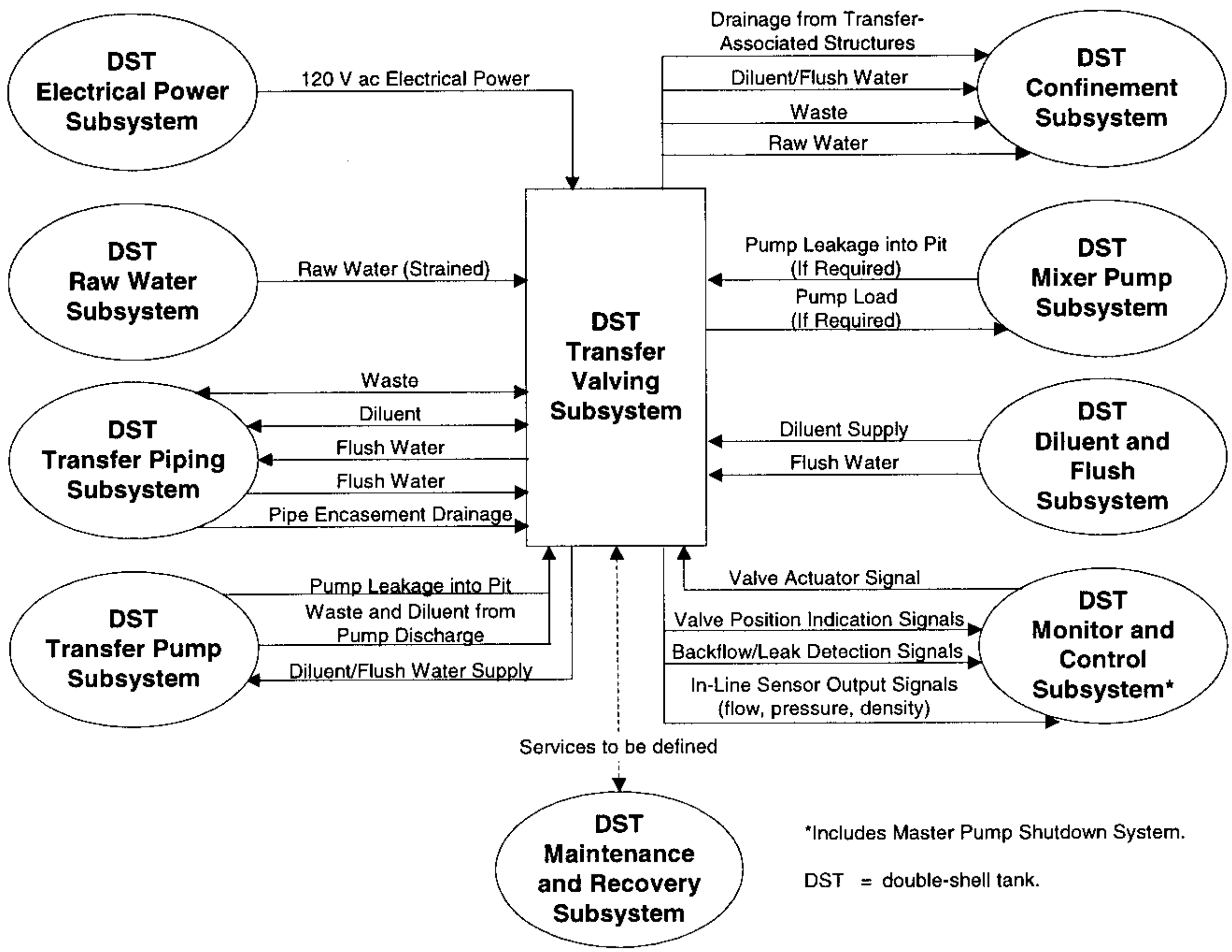


Figure 3-8. Major Interfaces of the Double-Shell Tank Transfer Valving Subsystem.



3.1.2.1 Functional Interfaces

3.1.2.1.1 Double-Shell Tank Transfer Pump Subsystem. The DST Transfer Pump Subsystem provides the hydraulic pressure to convey the waste through the piping system to a desired location. Each DST will have one or more designated pumps for transferring waste out of the tank during WFD operations. The pump pits provide secondary confinement of the transfer pumps.

a. The DST Transfer Valving Subsystem shall transfer and route the waste or diluent from the DST Transfer Pump Subsystem at a pressure equal to or greater than the design pressure defined in Section 3.2.1.4.c.

3.1.2.1.2 Double-Shell Tank Transfer Piping Subsystem. The DST Transfer Piping Subsystem provides a path to transfer the waste from the transfer-associated structure(s) to the desired location. The DST Transfer Piping Subsystem transfers waste, diluent, and filtered raw water to and from the DST Transfer Valving Subsystem. The DST Transfer Piping secondary confinement drains to the DST Transfer Valving System.

a. The DST Transfer Valving Subsystem shall route the waste, diluent, and filtered raw water from the DST Transfer Piping system at a pressure equal to or greater than the design pressure defined in Section 3.2.1.4.c.

b. The DST Transfer Valving Subsystem shall provide a method (e.g., seal loop jumper) to block and route the flow of waste, diluent, or water from the DST Transfer Piping Subsystem secondary confinement drain.

3.1.2.1.3 Double-Shell Tank Raw Water Subsystem. The DST Raw Water Subsystem provides filtered raw water to the transfer-associated structure for routing to the transfer piping for off-normal flushing conditions (e.g., when the DST Diluent and Flush Subsystem is unable to perform a required flush). The DST Raw Water Subsystem also provides filtered raw water for addition to the DST Confinement Subsystem via the DST Transfer Valving Subsystem.

a. The DST Transfer Valving Subsystem shall route the filtered raw water from the DST Raw Water Subsystem at a pressure equal to or greater than the design pressure defined in Section 3.2.1.4.c.

3.1.2.1.4 Double-Shell Tank Electrical Power Subsystem. The DST Electrical Power Subsystem provides electricity to the motor-operated valves.

a. The DST Transfer Valving Subsystem valve motor operators should be designed to operate using the 120 V ac power source provided by the DST Electrical Power Subsystem.

3.1.2.1.5 Double-Shell Tank Maintenance and Recovery Subsystem. The DST Maintenance and Recovery Subsystem provides the equipment, materials, and qualified personnel to perform any required preventive maintenance of valving system components located inside the pit. Initial calibration and periodic loop checks will be required for sensing devices, switches, etc.

The DST Maintenance and Recovery Subsystem will provide the necessary equipment for valve seat replacement, decontamination, and removal of valve operating devices, manifolds, and jumpers. Capability for size reduction and waste packaging of failed components will be provided as required. Laydown areas will be provided for valving system components.

a. Reserved.

3.1.2.1.6 Double-Shell Tank Diluent and Flush Subsystem. The DST Diluent and Flush Subsystem provides inhibited water to the DST Transfer Valving Subsystem for routing to the tanks, transfer pump, and transfer piping for flushing and dilution of waste.

a. The DST Transfer Valving Subsystem shall transfer and route the flush or diluent from the DST Diluent and Flush Subsystem at a pressure equal to or greater than the design pressure defined in Section 3.2.1.4.c.

3.1.2.1.7 Double-Shell Tank Mixer Pump Subsystem. The DST Mixer Pump Subsystem may, if located in a transfer-associated structure, generate pump leakage to the transfer-associated structure in the DST Transfer Valving Subsystem.

a. The DST Transfer Valving Subsystem transfer-associated structure should contain the leakage from the mixer pump and route it to the tank as required.

3.1.2.1.8 Double-Shell Tank Monitor and Control Subsystem. The DST Monitor and Control Subsystem will provide remote actuation for the motor-operated primary transfer valves in the transfer pump pits. The valve position signals will be generated by the valve operator from the operator interface station at the local tank farm.

a. The DST Transfer Valving Subsystem shall be designed using motor-operated valves where valve manipulation during a transfer cycle is required.

3.1.2.2 Physical Interfaces

Detailed physical interface definition and requirements associated with the DST Transfer Valving Subsystem are captured in interface control documents that are application specific and are (to be) developed by line item project organizations responsible for the design of DST subsystems, as directed by the WFD Program Office.

3.1.3 Major Component List

Major components of the DST Transfer Valving Subsystem are listed in Section 3.1.1.

3.1.4 Government-Furnished Property List

Not applicable.

3.1.5 Government-Loaned Property Lists

Not applicable.

3.2 CHARACTERISTICS

This section contains the minimum requirements related to performance characteristics, physical characteristics, reliability, maintainability, environmental conditions, transportability, and flexibility and expansion. Minimum requirements are identified by SHALL statements, while design goals are identified by SHOULD statements. If a requirement cannot be satisfied, justification of an alternative design shall be submitted to the Design Authority for approval. The source documents that provide the basis for each requirement are identified in Appendix A.

3.2.1 Performance Characteristics

This section contains all requirements related to the functionality and performance capabilities for the DST Transfer Valving Subsystem.

3.2.1.1 Position Valves for Transfer

The transfer valves shall enable or block waste flow from required ports to achieve transfer routing objectives.

a. The valves shall remain closed when within 5 degrees of full closed position.

3.2.1.2 Monitor Valve Position

The DST Transfer Valving Subsystem shall provide local indication of the actual position of all transfer valves and shall measure the actual position of all transfer valves for remote display.

3.2.1.2.1 Display Valve Position (Local). The DST Transfer Valving Subsystem shall provide local indication of the actual position of all transfer valves.

a. Mechanical (local) position indication for valves shall be accurate to within ±3 degrees with respect to the actual valve position.
b. Mechanical (local) indication of the valve's position shall be visible from the top of the cover block.

3.2.1.2.2 Measure Transfer Valve Position. The DST Transfer Valving Subsystem shall include measurement devices to provide an electronic signal that indicates the position status of transfer valves.

a. Measurement device(s) for remote indication of valve position shall be compatible with the requirements of the DST Monitor and Control Subsystem specification (HNF-4155).

3.2.1.3 Direct Waste Additions Within Double-Shell Tanks

DST addition drop-legs shall be provided to direct the waste, service water, or diluent into DSTs.

a. A method of minimizing aerosol generation should provided for Tanks 241-AP-102 and 241-AP-104.

b. A drop-leg or other method of discharging liquid beneath the tank waste surface shall be provided for Tanks 241-AZ-101 and 241-AZ-102.

3.2.1.4 Confine Waste Within Valve Manifolds and Jumpers

The transfer valve manifolds and jumpers provide the primary containment boundary for waste routed through the pump and valve pits. Jumpers provide the primary containment boundary for waste routed through diversion boxes.

a. The DST Transfer Valving Subsystem shall be designed to transfer waste (as defined in Section 3.2.5.2.3) up to 630 L/min (166 gal/min).

b. Pressure boundaries shall be designed for no visible leakage at test pressure in accordance with ASME B31.3.

c. The threshold design pressure of new DST Transfer Valving Subsystem components shall be >6240 kPa (>905 lb/in^2).

3.2.1.5 Confine Diluent/Flush Water Within Valve Manifolds and Jumpers

The DST Transfer Valving Subsystem shall be capable of routing diluent and flush water to the transfer pump suction or transfer pump discharge through fixed jumpers or valve manifolds. The DST Transfer Valving Subsystem also shall route diluent and flush water to the DST addition drop-leg in the tank riser for direct addition to the DST via fixed manifolds or jumpers. The DST Transfer Valving Subsystem also shall be capable of routing filtered raw water from the DST Raw Water Subsystem to the tank.

a. The DST Transfer Valving Subsystem shall be designed to transfer and route diluent/flush water at a flow rate up to 630 L/min (166 gal/min).

b. The DST Transfer Valving Subsystem shall be designed to transfer and route filtered raw water at a pressure not to exceed the design pressure defined in Section 3.2.1.4.c.

3.2.1.6 Position Recirculation Valve

The transfer valves shall enable or block flow to achieve recirculation from the transfer pump to the tank.

a. The valves shall be capable of being positioned in the full-open or full-closed positions for every port. The valve position is defined as fully closed and seated in Section 3.2.1.1.a.

3.2.1.7 Monitor Process Parameters for Waste Transfers

The DST Transfer Valving Subsystem shall monitor various process parameters (e.g., flow, density, pressure) during waste transfers.

3.2.1.7.1 Measure and Transmit Waste Transfer Flow Rate. The DST Transfer Valving Subsystem shall provide the capability to measure the waste flow rate at the transfer pump discharge.

a. The flow-rate measurement device shall be capable of measuring a range of 0-757 L/min (0-200 gal/min) with an accuracy of 1.0 percent of range.

3.2.1.7.2 Measure and Transmit Transfer Pump Discharge Pressure. The DST Transfer Valving Subsystem shall provide the capability to measure transfer pump discharge pressure.

a. The pressure measurement device(s) shall be capable of measuring a range of 0 -10,400 kPa (0-1510 lbf/in^2) with an accuracy of 0.5 percent of range.

3.2.1.7.3 Measure and Transmit Waste Transfer Density. The DST Transfer Valving Subsystem shall provide the capability to measure waste density at the transfer pump discharge. Density measurements will be used to ensure adequate waste dilution for pumpability.

a. The density measurement device shall be capable of measuring a range of 0.9 to 1.5 g/cm^3 with an accuracy of 0.0005 g/cm^3. <TBR>

3.2.1.8 Confine Waste Leakage Within the Transfer-Associated Structures

The DST Transfer Valving Subsystem shall confine waste leaks occurring within the transfer-associated structures. Valve pits, pump pits, clean-out boxes, and diversion boxes shall be provided with a drain path to a DST or double-contained receiver tank. Cover blocks shall be provided for all transfer-associated structures that are physically connected to an active waste transfer route.

a. Cover blocks shall be designed to provide an impaction surface to prevent the direct spray of waste into the atmosphere and to provide a tortuous path for aerosol release from the transfer-associated structure.

b. The design of the transfer-associated structure shall be in accordance with WAC 173-303-640 for final status facilities and 40 CFR 265, Subpart J, for interim status facilities. The design of the structure shall allow for detection of a leak within 24 hours.

3.2.1.9 Monitor for Leaks in Transfer-Associated Structures

Transfer-associated structures shall be provided with the capability to detect a liquid leak within the structure.

a. A new pit leak-detector assembly and conductivity probe shall be 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 24 hours, or at the earliest practicable time, if the owner or operator can demonstrate to the department that existing detection technologies or site conditions will not allow detection of a release within 24 hours and if the Washington State Department of Ecology approves the deviation from the requirements specified above.

b. The leak detection system shall be compatible with the DST Monitor and Control Subsystem specification and the master pump shutdown system.

3.2.1.10 Drain Transfer Piping

The transfer pipelines, valve manifolds, and jumpers shall be capable of being gravity drained to the source or receiving tank.

a. A means of breaking the vacuum in the transfer line should be provided as required to allow gravity liquid draining. The drain piping shall be sloped continuously from high point to low point with a minimum slope of 0.25%.

3.2.1.11 Position Valves for Offline Service

The transfer valves shall enable or block flow to provide offline service of waste, diluent, and water transfers.

The requirement is the same as 3.2.1.1.a.

3.2.1.12 Reposition Valves for Flush

The transfer valves shall enable or block flow to achieve flushing objectives for jumpers, transfer piping, and transfer pumps.

The requirement is the same as 3.2.1.1.a.

3.2.1.13 Detect Waste Backflow

The DST Transfer Valving Subsystem shall be capable of detecting any backflow of waste or contaminated flush or diluent from the transfer pump to the flush/diluent jumper.

a. The detection instrumentation shall be compatible with the requirements of the DST Monitor and Control Subsystem specification. The detection instrumentation shall be installed between the pump discharge and the backflow prevention device required in Section 3.2.1.14.a.

3.2.1.14 Prevent Waste Backflow

The DST Transfer Valving Subsystem shall be capable of preventing any backflow of waste or contaminated flush or diluent from the transfer pump into the raw water, flush water, or diluent supply piping.

a. The backflow prevention device shall be compatible with the requirements for jumpers and jumper components. The backflow prevention device shall be installed between the flush/diluent supply and the backflow prevention instrumentation required in Section 3.2.1.13.a.

3.2.1.15 Restrict Leakage in Secondary Confinement Piping

The DST Transfer Valving Subsystem shall restrict leakage of the DST Transfer Piping Subsystem secondary confinement drain piping.

a. The seal loop jumper shall be designed to impede the flow of any dangerous waste or liquid in the secondary confinement drain pipe to ensure that the leak detector in the DST Transfer Piping Subsystem will detect the failure of the primary containment or the presence of any dangerous waste or accumulated liquid in the secondary containment within 24 hours. The amount of anticipated leakage to actuate the leak detector shall be calculated during design of the system. The Washington State Department of Ecology, through the final status permitting process, may approve or disapprove the final system design.

3.2.2 Physical Characteristics

This section contains requirements related to physical characteristics (maximum/minimum physical size, weight, shape, etc.).

a. Transfer valve manifolds and jumpers should be 7.6 cm (3 in.) internal diameter.

b. Valves or operators should be provided with mechanical stops located as shown in Table 3-3. The operators and stops shall prevent overtorquing and plastic deformation of the valves.

Table 3-3. Valve and Operator Stop Locations.

Valve or Operator	Stop Position 1 (in degrees)	Stop Position 2 (in degrees)
2-way T-handle operated valve	0	90
3-way T-handle operated valve	0	180
2-way motor operated valve	-3	93
3-way motor operated valve	-3	183
2-way manual gear operator	-3	93
3-way manual gear operator	-3	183

c. Valves shall be capable of being manually or electrically operated from above the pit cover blocks.

d. Except for the check valves, all jumper valves shall be ball valves designed for installation in the stem-up position.

e. New cover blocks shall be sloped to allow water to drain off the top of the cover and shall extend over the outside of the pit walls. Existing cover blocks shall be modified with drip shields or other mechanical means, as required, to meet the requirements of WAC 173-303-640(4)(e).

f. Cover blocks shall have penetrations to facilitate operation and/or functional testing of the components inside transfer-associated structures. Operations include, but are not limited to, decontamination by washdown, removing standing water with a portable pump, retrieving gas and particulate samples, and taking still and motion pictures of valve stem position and of the entire structure interior.

g. Cover block penetrations shall be sealed adequately to stop rain/snow water intrusion.

h. Cover blocks shall prevent radiation streaming.

i. Cover blocks and jumpers shall be provided with lifting bails positioned suitable for balanced lifting by crane.

j. Nozzle, manifold, and jumper assembly connections installed in new pump or valve pits should be of the Plutonium-Uranium Extraction (PUREX)-type designed in accordance with drawings H-2-32430 and H-2-32420 or H-2-821324 and H-2-821325.

k. Manifold and jumper assembly connections installed in existing pump and valve pits and diversion boxes shall be designed to mate to existing nozzles.

l. The valve position hardware, as applicable, shall be designed to facilitate quick mechanical/electrical disconnect for ease of cover block removal and replacement.

m. Two-way valves shall be designed to close in the clockwise direction.

n. In existing pits where as low as reasonably achievable (ALARA) practices preclude accurate determination of existing nozzle locations by pit entry or photogrammetry, flexible piping sections should be used to facilitate jumper installation.

o. All valves shall prevent spray leaks resulting from overtorquing of valve stems.

p. Taps for instrumentation and test connections shall be made on the top of the pipe.

3.2.3 Reliability

This section contains the requirements and other features to promote reliability.

a. Process pits and cover blocks shall have a design life of 35 years.

b. Where practical, removable components located beneath cover blocks, including valves and jumpers, should have a design life of 12 years without maintenance. <TBR>

c. Valve manufacturers shall provide written recommendations of operational practices such as preventive maintenance to maximize the valve's useful life.

d. Valves shall be designed for at least 1,000 cycles over their design life.

e. Valve operator closure shall be sufficiently slow to prevent damage from water hammer.

f. Pipe elbow and bends should have a bend radius greater than or equal to a long-radius elbow.

3.2.4 Maintainability

The design shall consider the maintainability factors peculiar to the specific equipment to be used in the DST Transfer Valving Subsystem. Facility design shall provide for routine preventive maintenance/calibration where required and maintenance, repair, or replacement of equipment subject to failure.

a. The design of valve manifolds, jumpers, and process instrumentation installed in process pits shall include features to minimize contamination of other equipment within the pit, and the pit itself, during routine operation and removal or repair activities.

b. Instrument isolation valves for instrument sensor isolation and equalization shall be located outside of the primary transfer-associated structures. These valves shall be located in a supplemental structure constructed per Section 3.3.1.e.

c. The valve position switches shall be located above the pit cover block.

d. All electrical connections shall be designed as applicable with quick-disconnects for ease of cover block removal and replacement.

e. Jumpers and jumper components should be repairable or replaceable within 24 hours. This timeframe does not include work package preparation or cover block removal (time includes jumper removal and reinstallation in the pit).

f. The low-point leak detector sensors should be repairable or replaceable within 8 hours. Time to repair does not include preparatory work such as preparing procedures, staging personnel and equipment, or preparatory training.

3.2.5 Environmental Conditions

This section provides design requirements relevant to natural and induced environmental conditions.

3.2.5.1 Natural Environments

This section defines the natural conditions (e.g., weather).

a. The subsystem shall be designed for the natural environmental conditions specified in HNF-SD-GN-ER-501.

b. The subsystem shall be designed to withstand the natural phenomena hazards as specified in RPP-PRO-097.

c. For permanent structures, subsurface conditions shall be determined by means of borings or other methods that adequately disclose soil and groundwater conditions. Data and other information obtained from prior subsurface investigations may be used, supplemented by additional investigations at the specific location, as deemed necessary by the RPP Design Authority.

3.2.5.2 Induced Environments

This section defines the induced environment impinging on the subsystem including waste chemistry and radiation.

3.2.5.2.1 Chemistry. The subsystem components shall be designed to perform their intended function in the chemical environment defined in HNF-2937.

3.2.5.2.2 Radiation. The subsystem shall be designed for the 1,000 rad/h radiation environment for direct contact with tank waste as defined in HNF-2004.

3.2.5.2.3 Waste Properties. Transfer valves and manifolds shall be fabricated using materials compatible with the transfer of solutions over the range specified in RPP-5346, Table 5-1. These waste properties reflect conditions at the transfer pump discharge.

3.2.6 Transportability

Not applicable.

3.2.7 Flexibility and Expansion

The subsystem shall satisfy the following flexibility and expansion requirements.

a. All open piping, conduits, or penetrations protruding through the cover block shall be sealed or plugged.

3.3 DESIGN AND CONSTRUCTION

The subsystem shall comply with the general design guidelines provided in DOE Order 6430.1A, Sections 1300-7 and 1323.

3.3.1 Materials, Processes, and Parts

This section defines Valving Subsystem requirements governing the use of materials and processes.

a. The transfer jumper and nozzle components should be 304L stainless steel. All piping shall be ASTM A312 type 304L stainless steel.

b. All ball valves shall be full-ported, zero-cavity, and shall meet the applicable design and fabrication requirements contained in ASME B16.34.

c. Valve manifold piping and DST addition drop-legs shall meet the applicable design and fabrication requirements contained in ASME B31.3.

d. Jumpers shall meet the applicable design and fabrication requirements contained in HS-BS-0084.

e. All transfer-associated structures shall be designed to provide the required minimum functions of containment, shielding, and drainage. New transfer-associated structures shall be either welded structural steel per ANSI/AISC N690 or reinforced concrete per ACI 318.

f. Leak detection devices for transfer-associated structures shall comply with NFPA 70.

g. Electrical equipment enclosures shall be as a minimum NEMA-Type 4, per NEMA ICS 6.

h. All structural welds shall be in accordance with AWS D1.1.

i. Cooling media used in the pump pit cooling system, if required, shall be compatible with tank waste.

j. Capillary fluids used in sensing elements shall be compatible with tank waste.

k. The transfer-associated structure drain design shall allow drainage from the pump pits, valve pits, clean-out boxes, and diversion boxes to a level below the leak detector sensor position.

l. New process pits (a pit that redirects waste flow) where direct leakage from a primary waste boundary is possible shall be equipped with stainless steel liners that extend to the top of the pit (where the cover block steps start).

m. Cover blocks and existing process pits shall have a special protective coating to prevent waste absorption from a spray leak.

n. The pump pits shall be designed so that the bulk concrete temperature remains less than 66 °C (150 °F), except for local areas such as around penetrations, where the temperature shall be maintained less than 93 °C (200 °F).

3.3.2 Electromagnetic Radiation

The subsystem shall comply with electromagnetic radiation emission requirements set forth in HNF-2962.

3.3.3 Nameplates and Product Marking

This section defines marking and nameplate requirements of the various assemblies and subassemblies that make up the DST Transfer Valving Subsystem.

a. The subsystem shall label new equipment and/or modifications to existing equipment in a standardized format in accordance with the tank farm labeling program as specified in HNF-IP-0842, Volume II, Section 6.1.

b. Valves shall be marked in accordance with ASME B16.34 and HNF-IP-0842, Volume II, Section 6.1.

c. Each valve T-handle shall be uniquely identified by valve and pit number.

d. Valve manifolds, jumpers, and cover blocks shall be marked to indicate the weight.

e. Cover blocks shall be labeled/marked with valve identifications.

3.3.4 Workmanship

Reserved. The requirements for workmanship are to be addressed in lower level project design documentation (drawings, procurement specifications, etc.).

3.3.5 Interchangeability

All like equipment and parts shall be interchangeable/standardized to the maximum extent practical.

3.3.6 Safety

The subsystem shall be designed to protect the public, environment, workers, and equipment in accordance with the requirements of this section.

3.3.6.1 Personnel Safety

Personnel shall be protected from work place hazards in accordance with the following requirements:

a. Transfer-associated structure shielding shall be designed to keep personnel exposures ALARA in accordance with Section 12.4 of HNF-IP-0842, Volume VII.

b. The subsystem shall incorporate design features that comply with the applicable requirements of 29 CFR 1910, Subparts D, E, G, J, L, M, O, and S.

c. Method(s) used to calculate concrete radiation shielding values for transfer-associated structures shall comply with ANS 6.4.

3.3.6.2 Equipment Protection

The DST Transfer Valving Subsystem shall be designed to avoid damage to other components.

a. The subsystem shall be designed in accordance with WAC 173-303-640(3) for final status facilities and 40 CFR 265, Subpart J, for interim status facilities; DOE Order 6430.1A, Section 0262; and DOE Order 5820.2A, Chapter 1, Sec. 3.b(2)(g). The design of the subsystem shall allow for detection of a leak within 24 hours.

b. Tank dome loading shall satisfy the requirements specified in HNF-IP-1266, Chapter 5.16.

3.3.6.3 Environmental Safety

The DST Transfer Valving Subsystem shall be designed to protect the public and environment in accordance with the following requirements.

a. The DST Transfer Valving Subsystem and components shall be designed in accordance with the safety classification for each. The safety classification shall be determined using the process described in Sections 6.9 – 6.12 of HNF-IP-0842, Volume IV, based on the guidelines in HNF-SD-WM-SAR-067, Section 3.0. Unreviewed safety question screening will be required for system installation in accordance with "Unreviewed Safety Questions," HNF-IP-0842, Volume IV, Section 5.4.

b. Waste transfer paths connected to active waste transfer routes should be provided with two isolation valves. (Note: Three-way valves are considered isolation valves in the context of this requirement. Closed valves that are not designated Safety-Significant cannot be credited with physically disconnecting piping from the active transfer route.)

c. All equipment installed in areas in and around the tank that are subject to ignition controls shall be designed to meet the requirements of HNF-SD-WM-TSR-006, Section 5.10, "Ignition Controls." Areas requiring controls are delineated in HNF-SD-WM-SAR-067, Appendix K. The Flammable Gas Equipment Advisory Board shall be consulted whenever the application or interpretation of the requirements is unclear.

3.3.7 Human Performance/Human Engineering

The subsystem shall be designed for ease of operation.

a. Subsystem design shall comply with DOE Order 6430.1A, Section 1300.12, "Human Factors Engineering."

3.3.8 Decontamination and Decommissioning

This section defines features found to enhance decontamination at the end of the DST Transfer Valving Subsystem's life.

a. All components that may become contaminated with radioactive or other hazardous materials under normal or abnormal operating conditions shall be designed to incorporate measures to simplify future decontamination and decommissioning in accordance with DOE Order 6430.1A, Section 1300-11.

b. DST Transfer Valving Subsystem designs shall provide for ease of cut-up, dismantling, removal, and packaging of contaminated equipment (e.g., removal and packaging of components within transfer-associated structures) from the facility.

c. Piping shall be designed and fabricated to minimize crud traps.

d. Isolation valves for waste transfer branch lines, diluent addition lines, and service water flush lines shall be located as close to the main transfer line as practical.

3.4 DOCUMENTATION

This section defines the procedures that will control various documents associated with the DST Transfer Valving Subsystem.

a. Records, documents, and drawing control pertinent to design functions shall be in accordance with RPP-PRO-222 and HNF-PRO-224. Drafting standards for drawings and interface control shall be in accordance with RPP-PRO-709.

b. All DST Transfer Valving Subsystem structures, systems, and components (SSC) shall be incorporated into the master equipment list in accordance with the component index process requirements defined in Section 7.3 of HNF-IP-0842, Volume V.

3.5 LOGISTICS

This section identifies maintenance infrastructure support requirements.

3.5.1 Maintenance

Facility design shall provide for routine preventive maintenance/calibration, where required, and maintenance, repair, or replacement of equipment subject to failure. The subsystem shall be designed to be maintained in accordance with the following requirements.

a. Components internal to transfer-associated structures shall be designed to be remotely removed, repaired or replaced, and operated.

b. Components external to transfer-associated structures shall be designed for minimal contact maintenance and hands-on operation.

c. Cover blocks, valve manifolds, jumpers, and DST addition drop-legs shall be provided with lifting attachment points for installation of the assembly into position. Lifting attachment points for valve manifolds, jumpers, and DST addition drop-legs shall be designed such that the assembly can be adjusted to hang plumb within ±2.54 cm (1 in.) over its length during installation with a crane. Below-the-hook lifting hardware, if required, shall be designed and provided with the assembly. Design shall be in accordance with ANSI/ASME B30.2 and DOE/RL-92-36.

d. All components requiring maintenance, calibration, or hands-on operation should be located external to the pits. Transmitters for the liquid level, flow, and pressure should be located external to the pits.

e. Designs shall provide for the detection and isolation of electronic faults associated with valve position switches, pressure and flow elements, leak detectors, and any other remote signaling and control of equipment.

3.5.2 Supply

The subsystem shall use readily available commercial parts and components to the greatest extent practical.

a. Minimum numbers of spares for like components shall be determined based on mean time between failure and the number of like components installed.

3.5.3 Facility and Facility Equipment

Remotely operated impact wrenches shall be provided for installation/removal of PUREX jumper assemblies.

3.6 PERSONNEL AND TRAINING

Not applicable.

3.7 CHARACTERISTICS OF SUBELEMENTS

The major elements of the DST Transfer Valving Subsystem are as follows:

- DST addition drop-legs
- Valve manifolds, nozzles, and jumpers
- Transfer-associated structures and cover blocks
- Pit leak detectors
- In-line sensors.

3.7.1 Double-Shell Tank Addition Drop-Legs

The DST addition drop-legs route the waste or diluent into the tank through a riser. The drop-legs also may be provided with dispersion holes or ports to distribute the slurry within the tank. Drop-legs that extend below the waste level are provided with openings above the waste to prevent drawing a vacuum when the transfer line is drained.

3.7.2 Valve Manifolds, Nozzles, and Jumpers

The valve manifolds provide a confined routing path for the transfer of tank waste among storage locations and for routing diluent and flush water. The manifolds allow waste, diluent, and flush water to be routed from one nozzle location to another within a transfer-associated structure. The manifolds are made from rigid piping systems with male or female nozzle ends attached so that connections can be made easily. The valves within valve manifolds are devices by which flow in the transfer system can be started, stopped, or routed. Valves within transfer-associated structures are manual-operated or motor-operated valves. Manual-operated valves may be operated by reach rods and "T-handles" or by gearboxes with handwheels external to the pits. Valve position sensors are local and remote indicators that identify the position of the valve. Remote position indicators indicate where flow is being ported or whether the valve is open or closed. The local indication shows the valve's position based on mechanical devices connected to the valve stem.

Waste, diluent, or flush water routing through the transfer lines and pumps is determined by the configuration of jumpers in the transfer-associated structures. Jumpers are used in pump pits, valve pits, and diversion boxes. Jumpers exist in two forms: rigid and flexible. A rigid jumper is made from a pipe fabricated to fit existing nozzles. A flexible jumper is made from a flexible material (e.g., corrugated flexible stainless steel inner pipe wrapped with stainless steel braiding) and connects two nozzle ends together to provide a desired flow path.

Power of 120 V ac is supplied to the transfer-associated structures from the DST Electrical Power Subsystem.

3.7.3 Transfer-Associated Structures and Cover Blocks

The transfer-associated structures (pits) are structures through which transfer piping, DST Diluent and Flush Subsystem piping, and service water flush piping are routed. Transfer-associated structures include pump pits, valve pits, diversion boxes, and clean-out boxes. Pump pits, valve pits, and diversion boxes house valve manifolds, jumpers, and some in-line temperature, pressure, density, and flow elements. Transfer-associated structures also provide secondary containment for transfer valves and associated piping and are designed to provide shielding, enable leak detection, and allow collection of process leakage. The cover blocks provide secondary containment, shielding, and access to the components within the pits. Piping systems entering the transfer-associated structures provide welded nozzles for jumper or valve manifold connections.

3.7.4 Pit Leak Detectors

During transfer of tank waste, transfer-associated structures are monitored for leakage from valve manifolds, jumpers, piping nozzles, and transfer piping encasements by a leak detection system. The leak detection system transmits alarm signals to the tank farm instrument buildings and to the DST Monitor and Control Subsystem and the Tank Monitoring and Control System. Leak detection devices also provide signals to activate the DST Monitor and Control Subsystem interlocks, which trip(s) the associated transfer pump(s).

The leak detectors (conductivity probes) are mounted in the lowest part of the pit floor. The conductivity probes have electrodes at different electrical potentials that may be short-circuited by a conductive medium (i.e., liquid waste) and cause a change in state of the monitoring circuitry. When the liquid waste short circuits the leak detector electrodes, an alarm is generated, and associated DST Monitoring and Control Subsystem interlock circuitry is actuated to trip the transfer pump.

3.7.5 In-Line Sensors

Pressure, density, and flow elements are located on valve manifolds in the transfer-associated structures and provide output signals to transmitters. The transmitters and switches are located outside of the pit in the DST Monitor and Control Subsystem for maintenance purposes.

3.8 PRECEDENCE

Except in those instances where Washington State has been granted regulatory authority by the Federal Government, the hierarchical relationship among requirements specified in Section 3.0 is as follows:

- Federal requirements (e.g., *Code of Federal Regulations*, DOE orders)
- State requirements (e.g., Revised Code of Washington, as specified in the *Washington Administrative Code*)
- Local ordinances
- RPP procedures
- National consensus codes and standards.

The hierarchy is useful in establishing the relative order of precedence of the requirements documents levied in this specification.

3.9 SECURITY

The subsystem shall be designed such that access controls to radiation and high-radiation areas meet the requirements of HNF-5183 (local implementation of 10 CFR 835).

3.10 COMPUTER RESOURCE RESERVE CAPACITY

Not applicable.

4.0 QUALITY ASSURANCE PROVISIONS

Quality assurance for the DST Transfer Valving Subsystem shall be performed in accordance with HNF-IP-0842, Volume XI, Section 1.0.

4.1 GENERAL

Quality assurance provisions, as defined in Section 4.2, shall be conducted during the design and development of the DST Transfer Valving Subsystem to provide assurance of compliance with the requirements of this specification. Field verification, which takes place during the construction/turnover life-cycle phase, is not addressed in this specification. Field verification is addressed at the construction project level in operational test plans/procedures and acceptance test plans/procedures.

4.1.1 Responsibility

The design agent shall be responsible for the performance and documentation of all design verifications (see Section 4.2) for each subsystem developed in accordance with this specification. Design verifications shall be conducted at the design agent's facilities or the facilities of the design agent's choice with the approval of the sponsor organization. The sponsor organization reserves the right to witness the specified design verifications.

4.1.2 Special Tests

The following design verification qualification testing requirements apply to the qualification tests of the DST Transfer Valving Subsystem components. These test requirements correlate to the qualification testing of the design to the requirements of Section 3.0 of this specification. The design agent is responsible for planning and executing the required qualification tests.

a. Electrical materials and equipment shall be qualification tested unless they are Underwriters Laboratories, Inc. (UL) listed, or factory-mutual tested, with label attached, and for the purpose intended, whenever such products are available. Where no UL or factory-mutual listed products are available, testing and certification by another nationally recognized testing agency may be acceptable, as long as the design agent documents acceptance of the testing agency.

b. Seat closure tests shall be performed for all transfer valves in accordance with the test methods in ASME B16.34 and API 598. Seat leakage from each flow side to the isolated port shall be within the limits specified in API 598.

c. Shell tests shall be performed for all transfer valves in accordance with ASME B16.34.

d. All valve manifold and jumper pipe welds shall be examined by 100% radiography.

4.2 DESIGN VERIFICATION

Design verification shall be performed on the DST Transfer Valving Subsystem, as represented in design drawings, prototypes, engineering models, etc., for the purposes of verifying that the design meets the requirements of this specification. Design verification is subject to the procedure identified in RPP-PRO-1819, Section 2.5.1. Inspection of the subsystem design to ensure compliance with the requirements of Section 3.0 shall be performed by one or more of the following methods: qualification testing, reviews, and/or alternate calculations. The verification method(s) that apply to each specification requirement is identified in Appendix A. Definitions of qualification testing, reviews, and alternate calculations are as follows.

a. Qualification testing is a design verification method consisting of tests on hardware representative of the design being verified. Qualification testing can be subdivided into methods that consist of checking functional operation (Demonstration) and methods that consist of measuring specific hardware inputs/outputs (Test) to verify compliance of the design with requirements.

    i. Demonstration is a subcategory of the "qualification testing" design verification method. Demonstration is limited to readily observable functional operation to determine compliance with requirements. Demonstration does not require the use of special equipment or sophisticated instrumentation.

    ii. Test is another subcategory of the "qualification testing" design verification method. Test employs technical means including, but not limited to, the evaluation of functional characteristics by use of special equipment or instrumentation and the application of established principles and procedures to determine compliance with requirements. The evaluation of data derived from test is an integral part of Test.

b. Review is a design verification method that consists of an investigation of the existing design information. This can be done via a simple review of the design media (Examination) or a rigorous analysis of the design, as represented in the design media (Analysis).

    i. Examination is a subcategory of the "review" design verification method. Examination consists of investigation without the use of special laboratory equipment or procedures to determine compliance with requirements. Examination can be performed on design media such as drawings, design reports, etc.

    ii. Analysis is a subcategory of the "review" design verification method. Analysis takes the form of processing accumulated results and conclusions, intended to provide proof that verification of a requirement has been accomplished. The analytical results may comprise a compilation/interpretation of existing information or may be obtained from lower level examination, tests, demonstrations, or analyses.

c. Alternate calculation is a verification of a calculation or analysis using alternate methods or procedures.

Field verification of DST Transfer Valving Subsystem performance/design features and acceptance inspection of construction is called out in Section 2.5.2 of RPP-PRO-1819.

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5.0 PREPARATION FOR DELIVERY

Safety-Class and Safety-Significant SSCs will require special packaging to protect against corrosion, contamination, physical damage, or any effect that would lower the quality or cause the items to deteriorate during the time they are shipped and handled. Packaging, receipt, and storage requirements will depend on the classification level of the items shown in ASME NQA-1, Subpart 2.2, Section 3-2. Lower level specifications (e.g., procurement specifications) will establish the specific packaging requirements for all SSCs.

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6.0 NOTES

6.1 DEFINITIONS

Active—An active component is one that is part of the "as-built" tank farms and has not been isolated and disconnected from all other tank farm components as part of an approved engineering change notice.

Administrative Lock—A locking device that prevents an inadvertent equipment start. Administrative locks ensure that the equipment or systems(s) being isolated and/or controlled cannot be operated (e.g., removing the motive force of a transfer pump—such as electrical power, steam, water, or air—and installing an administrative lock so that the transfer pump cannot be activated) until the administrative lock is removed.

Equivalent Length—The equivalent length is the actual length of piping plus the friction loss of all valves and fittings in the system expressed in terms of equivalent feet of piping.

Ex-Tank Intrusive—The ex-tank intrusive region includes pits (e.g., transfer-associated structures) that are not isolated from the tank dome space by a seal barrier. The ex-tank intrusive region also includes the area around tank openings that are directly connected to the dome space, out to the shortest of eighteen 4.92-m (15-ft) opening diameters, or the boundary of temporary containment devices, whichever distance is less.

General Service (GS) SSC—Structures, systems, and components (SSC) not classified as either Safety-Class or Safety-Significant.

Manifold—A remotely installed rigid piping system inside a pit that transfers waste and flush water between nozzles.

Physically Connected—Physically connected piping is any piping that is part of the direct transfer path or is connected to the transfer path. Piping is not considered to be connected to the transfer path if it is physically disconnected by (1) an air gap, (2) a blind flange or process blank, (3) an operable Safety-Significant service water pressure detection system, (4) an operable Safety-Significant backflow prevention system, or (5) two closed Safety-Significant isolation valves. It is important to note that closed valves that are not designated as Safety-Significant cannot be credited with physically disconnecting piping from the active transfer route.

Pit Nozzle—A rigid male connector anchored in the pit wall or the transfer pump housing that provides a leak-tight connection with the integral seal block attached to a manifold.

Procuring Authority—A qualified engineer responsible for procurement of the equipment according to a procurement specification developed based on the design requirement.

RPP Design Authority—A qualified engineer responsible for implementation of authorization basis requirements into the facility design.

Safety-Class (SC) SSC—Safety functions performed by Safety-Class SSCs prevent or mitigate releases to the public that would otherwise exceed the offsite radiological risk guidelines or prevent a nuclear criticality.

Safety-Significant (SS) SSC—Safety functions performed by Safety-Significant SSCs prevent or mitigate releases of radiological materials to onsite workers and toxic chemicals to the offsite public and onsite workers. Safety-Significant SSCs also include those safety SSCs that protect the facility worker from serious injury (or fatality) because of hazards not controlled by institutional safety programs.

> NOTE: Safety-Significant SSC distinguishes a specific category of SSCs other than Safety-Class SSCs. It should not be confused with the generic modifier "safety significant" used in DOE orders (e.g., DOE 5480.23).

Shall—Denotes a requirement.

Should—Denotes a recommendation. If a "should" requirement cannot be satisfied, justification of an alternative design shall be submitted to the Design Authority for approval.

Tank Opening—Tank risers and pits with an open path to the tank.

TBD—To be determined. A study and/or calculation needs to be performed to provide a sufficient technical basis for the requirement.

TBR—To be refined. A "soft" basis for the requirement has been identified. However, a further study and/or calculation needs to be performed to solidify the requirement's technical basis.

Transfer-Associated Structure—Pump pits, valve pits, diversion boxes, or cleanout boxes.

6.2 LIST OF TERMS

ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
AWS	American Welding Society
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
DST	double-shell tank
GS	general service
HLW	high-level waste
IEEE	Institute of Electrical and Electronics Engineers
LAW	low-activity waste
NEC	*National Electrical Code*
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
ORP	Office of River Protection

PUREX	Plutonium-Uranium Extraction (Plant)
RCRA	*Resource Conservation and Recovery Act of 1976*
RPP	River Protection Project
SC	Safety-Class
SS	Safety-Significant
SSC	structures, systems, and component
TBD	to be determined
TBR	to be refined
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
UL	Underwriters Laboratories, Inc.
V ac	volts alternating current
WAC	*Washington Administrative Code*
WFD	waste feed delivery

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7.0 REFERENCES

DOE Order 5480.23, *Nuclear Safety Analysis Reports*, U.S. Department of Energy, Washington, D.C.

HNF-1939, Rev. 0a, 1999, *Waste Feed Delivery Technical Basis*, Vol. II, Addendum 1-1, "Waste Feed Delivery Flow Sheet for Tank 241-AZ-101," Numatec Hanford Company for Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-1939, Rev. 0b, 1999, *Waste Feed Delivery Technical Basis*, Vol. II, Addendum 2-1, "Waste Feed Delivery Flow Sheet for Tank 241-AN-105," Numatec Hanford Company for Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-1939, Rev. 0c, 1999, *Waste Feed Delivery Technical Basis*, Vol. II, Addendum 3-1, "Waste Feed Delivery Flow Sheet for Tank 241-AN-104," Numatec Hanford Company for Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-5136, 2000, *Functional Analysis for Double-Shell Tank Subsystems,* Rev 0, Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-SD-WM-SP-012, 1999, *Tank Waste Remediation System Operation and Utilization Plan to Support Waste Feed Delivery*, Rev. 1, Numatec Hanford Corporation, Lockheed Martin Hanford Corporation, and COGEMA Engineering Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-SD-WM-TRD-007, 1999, *Technical Requirements Specification for the Double-Shell Tank System*, Draft E, COGEMA Engineering Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

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SOURCE DOCUMENTS AND TEST METHODS

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SOURCE DOCUMENTS AND TEST METHODS (25 SHEETS)

Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	Alt Calc	N/A
3.1.2.1.1.a	The DST Transfer Valving Subsystem shall transfer and route the waste or diluent from the DST Transfer Pump Subsystem at a pressure equal to or greater than the design pressure defined in Section 3.2.1.4.c.	RPP-5346							X
3.1.2.1.2.a	The DST Transfer Valving Subsystem shall route the waste, diluent, and filtered raw water from the DST Transfer Piping system at a pressure equal to or greater than the design pressure defined in Section 3.2.1.4.c.	RPP-5346							X
3.1.2.1.2.b	The DST Transfer Valving Subsystem shall provide a method (e.g., seal loop jumper) to block and route the flow of waste, diluent, or water from the DST Transfer Piping Subsystem secondary confinement drain.	WAC 173-303-640			X				
3.1.2.1.3.a	The DST Transfer Valving Subsystem shall route the filtered raw water from the DST Raw Water Subsystem at a pressure equal to or greater than the design pressure defined in Section 3.2.1.4.c.	RPP-5346							X
3.1.2.1.4.a	The DST Transfer Valving Subsystem valve motor operators should be designed to operate using the 120 V ac power source provided by the DST Electrical Power Subsystem.	HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.						X

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method: Exam	Demo	Test	Anal	AltCalc	N/A
3.1.2.1.6.a	The DST Transfer Valving Subsystem shall transfer and route the flush or diluent from the DST Diluent and Flush Subsystem at a pressure equal to or greater than the design pressure defined in Section 3.2.1.4.c.	RPP-5346							X
3.1.2.1.7.a	The DST Transfer Valving Subsystem transfer-associated structure should contain the leakage from the mixer pump and route it to the tank as required.	WAC 173-303-640			X				
3.1.2.1.8.a	The DST Transfer Valving Subsystem shall be designed using motor-operated valves where valve manipulation during a transfer cycle is required.	HNF-4553			X				
3.2.1.1.a	The valves shall remain closed when within 5 degrees of full closed position.	Letter # CO-00-RPP-124 (released as Appendix A in HNF-4716)	Need to ensure that flow is isolated when position indicator indicates that the valve is closed.		X				
3.2.1.2.1.a	Mechanical (local) position indication for valves shall be accurate to within ±3 degrees with respect to the actual valve position.	Letter # CO-00-RPP-124 (released as Appendix A in HNF-4716)			X				
3.2.1.2.1.b	Mechanical (local) indication of the valve's position shall be visible from the top of the cover block.	HNF-4553	Allows confirmation of valve position without cover block removal. To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.						X

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	Alt Calc	N/A
3.2.1.2.2.a	Measurement device(s) for remote indication of valve position shall be compatible with the requirements of the DST Monitor and Control Subsystem specification (HNF-4155).	HNF-4155	This requirement will be defined in the DST Monitor and Control Subsystem specification, which is in work.		X				
3.2.1:3.a	A method of minimizing aerosol generation should provided for Tanks 241-AP-102 and 241-AP-104.	HNF-2939, Table 4-1, Step 12.P2.1	Unacceptably high radiation fields, ammonia, or toxic vapors releases could be produced in the 241-AP ventilation system ductwork and piping resulting from settling out of aerosols generated by waste discharges into the tank headspace. A study is planned to evaluate quantitative values required. Estimated completion of the study is April 2000.			X			
3.2.1.3.b	A drop-leg or other method of discharging liquid beneath the tank waste surface shall be provided for Tanks 241-AZ-101 and 241-AZ-102.	HNF-2783	Unacceptably high radiation fields would be produced in the 702-AZ ventilation system ductwork and piping resulting from settling out of aerosols generated by waste discharges into the tank headspace.		X				
3.2.1.4.a	The DST Transfer Valving Subsystem shall be designed to transfer waste (as defined in Section 3.2.5.2.3) up to 630 L/min (166 gal/min).	RPP-5346	This transfer velocity provides sufficient energy to keep all expected solids suspended during the waste transfer.				X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method: Exam	Demo	Test	Anal	AltCalc	N/A
3.2.1.4.b	Pressure boundaries shall be designed for no visible leakage at test pressure in accordance with ASME B31.3.	RPP-PRO-097, Table B-1	Standard Design Code	X		X			
3.2.1.4.c	The threshold design pressure of new DST Transfer Valving Subsystem components shall be >6240 kPa (>905 lb/in^2 gauge).	RPP-5346				X	X		
3.2.1.5.a	The DST Transfer Valving Subsystem shall be designed to transfer and route diluent/flush water at a flow rate up to 630 L/min (166 gal/min).	RPP-5346					X		
3.2.1.5.b	The DST Transfer Valving Subsystem shall be designed to transfer and route filtered raw water at a pressure not to exceed the design pressure defined in Section 3.2.1.4.c.	RPP-5346					X		
3.2.1.6.a	The valves shall be capable of being positioned in the full-open or full-closed positions for every port. The valve position is defined as fully closed and seated in Section 3.2.1.1.c.	Letter # CO-00-RPP-124 (released as Appendix A in HNF-4716)	Need to ensure that flow is isolated when position indicator indicates that the valve is closed.		X				
3.2.1.7.1.a	The flow-rate measurement device shall be capable of measuring a range of 0-757 L/min (0-200 gal/min) with an accuracy of 1.0 percent of range.	W-211-AZ2-C1, Section 13440		X					

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	Alt Calc	N/A
3.2.1.7.2.a	The pressure measurement device(s) shall be capable of measuring a range of 10,400 kPa (0-1510 lbf/in^2) with an accuracy of 0.5 percent of range.	HNF-4716, Appendix D; W-211-AZ2-C1, Section 13440		X					
3.2.1.7.3.a	The density measurement device shall be capable of measuring a range of 0.9 to 1.5 g/cm^3 with an accuracy of 0.0005 g/cm^3. <TBR>	W-211-AZ2-C1, Section 13440	Will revise after completion of material balance study.	X					
3.2.1.8.a	Cover blocks shall be designed to provide an impaction surface to prevent the direct spray of waste into the atmosphere and to provide a tortuous path for aerosol release from the transfer-associated structure.	HNF-SD-WM-SAR-067 3.3.2.4.7-4	Safety function.	X					
3.2.1.8.b	The design of the transfer-associated structure shall be in accordance with WAC 173-303-640 for final status facilities and 40 CFR 265, Subpart J, for interim status facilities. The design of the structure shall allow for detection of a leak within 24 hours.	WAC 173-303-640; 40 CFR 265, Subpart J	The leak detector will be placed such that it will be capable of detecting the minimum amount of leakage within 24 hours.				X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method: Exam	Demo	Test	Anal	AltCalc	N/A
3.2.1.9.a	A new pit leak-detector assembly and conductivity probe shall be designed and operated so that it will detect the failure of the primary containment structure (e.g., transfer pipe or jumper) or the presence of any release of dangerous waste or accumulated liquid in the secondary containment system (pit) within 24 hours, or at the earliest practicable time, if the owner or operator can demonstrate to the department that existing detection technologies or site conditions will not allow detection of a release within 24 hours and if the Washington State Department of Ecology approves the deviation from the requirements specified above.	WAC 173-303-640; 40 CFR 265, Subpart J			X				
3.2.1.9.b	The leak detection system shall be compatible with the DST Monitor and Control Subsystem specification and the master pump shutdown system.	HNF-4155	This requirement will be defined in the DST Monitor and Control Subsystem specification which is in progress.	X					
3.2.1.10.a	A means of breaking the vacuum in the transfer line should be provided as required to allow gravity liquid draining. The drain piping shall be sloped continuously from high point to low point with a minimum slope of 0.25%.	WHC-SD-GN-DGS-30011, Section 10.4.3	Current value based on current Hanford practice until verified by independent study.	X		X			
3.2.1.11	See 3.2.1.1.a.								
3.2.1.12	See 3.2.1.1.a.								

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	AltCalc	N/A
3.2.1.13.a	The detection instrumentation shall be compatible with the requirements of the DST Monitor and Control Subsystem specification. The detection instrumentation shall be installed between the pump discharge and the backflow prevention device required in Section 3.2.1.14.a.	HNF-4155	This requirement will be defined in the DST Monitor and Control Subsystem specification which is in progress.	X					
3.2.1.14.a	The backflow prevention device shall be compatible with the requirements for jumpers and jumper components. The backflow prevention device shall be installed between the flush/diluent supply and the backflow prevention instrumentation required in Section 3.2.1.13.a.	HNF-SD-WM-TSR-006, Section B 3.1.2		X					
3.2.1.15.a	The seal loop jumper shall be designed to impede the flow of any dangerous waste or liquid in the secondary confinement drain pipe to ensure that the leak detector in the DST Transfer Piping Subsystem will detect the failure of the primary containment or the presence of any dangerous waste or accumulated liquid in the secondary containment within 24 hours. The amount of anticipated leakage to actuate the leak detector shall be calculated during design of the system. The Washington State Department of Ecology, through the final status permitting process, may approve or disapprove the final system design.	WAC 173-303-640: 40 CFR 265, Subpart J					X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	Alt Calc	N/A
3.2.2.a	Transfer valve manifolds and jumpers should be 7.6 cm (3 in.) internal diameter.	RPP-5346		X					
3.2.2.b	Valves or operators should be provided with mechanical stops located as shown in Table 3-3. The operators and stops shall prevent overtorquing and plastic deformation of the valves.	Letter # CO-00-RPP-124 (released as Appendix A in HNF-4716)			X				
3.2.2.c	Valves shall be capable of being manually or electrically operated from above the pit cover blocks.	HNF-4553, Section 3.2			X				
3.2.2.d	Except for the check valves, all jumper valves shall be ball valves designed for installation in the stem-up position.	HNF-5141, Table 3	Allows for ease in valve operation and maintenance. HNF-5141 is still in Draft form.		X				
3.2.2.e	New cover blocks shall be sloped to allow water to drain off the top of the cover and shall extend over the outside of the pit walls. Existing cover blocks shall be modified with drip shields or other mechanical means, as required, to meet the requirements of WAC 173-303-640(4)(e).	WAC 173-303-640(4)(e)		X			X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method: Exam	Demo	Test	Anal	AltCalc	N/A
3.2.2.f	Cover blocks shall have penetrations to facilitate operation and/or functional testing of the components inside transfer-associated structures. Operations include, but are not limited to, decontamination by washdown, removing standing water with a portable pump, retrieving gas and particulate samples, and taking still and motion pictures of valve stem position and of the entire structure interior.	HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.	X					
3.2.2.g	Cover block penetrations shall be sealed adequately to stop rain/snow water intrusion.	HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.		X				
3.2.2.h	Cover blocks shall prevent radiation streaming.	DOE Order 6430.1A, Section 1300-6.2; WHC-SD-GN-DGS-30011, Section 7.3	"Radiation Protection – Shielding Design"	X					
3.2.2.i	Cover blocks and jumpers shall be provided with lifting bails positioned suitable for balanced lifting by crane.	RPP-PRO-1622, Appendix E, Section 4.6		X					

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	Alt Calc	N/A
3.2.2.j	Nozzle, manifold, and jumper assembly connections installed in new pump or valve pits should be of the Plutonium-Uranium Extraction (PUREX)-type designed in accordance with drawings H-2-32430 and H-2-32420 or H-2-821324 and H-2-821325.	H-2-32420, H-2-32430, H-2-821324, H-2-821325	The PUREX connector is a tank farms standard unit with a good operational performance history.	X					
3.2.2.k	Manifold and jumper assembly connections installed in existing pump and valve pits and diversion boxes shall be designed to mate to existing nozzles.	HNF-4553	Ensures compatibility with existing nozzles.						X
3.2.2.l	The valve position hardware, as applicable, shall be designed to facilitate quick mechanical/electrical disconnect for ease of cover block removal and replacement.	HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.	X					
3.2.2.m	Two-way valves shall be designed to close in the clockwise direction.	DOE Order 5480.19; HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.	X					
3.2.2.n	In existing pits where as low as reasonably achievable (ALARA) practices preclude accurate determination of existing nozzle locations by pit entry or photogrammatry, flexible piping sections should be used to facilitate jumper installation.	HNF-4553			X				

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	AltCalc	N/A
3.2.2.o	All valves shall prevent spray leaks resulting from overtorquing of valve stems.	WHC-SD-GN-DGS-30011, Section 3.4.2		X					
3.2.2.p	Taps for instrumentation and test connections shall be made on the top of the pipe.	WHC-SD-GN-DGS-30011, Section 10.4.3		X					
3.2.3.a	Process pits and cover blocks shall have a design life of 35 years.	HNF-SD-WM-SP-012	Phase II retrieval operations are scheduled to complete in 2034. Thus, the pits and cover blocks need to be operable for 35 years.				X		
3.2.3.b	Where practical, removable components located beneath cover blocks, including valves and jumpers, should have a design life of 12 years without maintenance. <TBR>	HNF-5141, Table 4	Document is still in Draft form. Current value is based on W-314 criteria until independent studies have been completed.				X		
3.2.3.c	Valve manufacturers shall provide written recommendations of operational practices such as preventive maintenance to maximize the valve's useful life.	HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.		X				
3.2.3.d	Valves shall be designed for at least 1,000 cycles over their design life.	HNF-5141, Table 4	Document is still in Draft form.				X		
3.2.3.e	Valve operator closure shall be sufficiently slow to prevent damage from water hammer.	HNF-5141, Table 3	Document is still in Draft form. Current value is based on W-314 criteria until independent studies have been completed.		X				
3.2.3.f	Pipe elbow and bends should have a bend radius greater than or equal to a long-radius elbow.	WHC-SD-GN-DGS-30011, Section 10.4.3					X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	Alt Calc	N/A
3.2.4.a	The design of valve manifolds, jumpers, and process instrumentation installed in process pits shall include features to minimize contamination of other equipment within the pit, and the pit itself, during routine operation and removal or repair activities.	DOE Order 6430.1A, Section 1300.3.5							X
3.2.4.b	Instrument isolation valves for instrument sensor isolation and equalization shall be located outside of the primary transfer-associated structures. These valves shall be located in a supplemental structure constructed per Section 3.3.1.e.	HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.	X					
3.2.4.c	The valve position switches shall be located above the pit cover block.	HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.	X					
3.2.4.d	All electrical connections shall be designed as applicable with quick-disconnects for ease of cover block removal and replacement.	HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.	X					
3.2.4.e	Jumpers and jumper components should be repairable or replaceable within 24 hours. This timeframe does not include work package preparation or cover block removal (time includes jumper removal and reinstallation in the pit).	HNF-5141, Table 4-1			X				

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	Alt Calc	N/A
3.2.4.f	The low-point leak detector sensors should be repairable or replaceable within 8 hours. Time to repair does not include preparatory work such as preparing procedures, staging personnel and equipment, or preparatory training.	HNF-5141, Table 4-1			X				
3.2.5.1.a	The subsystem shall be designed for the natural environmental conditions specified in HNF-SD-GN-ER-501.	HNF-SD-GN-ER-501					X		
3.2.5.1.b	The subsystem shall be designed to withstand the natural phenomena hazards as specified in RPP-PRO-097.	RPP-PRO-097					X		
3.2.5.1.c	For permanent structures, subsurface conditions shall be determined by means of borings or other methods that adequately disclose soil and groundwater conditions. Data and other information obtained from prior subsurface investigations may be used, supplemented by additional investigations at the specific location, as deemed necessary by the RPP Design Authority.	DOE Order 6430.1A, Section 0201-1				X			
3.2.5.2.1	The subsystem components shall be designed to perform their intended function in the chemical environment defined in HNF-2937.	HNF-2937					X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	Alt Calc	N/A
3.2.5.2.2	The subsystem shall be designed for the 1,000 rad/h radiation environment for direct contact with tank waste as defined in HNF-2004.	HNF-2004					X		
3.2.5.2.3	Transfer valves and manifolds shall be fabricated using materials compatible with the transfer of solutions over the range specified in RPP-5346, Table 5-1. These waste properties reflect conditions at the transfer pump discharge.	RPP-5346, Table 5-1		X					
3.2.6	Not applicable.	N/A							X
3.2.7.a	All open piping, conduits, or penetrations protruding through the cover block shall be sealed or plugged.	HNF-4553	Prevents contaminants (soil, water, etc.) from entering and damaging piping/conduit. To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.	X					
3.3	The subsystem shall comply with the general design guidelines provided in DOE Order 6430.1A, Sections 1300-7 and 1323.	DOE Order 6430.1A, Sections 1300 and 1323							X
3.3.1.a	The transfer jumper and nozzle components should be 304L stainless steel. All piping shall be ASTM A312 type 304L stainless steel.	WHC-SD-W236A-ER-003		X			X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	Alt Calc	N/A
3.3.1.b	All ball valves shall be full-ported, zero-cavity, and shall meet the applicable design and fabrication requirements contained in ASME B16.34.	RPP-PRO-097, Table B-1	Standard Design Code			X			
3.3.1.c	Valve manifold piping and DST addition drop-legs shall meet the applicable design and fabrication requirements contained in ASME B31.3.	RPP-PRO-097, Table B-1	Standard Design Code	X			X		
3.3.1.d	Jumpers shall meet the applicable design and fabrication requirements contained in HS-BS-0084.	HS-BS-0084	Standard site design document.	X			X		
3.3.1.e	All transfer-associated structures shall be designed to provide the required minimum functions of containment, shielding, and drainage. New transfer-associated structures shall be either welded structural steel per ANSI/AISC N690 or reinforced concrete per ACI 318.	RPP-PRO-097, Table B-1		X					
3.3.1.f	Leak detection devices for transfer-associated structures shall comply with NFPA 70.	NFPA.70	Standard Design Code				X		
3.3.1.g	Electrical equipment enclosures shall be as a minimum NEMA-Type 4, per NEMA ICS 6.	RPP-PRO-097, Table B-1	Standard Design Code	X					
3.3.1.h	All structural welds shall be in accordance with AWS D1.1.	RPP-PRO-097, Table B-1	Standard Design Code	X		X	X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method: Exam	Demo	Test	Anal	AltCalc	N/A
3.3.1.i	Cooling media used in the pump pit cooling system, if required, shall be compatible with tank waste.	WHC-SD-GN-DGS-30011, Section 3.4.2					X		
3.3.1.j	Capillary fluids used in sensing elements shall be compatible with tank waste.	WHC-SD-GN-DGS-30011, Section 3.4.2					X		
3.3.1.k	The transfer-associated structure drain design shall allow drainage from the pump pits, valve pits, clean-out boxes, and diversion boxes to a level below the leak detector sensor position.	WAC 173-303-640(4)		X					
3.3.1.l	New process pits (a pit that redirects waste flow) where direct leakage from a primary waste boundary is possible shall be equipped with stainless steel liners that extend to the top of the pit (where the cover block steps start).	WAC 173-303-640(4)	Pit will become contaminated during normal operation/ maintenance. Liner will prevent seepage of waste into pit concrete.	X					
3.3.1.m	Cover blocks and existing process pits shall have a special protective coating to prevent waste absorption from a spray leak.	WAC 173-303-640(4)	Coating will prevent seepage of waste into pit cover block concrete.	X					
3.3.1.n	The pump pits shall be designed so that the bulk concrete temperature remains less than 66 °C (150 °F), except for local areas such as around penetrations, where the temperature shall be maintained less than 93 °C (200 °F).	ACI 349, Subsection A.4; HNF-2938, Appendix F.5.1	Maximum pit temperature is governed by the maximum allowable ambient temperature for various equipment in the pit.				X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	AltCalc	N/A
3.3.2	The subsystem shall comply with electromagnetic radiation emission requirements set forth in HNF-2962.	HNF-2962		X			X		
3.3.3.a	The subsystem shall label new equipment and/or modifications to existing equipment in a standardized format in accordance with the tank farm labeling program as specified in HNF-IP-0842, Volume II, Section 6.1.	HNF-IP-0842 Volume II, Section 6.1		X					
3.3.3.b	Valves shall be marked in accordance with ASME B16.34 and HNF-IP-0842, Volume II, Section 6.1.	ASME B16.34 HNF-IP-0842	Standard Design Code	X					
3.3.3.c	Each valve T-handle shall be uniquely identified by valve and pit number.	DOE Order 5480.19, Chapter XVIII; HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.	X					
3.3.3.d	Valve manifolds, jumpers, and cover blocks shall be marked to indicate the weight.	HS-BS-0084	Standard site design document	X					
3.3.3.e	Cover blocks shall be labeled/marked with valve identifications.	HNF-IP-0842, Volume II, Section 4.10.1; DOE Order 5480.19, Chapter X	Must have pit cover blocks marked in order to identify correct valve for verification. Also supports ALARA principles.	X					
3.3.4	Reserved. The requirements for workmanship are to be addressed in lower level project design documentation (drawings, procurement specifications, etc.).	N/A							X

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method: Exam	Demo	Test	Anal	Alt Calc	N/A
3.3.5	All like equipment and parts shall be interchangeable/standardized to the maximum extent practical.	DOE Order 6430.1A, Sections 0110-3 and 1100	"Flexibility" and "Equipment – General"	X					
3.3.6.1.a	Transfer-associated structure shielding shall be designed to keep personnel exposures ALARA in accordance with Section 12.4 of HNF-IP-0842, Volume VII.	HNF-IP-0842					X		
3.3.6.1.b	The DST Transfer Valving Subsystem shall incorporate design features that comply with the applicable requirements of 29 CFR 1910, Subparts D, E, G, J, L, M, O, and S.	RPP-PRO-097, Table B-1							X
3.3.6.1.c	Method(s) used to calculate concrete radiation shielding values for transfer-associated structures shall comply with ANS 6.4.	ANS 6.4	Standard Design Code						X
3.3.6.2.a	The subsystem shall be designed in accordance with WAC 173-303-640(3) for final status facilities and 40 CFR 265, Subpart J, for interim status facilities; DOE Order 6430.1A, Section 0262; and DOE Order 5820.2A, Chapter 1, Sec. 3.b(2)(g). The design of the subsystem shall allow for detection of a leak within 24 hours.	WAC 173-303-640(3); 40 CFR 265, Subpart J; DOE Order 6430.1A, Section 0262; DOE Order 5820.2A, Chapter 1, Sec. 3.b(2)(g)							X
3.3.6.2.b	Tank dome loading shall satisfy the requirements specified in HNF-IP-1266, Chapter 5.16.	HNF-IP-1266, Chapter 5.16					X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	AltCalc	N/A
3.3.6.3.a	The subsystem and components shall be designed in accordance with the safety classification for each. The safety classification shall be determined using the process described in Sections 6.9 – 6.12 of HNF-IP-0842, Volume IV, based on the guidelines in HNF-SD-WM-SAR-067, Section 3.0. Unreviewed safety question screening will be required for system installation in accordance with "Unreviewed Safety Questions," HNF-IP-0842, Volume IV, Section 5.4.	HNF-IP-0842 HNF-SD-WM-SAR-067, Section 3.0					X		
3.3.6.3.b	Waste transfer paths connected to active waste transfer routes should be provided with two isolation valves. (Note: Three-way valves are considered isolation valves in the context of this requirement. Closed valves that are not designated Safety-Significant cannot be credited with physically disconnecting piping from the active transfer route.)	HNF-SD-WM-TSR-006, AC 5.12			X				

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method: Exam	Demo	Test	Anal	AltCalc	N/A
3.3.6.3.c	All equipment installed in areas in and around the tank that are subject to ignition controls shall be designed to meet the requirements of HNF-SD-WM-TSR-006, Section 5.10, "Ignition Controls." Areas requiring controls are delineated in HNF-SD-WM-SAR-067, Appendix K. The Flammable Gas Equipment Advisory Board shall be consulted whenever the application or interpretation of the requirements is unclear.	HNF-SD-WM-TSR-006, Section 5.10; HNF-SD-WM-SAR-067, Appendix K					X		
3.3.7.a	Subsystem design shall comply with DOE Order 6430.1A, Section 1300.12, "Human Factors Engineering."	DOE Order 6430.1A, Section 1300-12							X
3.3.8.a	All components that may become contaminated with radioactive or other hazardous materials under normal or abnormal operating conditions shall be designed to incorporate measures to simplify future decontamination and decommissioning in accordance with DOE Order 6430.1A, Section 1300-11.	DOE Order 6430.1A, Section 1300-11							X
3.3.8.b	DST Transfer Valving Subsystem designs shall provide for ease of cut-up, dismantling, removal, and packaging of contaminated equipment (e.g., removal and packaging of components within transfer-associated structures) from the facility.	DOE Order 6430.1A, Section 1300-11							X

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	AltCalc	N/A
3.3.8.c	Piping shall be designed and fabricated to minimize crud traps.	RPP-PRO-1622, Appendix E, Section 9.1		X					
3.3.8.d	Isolation valves for waste transfer branch lines, diluent addition lines, and service water flush lines shall be located as close to the main transfer line as practical.	WHC-SD-GN-DGS-30011, Section 10.4.3	Prevents long pipe runs of stagnant fluids.	X					
3.4.a	Records, documents, and drawing control pertinent to design functions shall be in accordance with RPP-PRO-222 and HNF-PRO-224. Drafting standards for drawings and interface control shall be in accordance with RPP-PRO-709.	RPP-PRO-222; HNF-PRO-224; RPP-PRO-709		X					
3.4.b	All DST Transfer Valving Subsystem structures, systems, and components (SSC) shall be incorporated into the master equipment list in accordance with the component index process requirements defined in Section 7.3 of HNF-IP-0842, Volume V.	HNF-IP-0842	New master equipment list procedure under development.						X
3.5.1.a	Components internal to transfer-associated structures shall be designed to be remotely removed, repaired or replaced, and operated.	DOE Order 6430.1A, Section 1300-6.3	Hand and forearm exposure would exceed dose limits.				X		
3.5.1.b	Components external to transfer-associated structures shall be designed for minimal contact maintenance and hands-on operation.	DOE Order 6430.1A, Section 1300-6.3	Hand and forearm exposure would exceed dose limits.				X		

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	AltCalc	N/A
3.5.1.c	Cover blocks, valve manifolds, jumpers, and DST addition drop-legs shall be provided with lifting attachment points for installation of the assembly into position. Lifting attachment points for valve manifolds, jumpers, and DST addition drop-legs shall be designed such that the assembly can be adjusted to hang plumb within ±2.54 cm (1 in.) over its length during installation with a crane. Below-the-hook lifting hardware, if required, shall be designed and provided with the assembly. Design shall be in accordance with ANSI/ASME B30.2 and DOE/RL-92-36.	ANSI/ASME B30.2; DOE/RL-92-36							X
3.5.1.d	All components requiring maintenance, calibration, or hands-on operation should be located external to the pits. Transmitters for the liquid level, flow, and pressure should be located external to the pits.	DOE Order 6430.1A, Section 1300-3.5		X					
3.5.1.e	Designs shall provide for the detection and isolation of electronic faults associated with valve position switches, pressure and flow elements, leak detectors, and any other remote signaling and control of equipment.	DOE Order 6430.1A, Section 1630-2.2.1	"Power Supply Lines – General"	X			X		
3.5.2	The subsystem shall use readily available commercial parts and components to the greatest extent practical.	DOE Order 6430.1A, Section 1100	"Equipment – General"						X

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	Alt Calc	N/A
3.5.2.a	Minimum numbers of spares for like components shall be determined based on mean time between failure and the number of like components installed.	HNF-4553	To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.						X
3.5.3	Remotely operated impact wrenches shall be provided for installation/removal of PUREX jumper assemblies.	HNF-4553	Special operational equipment for remote installation of manifolds. To be added to HNF-4553 per Memorandum of Understanding dated 10/28/99 between Cary Graves and Gary Duncan.						X
3.6	Personnel and Training	N/A.							X
3.7	Characteristics of Subelements	N/A.							X
3.7.1	Double-Shell Tank Addition Drop-Legs	N/A.							X
3.7.2	Valve Manifolds and Jumpers	N/A.							X
3.7.3	Transfer-Associated Structures	N/A.							X
3.7.4	Pit Leak Detectors	N/A.							X
3.7.5	In-Line Sensors	N/A.							X

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method					
				Exam	Demo	Test	Anal	AltCalc	N/A
3.8	Except in those instances where Washington State has been granted regulatory authority by the Federal Government, the hierarchical relationship among requirements specified in Section 3.0 is as follows: • Federal requirements (e.g., *Code of Federal Regulations*, DOE orders) • State requirements (e.g., Revised Code of Washington, as specified in the *Washington Administrative Code*) • Local ordinances • RPP procedures • National consensus codes and standards.	N/A.							X
3.9	The subsystem shall be designed such that access controls to radiation and high-radiation areas meet the requirements of HNF-5183 (local implementation of 10 CFR 835).	HNF-5183		X					
3.10	Not applicable.	N/A.							X
4.0	Quality assurance for the DST Transfer Valving Subsystem shall be performed in accordance with HNF-IP-0842, Volume XI, Section 1.0.	HNF-IP-0842, *Volume XI*, Section 1.0							X

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Section	Function/Requirement	Source Document(s)	Remarks	Verification Method: Exam	Demo	Test	Anal	Alt Calc	N/A
4.1.2.a	Electrical materials and equipment shall be qualification tested unless they are Underwriters Laboratories, Inc. (UL) listed, or factory-mutual tested, with label attached, and for the purpose intended, whenever such products are available. Where no UL or factory-mutual listed products are available, testing and certification by another nationally recognized testing agency may be acceptable, as long as the design agent documents acceptance of the testing agency.	DOE Order 6430.1A, Section 1605-1	"Electrical – General"			X			
4.1.2.b	Seat closure tests shall be performed for all transfer valves in accordance with the test methods in ASME B16.34 and API 598. Seat leakage from each flow side to the isolated port shall be within the limits specified in API 598.	ASME B16.34; API 598; RPP-PRO-097, Table B-1	Standard Design Codes			X			
4.1.2.c	Shell tests shall be performed for all transfer valves in accordance with ASME B16.34.	ASME B16.34; RPP-PRO-097, Table B-1	Standard Design Code			X			
4.1.2.d	All valve manifold and jumper pipe welds shall be examined by 100% radiography.	WHC-SD-GN-DGS-30011				X			
4.2	Design Verification.	RPP-PRO-1819, Sections 2.9.1 and 2.9.2							X

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- H-2-821325, 1995, *Integral Seal Block, 3-Inch Jumper Connector*, Rev. 0
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- RPP-PRO-222, Rev. 0, 1999, *Quality Assurance Records Standards*
- RPP-PRO-709, Rev. 0, 1999, *Preparation and Control Standard for Engineering Drawings.*
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