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Project Development Specification for Valve Pit Manifold

DL McGrew

NHC

Richland, WA 99352

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Abstract: Establishes the performance, design development, and test requirements for the valve pit manifolds. The system engineering approach was used to develop this document in accordance with the guidelines laid out in the Systems Engineering Management Plan for Project W-314.

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Project Development Specification

for

Valve Pit Manifold

Project W-314
Tank Farm Restoration and Safe Operations

September 2000

Approval: 9/27/00
K. N. Jordan, Project Manager Date

Approval: 9/25/00
D. E. Bowers, RPP Design Authority Date

Approval: 9/22/00
R. P. Raven, CHG, Project W-314 Retrieval Operations Date

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1 SCOPE

1.1 Description

This specification establishes the design basis for the performance, design development, and test requirements for upgrading six (6) valve pits, twenty-eight (28) pump pits, three (3) drain pits, two (2) feed pump pits, and providing two (2) new valve pits located in the 200 East Area. The upgrades will be provided to support privatization waste transfers to the 241-AP Tank Farm and to add waste routing flexibility by deleting the need to reposition jumpers for various waste transfers. The upgrades consist of new valve manifolds, valve position sensor systems, rupture disks, pressure transmitters and associated hardware, new floor drain seal assemblies, pit cover blocks, and new pits as required.

1.2 Classification

Not applicable to this specification.

2 APPLICABLE DOCUMENTS

See Section 5.3 for notes regarding applicable documents.

2.1 DOE Documents

DOE 5480.20A, *Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities*, 1/15/94.

DOE 6430.1A, *General Design Criteria*, United States Department of Energy, 4/6/89.

DOE-STD-1020, *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities*, Jan. 1996.

2.2 Code of Federal Regulations

Not applicable to this specification.

2.3 Tank Farm Contractor Documents

HNF-IP-0842, *RPP Administration*, Rev. 0a.

HNF-PRO-242, *Engineering Drawing Requirements*, Rev. 1.

HS-BS-0084, *Jumper Fabrication*, Rev. B, Amendment 2, September 12, 1995.

RPP-PRO-224, *Document Control Program Standards*, Rev. 0.

RPP-PRO-233, *Review and Approval of Documents*, Rev. 0.

RPP-PRO-709, *Preparation and Control Standards for Engineering Drawings*, Rev. 0.

WHC-SD-WM-SARR-016, *Tank Waste Compositions and Atmospheric Dispersion Coefficients for use in Safety Analysis Consequence Assessments*, Rev. 2.

2.4 Project W-314 Documents

HNF-SD-W314-PDS-001, *Project Development Specification for Transfer Piping*, Rev. 3.

HNF-SD-W314-PDS-003, *Project Development Specification for Pit Leak Detection*, Rev. 3.

HNF-SD-W314-PDS-004, *Project Development Specification for Master Pump Shutdown System*, Rev. 3.

HNF-SD-W314-PICD-001, *Project Interface Control Document for Project W-314*, Rev. 2.

HNF-SD-W314-QAPP-001, *Quality Assurance Program Plan for Project W-314*.

2.5 Codes and Standards

ACI-301, *Standard Specifications for Structural Concrete*, American Concrete Institute.

ACI-318, *Building Code Requirements for Reinforced Concrete*, American Concrete Institute.

ACI-349, *Code Requirements for Nuclear Safety Related Concrete Structures and Commentary*, American Concrete Institute.

ANSI B16.34, *Valves-Flanged, Threaded, and Welding End*.

API 598, *Valve Inspection and Testing*.

ASCE 7-95, *Minimum Design Loads for Buildings and Other Structures*, American Society of Civil Engineers.

ASME B31.3, *Process Piping*.

FM, *Approval Guide Building Materials*, Factory Mutual System.

ICRP Publication 37, *Cost Benefit Analysis in the Optimization of Radiological Protection*.

MIL-STD-1472E, *Human Engineering Design Criteria for Military Systems, Equipment and Facilities*, U.S. Department of Defense.

NFPA 70, *National Electrical Code*, National Fire Protection Association.

NUREG 0700, *Human System Interface Design Review Guideline*.

UBC, *Uniform Building Code*.

UCRL-15910, *Design and Evaluation Guidelines for DOE Facilities Subject to Natural Phenomena Hazards*, University of California Research Laboratory.

UL 508A, *Outline of Investigation for Industrial Control Panels*, Underwriters Laboratories.

2.6 Other Documents

MSS-SP-61, *Manufacturers Standardization Society, Standard Practice SP-61 for Pressure Testing of Steel Valves*.

2.7 Drawings

H-2-32420, *Assembly - Horizontal & Vertical 2" Connector*, Rev. 10.

H-2-32430, *Assembly Horiz. & Vert. Conn. 3" Connector*, Rev. 9.

H-2-90185, *Male Nozzle 2" PUREX*, Rev. 4.

H-2-90186, *Male Nozzle 3" PUREX*, Rev. 4.

3 REQUIREMENTS

3.1 Item Definition

The valve manifold piping systems provide a confined routing for the transfer of tank waste between storage locations. The valve manifolds addressed by this specification are discrete segments of the Hanford tank farm waste transfer system.

This specification covers the design basis for the installation of manifolds/jumpers in the following pits:

- 241-AN-A and 241-AN-B Valve Pits
- 241-AW-A and 241-AW-B Valve Pits
- 241-AN-01A and 241-AN-04A Central Pump Pits
- 241-AY-01A Central Pump Pit
- 241-AZ-01A and 241-AZ-02A Central Pump Pits
- 241-AZ-VP Valve Pit

This specification also covers the design basis for the installation of valve position sensor systems in the following pits:

- 241-AN-A and 241-AN-B Valve Pits
- 241-AW-A and 241-AW-B Valve Pits
- 241-AN-01A Central Pump Pit
- 241-AZ-VP Valve Pit

This specification also covers the design basis for the installation of new pit cover blocks in the following pits:

- 241-AN-A and 241-AN-B Valve Pits
- 241-AW-A and 241-AW-B Valve Pits
- 241-AZ-VP Valve Pit
- 214-AN-04D Slurry Receiver Pit

This specification also covers the design basis for the installation of new process pits (241-AZ-VP Valve Pit and 241-AN-04D Slurry Receiver Pit), as required.

This specification also covers the design basis for the installation of new floor drain seal assemblies in the following pits:

- 241-AN-A and 241-AN-B Valve Pits
- 241-AN-01A through 241-AN-07A Central Pump Pits
- 241-AN-04D Slurry Receiver Pit (New)
- 241-AP-01A through 241-AP-08A Central Pump Pits
- 241-AP-03D Drain Pit
- 241-AW-A and 241-AW-B Valve Pits
- 241-AW-01A through 241-AW-06A Central Pump Pits
- 241-AW-02D Drain Pit
- 241-AW-02E Feed Pump Pit

241-AY-01A and 241-AY-02A Central Pump Pits
 241-AZ-01A and 241-AZ-02A Central Pump Pits
 241-AZ-VP Valve Pit (New)
 241-SY-01A through 241-SY-03A Central Pump Pits
 241-SY-A and 241-SY-B Valve Pits
 241-SY-02D Drain Pit
 241-SY-02E Feed Pump Pit

Note: The existing cover blocks for 241-AZ-01A and 241-AZ-02A, 241-AY-01A and 241-AY-02A, 241-AN-01A through 241-AN-07A, 241-AP-01A through 241-AP-08A, 241-AW-01A through 241-AW-06A, and 241-SY-01A through 241-SY-03A Central Pump Pits; 241-SY-A and 241-SY-B Valve Pits; 241-AP-03D, 241-AW-02D, and 241-SY-02D Drain Pits; and 241-AP-02E and 241-SY-02E Feed Pump Pits will not be replaced, therefore the requirements in this specification associated with fabrication and installation of new cover blocks do not apply.

The above pits are designed to route tank waste between tanks within the tank farms in which they are located and also between specific tank farms and adjacent facilities via the waste transfer lines. Control over transfers is currently achieved through the configuration of the pit jumpers, i.e., which pit nozzles are tied together and the alignment of the valves on the jumpers, within the pits. Routing can be changed through the valves in the jumpers within the pits.

The nozzle configurations for the valve manifolds within the above pits are shown in the Table 3-1. Valve manifolds shall be connected only to the 3-inch transfer system, except as noted in this table. All applicable 3-inch nozzles inside a pit will be connected by a manifold assembly while all applicable 2-inch nozzles will be connected by a separate manifold assembly. Isolation/process blanks identified in Table 3-1 are within Project W-314. If during construction, any unused nozzle is discovered to not have an isolation/process blank, one shall be provided and installed.

The valve manifolds, the pit cover blocks, and existing pits provide the primary and secondary confinement of the waste. The major components of the pit upgrades are as follows: (1) valve pit manifolds; (2) valve position sensor systems; (3) pit cover blocks, as required, (4) new process pit(s), as required, (5) pit floor drain seal assemblies, as required, and (6) tank farm lighting, as required. Note that pit cover blocks for 241-AZ-01A, 241-AZ-02A, 241-AY-01A, 241-AY-02A, 241-AN-01A, and 241-AN-04A Central Pump Pits and 241-AP Valve Pit will not be replaced, but modified as necessary for valving, leak detection, and access. The components of the pit upgrades and their relationship to the rest of the W-314 Waste Transfer System are shown graphically in Figure 3-1. The functional and physical relationship of the valve manifolds, valve position sensor system, and cover blocks to the tank farm waste transfer system is described in paragraphs 3.1.1 and 3.1.2.

Table 3-1 Manifold/Jumper Configuration Details

Nozzle No.	Size	Pipe No.	Descriptions
Location: 241-AN-A Valve Pit			
L1	3"	3" SN-267	To Central Pump Pit 07A (A)
L2	2"		Isolation Blank
L3	2"	2" SL-167	To Central Pump Pit 07A (B)

Table 3-1 Manifold/Jumper Configuration Details (Continued)

Nozzle No.	Size	Pipe No.	Descriptions
L4	2"		Isolation Blank
L5	2"	2" SL-164	To Central Pump Pit 04A (B)
L7	2"	2" SL-165	To Central Pump Pit 05A (B)
L9	2"	2" SL-166	To Central Pump Pit 06A (B)
L10	2"		Isolation Blank
L11	3"		Isolation Blank
L12	3"		Isolation Blank
L13	3"		Isolation Blank
L14	3"	3" SN-266	To Central Pump Pit 06A (A)
L15	3"	3" SN-264	To Central Pump Pit 04A (A)
L16	3"	3" SN-265	To Central Pump Pit 05A (A)
L17	2"		Process blank (existing)
L18	2"		Isolation Blank
L19	3"	3" SN-268	To Valve Pit AN-B (R19)
L21	3"	New 3" Flush	Note: only new nozzle installed.
Location: 241-AN-B Valve Pit			
R1	3"		Isolation Blank
R2	2"		Isolation Blank
R3	2"		Isolation Blank
R4	2"		Isolation Blank
R5	2"	2" SL-161	To Central Pump Pit 01A (B)
R7	2"	2" SL-162	To Central Pump Pit 02A (B)
R9	2"	2" SL-163	To Central Pump Pit 03A (B)
R10	2"		Isolation Blank
R11	3"		Isolation Blank
R12	3"		Isolation Blank
R13	2"		Isolation Blank
R14	3"	3" SN-263	To Central Pump Pit 03A (A)
R15	3"	3" SN-261	To Central Pump Pit 01A (A)
R16	3"	3" SN-262	To Central Pump Pit 02A (A)
R17	2"		Isolation Blank

Table 3-1 Manifold/Jumper Configuration Details (Continued)

Nozzle No.	Size	Pipe No.	Descriptions
R18	2"		Isolation Blank
R19	3"	3" SN-268	To Valve Pit AN-A (L19)
R20	2"	New 2" Flush	From Blending Tank TK-301
Location: 241-AY-01A Central Pump Pit			
U3	4"	Spare	Isolation Blank
U8	2"	Spare	Isolation Blank
U9	3"	Spare	Isolation Blank
U12	2"	SL-505	To Distributor (Existing)
U13	3"	New SN-635	Process blank
U13A	2"	New 2" DR	New SN-635 Encasement DR
Location: 241-AY-02A Central Pump Pit			
U5	3"	New SN-633	Process blank
U12	3"	New SN-635	Process blank
Location: 241-AZ-01A Central Pump Pit			
U11	3"	New SN-631	Process blank
U11A	2"	New 2" Drain	New SN-631 Encasement Drain
U12	3"	New SN-632	Process blank
U12A	2"	New 2" DR	New SN-632 Encasement DR
Location 241-AZ-02A Central Pump Pit			
U13	3"	New SN-631	Process blank
Location: 241-AW-A Valve Pit			
L1	3"	3" SN-267	To Pump Pit 241-AW-02A (J)
L2	3"	3" SN-220	From 204-AR
L3	2"	2" SL-168	From Evap. Bldg. 242-A (18)
L4	2"	2" SL-510	To Valve Pit 241-AP (2)
L5	2"	TBD	Failed line to be replaced by Project W-521. New nozzle for Project W-521.
L7	2"	2" SL-163	To Pump Pit 241-AW-03A (B)
L9	2"	2" SL-165	To Pump Pit 241-AW-05A (B)
L10	2"	Spare	Vapor Seal
L11	3"	3" Flush	New for Project W-521

Table 3-1 Manifold/Jumper Configuration Details (Continued)

Nozzle No.	Size	Pipe No.	Descriptions
L12	3"	3" P-V021	Isolation blank
L13	3"	Spare	Vapor Seal
L14	3"	3" SN-263	To Pump Pit 241-AW-03A (A)
L15	3"	3" SN-265	To Pump Pit 241-AW-05A (A)
L16	3"	3" SN-261	To Pump Pit 241-AW-01A (A)
L17	1 1/2"	1 1/2" Flush	Process blank
L18	2"	2" SL-169	Vapor Seal
L19	3"	3" SN-271	Vapor Seal
Location: 241-AW-B Valve Pit			
R1	3"	3" SN-268	To Pump Pit 241-AW-02A (H)
R2	3"	3" SN-167	Process blank
R3	2"	2" SL-167	To Evap. Bldg. 242-A (19)
R4	2"	2" SL-509	To Valve Pit 241-AP (1)
R5	2"	2" SL-161	Process blank
R7	2"	2" SL-164	To Pump Pit 241-AW-04A (B)
R9	2"	2" SL-166	To Pump Pit 241-AW-06A (B)
R11	3"	3" P-V023	Process blank
R12	3"	3" P-V022	Process blank
R13	3"	Spare	Vapor Seal
R14	3"	3" SN-264	To Pump Pit 241-AW-04A (A)
R15	3"	3" SN-266	To Pump Pit 241-AW-06A (A)
R16	3"	3" SN-262	Process blank
R17	1 1/2"	1 1/2" Flush	Process blank
R18	2"	2" SL-169	Vapor Seal
R19	3"	3" SN-271	Vapor Seal
R21	3"	3" Flush Line	New nozzle for Project W-521
Location: 241-AN-01A Central Pump Pit			
A	3"	SN-261	To Valve Pit 241-AN-B (R15)
H	3"	SNL-3150	From cross-site tie-in (new)
C	2"	2" DR	New SNL-3150 Drain
D	3"	SN-630	From 241-AZ-VP Valve Pit (A) (new)

Table 3-1 Manifold/Jumper Configuration Details (Continued)

Nozzle No.	Size	Pipe No.	Descriptions
J	2"	2" DR	New SN-630 Drain
E	2"		Process blank
F	2"		Process blank
3A	3"		To Transfer Pump
Location: 241-AN-04A Central Pump Pit			
C	2"		Isolation blank
D	3"	SN-636	Isolation blank
H	2"	SN-636 ENC DR	New SN-636 encasement drain
E	2"		Process blank
F	2"		Process blank
241-AZ-VP Valve Pit			
A	3"	SN-630	To Pump Pit 241-AN-01A (D)
B	2"	SN-637 ENC DR	New Encasement Drain
C	3"	SN-637	To New AP-A Valve Pit (Project W-521)
D	2"	SN-634 ENC DR	New Encasement Drain
E	3"	SN-634	To New AP-A Valve Pit (Project W-521)
F	3"	SN-633	To Pump Pit 241-AY-02A (U5)
G	2"	SN-633 ENC DR	New Encasement Drain
H	3"	SN-632	To Pump Pit 241-AZ-01A (U12)

Note: In the description, block numbers and/or letters in parenthesis (x) indicate the nozzle location in the referenced pit.

Figure 3-1. Relationship of Pit Upgrades to W-314 Transfer Waste System

3.1.1 Item Diagrams

The functions of the valve pit manifolds were developed during the functional analysis of the W-314 Waste Transfer System. The valve pit manifolds and their major components must meet the requirements of the following functions:

- Function 3.1.1 Confine Waste Within Valve Manifolds and Jumpers
- Function 3.1.2 Position Manifold Valves
- Function 3.1.3 Confine Flush Within Valve Manifolds and Jumpers
- Function 3.1.4 Monitor Valve Position
- Function 3.1.8 Position Pit Drain Seal Assembly
- Function 3.2.1 Confine Waste Leakage Within Transfer-Associated Structures
- Function 3.2.6 Site Transfer Associated Structures

Appendix A contains the Functional Flow Block Diagrams (FFBD) that include diagrammatic presentations of the above functions and their inter-relationship with other applicable functions of the transfer waste system.

Appendix B contains the Requirements Allocation Sheets (RASs) for all requirements in this specification.

3.1.2 Interface Definition

Functional and physical interfaces for the valve pit manifolds are described in the Project W-314 Project Interface Control Document (PICD), HNF-SD-W314-PICD-001.

In addition, the design shall be coordinated with the systems identified in the following Project Development Specifications (PDS):

- HNF-SD-W314-PDS-001 PDS for Transfer Piping
- HNF-SD-W314-PDS-003 PDS for Pit Leak Detection
- HNF-SD-W314-PDS-004 PDS for MPS System

3.1.3 Major Component List

In addition to new valve pit manifolds, the upgrades to the valve and pump pits have the following major components:

- Valve position sensor systems.
- Pit cover blocks.
- New process pit(s)
- Site work
- Pit floor drain seal assemblies

3.2 Characteristics

3.2.1 Performance Characteristics

The valve manifold piping system and the piping in 214-AN-04D Slurry Receiver Pit and components shall meet the performance requirements stated in this section.

3.2.1.1 Confine Waste Within Valve Manifolds and Jumpers. (FFBD Function 3.1.1) After the transfer pump has started, the piping system shall confine the waste during transfers.

3.2.1.1.1 Corrosion/Erosion. The piping system components shall support a corrosion/erosion allowance of 0.01 mm per year (0.4 mil per year) for the life of the system.

3.2.1.1.2 Reynolds Number. The piping system components shall be capable of transferring the waste at a Reynolds number greater than or equal to 20,000.

3.2.1.1.3 Head Loss. The valve manifold/jumper piping system shall have a head loss no greater than 10 meters per 100 meters (10 feet per 100 feet) of equivalent length of 3 in Sch 40 pipe.

3.2.1.1.4 Design Pressure. The valve manifold/jumper piping system components shall be capable of supporting a design pressure of 400 psig. For interconnecting piping that have design pressures exceeding 400 psig, it is the owner/operator responsibility to verify that the

most severe condition of coincidental internal pressure and temperature expected during service does not exceed the design conditions of the valve manifold.

3.2.1.1.5 WT-SLL-3160 Design Pressure. The connection of WT-SLL-3160 to Riser 10 on tank 241-AN-104 shall be capable of supporting a design pressure of 10.27 Mpa (1490 psi) up to and including the last point of isolation prior to entry into the riser.

3.2.1.1.6 WT-SLL-3160 Encasement Design Pressure. The WT-SLL-3160 line encasement shall have a design pressure of 50 psig and a design temperature of 180 °F.

3.2.1.1.7 Temperature Maintenance. The valve manifold/jumper piping system components, as part of the waste transfer system, shall be capable of maintaining the temperature of the contents such that the temperature drop through the piping in the pit does not exceed 2 °C (3 °F) during a waste transfer.

3.2.1.1.8 Compatibility with Waste. The piping system components shall be capable of withstanding the liquid waste chemical composition ranges listed in Table 3-2 and the waste radionuclide concentrations listed under the W-314 column in Table 3-3.

Table 3-2 Chemical Composition Range

Species	Retrieved waste			
	DST		SST	
	Anion/cation		Anion/cation	
	min mol/L	max mol/L	min mol/L	max mol/L
Ag	0	0.0013	-	-
Al	0.05	1.1	0.029	0.5
As	0	0.0066	-	-
B	0	0.013	-	-
Ba	0	0.0004	0	0.0014
Bi	-	-	0	0.076
Ca	0.0014	0.1	0	0.17
Cd	0	0.0074	0	0.0007
Cr	0.0067	0.28	0.0001	0.091
Cu	0	0.02	-	-
Fe	0.0004	0.26	0.0057	0.89
Hg	0	2.8E-05	0	0.0001
K	0.044	0.55	0.0002	0.0095
La, Nd	0	0.0066	0	0.001
Mg	0.0004	0.046	-	-
Mn	0.0003	0.16	0.0009	0.41

Table 3-2 Chemical Composition Range (Continued)

Species	Retrieved waste			
	DST		SST	
	Anion/cation		Anion/cation	
	min mol/L	max mol/L	min mol/L	max mol/L
Mo	0	0.0029	-	-
Na	1.6	10.7	1.6	7.1
Ni	0.0002	0.008	0	0.042
Pb	0	0.004	0	0.12
Pd, Rh	0	0.0063	-	-
Si(SiO ₂)	0.0024	0.028	0.0004	0.46
Ti	0	0.002	-	-
U	0	0.0092	-	-
Zr(ZrO ₂)	0	0.3	0	0.065
Acetate	-	-	0	0.0055
Citrate	0	0.03	0.0042	0.06
EDTA	0	0.016	0	0.011
HEDTA	0	0.021	-	-
Fe(CN) ₆	-	-	0	0.025
Cl	0.003	0.17	0	0.022
CO ₃	0.03	0.69	0.014	0.38
F	0.014	1	0.001	0.71
Fission product	0	0.0001	-	-
NO ₂	0.1	1.8	0.0086	0.83
NOX(NO ₃)	0.15	3.6	0.64	5.1
OH	0.24	4.4	0.25	6.9
PO ₄	0	0.4	0.0007	3.8
SO ₄	0.003	0.16	0.01	0.22
TOC	0	2	-	-

DST = Double-shell tank
 EDTA = Ethylenediametraacetic acid
 HEDTA = n-(hydroxyethyl)-Ethylenediametraacetic acid
 SST = Single-shell tank
 TOC = Total organic carbon

Table 3-3 Radionuclide Concentrations

Nuclide	Nuclide Concentrations (Bq/L)		
	(a)All liquids	(a)All solids	(b)W-314
14C	2.3E+05	1.6E+05	2.3E+05
60Co	9.5E+06	4.9E+08	1.7E+08
79Se	(c)	1.7E+04	1.7E+04
90Sr	1.1E+10	2.9E+12	9.6E+11
90Y	1.1E+10	2.9E+12	9.6E+11
99Tc	1.7E+07	1.2E+10	4.0E+09
106Ru	9.9E+02	7.2E+04	2.4E+04
125Sb	3.4E+04	1.8E+08	5.9E+07
129I	2.0E+04	6.4E+06	2.1E+06
134Cs	6.1E+06	9.4E+06	7.2E+06
137Cs	8.8E+10	1.0E+11	9.2E+10
144Ce	9.1E+00	3.4E+02	1.2E+02
147Pm	3.6E+07	(c)	3.6E+07
154Eu	2.4E+09	1.1E+10	5.2E+09
155Eu	5.9E+07	5.0E+06	5.9E+07
237Np	2.3E+05	9.9E+08	3.3E+08
238Pu	1.8E+06	1.9E+08	6.4E+07
239Pu(d)	3.6E+07	1.6E+09	5.5E+08
241Pu	2.6E+08	3.8E+09	1.4E+09
241Am	4.2E+07	1.1E+10	3.7E+09
242Cm	1.1E+01	2.0E+02	7.3E+01
244Cm	4.2E+05	6.1E+07	2.0E+07

(a) From Table 1a., Van Keuren, J. C., 1996, Tank Waste Compositions and Atmospheric Dispersion Coefficients for Use in Safety Analysis Consequence Assessments, WHC-SD-WM-SARR-016, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

(b) W-314 values represent a bounding mixture for design of 67% liquid and 33% solid, except for 14C and 155Eu where the maximum liquid value was used as it is higher than the mix and for 79Se and 147Pm where data is not available.

(c) No available data.

(d) The 239Pu activity concentration also includes 240Pu.

3.2.1.2 Position Manifold Valves. (FFBD Function 3.1.2) After the appropriate valve manifolds have been selected, the waste transfer system shall position the valves on the selected manifold.

3.2.1.2.1 Remote Valve Operation. The valve manifold/jumper valves shall be remote manually operated from above the pit cover blocks.

3.2.1.3 Confine Flush in Valve Manifolds and Jumpers. (FFBD Function 3.1.3) During the flush of the waste transfer system, the piping system shall confine the flush water.

3.2.1.3.1 Compatibility with Flush Water. The piping system components shall be capable of confining flush water with the following properties:

- Volumetric flow rate of 151 - 530 L/min (40 - 140 gpm)
- Temperature of 12.8 - 66 °C (55-150 °F)
- pH range of no less than 7 and a maximum of 14.

3.2.2 Physical Characteristics

3.2.2.1 Valve Piping System Features. The valve piping system shall have the following features:

- a. Manual valve actuation from above the cover blocks (except for the encasement rupture disk isolation valve in 241-AN-04D Slurry Receiver Pit).
- b. Valves shall be capable of being locked in position (except the WT-SLL-3160 block valve at Riser 10).

3.2.2.2 Valve Extension Handles. The pit valves shall be manually operated with valve operating extension rods extending through the pit cover blocks (except for the encasement rupture disk isolation valve in 241-AN-04D Slurry Receiver Pit).

3.2.2.3 PUREX Jumper Connector. The PUREX jumper connector assembly design will be in accordance with drawings H-2-32430 and H-2-32420. The pit nozzle shall be PUREX type design (reference drawings H-2-90185 and H-2-90186).

3.2.2.4 Jumper Manifold. Each jumper manifold shall have a valved nozzle to facilitate interface with the existing transfer piping system via flexible jumpers (Valve Pit 241-AP and the new 241-AZ-VP Valve Pit are excluded from this requirement).

3.2.2.5 Valve Position Indication System. The valve position indication system shall provide sufficient accuracy with respect to the actual valve position such that the selected flow path configuration is leak tight.

3.2.2.6 Not used

3.2.2.7 Valve Position Indicators. Indication of the valves position shall be visible when extension handles are removed.

3.2.2.8 Valve Lock Capacity. The valve operators shall be capable of being locked in place by a padlock that has a bail diameter of 5/16" and a minimum closed length of 1.5 inches.

3.2.3 Reliability

3.2.3.1 Design Life of Valve Manifold. The design life of the valve manifold/jumper piping system components shall be 12 years. The design life of the WT-SLL-3160 piping system components shall be 40 years.

3.2.3.2 Design Life of Cover Blocks. The design life of the cover blocks and the new 241-AZ-VP shall be 35 years.

3.2.3.3 Design Life of Slurry Receiver Pit. The design life of the Slurry Receiver Pit, 241-AN-04D, shall be 40 years.

3.2.3.4 Degree of Reliability. Valves shall be designed to operate properly following stagnant periods of up to one year.

3.2.3.5 Valve Life. Valves shall be capable of being operated up to 1000 cycles over its design life.

3.2.3.6 Fault Detection/Isolation. Designs shall provide for the detection and isolation of faults to systems, structures, and components as necessary in order to minimize the risks associated with faulty operation to plant, personnel and environment. Protection systems and associated instrumentation and controls shall be designed in accordance with DOE 6430.1A, Section 1660-99.0.2.

3.2.4 Maintainability

3.2.4.1 Corrective Maintenance. The repair or replacement of a failed components on the valve manifold/jumper shall be performed within 25 days.

3.2.4.2 Preventive Maintenance. The design of the valve manifold/jumper system shall ensure no preventive maintenance requiring pit entry.

3.2.5 Environmental Conditions

The systems and components covered by this specification shall be compatible with the environmental conditions listed below, as applicable. Performance Category (PC) 3 is assigned to safety class systems and PC1 is assigned to general service systems. The design and analysis of loads associated with existing systems shall, as a minimum, be performed to the design requirements of the existing system.

3.2.5.1 Natural Environments

3.2.5.1.1 Ambient Air Temperature. The ambient air (outside the pit) temperature range is 48.9°C (120°F) to -35.5°C (-32°F), and with a maximum 24 hour differential of 28.9°C (52°F).

3.2.5.1.2 Soil Temperature. The minimum soil temperatures below ground surface is:

1.3 cm (0.5 in):	-19.5 °C (-3.0 °F)
38 cm (15 in):	-8.8 °C (16.1 °F)
92 cm (36 in):	0.8 °C (33.5 °F)

3.2.5.1.3 Seismic Loads. PC1 structures, systems, and components

Earthquake load design of PC1 SSCs shall comply with the UBC, Seismic Zone 2B, for standard occupancy facilities.

PC3 structures, systems, and components

Earthquake load design of PC3 SSCs shall comply with DOE-STD-1020 by using dynamic analysis and site-specific design response spectra listed in Table 3-4.

New process pits and new cover blocks shall be designed, analyzed, procured, and constructed to PC3 requirements.

Calculate elastic seismic response, D_s , by dynamic analysis using Response Level 2 damping values from Table 3-5.

Table 3-4 Response Spectra

Horizontal Response Spectra "g"						
Frequency (Hertz)	Damping					
	0.50%	2%	5%	7%	10%	12%
100	0.26	0.26	0.26	0.26	0.26	0.26
33.3	0.26	0.26	0.26	0.26	0.26	0.26
13.3	0.57	0.48	0.41	0.38	0.36	0.35
10	0.77	0.59	0.47	0.43	0.38	0.36
5	1.04	0.76	0.58	0.52	0.45	0.42
3.3	0.98	0.72	0.54	0.48	0.42	0.39
2	0.74	0.55	0.41	0.37	0.33	0.30
1	0.45	0.34	0.26	0.23	0.21	0.19
0.5	0.22	0.17	0.13	0.12	0.11	0.10
0.25	0.08	0.06	0.05	0.05	0.04	0.04

Vertical Response Spectra "g"						
Frequency (Hertz)	Damping					
	0.50%	2%	5%	7%	10%	12%
100	0.18	0.18	0.18	0.18	0.18	0.18
33.3	0.18	0.18	0.18	0.18	0.18	0.18
13.3	0.60	0.46	0.37	0.33	0.30	0.28
10	0.66	0.49	0.37	0.33	0.29	0.27
5	0.60	0.44	0.33	0.30	0.26	0.24
3.3	0.48	0.36	0.27	0.24	0.21	0.19
2	0.32	0.24	0.18	0.16	0.14	0.13
1	0.19	0.14	0.11	0.10	0.09	0.08
0.5	0.14	0.11	0.08	0.07	0.07	0.06
0.25	0.06	0.05	0.04	0.03	0.03	0.03

Table 3-5 Response Level

	Damping (% of critical)
	Response Level 2
Demand/capacity ratio	~0.5 to 1.0
Welded and friction bolted metal structures	4
Bearing-bolted metal structures	7
Prestressed concrete structures without complete loss of prestress	5
Reinforced concrete structures	7
Masonry shear walls	7
Wood structures with nailed joints	10
Distribution systems	5
Massive low stressed components (pumps, motors, etc.)	3
Light welded instrument racks	3
Electrical cabinets and other equipment	4
Liquid containing metal tanks Impulsive mode	3
Liquid containing metal tanks Sloshing mode	0.5

3.2.5.1.4 Wind Loads. For PC3 systems:

"Fastest Mile" wind velocity: 36 m/s (80 mi/h)

"Three Second Gust" wind velocity: 44 m/s (100 mi/h)

Missile (horizontal): 50 x 100 mm (2 x 4 in.) Timber plank weighing 7 kg (15 lb) @ 22 m/s (50 mi/h). Maximum trajectory height = 9 m (30 ft).

For PC1 systems:

"Fastest Mile" wind velocity: 31 m/s (70 mi/h)

"Three Second Gust" wind velocity: 38 m/s (85 mi/h)

3.2.5.1.5 Snow Loads. The ground snow loads are: 720 Pa (15 lb/square foot)**3.2.5.1.6 Relative Humidity.** The relative humidity range is 0 to 100% (Rate of change is negligible).**3.2.5.1.7 Surface Precipitation.** The surface precipitation is 4 cm (1.56 in) in a 24 hour period.**3.2.5.1.8 Hail Events.** The hail diameter is less than or equal to 1.9 cm (0.75 in).

3.2.5.1.9 Sand and Dust. The sand/dust concentration is 0.177 gm/cubic meter with a typical size of 350 μm .

3.2.5.1.10 Solar Radiation. The solar radiation range is between 4 Watts/square meter and 406 Watts/square meter.

3.2.5.1.11 Glaze. (See definition in Section 5.1) The glaze is 2.54 cm (1 in.).

3.2.5.1.12 Ashfall. A total combination load of snow fall and ash fall of 960 Pa (20 lb/square foot) shall be used.

3.2.5.1.13 Dead Loads. Dead loads include the weights of all permanent materials and equipment, including the structure's own weight. Design dead loads shall include the weight of all permanent service equipment. Load calculations shall include an allowance for any loadings anticipated to be added at a later date. Initially assumed loads shall be revised so that the final design reflects the configuration shown on the drawings.

The unit weights of materials and construction assemblies for buildings and other structures shall be those given in ASCE 7-95. Where unit weights are neither established in that standard nor determined by test or analysis, the weights shall be determined from data in manufacturer drawings or catalogs.

3.2.5.1.14 Thermal Forces. The design of structures shall include the effects of stresses and movements resulting from variations in temperature. Structures shall be designed for movements resulting from the maximum seasonal temperature change. The design shall provide for the lags between air temperatures and the interior temperatures of massive concrete members or structures. Consideration shall be given to passive soil loading resulting from thermal growth of subgrade structures.

3.2.5.1.15 Creep and Shrinkage Forces. Concrete and masonry structures shall be investigated for stresses and deformations induced by creep and shrinkage. For concrete and masonry structures, the minimum linear coefficient of shrinkage shall be assumed to be 0.0002 mm/mm, unless a detailed analysis is undertaken. The theoretical shrinkage displacement shall be computed as the product of the linear coefficient and the length of the member.

3.2.5.1.16 Load Combinations and Allowable Stresses. Load combinations, allowable stresses, and strength requirements for load conditions that include live load, dead load, snow load, and normal operating loads for all SSCs shall comply with the UBC or applicable system national codes and standards.

Load combinations, allowable stresses, and strength requirements for load conditions that include live load; dead load; snow load; normal operating loads; and NPH loads of extreme wind, earthquake, flood, and ashfall for all SSCs shall comply with DOE-STD-1020.

Load factors and load combinations for PC1 structures, systems, and components

Combine response from various loadings to determine the structural demand by using the UBC-specified load combination rules (e.g., load factors for ultimate strength design and unit load factors for allowable stress design).

Where:

DL = DEAD LOAD
 LL = LIVE LOAD
 RL = ROOF LIVE LOAD
 S = SNOW LOAD
 W = WIND LOAD
 E = EARTHQUAKE
 T = THERMAL
 C = CREEP/SHRINKAGE

Allowable Stress (AS) Design: All Construction

$AS = DL + LL + RL(\text{or } S)$
 $AS = 0.75[DL + LL + W(\text{or } E)]$
 $AS = 0.75[DL + LL + W + S/2]$
 $AS = 0.75[DL + LL + S + W/2]$

Ultimate Strength (U) Design: Reinforced Concrete

$U = 1.4DL + 1.7LL + 1.7RL(\text{or } 1.7S)$
 $U = 0.75[1.4DL + 1.7LL + 1.7W]$
 $U = 1.05[DL + LL + E]$
 $U = 0.9DL + 1.3W(\text{or } 1.4E)$
 $U = 1.4[DL + T(\text{or } C)]$
 $U = 0.75[1.4DL + 1.7LL + 1.4T(\text{or } 1.4C)]$

Strength (S) Design: Steel (Load & Resistance Factor Design) $S=1.4DL$

$S = 1.2DL + 1.6LL + 0.5(RL \text{ or } S)$
 $S = 1.2DL + 0.5LL(\text{or } 0.8W) + 1.6(RL \text{ or } S)$
 $S = 1.2DL + 1.3W + 0.5LL + 0.5(RL \text{ or } S)$
 $S = 1.2DL + 1.5E + 0.5LL(\text{or } .2S)$
 $S = 0.9DL - 1.3W(\text{or } 1.5E)$

Load factors and load combination for PC3 structures, systems, and components

Combine response from various loadings to determine structural demand as follows:

Where:

DL = DEAD LOAD
 LL = LIVE LOAD
 RL = ROOF LIVE LOAD
 S = SNOW LOAD
 W = WIND LOAD
 E = EARTHQUAKE
 A = ASHFALL
 T = THERMAL
 C = CREEP/SHRINKAGE

Allowable Stress (AS) Design:

$$AS = DL + LL + RL(\text{or } S)$$

$$AS = 0.62[DL + LL + RL(\text{or } S) + W + T(\text{or } C)]$$

for shear stress

$$AS = 0.71[DL + LL + RL(\text{or } S) + E(\text{or } A) + T(\text{or } C)]$$

for all stress other than sheer stress

$$AS = 0.59[DL + LL + RL(\text{or } S) + E(\text{or } A) + T(\text{or } C)]$$

Ultimate Strength (U) Design:

$$U = 1.4DL + 1.7LL + 1.7RL(\text{or } 1.7S)$$

$$U = 1.4[DL + T(\text{or } C)]$$

$$U = DL + LL + RL(\text{or } S) + W(\text{or } E \text{ or } A) + T(\text{or } C)$$

Strength (S) Design: Steel (Load & Resistance Factor Design) $S=1.4DL$

$$S = 1.2DL + 1.6LL + 0.5(RL \text{ or } S)$$

$$S = 1.2DL + 0.5LL + 1.6(RL \text{ or } S)$$

$$S = DL + LL + RL(\text{or } S) + W(\text{or } E \text{ or } A) + T$$

3.2.5.2 Induced Environments

3.2.5.2.1 Waste Properties. Materials used that come in contact with the waste shall be capable of safely handling waste with the following properties:

Specific Gravity	1 to 1.5
Viscosity	1 to 30 centipoise (Newtonian)
Miller Number	100 Maximum
pH	7 to 14
Temperature	10 to 93 °C (50 to 200 °F)
Solids Content	30 Vol. %
Particle Size	0.5 to 4000 microns
Note: 95% of total particles 0 to 50 microns	
<5 percent of total particles 50 to 500 microns	
<1 percent of total particles 500 to 4000 microns	

3.2.5.2.2 Radiation Tolerance

3.2.5.2.2.1 Inside Pit Radiation Level. Materials used that are located inside a pit shall be capable of operating in the following radiation environment:

total accumulated dose:	6.0E+7 rads
dose rate:	1.0E+7 mr/hr

3.2.5.2.2.2 Background Pit Radiation Level. Materials used that are located outside a pit shall be capable of operating in the following radiation environment:

total accumulated dose:	4.4 rad/year
dose rate:	0.5 mrem/hour

3.2.6 Transportability

Not applicable to this specification.

3.2.7 Flexibility and Expansion

Each system design shall, to the maximum extent practicable, provide sufficient flexibility to accommodate for programmatic changes or operation modifications.

3.3 Design and Construction

3.3.1 Materials, Processes, and Parts

3.3.1.1 Design and Construction Requirements. The valve piping system shall meet the applicable design and construction requirements contained in DOE Order 6430.1A, HS-BS-0084, ASME B31.3, and UCRL-15910.

3.3.1.2 Cover Blocks Design and Construction Requirements. The new pits and cover blocks shall meet the applicable design and construction requirements contained in DOE Order 6430.1A, ACI-318, ACI-349, UCRL-15910, AISC, and ASCE 7.

3.3.1.3 Valve Position Sensor System. The valve position sensor systems shall comply with NFPA 70 in accordance with DOE Order 6430.1A, Section 1600.

3.3.1.4 Electrical Materials and Equipment. Electrical materials and equipment shall be UL or FM tested, with label attached, for the purpose intended, whenever such products are available. Where there are no UL or FM listed products of the type, testing and certification by another nationally recognized testing agency may be acceptable.

3.3.1.5 Field Control Equipment. Field control equipment shall comply with the NEMA ICS standards and UL 508A in accordance with DOE Order 6430.1A, Section 1640-2.5.

3.3.1.6 Corrosion Resistance. All components of the valve manifold piping system including manifold supports, but excluding the PUREX connector assemblies, should be exterior corrosion resistant (e.g., coated with suitable corrosion resistant materials).

3.3.1.7 Two-Way Full Ported Valves. Two-way valves shall be full ported and designed for isolation service in accordance with ANSI B16.34.

3.3.1.8 Three-Way Full Ported Valves. Three-way valves shall be full ported, designed in accordance with ANSI B16.34 and seat closure tested per MSS-SP-61 or API 598. For seat closure test there shall be no leakage from the flow side to the isolated port for each flow position.

3.3.1.9 Optimization. During the design of facilities, optimization principles, as discussed in ICRP Publication 37, shall be utilized in developing and justifying facility design and physical controls.

3.3.2 Electromagnetic Radiation

3.3.2.1 Interference. Hand held radio and cell phone wattage frequency shall not interfere with

electrical/electronic components at a distance of one meter.

3.3.2.2 Electromagnetic Force Interference. The valve position system shall not be adversely affected by outside electromagnetic forces generated by a 60 horse power, 480 Vac, induction type motor operating at frequencies between 0 and 60 hertz and located 1 meter away from the leak detection system.

3.3.3 Identification and Marking

3.3.3.1 Labeling. New equipment and/or modifications to existing equipment shall be labeled in a standardized format in accordance with HNF-IP-0842, Volume II, Section 6.1, Rev. 0.

3.3.3.2 Master Equipment List. A master equipment list consisting of electronic database for structures, systems, and components shall be generated in accordance with HNF-IP-0842, Volume II, Section 6.1, Rev. 0. The list contains such information as: unique equipment label, drawing reference, procedures, vendor information, safety classification, nameplate data, etc.

3.3.3.3 Operations and Maintenance Drawings. Operations and maintenance drawings (as-built H-14 essential drawings) shall be prepared as the system master drawings showing as-built configuration changes in accordance with HNF-IP-0842, Volume II, Section 6.1, Rev. 0.

3.3.3.4 Valve Extension Handle Identification. Valve extension handles shall be uniquely identified.

3.3.4 Workmanship

3.3.4.1 Valve Pit Piping Workmanship. The design of the valve piping system shall determine and specify appropriate levels of workmanship for the fabrication and installation of the manifold according to the requirements of ASME B31.3, except PUREX connectors.

3.3.4.2 Cover Blocks and New Pits Workmanship. The design of the cover blocks and new pits shall determine and specify appropriate levels of workmanship for the fabrication and installation of the cover blocks and new pits according to the requirements of ACI-301, Section 1 through 5 and ACI-318, Part 3.

3.3.5 Interchangeability

All like equipment (valves, position sensors, etc.) shall have interchangeable parts.

3.3.6 Safety

3.3.6.1 Nuclear Safety

3.3.6.1.1 Safety Classification. The cover blocks and new pits are identified as safety class items for the structures, systems, and components (SSCs). The safety class function of the cover blocks and new pits is to knockdown spray and limit the release of aerosols to the atmosphere.

3.3.6.1.2 Flammable Gas Hazardous Environment. The components of the valve position sensor systems installed in the tank intrusive locations, shall be intrinsically safe, designed to

meet NFPA 70 Class I, Division 1, Group B criteria for hazardous locations.

3.3.7 Human Performance/Human Engineering

3.3.7.1 Control Devices. Each control device shall be in accordance with NUREG 0700, Section 6.4 and MIL-STD-1472E, Section 5.4 in accordance with DOE 6430.1A, Section 1300-12.4.7.

3.3.7.2 Display Devices. Each display device shall be in accordance with NUREG 0700, Section 6.5 and MIL-STD-1472E, Section 5.2 in accordance with DOE 6430.1A, Section 1300-12.4.6.

3.3.7.3 Valve Actuator Handwheel. Each valve actuator shall be designed to produce the required operating torque with a maximum rim pull of 80 lbs on the handwheel.

3.4 Documentation

3.4.1 Document Control

Records, documents, and document control pertinent to design functions shall be in accordance with RPP-PRO-224 and RPP-PRO-233.

3.4.2 Drawings Preparation

Drawings shall be prepared according to the formats set forth in HNF-PRO-242, Rev. 1, *Engineering Drawing Requirements for Documents* produced prior to June 15, 1999 and RPP-PRO-709, Rev. 0, *Preparation and Control Standards for Engineering Drawings* produced after June 15, 1999.

3.5 Logistics

3.5.1 Maintenance

3.5.1.1 Fully Remote Maintenance and Operation. Each system or portion of a system having radiation levels greater than 50 mrem/hr contact exposure shall be designed to be remotely maintained and operated or designed to require no maintenance and be remotely operated.

3.5.1.2 Limited Contact Maintenance and Operation. Each system or portion of a system having radiation levels greater than 0.1 mrem/hr to less than or equal to 50 mrem/hr shall be designed for limited contact maintenance and operation.

3.5.1.3 Full Contact Maintenance and Operation. Each system or portion of a system having radiation levels less than or equal to 0.1 mrem/hr shall be designed for full contact maintenance and operation.

3.5.1.4 Dome Loading Constraints. The equipment used for installation and maintenance must comply with the DST dome loading constraints.

3.5.1.5 Valve Maintenance. Valves shall be maintenance free with up to 1000 cycles over a

design life of 12 years.

3.5.2 Supply

3.5.2.1 Parts and Components. The system design shall, to the greatest extent practicable, use readily available parts and components.

3.5.3 Facilities and Facility Equipment

New Hanford Site remote operation wrenches shall be developed for installation/removal of the PUREX Jumper Connector Assembly.

3.6 Personnel and Training

The valve pit piping system, cover blocks, and valve position sensor systems, shall be designed for operation by personnel possessing qualifications in accordance with DOE 5480.20A, Chapter IV, and trained in accordance with Chapter 1.

3.7 Major Component Characteristics

3.7.1 New Process Pits and Cover Blocks

3.7.1.1 Performance Characteristics

3.7.1.1.1 Confine Waste Leakage within the Transfer Associated Structures. (FFBD Function 3.2.1)

3.7.1.1.1.1 Transfer Line Equipment. The process pit(s) shall support transfer line equipment located in and above the pits, nozzles where transfer lines terminate at the pit sidewalls, and the cover blocks.

3.7.1.1.1.2 Equipment in Process Pits. The process pit(s) and cover blocks shall enclose the valve pit piping system and pit leak detection equipment.

3.7.1.1.1.3 Process Pit Liner. The process pit(s) with liners/special protective coatings shall provide leaktight secondary confinement.

3.7.1.1.1.4 Release of Contamination. The process pit(s) and cover blocks shall confine release of any aerosol spray of a product leak from the valve manifold within the valve or pump pit. Compressible gasket shall be used between cover block and top of pit to prevent leakage.

3.7.1.1.1.5 Leak Detection Equipment Location. The process pit(s) shall provide a low-point location in the floor for the pit leak detection equipment.

3.7.1.1.1.6 Low-Point Drain System. The process pit(s) shall provide a low-point drain system to return accumulated liquids, leakage from the primary confinement system, and wash-down liquids to a Double-Shell Tank.

3.7.1.1.1.7 Radiation Shielding. The process pit(s) and cover blocks, including penetrations, shall provide adequate shielding for facility workers located on top of the cover blocks and

adjacent to the process pits during normal operations and maintenance. The radiation shielding shall meet the design objective to maintain exposure levels below an average of 0.5 mrem (5 microsieverts) per hour and as far below this average as is reasonably achievable. The goal for reasonably achievable is 0.05 mrem (5 microsieverts) per hour or less.

3.7.1.1.1.8 Cover Block Rain Intrusion. The cover blocks shall be designed to limit intrusion of rain water or snow melt into the process pits.

3.7.1.1.1.9 Protective Coating. New process pit(s) shall be equipped with stainless steel liners that extend to the bottom of the cover blocks. All other exposed surfaces and the cover blocks shall have a special protective coating to protect the structural secondary confinement by providing a barrier between the interior exposed surfaces of the pit and cover blocks and any waste present in the pit due to leaks, spill, or intrusion. 241-AN-04D Slurry Receiver Pit shall be protected by SPC on exposed surfaces.

3.7.1.1.1.10 Low-Point Drain System Capabilities. The drain system shall have the ability to drain accumulated leakage within 24 hours.

3.7.1.2 Physical Characteristics

3.7.1.2.1 Reinforced Concrete. New process pits and cover blocks shall be constructed of reinforced concrete and pits shall be below grade. Edges of the cover blocks shall be stepped to preclude radiation streaming.

3.7.1.2.2 Process Pit Wall Nozzles. Process pits shall be equipped with sleeves for wall nozzles as required. Wall nozzles shall be PUREX type design (reference drawings H-2-90185 and H-2-90186).

3.7.1.2.3 Process Pit Spare Nozzles. Sleeves for spare nozzles shall be installed in any new process pit, except for the new 241-AN-04D Slurry Receiver Pit.

3.7.1.2.4 Grounding Systems. A grounding system shall be furnished for electrical equipment, structural components, valve pit liners, reinforcing steel, nozzles and other metallic equipment. This grounding system shall be interfaced to the appropriate tank farm grounding and cathodic protection systems.

3.7.1.2.5 Cover Blocks Penetrations. New cover blocks and existing cover blocks to be modified (see 3.1) shall be equipped with penetrations to facilitate operations and/or maintenance of manifold valves, pit drains, pit leak detection devices and transfer leak detection devices. Additionally, the penetrations shall provide for access to any other equipment in the pits requiring maintenance, pit wash down, gas sampling ports, and installation of support equipment (e.g., video cameras, etc.). A sufficient number of penetrations shall be provided to allow full visual inspection of the interior of the pits.

3.7.1.2.6 Cover Blocks Rain Ingress. Cover blocks shall be sloped to drain off the top of the blocks and shall extend over the outside of the pit walls, except that the single piece cover block for 241-AN-04D Slurry Receiver Pit shall not be sloped.

3.7.1.2.7 Cover Blocks for Pump Pits. The cover blocks for 241-AZ-02A, 241-AZ-01A, 241-AY-01A, and 241-AY-02A Central Pump Pits, including penetrations shall be sealed to limit

air infiltrations.

3.7.1.2.8 Gas Sampling Ports. Gas sampling ports shall be greater than 0.7 inch and less than 1.0 inch in diameter, located above the drain or center of the pit, flared on the bottom to minimize snagging of sample line during removal, and equipped with two bonding lugs for attachment to the portable sampler.

3.7.1.2.9 Gas Sampling Ports Material. Gas sampling ports shall be constructed of low sparking, electrically conductive material, and shall be electrically bonded.

3.7.1.2.10 Gas Sampling Port Covers. Gas sampling ports shall have an electrically conductive, non-screw type cover that is electrically bonded to the port with a noninsulated conductor strong enough to act as a cover keeper.

3.7.1.2.11 Lifting Mechanism. Cover blocks shall be supplied with lifting mechanisms on the top surface to facilitate handling with a crane. The maximum weight of new cover block shall be 16.5 ton.

3.7.1.2.12 Cover Blocks Alignment. Cover blocks and pit walls shall be marked to facilitate alignment of the cover blocks.

3.7.2 Valve Position Sensor Systems

3.7.2.1 Performance Characteristics

3.7.2.1.1 Monitor Valve Position. (FFBD Function 3.1.4) After the transfer system route has been setup, the transfer system shall monitor the limit positions of the valves on the valve jumper manifolds in the transfer route. This requirement does not apply to 241-AN-04D Slurry Receiver Pit.

3.7.2.1.1.1 Indicate Valve Limit Position. The waste transfer system jumper/manifold valves shall indicate valve limit position.

3.7.2.1.1.2 Active Valve Indication. Each separate valve limit position shall be actively indicated.

3.7.2.1.1.3 Valve Position Transmission. The valve position shall be transmitted to the Master Pump Shutdown system.

3.7.2.1.1.4 Valve Position Indication Accuracy. The valve position indication system shall provide sufficient accuracy with respect to the actual valve position such that the selected flow path configuration is leak tight.

3.7.2.2 Physical Characteristics. This requirement does not apply to 214-AN-04D Slurry Receiver Pit.

3.7.2.2.1 Hardware Proximity. The valve position sensing hardware, display, and transmitter as applicable shall be able to withstand the insertion and removal, turning, and overturning of the valve actuator handle and still operate properly.

3.7.2.2.2 Hardware Exposure to Environment. The valve position hardware, display, and transmitter, as applicable, shall be designed to perform in the environment on top of the cover block and withstand inadvertent physical abuse.

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

3.7.2.2.4 Hardware Capabilities. The valve position hardware to detect, display, and transmit valve position shall be located outside the pit.

3.7.3 Pit Manifolds Sitework - New Pits

3.7.3.1 Performance Characteristics

3.7.3.1.1 Site Transfer Associated Structures. (FFBD Function 3.2.6)

3.7.3.1.1.1 Site Soils. The site soils shall support the major components of the new Valve Pits.

3.7.3.1.1.2 Access Control Fencing. Access control to radiological and hazardous waste areas shall be provided by fencing consistent with existing fencing for RPP operations.

3.7.3.1.1.3 Existing Lighting Extended. The existing area lighting system at the 241-AZ tank farm shall be extended to provide an adequate level of illumination for night-time operations at the new 241-AZ-VP Valve Pit. The lighting system shall provide a minimum average illumination of 54 lux (5 fc) with a maximum uniformity ratio of 5:1 average to minimum.

3.7.3.1.1.4 Lighting Control. Lighting control shall be furnished with a photocell override to ensure that lights are turned off during the day.

3.7.3.2 Physical Characteristics

3.7.3.2.1 Disturbed Areas Stabilized. All areas disturbed by construction shall be stabilized subsequent to construction.

3.7.3.2.2 Pole-Mounted Luminaries. Pole-mounted banks of luminaries shall be used. Fixture lowering devices shall be provided for poles over 18m high. Existing electrical distribution system in the area shall be utilized to provide necessary power.

3.7.3.2.3 Luminary Glare. Luminaries shall be shielded mercury vapor, or metal halide directed to minimize upward glare.

3.7.4 Pit Drain Seal Assemblies

3.7.4.1 Performance Characteristics

3.7.4.1.1 Position Pit Drain Seal Assembly. (FFBD Function 3.1.8)

3.7.4.1.1.1 Twenty-four (24) Hour Holdup of Ten Gallons. The pit drain seal assembly shall

provide a 24 hour holdup for ten gallons of liquid to activate a leak detector.

3.7.4.1.1.2 Vapor Seal. The pit drain seal assembly shall provide a vapor seal to prevent the tank vapor space pressure from offgassing into the pit and air in-leakage into the tank vapor space.

3.7.4.1.1.3 Retractable Drain Seal. The drain seal assembly shall be retractable to permit complete drainage of the pit and removable for gasket replacement.

3.7.4.1.1.4 Drainage to the Tank. The pit drain seal assembly shall provide drainage into the tank to prevent a pit overflow condition.

3.7.4.2 Physical Characteristics

3.7.4.2.1 Operation Above Cover Block. Operation, removal, and insertion of the drain seal assembly shall be from above the cover block.

3.7.4.2.2 Visible Indication of Position. Visible indication shall be provided above the cover block at the drain seal assembly position (i.e., inserted or retracted).

3.7.4.2.3 Configuration to Prevent Drain Plugging. Configuration of the drain seal assembly shall minimize the potential for drain line plugging in both the inserted and retracted positions.

3.7.4.2.4 Electrical Grounding Jumper. The drain seal operator shall be provided with an electrical grounding jumper.

3.7.4.2.5 Configuration to Prevent Inadvertent Manipulation. Configuration of the drain seal assembly operator shall prevent inadvertent manipulation of the drain seal assembly beyond the retracted position.

4 SYSTEM QUALIFICATION PROVISIONS

4.1 General

The Project W-314 QAPP (HNF-SD-W314-QAPP-001) defines the quality assurance requirements for this project.

Table 4-1 listed verifications may be performed in conjunction with QAPP verifications. Inspections as defined in 4.2 shall be conducted during the design and development of each system to provide assurance of compliance with the requirements of this PDS.

4.1.1 Responsibility for Inspections

The design contractor shall be responsible for the performance of all inspections for each system developed in accordance with this PDS. Inspections shall be conducted at the contractor facilities or the facilities of his choice with the approval of the procuring authority. The procuring authority reserves the right to witness or perform the specified inspections.

4.1.2 Special Tests and Examinations

Not applicable to this specification.

4.2 Quality Conformance Inspections.

Qualification shall be performed on System hardware representative of the approved production design. Qualification of the System to assure compliance with the requirements of Section 3 shall be by examination, demonstration, test, and/or analysis, as defined herein. Test program data may be used to assure compliance with requirements.

- a. Examination is an element of inspection consisting of investigation, without the use of special laboratory appliances or procedures, to determine compliance with requirements. This method is intended to be construction related and consists of examination of documents and construction activities.
- b. Demonstration is an element of inspection that is limited to readily observable functional operation to determine compliance with requirements. This element of inspection does not require the use of special equipment or sophisticated instrumentation. This method is intended to be utilized for any mock-up testing.
- c. Test is an element of inspection that employs technical means including (but not limited to) the evaluation of functional characteristics by use of special equipment or instrumentation, simulation techniques, and the application of established principles and procedures to determine compliance with requirements. The analysis of data derived from test is an integral part of this inspection. This method is intended to be utilized for any acceptance testing in the field.
- d. Analysis is an element of inspection, taking the form of the processing of accumulated results and conclusions, intended to provide proof that verification of a requirement(s) has been accomplished. The analytical results may be comprised of a compilation of interpretation of

existing information or derived from lower level examinations, tests, demonstrations, or analyses.

The environmental capability of equipment shall be demonstrated by appropriate testing, analysis, and operating experience, or other methods that can be supported by auditable documentation, or a combination of these methods.

Table 4-1 Quality Conformance Inspection Matrix

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element				
			Exam	Demo	Test	Only	N/A
3.2	Characteristics						X
3.2.1	Performance Characteristics						X
3.2.1.1	Confine Waste Within Valve Manifolds and Jumpers						X
3.2.1.1.1	Corrosion/Erosion					X	
3.2.1.1.2	Reynolds Number					X	
3.2.1.1.3	Head Loss					X	
3.2.1.1.4	Design Pressure					X	
3.2.1.1.5	WT-SLL-3160 Design Pressure					X	
3.2.1.1.6	WT-SLL-3160 Encasement Design Pressure					X	
3.2.1.1.7	Temperature Maintenance					X	
3.2.1.1.8	Compatibility with Waste					X	
3.2.1.2	Position Manifold Valves						X
3.2.1.2.1	Remote Valve Operation		X			X	
3.2.1.3	Confine Flush in Valve Manifolds and Jumpers						X
3.2.1.3.1	Compatibility with Flush Water					X	
3.2.2	Physical Characteristics						X
3.2.2.1	Valve Piping System Features					X	
3.2.2.2	Valve Extension Handles		X			X	
3.2.2.3	PUREX Jumper Connector					X	
3.2.2.4	Jumper Manifold					X	
3.2.2.5	Valve Position Indication System		X			X	
3.2.2.6	Not used						X
3.2.2.7	Valve Position Indicators		X			X	
3.2.2.8	Valve Lock Capacity				X	X	

Table 4-1 Quality Conformance Inspection Matrix (Continued)

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element				
			Exam	Demo	Test	Only	N/A
3.2.3	Reliability						X
3.2.3.1	Design Life of Valve Manifold					X	
3.2.3.2	Design Life of Cover Blocks					X	
3.2.3.3	Design Life of Slurry Receiver Pit					X	
3.2.3.4	Degree of Reliability					X	
3.2.3.5	Valve Life					X	
3.2.3.6	Fault Detection/Isolation					X	
3.2.4	Maintainability						X
3.2.4.1	Corrective Maintenance					X	
3.2.4.2	Preventive Maintenance					X	
3.2.5	Environmental Conditions						X
3.2.5.1	Natural Environments						X
3.2.5.1.1	Ambient Air Temperature					X	
3.2.5.1.2	Soil Temperature					X	
3.2.5.1.3	Seismic Loads					X	
3.2.5.1.4	Wind Loads					X	
3.2.5.1.5	Snow Loads					X	
3.2.5.1.6	Relative Humidity					X	
3.2.5.1.7	Surface Precipitation					X	
3.2.5.1.8	Hail Events					X	
3.2.5.1.9	Sand and Dust					X	
3.2.5.1.10	Solar Radiation					X	
3.2.5.1.11	Glaze					X	
3.2.5.1.12	Ashfall					X	
3.2.5.1.13	Dead Loads					X	

Table 4-1 Quality Conformance Inspection Matrix (Continued)

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element				
			Exam	Demo	Test	Anly	N/A
3.2.5.1.14	Thermal Forces					X	
3.2.5.1.15	Creep and Shrinkage Forces					X	
3.2.5.1.16	Load Combinations and Allowable Stresses					X	
3.2.5.2	Induced Environments						X
3.2.5.2.1	Waste Properties					X	
3.2.5.2.2	Radiation Tolerance						X
3.2.5.2.2.1	Inside Pit Radiation Level					X	
3.2.5.2.2.2	Background Pit Radiation Level					X	
3.2.6	Transportability						X
3.2.7	Flexibility and Expansion					X	
3.3	Design and Construction						X
3.3.1	Materials, Processes, and Parts						X
3.3.1.1	Design and Construction Requirements					X	
3.3.1.2	Cover Blocks Design and Construction Requirements					X	
3.3.1.3	Valve Position Sensor System					X	
3.3.1.4	Electrical Materials and Equipment					X	
3.3.1.5	Field Control Equipment					X	
3.3.1.6	Corrosion Resistance					X	
3.3.1.7	Two-Way Full Ported Valves					X	
3.3.1.8	Three-Way Full Ported Valves					X	
3.3.1.9	Optimization					X	
3.3.2	Electromagnetic Radiation						X
3.3.2.1	Interference			X	X	X	
3.3.2.2	Electromagnetic Force Interference					X	

Table 4-1 Quality Conformance Inspection Matrix (Continued)

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element				
			Exam	Demo	Test	Only	N/A
3.3.3	Identification and Marking						X
3.3.3.1	Labeling		X			X	
3.3.3.2	Master Equipment List		X			X	
3.3.3.3	Operations and Maintenance Drawings		X			X	
3.3.3.4	Valve Extension Handle Identification		X			X	
3.3.4	Workmanship						X
3.3.4.1	Valve Pit Piping Workmanship					X	
3.3.4.2	Cover Blocks and New Pits Workmanship					X	
3.3.5	Interchangeability					X	
3.3.6	Safety						X
3.3.6.1	Nuclear Safety						X
3.3.6.1.1	Safety Classification					X	
3.3.6.1.2	Flammable Gas Hazardous Environment					X	
3.3.7	Human Performance/Human Engineering						X
3.3.7.1	Control Devices					X	
3.3.7.2	Display Devices					X	
3.3.7.3	Valve Actuator Handwheel			X		X	
3.4	Documentation						X
3.4.1	Document Control		X			X	
3.4.2	Drawings Preparation					X	
3.5	Logistics						X
3.5.1	Maintenance						X
3.5.1.1	Fully Remote Maintenance and Operation					X	
3.5.1.2	Limited Contact Maintenance and Operation					X	
3.5.1.3	Full Contact Maintenance and Operation					X	

Table 4-1 Quality Conformance Inspection Matrix (Continued)

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element			
			Exam	Demo	Test	Any
3.5.1.4	Dome Loading Constraints					X
3.5.1.5	Valve Maintenance					X
3.5.2	Supply					X
3.5.2.1	Parts and Components					X
3.5.3	Facilities and Facility Equipment					X
3.6	Personnel and Training					X
3.7	Major Component Characteristics					X
3.7.1	New Process Pits and Cover Blocks					X
3.7.1.1	Performance Characteristics					X
3.7.1.1.1	Confine Waste Leakage within the Transfer Associated Structures					X
3.7.1.1.1.1	Transfer Line Equipment					X
3.7.1.1.1.2	Equipment in Process Pits					X
3.7.1.1.1.3	Process Pit Liner		X			X
3.7.1.1.1.4	Release of Contamination					X
3.7.1.1.1.5	Leak Detection Equipment Location					X
3.7.1.1.1.6	Low-Point Drain System					X
3.7.1.1.1.7	Radiation Shielding					X
3.7.1.1.1.8	Cover Block Rain Intrusion					X
3.7.1.1.1.9	Protective Coating		X			X
3.7.1.1.1.10	Low-Point Drain System Capabilities					X
3.7.1.2	Physical Characteristics					X
3.7.1.2.1	Reinforced Concrete		X			X
3.7.1.2.2	Process Pit Wall Nozzles		X			X
3.7.1.2.3	Process Pit Spare Nozzles		X			X

Table 4-1 Quality Conformance Inspection Matrix (Continued)

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element				
			Exam	Demo	Test	Anly	N/A
3.7.1.2.4	Grounding Systems					X	
3.7.1.2.5	Cover Blocks Penetrations		X			X	
3.7.1.2.6	Cover Blocks Rain Ingress					X	
3.7.1.2.7	Cover Blocks for Pump Pits					X	
3.7.1.2.8	Gas Sampling Ports		X			X	
3.7.1.2.9	Gas Sampling Ports Material					X	
3.7.1.2.10	Gas Sampling Port Covers					X	
3.7.1.2.11	Lifting Mechanism		X			X	
3.7.1.2.12	Cover Blocks Alignment		X			X	
3.7.2	Valve Position Sensor Systems						X
3.7.2.1	Performance Characteristics						X
3.7.2.1.1	Monitor Valve Position						X
3.7.2.1.1.1	Indicate Valve Limit Position					X	
3.7.2.1.1.2	Active Valve Indication					X	
3.7.2.1.1.3	Valve Position Transmission					X	
3.7.2.1.1.4	Valve Position Indication Accuracy					X	
3.7.2.2	Physical Characteristics						X
3.7.2.2.1	Hardware Proximity				X	X	
3.7.2.2.2	Hardware Exposure to Environment					X	
3.7.2.2.3	Hardware Removability					X	
3.7.2.2.4	Hardware Capabilities					X	
3.7.3	Pit Manifolds Sitework - New Pits						X
3.7.3.1	Performance Characteristics						X
3.7.3.1.1	Site Transfer Associated Structures						X
3.7.3.1.1.1	Site Soils					X	

Table 4-1 Quality Conformance Inspection Matrix (Continued)

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element				
			Exam	Demo	Test	Anly	N/A
3.7.3.1.1.2	Access Control Fencing					X	
3.7.3.1.1.3	Existing Lighting Extended				X	X	
3.7.3.1.1.4	Lighting Control				X	X	
3.7.3.2	Physical Characteristics						X
3.7.3.2.1	Disturbed Areas Stabilized		X			X	
3.7.3.2.2	Pole-Mounted Luminaries		X			X	
3.7.3.2.3	Luminary Glare		X			X	
3.7.4	Pit Drain Seal Assemblies						X
3.7.4.1	Performance Characteristics						X
3.7.4.1.1	Position Pit Drain Seal Assembly						X
3.7.4.1.1.1	Twenty-four (24) Hour Holdup of Ten Gallons				X	X	
3.7.4.1.1.2	Vapor Seal					X	
3.7.4.1.1.3	Retractable Drain Seal			X		X	
3.7.4.1.1.4	Drainage to the Tank					X	
3.7.4.2	Physical Characteristics						X
3.7.4.2.1	Operation Above Cover Block			X		X	
3.7.4.2.2	Visible Indication of Position			X		X	
3.7.4.2.3	Configuration to Prevent Drain Plugging					X	
3.7.4.2.4	Electrical Grounding Jumper		X			X	
3.7.4.2.5	Configuration to Prevent Inadvertent Manipulation					X	

5 NOTES

5.1 Definitions

5.1.1 Manifold

Remotely installed rigid piping systems inside a pit that transfer waste and flush water between nozzles.

5.1.2 Pit Nozzle

Rigid male connector anchored in the pit wall that provides a leak tight connection with the integral seal block attached to a manifold.

5.1.3 Equivalent Length

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.

5.1.4 Glaze

Coating of ice formed when rain or drizzle freezes on contact with any surface having a temperature that is below freezing.

5.2 Acronym List

ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ALARA	As Low As Reasonable Achievable
ANSI	American National Standard Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
BIO	Basis for Interim Operation
CDR	Conceptual Design Report
CFR	Code of Federal Regulations
DOE	Department of Energy
DRD	Design Requirements Document
DST	Double Shell Tank
EDTA	Ethylenediametraacetic acid
FDC	Functional Design Criteria
FFBD	Functional Flow Block Diagram
FM	Factory Mutual System
HEDTA	N-(hydroxyethyl)-ethylenediaminetriacetic acid
LLW	Low Level Waste
MTBF	Mean Time Between Failure
MWTF	Multi-Function Waste Tank Facility
N/A	Not applicable
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association

NUREG	Nuclear Regulatory Reports
PC	Performance Category
PDC	Project Design Concept
PDS	Project Development Specification
PHMC	Project Hanford Management Contract
PICD	Project Interface Control Document
PUREX	Plutonium-Uranium Extraction
RAS	Requirements Allocation Sheet
RPP	River Protection Project
SPC	Special Protective Coating
SpG	Specific Gravity
SST	Single Shell Tank
TOC	Total Organic Carbon
TWRS	Tank Waste Remediation System
UCRL	University of California Research Laboratory
USSR	Upgrade Scope Summary Report

5.3 Applicable Documents

National codes and standards will be identified within Section 2, Applicable Documents, of the PDS without dates or revision numbers. Government documents and Hanford site standards will be identified by the effective date or revision number.

APPENDIX A

FUNCTIONAL FLOW BLOCK DIAGRAMS (FFBDs)

3.1 Confine Waste along Transfer Route

SYSTEM:	NUMBER:	DATE:
	3.1	September 12, 2000
ORIGINATED BY:	FLOW TITLE:	
Project W-314	Confine Waste along Transfer Route	

CADFILE: tfr&so2d.dwg

3.2 Confine Waste Leakage along Transfer Route

SYSTEM:	NUMBER: 3.2	DATE: September 12, 2000
ORIGINATED BY: Project W-314	FLOW TITLE: Confine Waste Leakage along Transfer Route	

CADFILE: tfrdso2a.dwg

APPENDIX B

REQUIREMENTS BASIS

Table B-1 Requirements Basis

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
3.1.1 Confine Waste within Valve Manifolds and Jumpers	<p>3.2.1.1.1 Corrosion/Erosion</p> <p>Basis: This requirement is derived from Internal Memo 77120-91-030, <i>Recommendation on Material Selection for Replacement of the Cross-Site Transfer Line, Project W-058</i>, A.P. Larrick to J.M. Light, April 22, 1991. The waste that will be transferred through the W-314 transfer system is assumed to be no more corrosive or cause more erosion than the waste transferred through the cross-site transfer system.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
3.1.1 Confine Waste within Valve Manifolds and Jumpers	<p>3.2.1.1.2 Reynolds Number</p> <p>Basis: This is the Waste Pumpability Rule required for waste transfers per WHC-SD-WM-OCD-015, <i>Tank Farm Waste Transfer Compatibility Program</i>, Rev. 2, K.D. Fowler, April 24, 1995, Section 4.2.5.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
3.1.1 Confine Waste within Valve Manifolds and Jumpers	<p>3.2.1.1.3 Head Loss</p> <p>Basis: This requirement was derived from the worst case transfer for privatization transfers from the AN-Tank Farm to the AP-Tank Farm, WHC-SD-WM-TI-750, <i>Decision Document for Phase I Privatization Transfer System Needs</i>, LLW Option 4. The total equivalent length from Calculation E44810-2708 was found to be 4500 ft. The total head loss for this equivalent length must stay below the 275 psi design limit (450 ft at a SpG of 1.4) of the existing piping.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
3.1.1 Confine Waste within Valve Manifolds and Jumpers	<p>3.2.1.1.4 Design Pressure</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 2, Section 2.3.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
3.1.1 Confine Waste within Valve Manifolds and Jumpers	<p>3.2.1.1.5 WT-SLL-3160 Design Pressure</p> <p>Basis: This requirement is based on the primary design pressure requirement for the cross-site transfer line extensions and block valves comes from W-058-C1, <i>Project W-058 Construction Specification</i>, Rev. 1.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
3.1.1 Confine Waste within Valve Manifolds and Jumpers	<p>3.2.1.1.6 WT-SLL-3160 Encasement Design Pressure</p> <p>Basis: WHC-SD-W058-FDC-001, <i>Project W-058 Replacement Cross-Site Transfer Line</i>.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
3.1.1 Confine Waste within Valve Manifolds and Jumpers	<p>3.2.1.1.7 Temperature Maintenance</p> <p>Basis: The requirement is derived from the total allowable temperature drop of 11 °C (20 °F) from origin to destination during a worst case distance and flow rate transfer and is based on WHC-SD-W058-DRD-001, <i>Preliminary Design Requirements Document</i>, <i>Project W-058, Replacement of the Cross-Site Transfer System</i>. The cross-site transfer piping system shall be capable of maintaining the temperature of the contents of the piping system such that the contents do not loose more than 20 °F during a worst case distance & flow rate cross-site transfer.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
3.1.1 Confine Waste within Valve Manifolds and Jumpers	<p>3.2.1.1.8 Compatibility with Waste</p> <p>Basis: The waste composition from the cross-site transfer system is the worst-case for the W-314 transfer piping. The cross-site transfer system chemical composition as listed in Table 3-1 above is referenced from WHC-SD-W058-FDC-001. The specified requirement for Project W-058 was based on Internal Memo 22170-93-012, <i>Recommended Waste Composition Changes to the MWTF FDC</i>, Rev. 1, Waste Management Engineering to J. M. Light, Westinghouse Hanford Company.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
3.1.2 Position Manifold Valves	3.2.1.2.1 Remote Valve Operation Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 2, Section 3.2.4.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
3.1.3 Confine Flush within Valve Manifolds and Jumpers	3.2.1.3.1 Compatibility with Flush Water Basis: Project W-211 is installing new hot water/caustic supply systems for flushing of the 200 East waste transfer system. The capabilities of these new systems are more stringent than the current raw water supply flush. This requirement is incorporated from WHC-SD-W211-TDR-001, <i>Supplement 2 to Title I Design Summary Report</i> , Rev. 0B. The pH range of no less than 7 is based on a water sample analysis of the 200 East raw water, documented in Internal Letter CO 8124, <i>Water Sample Analysis</i> , P.A. Swoboda, Hanford Environmental Health Foundation, to D.R. Schielke, Pacific Northwest Laboratory, October 28, 1983.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.2.1 Valve Piping System Features Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 2, Section 3.2.4.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.2.2 Valve Extension Handles Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 2, Section 3.2.4.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.2.3 PUREX Jumper Connector Basis: The PUREX type nozzle and connector is a standard unit in TWRS RPP with a good operational performance history.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	<p>3.2.2.4 Jumper Manifold</p> <p>Basis: This feature (requested by Tank Farm Operations in Letter 77100-97-044, <i>Project W-314, Tank Farm Restoration and Safe Operation, Design Change Recommendations and Action Requests for Piping and Manifolds</i>, R.A. Dodd, LMHC, to W.W. Rutherford, NHC, April 17, 1997) will allow future use of the existing slurry lines as backup transfer route in the event of a 3-inch failure.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.2.2.5 Valve Position Indication System</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 2, Section 2.2.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.2.2.7 Valve Position Indicators</p> <p>Basis: WHC-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 2, Section 2.2.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.2.2.8 Valve Lock Capacity</p> <p>Basis: WHC-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 2, Section 2.2.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	<p>3.2.3.1 Design Life of Valve Manifold</p> <p>Basis: Technical Data Checklist, Rev. 5, Project W-454, AW Jumper Manifold Upgrade specified the design life of 10 years for jumpers including valves. Seals, packing, etc were specified to meet the design life. Engineering judgement based on previous operational experience with valve components in radioactive waste service was used to specify the requirement. The enhanced design life of 12 years was specified in this document such that only three manifold replacements will be required during the 35 years design life time of the pit. The design life of WT-SLL-3160 is based on the Functional Design Criteria for W-058, WHC-SD-W058-FDC-001.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.2.3.2 Design Life of Cover Blocks</p> <p>Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i>, Rev. 1, Section 3.2.3.1.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.2.3.3 Design Life of Slurry Receiver Pit</p> <p>Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i>, Rev. 1.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.2.3.4 Degree of Reliability</p> <p>Basis: Valves must be able to be operated after periods of non-activity.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.2.3.5 Valve Life</p> <p>Basis: WHC-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 2, Section 2.2.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.2.3.6 Fault Detection/Isolation Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i> , Rev. 1, Section 3.2.3.3.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.4.1 Corrective Maintenance Basis: WHC-SD-WM-RPT-224, <i>Low-Level Waste Feed Staging Plan</i> , Rev. 0.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.4.2 Preventive Maintenance Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 2, Section 4.0.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.1 Ambient Air Temperature Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i> , Rev. 1, Section 3.2.4.1.1.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.2 Soil Temperature Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i> , Rev. 1, Section 3.2.4.1.1.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.3 Seismic Loads Basis: RPP-PRO-097, <i>Engineering Design and Evaluation</i> , Rev. 0, Section 5.1.5.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.4 Wind Loads Basis: RPP-PRO-097, <i>Engineering Design and Evaluation</i> , Rev. 0, Section 5.1.3.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.2.5.1.5 Snow Loads Basis: RPP-PRO-097, <i>Engineering Design and Evaluation</i> , Rev. 0, Section 5.1.3.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.6 Relative Humidity Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i> , Rev. 1, Section 3.2.4.1.2.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.7 Surface Precipitation Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i> , Rev. 1, Section 3.2.4.1.3.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.8 Hail Events Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i> , Rev. 1, Section 3.2.4.1.3.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.9 Sand and Dust Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i> , Rev. 1, Section 3.2.4.1.4.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.10 Solar Radiation Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i> , Rev. 1, Section 3.2.4.1.6.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.2.5.1.11 Glaze Basis: The basis for this requirement is based on engineering judgement from years of experience in the area.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.12 Ashfall Basis: RPP-PRO-097, <i>Engineering Design and Evaluation</i> , Rev. 0, Section 5.1.6.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.13 Dead Loads Basis: RPP-PRO-097, <i>Engineering Design and Evaluation</i> , Rev. 0, Section 5.1.1.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.14 Thermal Forces Basis: RPP-PRO-097, <i>Engineering Design and Evaluation</i> , Rev. 0, Section 5.1.9.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.15 Creep and Shrinkage Forces Basis: RPP-PRO-097, <i>Engineering Design and Evaluation</i> , Rev. 0, Section 5.1.10.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.2.5.1.16 Load Combinations and Allowable Stresses Basis: RPP-PRO-097, <i>Engineering Design and Evaluation</i> , Rev. 0, Section 5.1.12.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	<p>3.2.5.2.1 Waste Properties</p> <p>Basis: The waste properties are from WHC-SD-WM-DGS-006, Rev. 0, draft, Table 4-1 except particle size and specific gravity. Particle size basis is WHC-SD-W058-FDC-001, <i>Preliminary Design Requirements Document for Project W-058, Replacement of the Cross-Site Transfer System</i>, Rev. 0, Section 3.2.6.5. The transfer system piping components must be compatible with transferring liquid waste with a SpG of 1.5 based on receipt of waste from Privatization per DE-RP06-96RL13308, <i>TWRS Privatization Contract</i>, Part 1, Section C, Table TS-9.1 "Physical Requirements for Liquids or Slurries Transferred to DOE."</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.2.5.2.2.1 Inside Pit Radiation Level</p> <p>Basis: The dose rate for new components in contact with HLW is 1E+07 m/hr. Total accumulated dose for components in contact with HLW is 2E+11 mrad in 40 years. The prorated accumulated dose for the design life of 12 years is 6E+10 mrad = 6E+07 rads for components in contact with the waste of the 12 years. Both basis HLW requirements are consistent with Letter W-058-076, <i>Project W-058 Cross-site Transfer System</i>, J. L. Henderson to C. van Katwijk, May 13, 1996.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.2.5.2.2.2 Background Pit Radiation Level</p> <p>Basis: WHC-SD-GN-DGS-30011, <i>Radiological Design Guide</i>, Rev. 0, Table 7.1 for accumulated dose and Section 2.4 for dose rate.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.2.7 Flexibility and Expansion</p> <p>Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i>, Rev. 1, Section 3.2.5.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	<p>3.3.1.1 Design and Construction Requirements</p> <p>Basis: DE-AC06-96RL13200, <i>Project Hanford Management Contract</i> specified DOE 6430.1A as an applicable document for Hanford Site work activities. The remaining documents are standard design codes.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.1.2 Cover Blocks Design and Construction Requirements</p> <p>Basis: DE-AC06-96RL13200, <i>Project Hanford Management Contract</i> specified DOE 6430.1A as an applicable document for Hanford Site work activities. The remaining documents are standard design codes.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.1.3 Valve Position Sensor System</p> <p>Basis: DE-AC06-96RL13200, <i>Project Hanford Management Contract</i> specified DOE 6430.1A as an applicable document for Hanford Site work activities.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.1.4 Electrical Materials and Equipment</p> <p>Basis: DE-AC06-96RL13200, <i>Project Hanford Management Contract</i> specified DOE 6430.1A as an applicable document for Hanford Site work activities.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.1.5 Field Control Equipment</p> <p>Basis: DE-AC06-96RL13200, <i>Project Hanford Management Contract</i> specified DOE 6430.1A as an applicable document for Hanford Site work activities.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.1.6 Corrosion Resistance</p> <p>Basis: WHC-SD-GN-DGS-30011, <i>Radiological Design Guide</i>, Rev. 0.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.3.1.7 Two-Way Full Ported Valves Basis: WHC-SD-GN-DGS-30011, <i>Radiological Design Guide</i> , Rev. 0, Section 3.4.2.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.3.1.8 Three-Way Full Ported Valves Basis: WHC-SD-GN-DGS-30011, <i>Radiological Design Guide</i> , Rev. 0, Section 3.4.2.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.3.1.9 Optimization Basis: DOE 5480.11, <i>Radiation Protection for Occupational Workers</i> , Section 9.j (1)(a).	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.3.2.1 Interference Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 3, Section 2.2.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.3.2.2 Electromagnetic Force Interference Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 3, Section 2.2. The requirement is derived from a 60 hp transfer pump located in a DST central pump pit equipped with a 0 to 60 hertz adjustable frequency drive located 1 meter from the valve position system.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.3.3.1 Labeling Basis: The applicable requirements of DOE 4330.4B and DOE 5480.19 regarding configuration control using labeling are set forth in HNF-IP-0842, <i>TWRS Administration</i> , Rev. 0, Volume II, Section 6.1.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	<p>3.3.3.2 Master Equipment List</p> <p>Basis: The applicable requirements of DOE 4330.4B and DOE 5480.19 regarding configuration control using master equipment list are set forth in HNF-IP-0842, <i>TWRS Administration</i>, Rev. 0, Volume II, Section 6.1.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.3.3 Operations and Maintenance Drawings</p> <p>Basis: The applicable requirements of DOE 4330.4B and DOE 5480.19 regarding configuration control using as-built drawings are set forth in HNF-IP-0842, <i>TWRS Administration</i>, Rev. 0, Volume II, Section 6.1.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.3.4 Valve Extension Handle Identification</p> <p>Basis: WHC-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 2, Section 2.2.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.4.1 Valve Pit Piping Workmanship</p> <p>Basis: The valve manifold is part of the underground piping system. ASME B31.3 is specified in WHC-SD-GN-DGS-30008, <i>Design Loads for New Underground DST and Associated Underground Process Piping</i>, Rev. 0, Section 2.7. PUREX connectors are specified in Section 3.2.2.3.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.4.2 Cover Blocks and New Pits Workmanship</p> <p>Basis: The requirement is specified to ensure that the component is fabricated and installed to the same standards that it is designed to.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.5 Interchangeability</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 3, Section 4.0.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	<p>3.3.6.1.1 Safety Classification</p> <p>Basis: Since Project W-314 is intended to be designed and operated under the current authorization basis, if at all possible, then the safety classification for the encasement piping is specified as Safety Class in HNF-SD-WM-BIO-001, <i>Tank Waste Remediation System Basis for Interim Operations</i>, Rev. 2, Section 5.3.2.20 (Table 5.3.2.20-8).</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.6.1.2 Flammable Gas Hazardous Environment</p> <p>Basis: Since Project W-314 is intended to be designed and operated under the current authorization basis, the environment classification is specified in HNF-SD-WM-BIO-001, <i>Tank Waste Remediation System Basis for Interim Operations</i>, Rev. 1, Appendix E, Section E4.3.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.7.1 Control Devices</p> <p>Basis: DE-AC06-96RL13200, <i>Project Hanford Management Contract</i> specified DOE 6430.1A as an applicable document for Hanford Site work activities.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.7.2 Display Devices</p> <p>Basis: DE-AC06-96RL13200, <i>Project Hanford Management Contract</i> specified DOE 6430.1A as an applicable document for Hanford Site work activities.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.3.7.3 Valve Actuator Handwheel</p> <p>Basis: A maximum 80 lb rim pull is an accepted industry practice.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.4.1 Document Control</p> <p>Basis: RPP-PRO-224, <i>Document Control Program Standards</i>, Rev. 0, and RPP-PRO-233, <i>Review and Approval of Documents</i>, Rev. 0 are site standards that must be adhered to.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	<p>3.4.2 Drawings Preparation</p> <p>Basis: HNF-PRO-242, <i>Engineering Drawing Requirements</i>, Rev. 1 is the site standard that must be adhered to for documents produced prior to June 15, 1999. After June 15, 1999, RPP-PRO-709, <i>Preparation and Control Standards for Engineering Drawings</i>, Rev. 0 is the site standard that must be adhered to.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.5.1.1 Fully Remote Maintenance and Operation</p> <p>Basis: WHC-SD-GN-DGS-30011, <i>Radiological Design Guide</i>, Rev. 0.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.5.1.2 Limited Contact Maintenance and Operation</p> <p>Basis: WHC-SD-GN-DGS-30011, <i>Radiological Design Guide</i>, Rev. 0.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.5.1.3 Full Contact Maintenance and Operation</p> <p>Basis: WHC-SD-GN-DGS-30011, <i>Radiological Design Guide</i>, Rev. 0.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.5.1.4 Dome Loading Constraints</p> <p>Basis: HNF-IP-1266, <i>Tank Farm Operations Administrative Controls</i>, Section 5.16, "Tank Dome Controls."</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.5.1.5 Valve Maintenance</p> <p>Basis: WHC-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 2, Section 2.2.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	<p>3.5.2.1 Parts and Components</p> <p>Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i>, Rev. 1, Section 3.5.5.</p>	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.5.3 Facilities and Facility Equipment Basis: Special operational equipment for remote installation of manifold.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
	3.6 Personnel and Training Basis: WHC-SD-W314-DRD-001, <i>Preliminary Design Requirements Document for Project W-314, Tank Farm Restoration and Safe Operations</i> , Rev. 1, Section 3.6.	hsems.2.3.1.1.2.1.3.1 W-314 Valve Pit Manifold Upgrades
3.2.1 Confine Waste Leakage within the Transfer Associated Structures	3.7.1.1.1.1 Transfer Line Equipment Basis: DOE 6430.1A, <i>General Design Criteria</i> , Section 0111-2.1, "LOADS, <u>General Requirements</u> ." Structures and their elements shall be designed for the loads prescribed in these criteria.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
3.2.1 Confine Waste Leakage within the Transfer Associated Structures	3.7.1.1.1.2 Equipment in Process Pits Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 2, Section 3.2.7.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
3.2.1 Confine Waste Leakage within the Transfer Associated Structures	3.7.1.1.1.3 Process Pit Liner Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 2, Section 3.2.7.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
3.2.1 Confine Waste Leakage within the Transfer Associated Structures	3.7.1.1.1.4 Release of Contamination Basis: HNF-SD-WM-BIO-001, <i>Tank Waste Remediation System Basis for Interim Operation</i> , Vol. 1, Section 3.2.20, "Spray Leak in Structure or from Over ground Waste Transfer Line."	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
3.2.1 Confine Waste Leakage within the Transfer Associated Structures	3.7.1.1.1.5 Leak Detection Equipment Location Basis: WHC-SD-GN-DGS-30011, <i>Radiological Design Guide</i> , Rev. 0, Section 10.4.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
3.2.1 Confine Waste Leakage within the Transfer Associated Structures	3.7.1.1.1.6 Low-Point Drain System Basis: WHC-SD-GN-DGS-30011, <i>Radiological Design Guide</i> , Rev. 0, Section 10.7.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
3.2.1 Confine Waste Leakage within the Transfer Associated Structures	3.7.1.1.1.7 Radiation Shielding Basis: The DST Tank Farms are operated as Radiological Buffer Areas (RBA). Maintaining this status requires exposure rates to be within those for continuous occupancy (0.5 mrem/hr for 2000 hrs/yr) and below the requirements for posting as a radiation area (5 mrem/hr). The goal of 0.05 mrem/hr or less is intended to meet article 233.3 which states that the boundary for the RBA should be established to limit radiation doses to general employees to less than 100 mrem/yr. This low exposure rate also assists in performing radiological surveys in the field by maintaining an appropriately low background. Requirements per HSRCM-1, <i>Hanford Site Radiological Control Manual</i> , Rev. 2, Articles H128.1, 233.3, 234.2, and 234.7.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
3.2.1 Confine Waste Leakage within the Transfer Associated Structures	3.7.1.1.1.8 Cover Block Rain Intrusion Basis: WAC-173-303, <i>Dangerous Waste Regulations</i> , Section 640, "Tank Systems," Paragraph (4)(e)(ii)(B), "Designed or operated to prevent run-on or infiltration of precipitation into the secondary containment system unless the collection system has sufficient excess capacity to contain run-on or infiltration. Such additional capacity must be sufficient to contain precipitation from a twenty-five-year, twenty-four-hour rainfall event."	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
3.2.1 Confine Waste Leakage within the Transfer Associated Structures	3.7.1.1.1.9 Protective Coating Basis: WAC-173-303, <i>Dangerous Waste Regulations</i> , 1998, Section 640, "Tank Systems."	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
3.2.1 Confine Waste Leakage within the Transfer Associated Structures	3.7.1.1.1.10 Low-Point Drain System Capabilities Basis: WAC 173-303, <i>Dangerous Waste Regulations</i> , Section 640(4)(d)(iv).	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
	3.7.1.2.1 Reinforced Concrete Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 2, Section 3.2.7.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
	3.7.1.2.2 Process Pit Wall Nozzles Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 2, Section 3.2.7.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
	3.7.1.2.3 Process Pit Spare Nozzles Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 2, Section 3.2.7.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
	3.7.1.2.4 Grounding Systems Basis: WHC-SD-W058-FDC-001, <i>Project W-058 Replacement Cross-Site Transfer Line</i> , Rev. 4, Section 4.3.5, "Grounding."	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
	3.7.1.2.5 Cover Blocks Penetrations Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 2, Section 3.2.6.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	<p>3.7.1.2.6 Cover Blocks Rain Ingress</p> <p>Basis: WAC-173-303, <i>Dangerous Waste Regulations</i>, Section 640, "Tank Systems," Paragraph (4)(e)(ii)(B), "Designed or operated to prevent run-on or infiltration of precipitation into the secondary containment system unless the collection system has sufficient excess capacity to contain run-on or infiltration. Such additional capacity must be sufficient to contain precipitation from a twenty-five-year, twenty-four-hour rainfall event."</p>	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
	<p>3.7.1.2.7 Cover Blocks for Pump Pits</p> <p>Basis: WHC-SD-W030-RD-001, <i>Supplemental Definition of Requirements</i>, Rev. 3, Tank Farm Ventilation Upgrade, Project W-030, Section 3.2, page 5.</p>	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
	<p>3.7.1.2.8 Gas Sampling Ports</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 3.</p>	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
	<p>3.7.1.2.9 Gas Sampling Ports Material</p> <p>Basis: WHC-SD-WM-TI-568, <i>Grounding and Bonding Requirements for Portable Equipment in the Tank Farms</i>, Rev. 1.</p>	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
	<p>3.7.1.2.10 Gas Sampling Port Covers</p> <p>Basis: WHC-SD-WM-TI-568, <i>Grounding and Bonding Requirements for Portable Equipment in the Tank Farms</i>, Rev. 1.</p>	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
	<p>3.7.1.2.11 Lifting Mechanism</p> <p>Basis: Existing crane with a nominal capacity of 50 to 55 ton can lift 16.5 ton.</p>	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.7.1.2.12 Cover Blocks Alignment Basis: The alignment of cover blocks is critical to assure operations of valve handles and other devices through specific penetrations.	hsems.2.3.1.1.2.1.3.1.1.1 New Process Pits and Cover Blocks
3.1.4 Monitor Manifold Valve Position	3.7.2.1.1.1 Indicate Valve Limit Position Basis: <i>Upgrade Scope Summary Report</i> , Appendix C, Page 22, "Compliance 40 CFR 264.196, eliminate spills due to misrouting."	hsems.2.3.1.1.2.1.3.1.1.2 Valve Position Sensor Systems
3.1.4 Monitor Manifold Valve Position	3.7.2.1.1.2 Active Valve Indication Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 3, Section 2.2.	hsems.2.3.1.1.2.1.3.1.1.2 Valve Position Sensor Systems
3.1.4 Monitor Manifold Valve Position	3.7.2.1.1.3 Valve Position Transmission Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 3, Section 2.2.	hsems.2.3.1.1.2.1.3.1.1.2 Valve Position Sensor Systems
3.1.4 Monitor Manifold Valve Position	3.7.2.1.1.4 Valve Position Indication Accuracy Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 3, Section 2.2.	hsems.2.3.1.1.2.1.3.1.1.2 Valve Position Sensor Systems
	3.7.2.2.1 Hardware Proximity Basis: Engineering judgement. The valve position sensors are in close proximity to the actuator part of the valve and are subject to the actions of the actuator handle.	hsems.2.3.1.1.2.1.3.1.1.2 Valve Position Sensor Systems

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	<p>3.7.2.2.2 Hardware Exposure to Environment</p> <p>Basis: The position sensors are located on the valve extension handles above the cover blocks in accordance with HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 2, Section 3.2.5. The valve position hardware will be in close proximity to the valve actuator and will be subject to working personnel activities and environmental conditions.</p>	hsems.2.3.1.1.2.1.3.1.1.2 Valve Position Sensor Systems
	<p>3.7.2.2.3 Hardware Removability</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 2, Section 3.2.5. Removal of the cover block is a standard tank farm procedure which the valve position hardware must accommodate.</p>	hsems.2.3.1.1.2.1.3.1.1.2 Valve Position Sensor Systems
	<p>3.7.2.2.4 Hardware Capabilities</p> <p>Basis: ALARA dictates that entry into a radiological zone be limited. WHC-SD-GN-DGS-30011, <i>Radiological Design Guide</i>, Rev. 0.</p>	hsems.2.3.1.1.2.1.3.1.1.2 Valve Position Sensor Systems
3.2.6 Site Transfer Associated Structures	<p>3.7.3.1.1.1 Site Soils</p> <p>Basis: DOE 6430.1A, <i>General Design Criteria</i>, Section 0111-2.1, "LOADS, <u>General Requirements</u>." Structures and their elements shall be designed for the loads prescribed in these criteria.</p>	hsems.2.3.1.1.2.1.3.1.1.3 Pit Manifolds Sitework - New Pits
3.2.6 Site Transfer Associated Structures	<p>3.7.3.1.1.2 Access Control Fencing</p> <p>Basis: 10 CFR 835, <i>Occupational Radiation Protection</i> and WAC 173-303, <i>Dangerous Waste Regulations</i>, Section 310 require entry control and security to radiological and hazardous waste areas.</p>	hsems.2.3.1.1.2.1.3.1.1.3 Pit Manifolds Sitework - New Pits

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
3.2.6 Site Transfer Associated Structures	<p>3.7.3.1.1.3 Existing Lighting Extended</p> <p>Basis: WHC-SD-280-FDC-001, <i>Functional Design Criteria for 200 Area "C" and "SY" Tank Farm Lighting Upgrade</i>, Rev. 0, Project W-280. RPP tank farm operations are 24 hr/day, seven days a week. Area lighting is needed to assure safety during night-time operations and meet the operations productivity goals for the W-314 project.</p>	hsems.2.3.1.1.2.1.3.1.1.3 Pit Manifolds Sitework - New Pits
3.2.6 Site Transfer Associated Structures	<p>3.7.3.1.1.4 Lighting Control</p> <p>Basis: DOE 6430.1A, <i>General Design Criteria</i>, requires control on outside lighting to provide illumination only when needed.</p>	hsems.2.3.1.1.2.1.3.1.1.3 Pit Manifolds Sitework - New Pits
	<p>3.7.3.2.1 Disturbed Areas Stabilized</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 3, Section 2.3, "Performance Requirements." A design life of 35 years is specified for the W-314 system. Stabilization is necessary in order to preclude wind and precipitation runoff erosion of the soil disturbed during construction of the transfer lines.</p>	hsems.2.3.1.1.2.1.3.1.1.3 Pit Manifolds Sitework - New Pits
	<p>3.7.3.2.2 Pole-Mounted Luminaries</p> <p>Basis: Maintenance work will be performed on similar existing lighting in the area. This design approach will provide efficient lighting consistent with existing arrangement.</p>	hsems.2.3.1.1.2.1.3.1.1.3 Pit Manifolds Sitework - New Pits

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	<p>3.7.3.2.3 Luminary Glare</p> <p>Basis: WHC-SD-280-FDC-001, <i>Functional Design Criteria for 200 Area "C" and "SY" Tank Farm Lighting Upgrade</i>, Rev. 0, Project W-280. DOE 6430.1A does not allow use of such lamps within 25 miles of the observatories. However, based on PNL letter dated April 5, 1991 yellow wavelength spectra for such lamps is narrow and can be filtered out in the use of the telescope. Appropriate glare control is recommended. Existing area lighting consists of such lamps.</p>	hsems.2.3.1.1.2.1.3.1.1.3 Pit Manifolds Sitework - New Pits
3.1.8 Position Pit Drain Seal Assembly	<p>3.7.4.1.1.1 Twenty-four (24) Hour Holdup of Ten Gallons</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 3, Sections 2.2 and 3.2.10.</p>	hsems.2.3.1.1.2.1.3.1.1.4 Pit Drain Seal Assemblies
3.1.8 Position Pit Drain Seal Assembly	<p>3.7.4.1.1.2 Vapor Seal</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 3, Sections 2.2 and 3.2.10.</p>	hsems.2.3.1.1.2.1.3.1.1.4 Pit Drain Seal Assemblies
3.1.8 Position Pit Drain Seal Assembly	<p>3.7.4.1.1.3 Retractable Drain Seal</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 3, Sections 2.2 and 3.2.10.</p>	hsems.2.3.1.1.2.1.3.1.1.4 Pit Drain Seal Assemblies
3.1.8 Position Pit Drain Seal Assembly	<p>3.7.4.1.1.4 Drainage to the Tank</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 3, Sections 2.2 and 3.2.10.</p>	hsems.2.3.1.1.2.1.3.1.1.4 Pit Drain Seal Assemblies
	<p>3.7.4.2.1 Operation Above Cover Block</p> <p>Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i>, Rev. 3, Sections 2.2 and 3.2.10.</p>	hsems.2.3.1.1.2.1.3.1.1.4 Pit Drain Seal Assemblies

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.7.4.2.2 Visible Indication of Position Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 3, Sections 2.2 and 3.2.10.	hsems.2.3.1.1.2.1.3.1.1.4 Pit Drain Seal Assemblies
	3.7.4.2.3 Configuration to Prevent Drain Plugging Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 3, Sections 2.2 and 3.2.10.	hsems.2.3.1.1.2.1.3.1.1.4 Pit Drain Seal Assemblies
	3.7.4.2.4 Electrical Grounding Jumper Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 3, Sections 2.2 and 3.2.10.	hsems.2.3.1.1.2.1.3.1.1.4 Pit Drain Seal Assemblies
	3.7.4.2.5 Configuration to Prevent Inadvertent Manipulation Basis: HNF-SD-W314-TI-007, <i>Project Design Concept for Transfer Piping</i> , Rev. 3, Sections 2.2 and 3.2.10.	hsems.2.3.1.1.2.1.3.1.1.4 Pit Drain Seal Assemblies