# DOCUMENT RELEASE AND CHANGE FORM

Prepared For the U.S. Department of Energy,
Assistant Secretary for Environmental Management
By Washington River Protection Solutions, LLC., PO Box 850, Richland, WA 99352
Contractor For U.S. Department of Energy, Office of River Protection, under Contract DE-AC27-08RV14800

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1b. **Project Number:** ☒ N/A

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2. **Document Title**
OPERATING SPECIFICATIONS FOR THE DOUBLE-SHELL STORAGE TANKS

3. **Design Verification Required**
☐ Yes ☒ No

4. **USQ Number** ☐ N/A
TF-14-2114-D

5. **PrHA Number** ☒ N/A
Rev.

6. **USQ Screening:**

a. Does the change introduce any new failure modes to the equipment? ☐ **Yes** ☒ **No**
Basis is required for Yes:_____

b. Does the change increase the probability of existing failure modes? ☐ **Yes** ☒ **No**
Basis is required for Yes:

c. For Safety Significant equipment, does the change require a modification to Chapter 4 of the DSA and/or FRED? ☐ **Yes** ☐ **No** ☒ **N/A**
Basis is required for Yes:

7. **Description of Change and Justification** (Use Continuation pages as needed)

OSD-T-151-00007 is revised from Revision 12 to Revision 13. Revised dome loading section to clarify requirement for dome elevation surveys and response for missed survey. Revised tank bump requirements to remove connection to administrative control that no longer exists. Revised annulus video inspection frequency to accommodate enhanced visual inspections resulting from letter of direction 13-TPD-0017, CONTRACT NO. DE-AC27-08RV14800 – DOUBLE-SHELL TANK (DST) ANNULUS VIDEO INSPECTIONS. Reference to former TSR administrative control key element for annulus visual inspection removed from technical basis section.

8. **Approvals**

| Title | Name | Signature | Date |
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| Clearance Review | WASHINGTON, MARGUERITE | WASHINGTON, MARGUERITE | 11/19/2014 |
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| Responsible Engineer | JOSLYN, CAMERON C | JOSLYN, CAMERON C | 11/18/2014 |
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9. **Clearance Review:**

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☐ Official Use Only Exemption 3-Statutory Exemption (OUO-3)
☐ Official Use Only Exemption 4-Commercial/Proprietary (OUO-4)
☐ Official Use Only Exemption 5-Privileged Information (OUO-5)
☐ Official Use Only Exemption 6-Personal Privacy (OUO-6)
☐ Official Use Only Exemption 7-Law Enforcement (OUO-7)

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10. **Distribution:**

| Name | Organization |
|---|---|
| ANDERSON, RICK A | AN TEAM AREA DAY SHIFT |
| BAIDE, DAN | TFP ENGINEERING |
| BERGMAN, SCOTT M | ELECTRICAL/AREA/242A-EVAP ENG |
| BINGHAM, JAMES D | ELECTRICAL/AREA/242A-EVAP ENG |
| BROWN, ROD | T/TX/TY/SX/SY/S/U FARM TEAM |
| CATO, DIANE M | NUCLEAR SAFETY |
| DALE, ROB | ELECTRICAL/AREA/242A-EVAP ENG |
| GAUCK, GREGORY J | WASTE STORAGE/TRANSFER ENG |
| HULL, KEVIN J | ELECTRICAL/AREA/242A-EVAP ENG |
| HURSON, PATRICK J | ST TEAM AREA DAY SHIFT |
| KIRCH, NICK | BASE OPERATIONS PROCESS ENGRNG |
| LANEY, TERANCE (TERRY) | WASTE STORAGE/TRANSFER ENG |
| LITTLE, DAVID B | ENGINEERING |
| MENDOZA, RUBEN E | WASTE STORAGE/TRANSFER ENG |
| NICHOLSON, ROBERT S (BOB) | WASTE STORAGE/TRANSFER ENG |
| PETERS, RAY | COGNIZANT SYSTEM ENGINEERING |
| REEPLOEG, GRETCHEN E | WASTE STORAGE/TRANSFER ENG |
| SHERIDAN, MIKE J | COGNIZANT SYSTEM ENGINEERING |
| SMITH, KELLY M | AZ TEAM AREA DAY SHIFT |
| STRASSER, DAVID W | A/AX/AY/AZ FARM TEAM |
| TUCKER, RON | AN/B/BX/BY/C FARM TEAM |
| TURKNETT, JERRY C | COGNIZANT SYSTEM ENGINEERING |
| VON BARGEN, BRIAN H | EV AREA-242A/AW/AP |

11. **TBDs or Holds** ☒ N/A

12. **Impacted Documents – Engineering** ☐ N/A

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13. **Other Related Documents** ☐ N/A

| Document Number | Rev. | Title |
|---|---|---|
| B-101-C1 | 00 | SPECIFICATION FOR PRIMARY AND SECONDARY STEEL TANKS PROJECT B-101 241SY TANK FARM |
| B-340-D1 | 01 | PRIMARY AND SECONDARY STEEL TANKS 241-AP TANK FARM |
| ECN-723442-R2 | 00 | DST ISOLATION PROJECT WEATHERSEAL OF 241-AZ-ELDP-101/102 AND 241-AZ-LDP-101 & 102 |
| H-14-020807 SH 001 | 14 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
| H-14-020807 SH 001 | 15 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
| H-14-020807 SH 001 | 16 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P & ID |
| H-14-020807 SH 002 | 14 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P & ID |
| H-14-020807 SH 002 | 12 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
| H-14-020807 SH 002 | 13 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
| H-14-020807 SH 003 | 06 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P & ID |
| H-14-020807 SH 004 | 15 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P & ID |
| H-14-020807 SH 004 | 14 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
| H-14-020807 SH 005 | 05 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
| H-14-020807 SH 005 | 06 | WASTE TRANSFER SYSTEM (WT) O&M SYSTEM P&ID |
| H-14-020807 SH 006 | 07 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
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| H-14-020807 SH 006 | 06 | WASTE TRANSFER SYSTEM (WT) O & M P&ID |
| H-14-020807 SH 007 | 02 | WASTE TRANSFER SYSTEM (WT) O&M SYSTEM P&ID |

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| H-14-020807 SH 007 | 01 | WASTE TRANSFER SYSTEM (WT) O&M SYSTEM P&ID |
| H-14-020807 SH 008 | 02 | WASTE TRANSFER SYSTEM (WT) O&M SYSTEM P&ID |
| H-14-020807 SH 008 | 01 | WASTE TRANSFER SYSTEM (WT) O&M SYSTEM P&ID |
| H-14-020807 SH 009 | 10 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
| H-14-020807 SH 009 | 09 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
| H-14-020807 SH 009 | 11 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
| H-14-020807 SH 010 | 00 | WASTE TRANSFER SYSTEM (WT) O & M SYSTEM P&ID |
| H-2-37703 SH 001 | 02 | TK BASE ODRAIN LEAK DETECTION SUMP PLNS+DETS TKS 241SY101,10 |
| H-2-37772 SH 001 | 02 | TANK CROSS SECTION 241SY TANK FARM |
| H-2-37787 SH 001 | 04 | PIPING PLAN & DETAILS LEAK DETECTION PIT 241-SY-01C, 02C & 03C |
| H-2-37787 SH 002 | 00 | PIPING PLAN & DETAILS LEAK DETECTION PIT 241-SY-01C, 02C & 03C |
| H-2-64306 SH 001 | 04 | TANK FOUNDATION PLAN |
| H-2-64317 SH 001 | 04 | LEAK DETECTION PIT + SLAB DRAIN PIPING |
| H-2-64419 SH 001 | 20 | TANK RISER DETAILS |
| H-2-64419 SH 002 | 10 | TANK RISER DETAILS |
| H-2-64419 SH 003 | 01 | TANK RISER DETAILS |
| H-2-64428 SH 001 | 01 | DUAL LEAK DETECT PIT PIPING SECT+DET TK-101+ENCASE. |
| H-2-64430 SH 001 | 01 | 241AYTANK FARM LEAK DETECT PIT PIPING SECT+DETS |
| H-2-64448 SH 001 | 04 | TANK PENETRATION DETAILS |
| H-2-64449 SH 001 | 06 | TANK ELEVATION + DETAILS |
| H-2-64449 SH 001 | 07 | TANK ELEVATION AND DETAILS |
| H-2-64449 SH 002 | 00 | TANK ELEVATION & DETAILS |
| H-2-67248 SH 001 | 01 | TK BASE DRAIN LEAK DETECTION SUMP PLANS+DETAILS TK241AZ-101+ |
| H-2-67316 SH 001 | 01 | PENETRATION DETS TK 101+102 241-AZ TANK FARM |
| H-2-67317 SH 001 | 02 | TANKS 101 & 102 SECTION & DETAILS 241-AZ TANK FARM |
| H-2-67317 SH 002 | 00 | TANKS 101 & 102 SECTION & DETAILS 241-AZ TANK FARM |
| H-2-67349 SH 001 | 01 | AIR LIFT CIRCULATOR+RISER EXTENSION DETAILS |
| H-2-68366 SH 001 | 01 | DUAL LEAK DETECTION PIT PIPING SECTION+DETAILS TK-102+ENCASE |
| H-2-68385 SH 001 | 02 | LEAK DETECTION PIT PIPING SECTIONS+DETAILS TANK 101 |
| H-2-70306 SH 001 | 02 | CIVIL LEAK DETECTION DRAIN AND SUMP PLANS AND DETAILS |
| H-2-70394 SH 001 | 02 | TANK CROSS SECTION |
| H-2-70413 SH 001 | 04 | PIPING PLAN & DETAILS LEAK DETECTION PIT 241-AW-01C THRU 06C |
| H-2-70413 SH 002 | 00 | PIPING PLAN & DETAILS LEAK DETECTION PIT 01C THRU 06C |
| H-2-71160 SH 001 | 02 | TANK CROSS SECTION 241-AN-107 TANK |
| H-2-71160 SH 002 | 00 | TANK CROSS SECTION 241-AN-107 TANK |
| H-2-71905 SH 001 | 02 | CIVIL LEAK DETECTION DRAIN AND SUMP PLANS AND DETAILS |
| H-2-71975 SH 001 | 03 | TANK CROSS SECTION 241-AN TANKS |
| H-2-71975 SH 002 | 00 | TANK CROSS SECTION 241-AN TANKS |
| H-2-71997 SH 001 | 06 | PIPING PLAN & DETAILS LEAK DETECTION PIT 241-AN-01C THRU 07C |
| H-2-71997 SH 002 | 01 | PIPING PLAN & DETAILS LEAK DETECTION PIT 241-AN-O1C THRU 07C |
| H-2-90444 SH 001 | 02 | PIPING LEAK DETECTION DRAIN PLANS AND SECTIONS |
| H-2-90444 SH 002 | 01 | PIPING LEAK DETECTION DRAIN PLANS AND SECTIONS |
| H-2-90444 SH 003 | 01 | PIPING LEAK DETECTION DRAIN PLANS AND SECTIONS |
| H-2-90534 SH 001 | 04 | TANK CROSS SECTION 241-AP TANKS |
| H-2-90851 SH 001 | 01 | PIPING SECTIONS & DETAILS LEAK DETECTION WELL 241-AP-03C & 05C |
| HNF-2317 | 00 | PROJECT W-320 HIGH VACUUM 241-AY-102 ANNULUS VENTILATION SYSTEM OPERABILITY TEST RPORT |
| HNF-SD-WM-OCD-015 | 33 | Tank Farms Waste Transfer Compatibility Program |
| HNF-SD-WM-OCD-015 | 32 | Tank Farms Waste Transfer Compatibility Program |
| HNF-SD-WM-OCD-015 | 30 | Tank Farms Waste Transfer Compatibility Program |
| HNF-SD-WM-OCD-015 | 34 | Tank Farms Waste Transfer Compatibility Program |
| HNF-SD-WM-OCD-015 | 29 | Tank Farms Waste Transfer Compatibility Program |
| HNF-SD-WM-OCD-015 | 31 | Tank Farms Waste Transfer Compatibility Program |
| RPP-13033 | 05D | TANK FARMS DOCUMENTED SAFETY ANALYSIS |
| RPP-13033 | 05C | TANK FARMS DOCUMENTED SAFETY ANALYSIS |
| RPP-13033 | 05 | TANK FARMS DOCUMENTED SAFETY ANALYSIS |
| RPP-13033 | 05A | TANK FARMS DOCUMENTED SAFETY ANALYSIS |
| RPP-13033 | 05B | TANK FARMS DOCUMENTED SAFETY ANALYSIS |
| RPP-13033 | 05F | TANK FARMS DOCUMENTED SAFETY ANALYSIS |
| RPP-13033 | 05E | TANK FARMS DOCUMENTED SAFETY ANALYSIS |
| RPP-13033 | 05G | TANK FARMS DOCUMENTED SAFETY ANALYSIS |
| RPP-13438 | 02 | TECHNICAL BASIS FOR THE TANK BUMP ACCIDENT AND ASSOCIATED REPRESENTATIVE HAZARDOUS |

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| | | CONDITIONS |
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| RPP-16922 | 28 | Environmental Specification Requirements |
| RPP-16922 | 27 | Environmental Specification Requirements |
| RPP-16922 | 25 | Environmental Specification Requirements |
| RPP-16922 | 26 | Environmental Specification Requirements |
| RPP-46868 | 00 | TECHNICAL BASIS FOR TEMPERATURE CONTROL TO PREVENT TANK BUMPS IN 241-AN-106 |
| RPP-6213 | 04 | HANFORD WASTE TANK BUMP ACCIDENT AND CONSEQUENCE ANALYSIS |
| RPP-7695 | 00A | DOUBLE-SHELL TANK ANNULUS VENTILATION ENGINEERING STUDY |
| RPP-7795 | 11 | Technical Basis for the Chemistry Control Program |
| RPP-7795 | 10 | TECHNICAL BASIS FOR THE CHEMISTRY CONTROL PROGRAM |
| RPP-ASMT-35619 | 00 | EXPERT PANEL OVERSIGHT COMMITTEE ASSESSMENT OF FY 2007 CORROSION & STRESS CORROSION CRACKING SIMULANT TESTING PROGRAM & THE IMPACT ON DST 241-AY-102 |
| RPP-ASMT-37653 | 00 | EXPERT PANEL OVERSIGHT COMMITTEE ASSESSMENT OF RPP-RPT-35923, HANFORD TANK AY101: EFFECT OF CHEMISTRY AND OTHER VARIABLES ON CORROSION AND STRESS CORR |
| RPP-ASMT-46121 | 00 | CORROSION PROPENSITY ASSESSMENT OF TANK 241-AN-106 WASTE |
| RPP-CALC-33163 | 00 | TANK WASTE VOLUME AND LEVEL CALCULATIONS IN DOME SPACE FOR 241-AP TANK FARM UP TO 460 INCHES |
| RPP-PLAN-32124 | 00A | PROCESS CONTROL PLAN FOR 241-AP-108 TANK WASTE LEVEL INCREASE |
| RPP-PLAN-40592 | 00 | PROCESS CONTROL PLAN FOR TANK 241-AP-103 TANK WASTE LEVEL INCREASE |
| RPP-PLAN-52170 | 00 | Process Control Plan for Tank 241-AP-101 Tank Waste Level Increase |
| RPP-RPT-28967 | 02 | HANFORD DOUBLE-SHELL TANK THERMAL AND SEISMIC PROJECT-BUCKLING EVALUATION METHODS AND RESULTS FOR THE PRIMARY TANKS |
| RPP-RPT-28968 | 01 | HANFORD DOUBLE-SHELL TANK THERMAL AND SEISMIC PROJECT-SUMMARY OF COMBINED THERMAKL AND OPERATING LOADS |
| RPP-RPT-31680 | 00 | HANFORD TANKS 241-AN-107 AND 241-AN-102: EFFECT OF CHEMISTRY AND OTHER VARIABLES ON CORROSION AND STRESS CORROSION CRACKING |
| RPP-RPT-32237 | 01 | HANFORD DOUBLE-SHELL TANK THERMAL AND SEISMIC PROJECT - INCREASED LIQUID LEVEL ANALYSIS FOR 241-AP TANK FARMS |
| RPP-RPT-33284 | 00 | HANFORD TANKS AY102 AND AP101 EFFECT OF CHEMISTRY AND OTHER VARIABLES ON CORROSION AND STRESS CORROSION CRACKING |
| RPP-RPT-35923 | 00 | HANFORD TANK AY101 EFFECT OF CHEMISTRY AND OTHER VARIABLES ON CORROSION AND STRESS CORROSION CRACKING |
| SD-WM-TI-150 | 00 | TECHNICAL BASIS FOR WASTE TANK CORROSION SPECIFICATIONS |

14. **Related Systems, Structures, and Components:**

| 14a. **Related Building/Facilities** ☐ N/A | 14b. **Related Systems** ☒ N/A | 14c. **Related Equipment ID Nos. (EIN)** ☒ N/A |
|---|---|---|
| 241-AN<br>241-AP<br>241-AW<br>241-AY<br>241-AZ<br>241-SY | | |

| DOCUMENT RELEASE AND CHANGE FORM CONTINUATION SHEET | **Document No:** OSD-T-151-00007 **Rev.** 13 |
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[Start Continuation Here]

# Operating Specifications for the Double-Shell Storage Tanks

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Abstract: OSD-T-151-00007 is revised from Revision 12 to Revision 13. Revised dome loading section to clarify requirement for dome elevation surveys and response for missed survey. Revised tank bump requirements to remove connection to administrative control that no longer exists. Revised annulus video inspection frequency to accommodate enhanced visual inspections resulting from letter of direction 13-TPD-0017, CONTRACT NO. DE-AC27-08RV14800 – DOUBLE-SHELL TANK (DST) ANNULUS VIDEO INSPECTIONS. Reference to former TSR administrative control key element for annulus visual inspection removed from technical basis section.

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**APPROVED**
*By marguerite washington at 11:49 am, Nov 19, 2014*

Release Approval Date

DATE:
Nov 19, 2014
HANFORD RELEASE

Release Stamp

**Approved For Public Release**

OSD-T-151-00007
Revision 13

# OPERATING SPECIFICATIONS FOR THE DOUBLE-SHELL STORAGE TANKS

**C.C. Joslyn**
Washington River Protection *Solutions*

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# RECORD OF REVISION

| Rev. | Date | ECN/EDT | Description of Change – Replace, Add and Delete Pages | Cog. Engr. | Cog. Mgr. |
|---|---|---|---|---|---|
| 1-10 | Various | Various | See OSD-T-151-00007, Rev. 12 for revision history from Rev. 1 through Rev. 10. | Various | Various |
| 11 | Nov 2012 | ECN-12-001314 | Revise Table 1.1.3 on LDP levels to include a time to pump element in response to Correction Action Plan S-12-AMTF-TANKFARM-002 | R.S. Rast | D.J. Washenfelder |
| 12 | July 2013 | ECN-13-000735 | Revise recovery action for section 1.0, leak detection pit liquid level to revise time to pump duration in response to WRPS-PER-2013-1001. Added pumping protocol in response to WRPS-1301766.Updated reference TFC-OPS-OPER-CD-01, *Event Notification* with TFC-OPS-OPER-C-57, *Event Notification*. | C.L. Rosenkrance | D.J. Washenfelder |
| 13 RS | October 2014 | DRCF SmartPlant Release | Revised dome loading section to clarify requirement for dome elevation surveys and response for missed survey. Revised tank bump requirements to remove connection to administrative control that no longer exists. Revised annulus video inspection frequency to accommodate enhanced visual inspections resulting from letter of direction 13-TPD-0017, CONTRACT NO. DE-AC27-08RV14800 – DOUBLE-SHELL TANK (DST) ANNULUS VIDEO INSPECTIONS. Reference to former TSR administrative control key element for annulus visual inspection removed from technical basis section. | C.C. Joslyn | D.G. Baide |

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# 1.0 INTRODUCTION

The operating specifications in this document cover storage operations for the Double-Shell Tank (DST) Farms (241-AN, AP, AW, AY, AZ, and SY Tank Farms).

The purpose and scope of the Operating Specification Documents (OSDs) as well as detailed requirements and authority for preparing, reviewing, releasing, and revising them are covered in TFC-ENG-CHEM-P-14, *Operating Specification Documents*.

Specification limits are given at the start of each section. The Detection/Control section describes the methods used to comply with the specification limits. The Recovery Action section describes the steps to be taken when a DST does not comply with an operating specification. The Technical Bases for the specification limits are located in Appendix A.

## 1.1 Liquid Levels

Tank liquid levels may be recorded by either an automatic liquid level measuring device (Enraf) or by manual liquid level tape/zip cord readings. When a tank has an operable Enraf and there is a discrepancy between the Enraf and manual tape readings, the Enraf readings shall be assumed to be accurate. Enrafs are calibrated in accordance with Maintenance Procedure 5-LCD-300. Manual Tapes are not calibrated.

**Table 1.1.1 Primary Tank Maximum Waste Liquid Level**

| Tanks | Normal Operating Limit (inch) | Maximum Authorized Limit (inch) | Structural Limit (inch) |
|---|---|---|---|
| **241-AN** | 416 | 422 | 422 |
| **241-AP-102, 104, 106, 107** | 416 | 422 | 460 |
| **241-AP-101, 103, 105, 108** | 454 | 458 | 460 |
| **241-AW-101, 103-106** | 416 | 422 | 422 |
| **241-AW-102** | 409 | 422 | 422 |
| **241-AY** | 364 | 370 | 370 |
| **241-AZ** | 364 | 370 | 370 |
| **241-SY** | 416 | 422 | 422 |

**Technical Basis: see Appendix A**

**Detection/Control**:

Double-Shell Tanks are operated under The Normal Operating Limit; however, the Normal Operating Limit may be raised to Maximum Authorized Limit by a Process Memo, which includes adjustments to surveillance requirements. The Normal Operating Limit and Maximum Authorized Limit can also be exceeded when performing level rise activities controlled by a Process Control Plan.

*An approved Process Memo or a Process Control Plan represents planned or approved activities that do not require Recovery Action for exceeding the Normal Operating Limit.

The primary tank waste level monitoring system in each tank is composed of several subsystems:

- Each tank is provided with an automatic liquid level measuring device (Enraf), which data is in most cases transmitted to the tank monitoring and control system (TMACS)

- Tank levels are recorded on data sheets and checked against maximum and minimum liquid levels. A manual liquid level tape/zip cord reading may be taken at each tank as a backup to the automatic liquid level gauge.

- 241-AP DST waste level above 422 inch must comply with in-service leak check requirements of RPP-19438. In-service leak check must be performed according to a process control plan. Results of an in-service leak check must be documented in an interoffice memo.

- In addition, some tanks are provided with a high-level alarm conductivity probe.

Readings are taken daily as specified by OSD-T-151-00031, or during transfers as specified per transfer procedure.

**Recovery Action**:

Liquid Level Limit specification non-compliance shall be reported according to the dispositions described under this section.

If the Normal Operating Limit is exceeded as a result of unplanned, or unapproved activity:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*

- Stop all transfers or additions into the tank

- Verify that the level is less than the Maximum Authorized Limit level as listed in Table 1.1.1 for all DST's

- Adjust surveillance requirements (alarms and/or rounds) to detect any more change, as required

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Ensure a Problem Evaluation Request (PER) has been submitted

<u>If the Maximum Authorized Limit is exceeded</u>:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification* Stop all transfers or additions into the tank

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Ensure a Problem Evaluation Request (PER) has been submitted

<u>If the Structural Limit is exceeded</u>:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*

- Stop all transfers or additions into the tank

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Ensure a Problem Evaluation Request (PER) has been submitted

**Table 1.1.2 Primary Tank Minimum Waste Liquid Level**

| Tanks | When Annulus Ventilation in Operation (inch) | When Primary Tank Ventilation in Operation (inch) |
|---|---|---|
| **241-AY, AZ** | 64 | 6 |
| **241-AN, SY, AW** | N/A | 6 |
| **241-AP** | N/A | 12 |

**Technical Basis: see Appendix A**

**Detection/Control**:

The primary tank waste level monitoring system in each tank is composed of several subsystems:

- Each tank is provided with an automatic liquid level measuring device (Enraf), which data is in most cases transmitted to the tank monitoring and control system (TMACS)

- Tank levels are recorded on data sheets and checked against maximum and minimum liquid levels. A manual liquid level tape/zip cord reading may be taken at each tank as a backup to the automatic liquid level gauge.

Readings are taken daily as specified by OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection*, or during transfers as specified per transfer procedure.

**Recovery Action**:

If the DST does not comply with the Minimum Primary Tank Waste Liquid Level limit while the Annulus Ventilation is in Operation:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*
- Immediately shutdown the annulus ventilation system

- Tank liquid level shall then be increased above the 64 inch limit by addition of water or waste and the annulus ventilation be restarted as soon as practical

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Ensure a Problem Evaluation Request (PER) has been submitted

If the DST does not comply with the Minimum Primary Tank Waste Liquid Level limit while the Primary Tank Ventilation is in Operation:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*
- Immediately shutdown the primary tank ventilation system until new conditions of operations are determined (1)
- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*
- Ensure a Problem Evaluation Request (PER) has been submitted

NOTE:
(1) Operating below the minimum liquid level of 6 inches (12 inches for 241-AP) would require adjustment of the primary tank ventilation system. This condition of operation is not described, as pumping to this level is not planned in the foreseeable future.

**Table 1.1.3 Tertiary Leak Detection Pit Liquid Level**

| Leak Detection Pit | Maximum Authorized Limit Dip Tube Reading (inch) | Structural Limit Dip Tube Reading (inch) |
|---|---|---|
| **241-AN-01C - 06C** | 63 | 78 |
| **241-AN-07C** | 63 | 74 |
| **241-AP-03C, 05C** | 46 | 123 |
| **241-AW-01C - 06C** | 63 | 74 |
| **241-AY-101A - 102A** | 16 | 66 |
| **241-AZ-101 - 102** | 23 | 73 |
| **241-SY-01C - 03C** | 23 | 73 |

NOTE: The values in Table 1.1.3 include a 2-inch “time to pump” margin. See technical basis section for details

**Technical Basis: see Appendix A**

**Detection/Control:**

The Tertiary Leak Detection Pit Monitoring System is such that:

- Dip tubes are used to monitor the liquid level in the leak detection pit; a manual tape/zip cord reading may be taken at each tank as a backup to the dip tube instrumentation

- Normal Operating Ranges (and if available, Alarm Set Points) verify equipment operation and provide indication that the liquid level is within the Maximum Authorized Limit. In some farms, (AN, AP, and AW) dip tubes are read manually using pressure M&TE. The levels are checked and recorded on a weekly basis by operator rounds

- The data is then reviewed per TFC-ENG-CHEM-D-21, *Process Engineering Waste Surveillance Data Review*

**Recovery Action:**

If the Maximum Authorized Limit Dip Tube Reading is exceeded:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Ensure a Problem Evaluation Request (PER) has been submitted

- Pump the leak detection pit to below the Maximum Authorized Dip Tube limit within 30 days.

- If an equipment issue prevents pumping within 30 days, system Engineering shall complete an OSD Recovery Action Plan Form (A-6005-240), submit the Recovery Action Plan to the WRPS Chief Engineer (with notification to the ORP Assistant Manager Tank Farms when it is approved) within 30 days, and restore the LDP level to within the established limit in accordance with the approved Recovery Action Plan.

    - The recovery action plan shall include a technical basis for extending the time to pump. The actual rate of ingress of liquid shall be evaluated to ensure pumping is complete before the level reaches the Structural Limit Dip Tube Reading.

If the Structural Limit Dip Tube Reading is exceeded:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Prohibit waste transfers into or out of the DST while the Structural Limit Dip Tube Reading is exceeded.

- Ensure a Problem Evaluation Request (PER) has been submitted

- Pump the leak detection pit to below the Maximum Authorized Dip Tube limit within 24 hours.

Protocol for pumping the leak detection pit:

Sampling and analysis of the 241-AY-102A leak detection pit is required prior to pumping. Prior to pumping all other LDPs, the following protocol shall be followed to ensure the proper controls are established for the pumping process.

Either:
Verify no waste is present in the leak detection pit by sampling and analysis of the liquid,
- OR -
Perform a Technical Evaluation to document that there is low probability of tank waste being in the leak detection pit. The following data must be considered in the evaluation:

1. Verification using the required leak detection system for double-shell tanks as defined in OSD-T-151-00031;
   - Verification of no unexplained decrease in liquid level in the primary tank during the accumulation period (i.e. the period of time that liquid has accumulated in the leak detection pit),

   -AND-
   - Verification of no level alarms of the ENRAF gauges in the annulus during the accumulation period.

2. If available, verification that the annulus Continuous Air Monitor has not detected any high airborne radiation during the accumulation period.

3. Verification of one of the following parameters;
   - Verification of no waste in the annulus by visual inspection during the accumulation period,

   -OR-

- Verification that there is no indication of a deviation (large increase in rate) from historical leak detection pit liquid accumulation trends. Any deviations shall be investigated prior to pumping of the leak detection pit.

The Technical Evaluation shall be prepared in accordance with TFC-ENG-FACSUP-C-03 and must discuss each of the applicable parameters.

The following control shall be followed prior to pumping operations:

- Verification of a liquid pH in the range that is not consistent with tank waste (pH range of 7-9), either from sample results or from testing the liquid in the leak detection pit either manually with pH paper or with a pH probe. If pH paper is used, the pH paper is recommended to be Hydrion MicroFine pH Paper[1] for the pH range of 6.0 to 9.5 and should be used per the manufacturer's recommendations. The pH reading must be recorded in the work package.
  - If the pH level is greater than 9, work shall be placed in a safe configuration and engineering should be contacted for further guidance.
  - If the pH level is less than 7, contact engineering for further guidance and a Criticality Safety Representative. A Criticality Safety Representative approval must be obtained prior to transferring waste with a pH of less than 7.

In addition, the following control shall be followed during pumping operations:

- Monitor radiation levels at the transfer line during the transfer in accordance with radiological work documents.

## 1.2 Hydrostatic Load

**Table 1.2.1 Maximum Bulk Specific Gravity**

| Tanks | Maximum Hydrostatic Load (in. w.g.) | Maximum Bulk Specific Gravity |
|---|---|---|
| **241 - AN, AW, SY** | 717 | 1.7 |
| **241 - AP** | 841 | 1.83 |
| **241 - AY, AZ** | 655 | 1.77 |

**Technical Basis: see Appendix A**

[1] Hydrion MicroFine is a trademark of Micro Essential Laboratory Inc., Brooklyn, NY.

**Detection/Control:**

DST waste specific gravity is accounted for in HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*. Tank Operations (TO) transfers procedures checklists verify waste specific gravity by way of Waste Compatibility Assessments.

Specific gravity is measured by:

- Densitometer readings
- Laboratory analysis of DST tank waste sample
- Transfers into DST's are evaluated and approved by Process Modeling per HNF-SD-WM-OCD-015, *Tank Farm Waste Transfer Compatibility Program*, to prevent exceeding the maximum bulk specific gravity values specified

**Recovery Action:**

If the Maximum Bulk Specific Gravity limit is exceeded:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*
- Notify the Manager of Process Modeling regarding the need to evaluate the waste level in the tank with respect to hydrostatic load and the need for restrictions on waste level in the tank. The restrictions shall be documented in a process memo.
- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*
- Ensure a Problem Evaluation Request (PER) has been submitted

## 1.3 Primary Tank and Annulus Vapor Space

**Table 1.3.1 Primary Tank Vapor Space Vacuum**

| Tanks | Primary Tank Vacuum | |
|---|---|---|
| | Maximum Vacuum | Minimum Vacuum |
| 241-AN, AW, AY, AZ, SY | - 6 in. w.g<br>(+6 in. w.g. vacuum) | 0 in. w.g. |
| 241-AP | - 8.7 in. w.g<br>(+8.7 in. w.g vacuum) | |

**Technical Basis: see Appendix A**

**Detection/Control:**

- Normal Operating Ranges (Alarm Set Points) provide indication that the primary tank vacuum is within Maximum and Minimum limits.

- Pressure indicators and recorders measure primary tank vacuum. Readings are recorded on daily round sheets. Recorded pressure readings are entered into the Surveillance Analysis Computer System (SACS) database

**Recovery Action:**

Primary tank vapor space vacuum shall be maintained within the Normal Operating Limits, except if the primary ventilation system was intentionally shut down or for planned activities described in the appropriate Alarm Response Procedure (ARP). In case of the ventilation being inoperable, respond per the appropriate ARP. If the pressure alarm becomes inoperable, it should be repaired or replaced on a priority basis.

If the Maximum Vacuum Limit -OR- Minimum Vacuum Limit is exceeded:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*

- Take immediate action to return the vacuum to within Normal Operating Limits

- In case of a pressurization alarm, take corrective action as described in the appropriate Alarm Response Procedure

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Ensure a Problem Evaluation Request (PER) has been submitted

**Table 1.3.2 Secondary Tank Annulus Vacuum**

| Tanks | Annulus Vacuum | |
|---|---|---|
| | Maximum Vacuum | Minimum Vacuum |
| 241-AW, AZ, SY | - 6 in. w.g.<br>(+6 in. w.g. vacuum) | 0 in. w.g. |
| 241-AN, AP, AY | - 20 in. w.g.<br>(+20 in. w.g. vacuum) | |

**Technical Basis: see Appendix A**

**Detection/Control:**

- Each DST has a pressure control system that includes a High and a Low alarm set point for the annulus vacuum
- Pressure indicators and recorders measure annulus vacuum. Readings are recorded on daily round sheets. Recorded pressure readings are entered into SACS database

**Recovery Action:**

See Recovery Action for Primary Tank Vapor Space Vacuum

**1.4** Tank and Waste Temperatures

**Table 1.4.1 Maximum Temperature for Waste, Steel, and Concrete**

| Tanks | Max Temperature for Waste and Steel (°F) | Max Temperature for Concrete (°F) |
|---|---|---|
| **241-AN, AW** | 350 | Dome: 160<br>Wall: 236 |
| **241-AP** | 210 | Dome: 135<br>Wall: 236 |
| **241-AY, AZ** | 260 | Dome: 160<br>Wall: 350 |
| **241-SY** | 250 | Dome: 160<br>Wall: 250 |

**Technical Basis: see Appendix A**

**Detection/Control:**

- For 241-AN, AP, AW, and SY tank farms, thermocouple trees are located in the primary tanks. Thermocouples are also located as pairs in the concrete dome and walls, and spaced in series in the concrete foundation and the insulating concrete. Temperatures can be read using a potentiometer the Tank Farm Instrument Buildings and are recorded continuously on the Tank Monitoring and Control System (TMACS)
- For 241-AY and AZ tank farms, see Table 1.4.3. Temperatures are continuously recorded on the Master Pump Shutdown System (MPSS)

- TMACS and MPSS display on the Surveillance Data Display System (SDDS) website, and the data is written to the Surveillance Analysis Computer System (SACS) database

- All 241-DST temperatures can be taken manually, if the automated systems are not available.

- When planning a transfer, the flow rates shall be adjusted if the difference in temperature between the originating tank and the receiving tank is such that the specification limit can be exceeded. During the transfers, tank temperatures are monitored to avoid violating the specifications

**Recovery Action:**

**NOTE:**
Table 1.4.1 temperatures are limits on DST bulk, or average temperature. The term "bulk" temperature is used such that the entire tank is assumed to be operating at this single temperature. Individual thermocouple readings in excess of Table 1.4.1 limits do not necessarily indicate DST "bulk" temperatures to be in excess of Table 1.4.1 limits. Process Engineering will make the determination for what readings constitute "bulk" tank temperature.

If a Table 1.4.1 temperature limit is exceeded, contact Process Engineering for determination if temperature represents bulk temperature.

If Process Modeling determines bulk temperature specification limit is exceeded:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER--57, *Event Notification*

- Stop all additions to and transfers from affected tank

- Adjust surveillance requirements (alarms and/or rounds) to detect any more change

- Appropriately adjust the ventilation

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Ensure a Problem Evaluation Request (PER) has been submitted

## Table 1.4.2 Bulk Temperature Change

Table 1.4.2-1 Bulk Temperature Change With Respect To Time

| Bulk Temperature Change Over Time for Solution and Concrete | | |
|---|---|---|
| **Tanks** | **For temp. < 125°F** | **For temp.≥ 125°F** |
| **241-AN, AP, AW, SY** | ≤10°F/hr | ≤20°F/day |
| **241-AY, AZ** | | ≤3 °F/day or ≤24°F/day provided the tank temperature is kept constant ±3□°F for 8 days thereafter. |

NOTE: Table 1.4.2-1 does not apply when filling an empty tank.

Table 1.4.2-2 Temperature Change Gradients

| Temperature Gradients for Solution and Concrete | | |
|---|---|---|
| **Tanks** | **Solution in Tank Including Solution/Vapor Interface** | **Concrete** |
| **241-AN, AP, AW, SY** | ≤55°F/ft | ≤ 35°F/ft |
| **241-AY, AZ** | | ≤ 18°F/ft |

**Technical Basis: see Appendix A**

**Detection/Control:**

See Detection/Control for Maximum Bulk Temperature for Steel, Concrete, and Waste.

**Recovery Action:**

See Recovery Action for Maximum Bulk Temperature for Steel, Concrete, and Waste.

**Table 1.4.3 Minimum Number of Operational Thermocouples for Tanks 241-AY and AZ**

| Type | | Minimum Number of Operational Thermocouples |
|---|---|---|
| **Solution** | | 2 |
| **Sludge** | | 3 (any combination of outer sludge thermocouples and central and outer radius Air lift circulator [ALC] thermocouples)<br>2 (any combination of inner sludge thermocouples and central and inner radius ALC thermocouples) |
| **Concrete** | **Dome: at 36-ft Radius** | 2 Inside, 2 Outside |
| | **Dome: at 41-ft Radius** | 2 Inside, 2 Outside |
| | **Middle Wall** | 2 Inside, 2 Outside |
| | **Bottom Wall** | 2 Inside, 2 Outside |

**Technical Basis: see Appendix A**

**Detection/Control:**

Each time a thermocouple failure occurs, the number of operable thermocouples is checked against the table to verify the requirement is met.

**Recovery Action:**

Concrete thermocouples are not replaceable.

If the DST does not comply with specification for the minimum number of concrete thermocouples:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*

- Additional in tank thermocouples could be added to make-up for the failed concrete thermocouples or tank operation could be restricted to maintain temperatures below this limit

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Ensure a Problem Evaluation Request (PER) has been submitted

## 1.5 Corrosion Mitigation

### Table 1.5.1 Waste Chemistry Limits

**Table 1.5.1-1**
**Waste Chemistry Limits for All DST's Waste Except the Interstitial Liquid in tanks 241-AN-102, AN-106, AN-107, AY-101, and AY-102**

| FOR $[NO_3^-]$ RANGE | VARIABLE | FOR WASTE TEMPERATURE (T) RANGE | | |
|---|---|---|---|---|
| | | T < 167 °F | 167 °F ≤ T ≤ 212 °F | T > 212 °F |
| $[NO_3^-] \leq 1.0M$ | $[OH^-]$ | $0.010M \leq [OH^-] \leq 8.0M$ | $0.010M \leq [OH^-] \leq 5.0M$ | $0.010M \leq [OH^-] < 4.0M$ |
| | $[NO_2^-]$ | $0.011M \leq [NO_2^-] \leq 5.5M$ | $0.011M \leq [NO_2^-] \leq 5.5M$ | $0.011M \leq [NO_2^-] \leq 5.5M$ |
| | $[NO_3^-] / ([OH^-] + [NO_2^-])$ | < 2.5 | < 2.5 | < 2.5 |
| $1.0M < [NO_3^-] \leq 3.0M$ | $[OH^-]$ | $0.1 ([NO_3^-]) \leq [OH^-] < 10M$ | $0.1 ([NO_3^-]) \leq [OH^-] < 10M$ | $0.1 ([NO_3^-]) \leq [OH^-] < 4.0M$ |
| | $[OH^-] + [NO_2^-]$ | $\geq 0.4 ([NO_3^-])$ | $\geq 0.4 ([NO_3^-])$ | $\geq 0.4 ([NO_3^-])$ |
| $[NO_3^-] > 3.0M$ | $[OH^-]$ | $0.3M \leq [OH^-] < 10M$ | $0.3M \leq [OH^-] < 10M$ | $0.3M \leq [OH^-] < 4.0M$ |
| | $[OH^-] + [NO_2^-]$ | $\geq 1.2M$ | $\geq 1.2M$ | $\geq 1.2M$ |
| | $[NO_3^-]$ | $\leq 5.5M$ | $\leq 5.5M$ | $\leq 5.5M$ |

**Table 1.5.1-2 Waste Chemistry Limits for the Interstitial Liquid of tanks 241-AN-102, AN-106, AN-107, AY-101, and AY-102**

| TEMPERATURE | VARIABLE | LIMIT |
|---|---|---|
| ≤ 122 °F | $[NO_2^-]/[NO_3^-]$ | ≥ 0.32(1) |
| | pH | ≥ 10 |
| > 122 °F | Limits in Table 1.5.1-1 above apply(2) | |

Note:
(1) The [NO2–]/[NO3–] limit ≥ 0.32 does not apply to 241-AY-102
(2) 241-AY-102 chemistry limits apply for temperatures not in excess of 170°F

**Technical Basis: see Appendix A**

**Detection/Control:**

- Conduct periodic sampling of the waste in DST's to determine the nitrite, nitrate, and hydroxide concentrations and to verify that measured concentrations are within the limits established in Tables 1.5.1-1 and 1.5.1-2. The technical basis for establishing sampling frequencies is provided in RPP-7795, *Technical Basis for Chemistry Control Program*

- Establish and maintain a database to track the nitrite, nitrate, and hydroxide concentrations in each DST. This database is used to monitor compliance with the waste chemistry limits and to identify patterns of caustic consumption that are important in determining tank sampling frequencies. The database also is used for trending to help predict when chemical adjustments are required to ensure DST waste chemistry is within the established limits. The database is published annually as part of the *Caustic Limits Report*, RPP-13639

- Prior to waste transfers, the final states of the sending and receiving DST's shall be evaluated for compliance with the waste chemistry limits. Compliance may be demonstrated by sample analysis or calculations of final waste chemistry conditions. The evaluation of compliance with the waste chemistry limits will be documented in a Waste Compatibility Assessment performed in accordance with HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*

**Recovery Action:**

Waste samples are analyzed per the requirements of a Tank Sampling and Analysis Plan (TSAP) and when results are not in compliance with the TSAP, the 222-S Laboratory and Tank Farm Inventory personnel invoke TFC-ENG-CHEM-P-18, *Response To Anomalous Sample Results.*

When a DST is identified to be outside the established limits for the nitrite, nitrate, or hydroxide concentrations:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Ensure a Problem Evaluation Request (PER) has been submitted

- Restore the nitrite, nitrate, or hydroxide concentrations within the established limits within 30 days and verify by sample analysis that the waste chemistry is within the established limits within 90 days

  -OR-

  Process Engineering shall complete an OSD Recovery Action Plan Form (A-6005-240), submit the Recovery Action Plan to the WRPS Chief Engineer (with notification to the ORP Assistant Manager Tank Farms when it is approved) within 30 days, and restore the nitrite, nitrate, or hydroxide concentrations within the established limits in accordance with the approved Recovery Action Plan

**Table 1.5.2 Annulus Tank Ventilation System and Annulus Inspection**

| Applicable System | Requirements |
|---|---|
| Annulus Ventilation | Annulus tank ventilation systems shall be operating except for outages not to exceed 30 days. |
| DST Annulus | Each DST annulus shall be video inspected on a 5 year frequency not to exceed 7 years (calendar years).<br><br>At least one DST in each of the six DST tank farms shall be video inspected on an 30 month frequency not to exceed 3 years (calendar years).<br><br>Annulus video inspections shall be conducted in one riser in each of the four quadrants, wherever possible.<br><br>Annual video inspections (i.e., not to exceed 365 days since completion of the last inspection) shall be performed in specific DST's where new patches of heavy corrosion and/or efflorescence stains/streaks have appeared since the last inspection. The annual inspections shall continue until the condition is stabilized/mitigated |

| Applicable System | Video Inspection Requirements |
|---|---|
| DST Annulus | 1. The starting date for establishing frequencies for the video inspection of each DST (5 year frequency not to exceed 7 years) and the video inspection of one DST in each of the six DST tank farms (30 month frequency not to exceed 3 years) is December 21, 2007<br><br>2. Video inspections shall be conducted in one riser in each of the four quadrants, wherever possible, to maximize the surface area and locations that will be inspected. The expectation is that there should be an available riser in each quadrant that allows access to the annulus, but it is possible that there may be equipment obstructions which preclude camera access. In situations where there is a physical access constraint, only three quadrants may be inspected.<br><br>3. Video inspections shall focus on the upper knuckle (haunch) where evidence of water ingress is most likely to appear. When one riser in each quadrant is used, about one third of the upper knuckle (haunch) will be observed in the video inspection. Where feasible, the riser locations shall be varied in subsequent video inspections to maximize the area of the upper knuckle (haunch) that is observed over the course of multiple inspections.<br><br>4. Evaluation of the data obtained for each DST annulus in the video inspection will lead to one of the following conclusions:<br><br>a. There is no direct observation of water ingress and the outer walls and secondary tank steel liner show no indications of patches of notable corrosion or efflorescence stains/streaks and conditions are essentially unchanged since the last video inspection. The next video inspection shall be performed consistent with the 5-year not to exceed 7 year (for each DST) and 30 month not to exceed 3 year (for at least one DST in each of the six DST tank farms) frequencies described above.<br><br>b. There is direct observation of water ingress and/or the outer walls and/or secondary steel liner show that new patches of heavy corrosion and/or efflorescence stains/streaks have appeared since the last inspection.<br><br>5. If the criteria of 4b are met, the video inspection frequency shall be increased to annually (i.e., not to exceed 365 days since completion of the last inspection) in the affected DST until the condition is stabilized/mitigated. Other actions, described in the Recovery Actions section shall also be implemented.<br><br>6. The criteria presented in 4a and 4b above (e.g., “no indications of patches of notable corrosion or efflorescence stains/streaks and conditions are essentially unchanged”, “new patches of heavy corrosion and/or efflorescence stains/streaks have appeared since the last inspection”) are qualitative. In situations where there is ambiguity on whether the observed conditions meet the criteria of 4a or 4b above, the Chief Engineer shall make the determination.<br><br>7. The results of the video inspection shall be documented in an engineering document. |

**Technical Basis: see Appendix A**

**Detection/Control:**

Annulus ventilation system operation is verified as follows:

- Verify that at least one fan is operating
- Verify that inlet annulus ventilation dampers/valves are not closed (except 241-SY farm emergency pump out isolation station valves SY101-VTA-V-202, SY102-VTA-V-212, and SY103-VTA-V-222) by either:

  Visual Inspection

  -OR-

  Indication of differential pressure across the annulus inlet high-efficiency particulate air filter

Conditions that indicate the ingress of water are direct observation of water ingress into the annulus or the presence of heavy patches of rusting corrosion and/or the presence of mineral deposit stains. This phenomenon is known as efflorescence and involves the growth of mineral deposits (e.g., salt crystals) from the evaporation of mineral laden water.

Annulus video inspection schedules are tracked using Enterprise Asset Management (EAM).

**Recovery Action:**

If the annulus tank ventilation system is out of service for longer than 30 days:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- System Engineering shall complete an OSD Recovery Action Plan Form (A-6005-240) in accordance with TFC-CHEM-P-14, *Operating Specification Documents*, submit the Recovery Action Plan to the WRPS Chief Engineer (with notification to the ORP Assistant Manager Tank Farms when it is approved) and restore the annulus ventilation to operation in accordance with the approved Recovery Action Plan

If video inspection indicates ingress of water into the annulus:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*

- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*

- Ensure a Problem Evaluation Request (PER) has been submitted

- Stop the ingress of water into the annulus within 30 days

  -OR-

  Process Engineering shall complete an OSD Recovery Action Plan Form (A-6005-240), submit the Recovery Action Plan to the WRPS Chief Engineer (with notification to the ORP Assistant Manager Tank Farms when it is approved) within 30 days, and stop the ingress of water into the annulus in accordance with the approved Recovery Action Plan

## 1.6 Dome Loading

**Table 1.6.1 Dome Loading Requirements**

| Applicable System | Requirements |
|---|---|
| DST | Establish tank safe operating limits for concentrated loads as described in an Analysis of Record.<br><br>Determine in-place load conditions on the specific tank.<br><br>Track and control load additions to ensure that the total applied load does not exceed the documented load limits.<br><br>Restrict load additions to the tank until assessment of in-place loading. (This restriction does not apply to personnel or equipment carried by personnel.)<br><br>Changes to load limits shall be determined by structural evaluations in accordance with national codes and standards and DOE orders, and approved by qualified personnel in accordance with Tank Operations Contractor engineering procedures<br><br>Tank dome surveys shall be performed on a 2 years ±4 month frequency. |

**Technical Basis: see Appendix A**

**Detection/Control:**

Analysis of Record documents for DSTs shall be developed and maintained in accordance with TFC-ENG-FACSUP-C-10, *Control of Dome Loading*. The Analysis of Record documents establish tank safe operating load limits, including limits for concentrated loads and vehicular access controls.

The change process for Analysis of Record load limits shall meet the Table 1.6.1 requirement stating that: "*Changes to load limits shall be determined by structural evaluations in accordance with national codes and standards and DOE orders, and approved by qualified personnel in accordance with Tank Operations Contractor engineering procedures*."

A Dome Load Record shall be developed and maintained for each DST in accordance with TFC-ENG-FACSUP-C-10.

Until the load summary provided in the Dome Load Record is completed for a specific DST, an interim load limit obtained from the Analysis of Record shall apply for that DST.

The addition and removal of temporary concentrated loads applied over tank domes and within Exclusion Zones shall be tracked and controlled in accordance with TFC-OPS-OPER-C-10, *Vehicle and Dome Load Control in Tank Farm Facilities*.

Vehicle access to tank farms and movement within tank farms shall be controlled in accordance with TFC-OPS-OPER-C-10

Before a temporary concentrated load is added to a tank dome or Exclusion Zone (including vehicle loads; excluding personnel and equipment carried by personnel), the resulting sum of the temporary concentrated loads shall be evaluated against the Allowable Load Margin for that facility in accordance with TFC-OPS-OPER-C-10. TFC-ENG-FACSUP-C-10 includes provisions for waiving and revising the Allowable Load Margin.

Changes to permanent load conditions shall be included in the Dome Load Record and evaluated to ensure the Analysis of Record limits are not exceeded, in accordance with TFC-ENG-FACSUP-C-10.

Dome elevation surveys shall be scheduled in the computerized maintenance management system per TFC-ENG-FACSUP-C-10. Survey results shall be reviewed and any necessary response taken in accordance with TFC-ENG-FACSUP-C-10.

**Recovery Action:**

If the Allowable Load Margin is exceeded:

- Notify the Shift Manager. Shift Manager shall treat OSD non-compliance as a significant operational issue and make appropriate notifications per TFC-OPS-OPER-C-57, *Event Notification*
- Notify the Engineering Discipline Lead - Civil/Structural to determine if any restrictions or immediate actions are warranted.
- Evaluate for reportability in accordance with TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*
- Ensure a Problem Evaluation Request (PER) has been submitted

If a Dome Elevation Survey is missed:

- The Cognizant System Engineer or Design Authority shall complete an OSD Recovery Action Plan Form (A-6005-240) in accordance with TFC-CHEM-P-14, *Operating Specification Documents*, and submit the Recovery Action Plan to the WRPS Chief Engineer (with notification to the ORP Assistant Manager Tank Farms when it is approved).

## 1.7 Tank Bump

**Table 1.7.1 End-State Analysis for Tank Bump**

| Applicable System | Requirements |
|---|---|
| DST | Prior to waste transfers into DSTs, the Tank Operations Contractor shall evaluate the end state of the receiving tank to verify that at least one of the following criteria is met.<br><br>a. Total tank heat load is < 58,000 Btu/h.<br><br>OR<br><br>b. Non-convective layer height is < 12 in.<br><br>OR<br><br>c. Supernatant depth is < 39 in.<br><br>OR<br><br>d. The non-condensable gas generation rate at saturation in the non-convective layer is sufficiently low, such that the ratio of vertical void fraction profile to the neutral buoyant void fraction is < 1.0.<br><br>OR<br><br>e. For AN-106 only, the supernatant temperature is <177ºF. |
| | The Tank Operations Contractor shall review all DSTs every two years to confirm that at least one of the criteria in Table 1.7.1 is met for all DSTs (i.e., that a tank bump is not a credible accident). |

**Technical Basis: see Appendix A**

**Detection/Control:**

The evaluation of the tank bump criteria prior to waste transfers shall be performed and documented in accordance with HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*.

Temperature readings for AN-106 are taken weekly to comply with AC 5.9.1 (HNF-IP-1266). The temperature limit listed in Table 5.9.1-1 of HNF-IP-1266 is more restrictive than what is listed in Table 1.7.1

**Recovery Action:**

If at least one of the criteria in Table 1.7.1 is not met:

- The waste transfer/addition into the receiving tank is prohibited until controls (non-safety SSC or non-TSR) to address tank bump hazards are established
- Ensure a Problem Evaluation Request (PER) has been submitted
- If 241-AN-106 supernatant temperature ≥ 177°F, ensure that active ventilation is restored within 15 days
    - If active ventilation in 241-AN-106 cannot be restored within 15 days, a recovery plan is necessary

If the two-year review indicates that none of the five criteria for excluding a tank bump in Table 1.7.1 are met, the reviewing organization shall notify the Shift Manager, and shall prepare a Problem Evaluation Request (PER).

## 2.0 REFERENCES

**Analyses, Calculations, and Evaluations**

2.1 RPP-RPT-28967, Rev. 2, *Hanford Double-Shell Tank Thermal and Seismic Project – Buckling Evaluation Methods and Results for the Primary Tanks*

2.2 RPP-RPT-28968, Rev.1 *Hanford Double-Shell Tank Thermal and Seismic Project – Summary of Combined Thermal and Operating Loads with Seismic Analysis*

2.3 RPP-RPT-32237, Rev.1 *Hanford Double-Shell Tank Thermal and Seismic Project – Increased Liquid Level Analysis for 241-AP Tank Farms*

2.4 RPP-CALC-33163, Rev.0 *Tank Waste Volume and Level Calculations in Dome Space for 241-AP Tank Farm Up to 460 inches*

2.5 HNF-2317, Rev. 0, *Project W-320 High Vacuum 241-AY-102 Annulus Ventilation System Operability Test Report*

2.6 TE-05-038, Rev. 0, *Technical Evaluation of High Annulus Vacuum on 241-AN Tanks*

**Drawings**

2.7 H-2-37772, *Tank Cross Section 241-SY Tank Farm*

2.8 H-2-37703, *Tank Base Drain Leak Detection Sump Plans & Details Tanks 241-SY101, 102, & 103*

2.9 H-2-37787, *Piping Plan & Details Leak Detection Pit 241-SY-01C, 02C, & 03C*

2.10 H-2-64306, *Tank Foundation Plan*

2.11 H-2-64317, *Leak Detection Pit & Slab Drain Piping*

2.12 H-2-64428, *Dual Leak Detection Pit Piping Section & Details TK-101 & Encasement*

2.13 H-2-64430, *241-AY Tank Farm Leak Detection Pit Piping Sections & Details (TK-102)*

2.14 H-2-64448, *Purex Tank Farm Expansion – Tank Penetration Details*

2.15 H-2-64449, *Purex Tank Farm Expansion – Tank Elevation & Details*

2.16 H-2-64419, *Tank Riser Details*

2.17 H-2-67349, *Air Lift Circulator and Riser Extension Details*

2.18 H-2-67248, *Tank Base Drain Leak Detection Sump Plans & Details Tank 241-AZ-101 & 102*

2.19 H-2-68385, *Leak Detection Pit Piping Sections & Details Tank 101*

2.20 H-2-68366, *Dual Leak Detection Pit Piping Section & Details Tank-102 & Encasement*

2.21 H-2-67317, *Tanks 101 & 102 Section & Details 241-AZ Tank Farm*

2.22 H-2-67316, *Penetration Details Tank 101 & 102 241-AZ Tank Farm*

2.23 H-2-70394, *Tank Cross Section 241-AW Tanks*

2.24 H-2-70306, *Civil Leak Detection Drain and Sump Plans and Details*

2.25 H-2-70413, *Piping Plan & Details Leak Detection Pit 241-AW-01C thru 06C*

2.26 H-2-71975, *Tank Cross Section 241-AN Tanks*

2.27 H-2-71905, *Civil Leak Detection Drain and Sump Plans and Details*

2.28 H-2-71997, *Piping Plan & Details Leak Detection Pit 241-AN-01C thru 07C*

2.29 H-2-71160, *Tank Cross Section 241-AN-107 Tank*

2.30 H-2-90534, *Tank Cross Section 241-AP Tanks*

2.31 H-2-90444, *Piping Leak Detection Drain Plan and Sections*

2.32 H-2-90851, *Piping Sections & Details Leak Detection Well, 241-AP-03C & -05C*

2.33 H-14-020807, *Waste Transfer System (WT) O & M System P&ID*

**Corrosion Mitigation**

2.34 SD-WM-TI-150, *Technical Basis for Waste Tank Corrosion Specification*

2.35 TWRS PP-94-025, *Sludge Washing Materials Study: The Behavior of Carbon Steel in a Dilute Waste Environment*

2.36 Letter 0602740, "Expert Panel Oversight Committee Assessment of the 241-AN-107 and 241-AN-102 Waste Chemistry Corrosion Testing for Double-Shell Tank Waste Chemistry Optimization"

2.37 RPP-RPT-31680, *Hanford Tanks 241-AN-107 and 241-AN-102: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking*

2.38 RPP-ASMT-37653, *Expert Panel Oversight Committee Assessment of RPP-RPT-35923, Hanford Tank AY101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking*

2.39 RPP-RPT-35923, *Hanford Tank AY101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking*

2.40 RPP-ASMT-35619, *Expert Panel Oversight Committee Assessment of Fiscal Year 2007 Corrosion and Stress Corrosion Cracking Simulant Testing Program and the Impact on Double-Shell Tank 241-AY102*

2.41 RPP-RPT-33284, *Hanford Tanks AY102 and AP101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking*

2.42 RPP-7795, *Technical Basis for Chemistry Control Program*

2.43 RPP-7695, *Double-Shell Tank Annulus Ventilation Engineering Study*

2.44 RPP-ASMT-46121, *Corrosion Propensity Assessment of Tank 241-AN-106 Waste*

2.45 Letter dated June 13, 2000 from State of Washington Department of Ecology to U.S. Department of Energy. *Re: Failure to Comply with Major Milestone M-32 of the Tri-Party Agreement; Administrative Order no. United States Department of Energy 00NWPKW-1250*

2.46 Letter dated April 24, 2002 from U.S. Department of Energy to State of Washington Department of Ecology (02-TOD-031). *SUBMISSION OF AN UPDATED PLAN FOR EXAMINATION OF DOUBLE-SHELL TANKS (DST) CONTAINED IN HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER (TRI-PARTY AGREEMENT) MILESTONE M-48 SERIES, M-48-05*

2.47 RPP-RPT-28538, Rev. 5. *Volume 1: IQRPE Double-Shell Tank Integrity Assessment Report HFFACO M-48-14*

**Design Specifications**

2.48 B-101-C1, *Specifications for Primary and Secondary Steel Tanks.* Project B-101. 241-SY Tank Farm

2.49 HWS-7789, *Specification for Primary and Secondary Steel Tanks Purex Tank Farm Expansion.* Project IAP-614

2.50 B-340-D1, *Design Specification for Primary and Secondary Steel Tanks.* 241-AP Tank Farm. Work Order X34001

2.51 B-130-D1, *Design Specification for Primary and Secondary Steel Tanks.* Project B-130. 241-AN Tank Farm

2.52 B-120-D1, *Design Specification for Primary and Secondary Steel Tanks*. Project B-120. 241-AW Tank Farm

2.53 HWS-8982, *Specification for Primary and Secondary Steel Tanks (241-AZ)*

**Supporting Documents**

2.54 HNF-IP-1266, *Tank Farms Operations Administrative Controls*,

2.55 HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*

2.56 RPP-6213, *Hanford Waste Tank Bump Accident, and Consequence Analysis*

2.57 RPP-13033, *Tank Farms Documented Safety Analysis*

2.58 RPP-13438, *Technical Basis for the Tank Bump Accident and Associated Representative Hazardous Conditions*

2.59 RPP-16922, *Environmental Specifications Requirements*

2.60 RPP-19438, *Report of Expert Panel Workshop for Hanford Site Double-Shell Tank Waste Level Increase*

2.61 TFC-ENG-FACSUP-C-03, *Technical Evaluations*

2.62 TFC-ENG-FACSUP-C-10, *Control of Dome Loading*

2.63 TFC-OPS-OPER-C-10, *Vehicle and Dome Load Control in Tank Farm Facilities*

2.64 TFC-OPS-OPER-C-24, *Occurrence Reporting And Processing of Operations Information*

2.65 FC-OPS-OPER-C-57, *Event Notification*

2.66 TFC-ESHQ-ENV_FS-C-01, *Environmental Notification*

2.67 WRPS-0900762, *241-AP-108 In-Service Leak Check Completion*

2.68 WRPS-0901127, *241-AP-103 In-Service Leak Check Completion*

2.69 RPP-PLAN-32124, *Process Control Plan for 241-AP-108 Tank Waste Level Increase*

2.70 RPP-PLAN-40592, *Process Control Plan for Tank 241-AP-103 Tank Waste Level Increase*

2.71 WRPS-1202787, *241-AP-101 In-Service Leak Check Completion*

2.72 WRPS-1202788, *241-AP-105 In-Service Leak Check Completion*

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2.75 ECN 723442, *DST Isolation Project: Weatherseal of 241-AZ-ELDP-101/102 and 241-AZ-LDP-101 & 102*

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2.77 SD-RE-TI-064, *Compilation of Basis Letters Referenced in OSD-T-151-00017*

2.78 SD-RE-TI-041, *Thermal Creep and Ultimate Load Analyses of the 241-AY/AZ Reinforced Concrete Underground Waste Storage Tanks*

2.79 RHO-C-59, *Additional Analysis of Underground Waste Storage Tanks 241-SY*

2.80 RHO-C-60, *A Comprehensive Summary of the Analyses of the 241-AW Underground Waste Storage Tanks*

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2.82 RPP-46868, Rev.0 *Technical Basis for Temperature Control to Prevent Tank Bumps in 241-AN-106*

2.83 Internal Memo WRPS-1203624, T. J. Venetz to D. J. Washenfelder, *Analysis of DST Leak Detection Pit Levels and Determination of Time to Pump Element*, August 30, 2012, Washington River Protection Solutions

2.84 Internal Memo WRPS-1301766, From D.B. Little to R.E. Wilkinson, "Leak Detection Pit Pumping Protocol," June 27, 2013, Washington River Protection Solutions

2.85 RPP-25782, Rev. 0A, *DST Dome Survey Program*, CH2M Hill Hanford Group Inc.

# Appendix A – OSD Technical Basis

## Table 1.1.1 Primary Tank Maximum Operating Limit

Normal Operating Limit
The Normal Operating Limit is set below the Maximum Authorized Limit to allow time for actions to be taken before the Maximum Authorized Limit is reached. (For levels less than 422 inch, 1 inch of tank liquid ≈ 2750 gallons)

- For 241-AN, AP-102, AP-104-107, AW-101, AW-103-106, and SY(1), the 6 inch difference between the Normal Operating Limit and the Maximum Authorized Limit is equivalent to 16,500 gallons.

- For 241-AY and AZ, the 6.0 inch difference between the Normal Operating Limit and the Maximum Authorized Limit is equivalent to 16,500 gallons.

- For 241-AP-101, 103, 105, and 108, the 4 inch difference between the Normal Operating Limit and the Maximum Authorized Limit is equivalent to 10,300 gallons as calculated per Table 1 of RPP-CALC-33163. A 4.2 DST inch space is required for a maximum pump run-out volume of 10,800 gallons based on a maximum flow rate of 360 gpm and an initial liquid level monitoring frequency of 30 minutes after transfer initiation. However, the 4 inch space provided is adequate since the actual flow rates during waste transfers will not approach the maximum pump run-out flow rate.

- For 241-AW-102, the 13 inch difference between the Normal Operating Limit and the Maximum Authorized Limit provides space for approximately 36,000 gallon 242-A Evaporator dump and flush. (25,000 gallon Evaporator dump with max 4 days pump seal water accumulation at a rate of approximately 1in/day)

NOTE:
(1) For 241-SY tanks, the Normal Operating Limit provides adequate space for two line flushes that could result from an aborted cross site transfer due to leakage, line blockage, or equipment malfunction.

Maximum Authorized Limit

The Maximum Authorized Limit is the maximum allowable waste solution height in the tank.

- For 241-AN, AW, and SY, the Maximum Authorized Limit and the Structural Limit are identical. (see Structural Limit below)

- For 241-AP-101, 103, 105, and 108, the Maximum Authorized Limit is the waste height that has passed an in-service leak check.

    - Process Control Plan RPP-PLAN-52170 documents the plan for the 241-AP-101 waste level increase. Internal Memo WRPS-1202787 documents the successful completion of the 241-AP-101 in-service leak check for a Maximum Operating Limit of 458 inch.

    - Process Control Plan RPP-PLAN-40592 documents the plan for the 241-AP-103 waste level increase. Internal Memo WRPS-0901127 documents the successful completion of the 241-AP-103 in-service leak check for a Maximum Operating Limit of 458 inch

    - Process Control Plan RPP-PLAN-52169 documents the plan for the 241-AP-105 waste level increase. Internal Memo WRPS-1202788 documents the successful completion of the 241-AP-105 in-service leak check for a Maximum Operating Limit of 458 inch.

    - Process Control Plan RPP-PLAN-32124 documents the plan for the 241-AP-108 waste level increase. Internal Memo WRPS-0900762 documents the successful completion of the 241-AP-108 in-service leak check for a Maximum Operating Limit of 458 inch.

- For 241-AP-102, and AP 104, 106, and 107, the Maximum Authorized Limit is set at 422 inch because in service leak checks have NOT been performed. Once successfully performed, the Maximum Authorized Limit shall be 458 inch and the Normal Operating Limit shall be 454 inch

Maximum Authorized Limit (continued)

- For 241- AY, the Maximum Authorized Limit is set by the height of sidewall process lines as shown in drawings, therefore preventing potential leakage of waste into the annulus:

| Item # | Item | | Drawing | Detail |
|---|---|---|---|---|
| A | Inside Tank Bottom EL (ft) | 623.07 | H-2-64449 | TYP Tank Section |
| B | Maximum Plate Thickness (ft) | 0.083 | H-2-64449 | 6 |
| C | Second Tangent Line EL (ft) | 654.86 | H-2-64449 | TYP Tank Section |
| D | Distance from Second Tangent Line to Centerline of Higher Process Line (ft) | 0.15 | H-2-64448 | 18 |
| E | Distance from Centerline of Lower Process Line to Centerline of Bottom Process Line (ft) | 0.75 | H-2-64448 | 18 |
| F | Centerline of Lower Process Line EL (ft) | 654.26 | calculated | calculated |
| G | Process Line Hole Diameter (ft) | 0.42 | H-2-64448 | 18 |
| H | Bottom of Lower Process Line Hole EL (ft) | 654.05 | calculated | calculated |

F = C + D - E = 654.26 ft
H= F – G/2 = 654.05 ft
Maximum Authorized Limit = (H –A - B)*12 in/ft = 370.75 in. USE 370 inches

- For 241- AZ, the Maximum Authorized Limit is set by the height of sidewall process lines as shown in drawings, therefore preventing potential leakage of waste into the annulus:

| Item # | Item | | Drawing | Detail |
|---|---|---|---|---|
| A | Inside Tank Bottom EL (ft) | 616.50 | H-2-67317 | TYP Tank Section |
| B | Maximum Plate Thickness (ft) | 0.083 | H-2-67317 | 6 |
| C | Second Tangent Line EL (ft) | 648.29 | H-2-67317 | TYP Tank Section |
| D | Distance from Second Tangent Line to Centerline of Higher Process Line (ft) | 0.15 | H-2-67316 | 19 |
| E | Distance from Centerline of Lower Process Line to Centerline of Bottom Process Line (ft) | 0.75 | H-2-67316 | 19 |
| F | Centerline of Lower Process Line EL (ft) | 647.69 | calculated | calculated |
| G | Process Line Hole Diameter (ft) | 0.42 | H-2-67316 | 19 |
| H | Bottom of Lower Process Line Hole EL (ft) | 647.48 | calculated | calculated |

F = C + D - E = 647.69 ft
H= F – G/2 = 647.48 ft
Maximum Authorized Limit = (H –A - B)*12 in/ft = 370.75 in. USE 370 inches

Structural Limit

The Structural Limit is the limit to which the tank structural analysis has been performed.

- For 241-AN, AW, and SY, the Structural Limits are based on the values presented in Table 1-1 of RPP-RPT-28968 and conclusions presented in Section 7 of RPP-RPT-28968.

- For 241-AP, the Structural Limit is based on conclusions presented in Section 7 of RPP-RPT-32237. In the 241-AP tanks, the Structural Limit is also the maximum waste liquid level that maintains double-confinement.

- For 241-AY and AZ, the structures are analyzed and deemed adequate for a 422 inch waste solution height in RPP-RPT-28968. However, the Structural Limit is equal to the Maximum Authorized Limit to prevent potential leakage of waste into the annulus by way of sidewall process lines.

## Table 1.1.2 Primary Tank Minimum Operating Limit:

When Annulus Ventilation in Operation

- For 241-AY and AZ, the Primary Tank Minimum Waste Liquid Level is set at 64 inch to prevent annulus contamination by vapor. A distance of 5.0 ft between the inside tank bottom and the bottom of pit drains is shown in drawings H-2-64419 (241-AY) and H-2-67349 (241-AZ). The 64 inch limit prevents these drains from being uncovered.

- For 241-AN, SY, AW, and AP, the Primary Tank Minimum Waste Liquid Level does not apply because these pit drains do not exist in these tank farms.

When Primary Tank Ventilation in Operation

- For 241-AY, AZ, AN, SY, and AW, the Primary Tank Minimum Waste Liquid Level is set at 6 inches to provide protection against bottom uplift and buckling of the primary tank as discussed in Section 8.0 of RPP-RPT-28967.

- For 241-AP, the Primary Tank Waste Minimum Liquid Level is set at 12 inch to provide protection against bottom uplift and buckling of the primary tank as discussed in Section 8.0 of RPP-RPT-28967.

## Table 1.1.3 Tertiary Leak Detection Pit Liquid Levels:

Leak detection pits (LDP) serve no purpose in leak detection from the primary tank. LDP's are used to detect a leak from the secondary tank should a primary tank leak into the annulus. All liquid levels presented in Table 1.1.3 are dip tube readings. These values reflect the use of an offset. The offset is the difference in elevation between the bottom of the dip tube and the inside bottom of the leak detection pit.

Maximum Authorized Limit Dip Tube Reading

The Maximum Authorized Limit Dip Tube Reading (MALDTR) corresponds to the elevation difference between the bottom of the drain line and the bottom of the leak detection pit, incorporating the offset. This limit prevents liquid flow from the leak detection pit (LDP) into the drain line.

NOTE: For both the maximum authorized limit and the structural limit, a 2 inch time to pump allowance is included in addition to the values determined from design dimensions. This will allow for 30 days for pumping the LDP based on rates of normal ingress, (see WRPS-1203624, *Analysis of DST Leak Detection Pit Level and Determination of Time to Pump Element*).

- For 241-AN-01C – 06C, refer to drawings for the following information:

| Item # | Item | | Drawing | Detail |
|---|---|---|---|---|
| A | Top of DST Tank Foundation EL (ft) | 612.33 | H-2-71975 | TYP Tank Section |
| B | Bottom LDP Baseplate EL (ft) | 605.52 | H-2-71905 | 7 |
| C | LDP Baseplate Thickness (ft) | 0.04 | H-2-71905 | 7 |
| D | Drain Pipe OD (in) | 6.625 | H-2-71905 | 4 |
| E | Centerline Drainpipe EL (ft) | 611.35 | H-2-71905 | 1 |
| F | LDP Bottom Inside EL (ft) | 605.56 | calculated | calculated |
| G | Offset (in) | 1 | H-2-71997 sht 2 of 2 | 3 |
| H | Time to pump allowance (in) | 2 | See Note above | |

F = B + C = 605.56 ft
MALDTR = (E –F)*12 in/ft – D/2 - G = 65.15 in. –H=63.15 USE 63 inches

- For 241-AN-07C, refer to drawings for the following information:

| Item # | Item | | Drawing | Detail |
|---|---|---|---|---|
| A | Top of DST Tank Foundation EL (ft) | 612.00 | H-2-71160 | TYP Tank Section |
| B | Bottom LDP Baseplate EL (ft) | 605.52 | H-2-71905 | 7 |
| C | LDP Baseplate Thickness (ft) | 0.04 | H-2-71905 | 7 |
| D | Drain Pipe OD (in) | 6.625 | H-2-71905 | 4 |
| E | Centerline Drainpipe EL (ft) | 611.35 | H-2-71905 | 1 |
| F | LDP Bottom Inside EL (ft) | 605.56 | calculated | calculated |
| G | Offset (in) | 1 | H-2-71997 sht 2 of 2 | 3 |
| H | Time to pump allowance (in) | 2 | See Note above | |

F = B + C = 605.56 ft
MALDTR = (E – F)*12 in/ft – D/2 – G = 65.15 in.-H=63.15 USE 63 inches

- For 241-AP-03C & 05C, refer to drawings for the following information:

| Item # | Item | | Drawing | Detail |
|---|---|---|---|---|
| A | Top of DST Tank Foundation EL (ft) | 623.26 | H-2-90534 | TYP Tank Section |
| B | Drain Pipe OD (in) | 6.625 | H-2-90444 | A |
| C | Centerline Drainpipe EL (ft) | 617.11 | H-2-90444 | A |
| D | LDP Bottom Inside EL (ft) | 612.28 | H-2-90851 | ELEVATION A - 1a |
| E | Offset (in) | 6 | H-2-90851 | ELEVATION A - 1a |
| F | Time to pump allowance (in) | 2 | See Note Above | |

MALDTR = (C – D)*12 in/ft – B/2 – E = 48.63 in.-F=46.63 USE 46 inches

- For 241-AW-01C - 06C, refer to drawings for the following information:

| Item # | Item | | Drawing | Detail |
|---|---|---|---|---|
| A | Top of DST Tank Foundation EL (ft) | 631.50 | H-2-70394 | TYP Tank Section |
| B | Bottom LDP Baseplate EL (ft) | 625.02 | H-2-70306 | 7 |
| C | LDP Baseplate Thickness (ft) | 0.04 | H-2-70306 | 7 |
| D | Drain Pipe diameter (ft) | 0.50 | H-2-70306 | 7 |
| E | Centerline Drainpipe EL (ft) | 630.85 | H-2-70306 | 1 |
| F | LDP Bottom Inside EL (ft) | 625.06 | calculated | calculated |
| G | Offset (in) | 1 | H-2-70413 sht 1 of 2 | 3 |
| H | Time to pump allowance (in) | 2 | See Note Above | |

F = B + C = 625.06 ft
MALDTR = (E – D/2 – F)*12 in/ft – G =65.46 in.- H=63.46 USE 635 inches

- For 241-AY-101A – 102A, refer to drawings for the following information:

| Item # | Item | | Drawing | Detail |
|---|---|---|---|---|
| A | Top of DST Tank Foundation EL (ft) | 622.39 | H-2-64306 | 2 |
| B | Bottom LDP Baseplate EL (ft) | 616.50 | H-2-64317 | 5 |
| C | LDP Baseplate Thickness (ft) | 0.04 | H-2-64317 | 5 |
| D | Drain Pipe OD (in) | 6.625 | H-2-64317 | 3 |
| E | Centerline Drainpipe EL (ft) | 618.54 | H-2-64317 | 2 |
| F | LDP Bottom Inside EL (ft) | 616.54 | calculated | calculated |
| G | AY-101A Offset (in) | 2 | H-2-64428 | Section B-B |
| H | AY-102A Offset (in) | 2 | H-2-64430 | Section A-A |
| I | Time to pump allowance (in) | 2 | See Note Above | |

F = B + C = 616.54 ft
MALDTR (AY-101A) = (E – F)*12 in/ft – D/2 – G = 18.67 in.-I=16.67 USE 16 inches
MALDTR (AY-102A) = (E– F)*12 in/ft – D/2 – H = 18.67 in. –I=16.67 USE 16 inches

- For 241-AZ-101 – 102, refer to drawings for the following information:

| Item # | Item | | Drawing | Detail |
|---|---|---|---|---|
| A | Top of DST Tank Foundation EL (ft) | 615.8 | H-2-67317 | TYP Tank Section |
| B | Bottom LDP Baseplate EL (ft) | 609.33 | H-2-67248 | 7 |
| C | LDP Baseplate Thickness (ft) | 0.04 | H-2-67248 | 7 |
| D | Drain Pipe OD (in) | 6.625 | H-2-67248 | 5 |
| E | Centerline Drainpipe EL (ft) | 611.96 | H-2-67248 | 1 |
| F | LDP Bottom Inside EL (ft) | 609.37 | calculated | calculated |
| G | AZ-101 Offset (in) | 2 | H-2-68385 | Section A-A |
| H | AZ-102 Offset (in) | 2 | H-2-68366 | Section B-B |
| I | Time to pump allowance (in) | 2 | See Note Above | |

F = B + C = 609.37 ft
MALDTR (AZ-101) = (E – F)*12 in/ft – D/2 – G = 25.75 in.-I=23.75 USE 23 inches
MALDTR (AZ-102) = (E – F)*12 in/ft – D/2 – H = 25.75 in.-I=23.75 USE 23 inches

- For 241-SY-01C – 02C, refer to drawings for the following information:

| Item # | Item | | Drawing | Detail |
|---|---|---|---|---|
| A | Top of DST Tank Foundation EL (ft) | 616.5 | H-2-37772 | TYP Tank Section |
| B | Bottom LDP Baseplate EL (ft) | 610.02 | H-2-37703 | 7 |
| C | LDP Baseplate Thickness (ft) | 0.04 | H-2-37703 | 7 |
| D | Drain Pipe OD (in) | 6.625 | H-2-37703 | 6 |
| E | Centerline Drainpipe EL (ft) | 612.65 | H-2-37703 | 1 |
| F | LDP Bottom Inside EL (ft) | 610.06 | calculated | calculated |
| G | Offset (in) | 2 | H-2-37787 sht 2 of 2 | II |
| H | Time to pump allowance (in) | 2 | See Note Above | |

F = B + C = 610.06 ft
MALDTR = (E – F)*12 in/ft – D/2 – G = 25.75 in.-H=23.75 USE 23 inches

<u>Structural Limit Dip Tube Reading</u>

The Structural Limit Dip Tube Reading (SLDTR) corresponds to the elevation difference between the inside bottom of the pit and the top of the concrete DST tank foundation. A level exceeding the Structural Limit Dip Tube Reading will create a hydrostatic uplift pressure on the primary and secondary steel tank bottoms.

- For 241-AN-01C – 06C, refer to information provided for Maximum Authorized Dip Tube Reading. The Structural Limit Dip Tube Reading is calculated as:
  SLDTR = (A – F)*12 in/ft - G = 80.22 in.-H=78.22 USE 78 inches

- For 241-AN-07C, refer to information provided for Maximum Authorized Dip Tube Reading. The Structural Limit Dip Tube Reading is calculated as:
  SLDTR = (A – F) *12 in/ft - G = 76.26 in.-H=74.26 USE 74 inches

- For 241-AP-03C, 05C, refer to information provided for Maximum Authorized Dip Tube Reading. The Structural Limit Dip Tube Reading is calculated as:
  SLDTR = (A – D)*12 in/ft - E = 125.75 in.-F=123.75 USE 123 inches

- For 241-AW-01C – 06C, refer to information provided for Maximum Authorized Dip Tube Reading. The Structural Limit Dip Tube Reading is calculated as:
  SLDTR = (A – F)*12 in/ft - G = 76.26 in.-H=74.26 USE 74 inches

- For 241-AY-101A – 102A, refer to information provided for Maximum Authorized Dip Tube Reading. The Structural Limit Dip Tube Reading is calculated as:
  SLDTR (AY-101A) = (A – F)*12 in/ft - G = 68.18 in.-I=66.18 USE 66 inches
  SLDTR (AY-102A) = (A – F)*12 in/ft - H = 68.18 in.-I=66.18 USE 66 inches

- For 241-AZ-101 – 102, refer to information provided for Maximum Authorized Dip Tube Reading. The Structural Limit Dip Tube Reading is calculated as:
  SLDTR (AZ-101) = (A – F)*12 in/ft - G = 75.14 in.-I=73.14 USE 73 inches
  SLDTR (AZ-102) = (A – F)*12 in/ft - H = 75.14 in.-I=73.14 USE 73 inches

- For 241-SY-01C – 03C, refer to information provided for Maximum Authorized Dip Tube Reading. The Structural Limit Dip Tube Reading is calculated as:
  SLDTR = (A – F)*12 in/ft - G = 75.26 in.-H=73.26 USE 73 inches

NOTE: The protocol for pumping a leak detection pit to a DST was established to ensure the proper controls are established for the pumping process. The basis for the protocol was developed to provide an alternative to sampling the LDP in order to provide a high confidence that tank waste has not leaked into the LDP. Details and further technical basis is provided in the Internal Memo WRPS-1301766, June 27, 2013, From D.B. Little to R.E. Wilkinson, "Leak Detection Pit Pumping Protocol."

**Table 1.2.1 Maximum Bulk Specific Gravity:**

The maximum hydrostatic head is one of the parameters used in structural analyses. The maximum allowable load is governed by the application of seismic accelerations, the liquid level in the tank, and the average specific gravity. In an earthquake, a larger hydrostatic head could damage the tank due to the hydrodynamic loading of the waste sloshing in the tank.

The maximum hydrostatic load is equal to the product of the structural liquid level limit and the maximum bulk specific gravity.

- For 241-AP, Section 7.0 of RPP-RPT-32237 concludes that a waste height of 460 in at Maximum Specific Gravity of 1.83 does not reveal structural deficiencies of the DST.

- For 241-AN, AW, and SY the waste Maximum Specific Gravity of 1.7 is based on the values presented in Table 7-4 of RPP-RPT-28967 and conclusions presented in Section 8 of RPP-RPT-28967.

- For 241-AYand AZ, the waste Maximum Specific Gravity of 1.77 is based on the values presented in Table 7-7 of RPP-RPT-28967 and conclusions presented in Section 8 of RPP-RPT-28967.

**Table 1.3.1 Primary Tank Vapor Space Vacuum:**

Primary Tank Vapor Space Vacuum is measured with respect to atmosphere. The primary tank vacuum limits are set to prevent development of high stresses and possible uplifting of the tank bottom or buckling of the primary tank wall. Minimum Primary Tank Vacuum is set to avoid a pressurization event and to maintain confinement.

Maximum Vacuum

- For 241-AP, the primary tank vacuum limit of -8.71 in w.g. is recognized as the governing allowable vacuum in Table 6-2 of RPP-RPT-32237

- For 241-AN, the primary tank vacuum limit is specified in Section II.C.2.d(1) of original design specification, B-130-D1.

- For 241-AW, the primary tank vacuum limit is specified in Section II.C.2.d.(1) of original design specification, B-120-D1.

- For 241-AY, the primary tank vacuum limit is specified in Section 4.0.c.(2) of original design specification, HWS-7789.

- For 241-AZ, the primary tank vacuum limit is specified in Section 5.0.a.(1) of original design specification, HWS-8982.

- For 241-SY, the primary tank vacuum limit is specified in Section 5.a(1) of original design specification, B-101-C1.

**Table 1.3.2 Secondary Tank Annulus Vacuum**

Secondary Tank Annulus Vacuum is with respect to atmosphere. Minimum Annulus Vacuum is set to avoid a pressurization event and to maintain confinement.

Maximum Vacuum

- For 241-AY, Appendix A of HNF-2317 indicates that tank AY-102 is capable of withstanding a vacuum of -20 in. w.g. 241-AY-101, being the same design, is qualitatively capable of the same vacuum.

- For 241-AN, the Technical Evaluation, TE-05-038, indicates that through similarity to 241-AY tanks, 241-AN tanks are also capable of withstanding a vacuum of -20 in w.g.

- For 241-AP, annulus vacuum limits are specified in Section 3.2.3.2 of original design specification, B-340-D1.

- For 241-AW, AZ, and SY tanks, the maximum vacuum remains at -6 in w.g., based on original design specifications. A Technical Evaluation is required to change the maximum vacuum to -20 in w.g.

**Table 1.4.1 Maximum Temperature for Waste, Steel, and Concrete**

Waste temperatures are limited to prevent excessive stress to the primary tank and structural degradation of the concrete shell. High temperatures, rapid temperature cycling and extreme temperature gradients can cause concrete deterioration and cracking.

Maximum Operating Temperatures for Waste and Steel

A maximum temperature limit of 350°F was used in the buckling evaluation in RPP-RPT-28967. Primary tank and secondary liner steel has adequate capacity for structural demands at 350°F for all DST's. However, past analyses have concluded lower operating temperatures are applicable.

- For 241-AN and AW, the 350°F limit agrees with conclusions presented in RPP-RPT-28967

- For 241-AP the 210°F limit is based on technical letters presented in SD-RE-TI-008

- For 241-AY and AZ, the 260°F limit is based on technical letters presented in SD-RE-TI-064 and analyses performed in SD-RE-TI-041

- For 241-SY, the 250°F limit is based on analyses performed in RHO-C-59

Maximum Operating Temperature for Concrete Wall

- For 241-AN and AW, the 236°F limit is based on technical letters presented in SD-RE-TI-008 and analyses performed in RHO-C-60

- For 241-AP the 236°F limit is based on technical letters presented in SD-RE-TI-008

- For 241-AY and AZ, the 350°F limit is based on analyses performed in SD-RE-TI-041

- For 241-SY, the 250°F limit is based on analyses performed in RHO-C-59

Maximum Operating Temperature for Concrete Dome

Dome temperature limits are based on the capacities of the anchorage between the steel tank and concrete structure in the dome region. Thermal structural analyses performed using steady state temperatures revealed lower temperature limits for the dome regions of the DST's.

- For 241-AP, the maximum dome temperature of 135°F is based on conclusions presented in Section 7.6 of RPP-RPT-32237.
- For 241- AN, AW, AY, AZ, and SY, the maximum dome temperatures of 160°F are based on conclusions presented in Section 8.0 of RPP-RPT-28967.

## Table 1.4.2 Temperature Change

Waste and concrete temperature change over time are limited to prevent structural degradation of the concrete. High temperatures, rapid temperature cycling, and extreme temperature gradients can cause concrete deterioration and cracking.

- Specification limits are somewhat based on recommendations from SD-RE-TI-008, a collection of basis letters of DST process specifications.
- The customary basis for the table limits is reproduced here from the previous revision of this document, OSD-T-151-00007, Rev. 2. The actual technical basis for the temperature change specifications is not well defined.

## Table 1.4.3 Minimum Number of Operational Thermocouples for Tanks AY and AZ

The number of operable thermocouples is enough to ensure compliance with the more restrictive temperature limits in aging waste tanks, 241-AY and AZ. The thermocouple requirements are listed in Table 1 of Internal Memo 13314-89-040, *Aging Waste Tank Thermocouple Needs*.

## Table 1.5.1 Waste Chemistry Limits

The concentration limits in Table 1.5.1-1 for all DST waste except 241-AN-102, 241-AN-106, 241-AN-107, 241-AY-101, and 241-AY-102 interstitial liquid are based on past corrosion studies (i.e., SD-WM-TI-150, Technical Basis for Waste Tank Corrosion Specification, and TWRS PP-94-025, Sludge Washing Materials Study: The Behavior of Carbon Steel in a Dilute Waste Environment) and are intended to limit the rate of uniform corrosion to less than or equal to the design basis of the tanks of 1 mil per year (0.001 inches per year) and to minimize the potential for pitting and stress corrosion cracking.

The concentration limits in Table 1.5.1-2 for 241-AN-102, 241-AN-106, 241-AN-107, 241-AY-101, and 241-AY-102 interstitial liquid are based on Expert Panel Oversight Committee for Chemistry Optimization recommendations which are supported by test data. The recommendations for 241-AN-102 and 241-AN-107 are contained in letter 0602740, "Expert Panel Oversight Committee Assessment of the 241-AN-107 and 241-AN-102 Waste Chemistry Corrosion Testing for Double-Shell Tank Waste Chemistry Optimization" (Terry 2006). These recommendations are supported by test data in RPP-RPT-31680, Hanford Tanks 241-AN-107

and 241-AN-102: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking, Recommendations for 241-AY-101 are documented in RPP-ASMT-37653, "Expert Panel Oversight Committee Assessment of RPP-RPT-35923, Hanford Tank AY101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking". These recommendations are supported by test data in RPP-RPT-35923, Hanford Tank AY101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking. Recommendations for 241-AY-102 are documented in RPP-ASMT-35619, "Expert Panel Oversight Committee Assessment of Fiscal Year 2007 Corrosion and Stress Corrosion Cracking Simulant Testing Program and the Impact on Double-Shell Tank 241-AY102." These recommendations are supported by test data in RPP-RPT-33284, Hanford Tanks AY102 and AP101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking. The [NO2–]/[NO3–] limit of ≥ 0.32 does not apply to 241-AY-102, because the interstitial liquid has low concentrations of nitrite and nitrate and the ratio does not satisfy the limit. These tests were also conducted at 77°C (170°F) and showed a low propensity for Stress Corrosion Cracking. There is an offsetting factor in that this interstitial liquid has a high carbonate concentration. In RPP-ASMT-35619, the Expert Panel states that this carbonate based waste does not promote pitting corrosion and the potential range for stress corrosion cracking is so negative that it is not a credible threat in the interstitial liquid of 241-AY-102. An assessment of 241-AN-106 interstitial liquid is made by the Expert Panel in RPP-ASMT-46121, *Corrosion Propensity Assessment for 241-AN-106 Waste*. In RPP-ASMT-46121, the Panel concludes that the 241-AN-106 waste interstitial liquid has a low propensity for corrosion.

## Table 1.5.2 Annulus Tank Ventilation System and Annulus Inspection

The basis for requiring operation of the annulus ventilation is that corrosion is a cumulative phenomenon that is minimized by operating the annulus ventilation system as much as possible to remove moisture and prevent condensation from collecting on the tank walls.

The effectiveness of the annulus ventilation systems was evaluated in RPP-7695, Double-Shell Tank Annulus Ventilation Engineering Study. RPP-7695 concluded that operation of the annulus ventilation systems may significantly reduce the amount of moisture in the annulus and thereby reduce the potential for corrosion.

The video inspection assesses the condition of the outer wall of the primary tank and the secondary tank steel liner and is focused on detecting corrosion caused by condensation or water intrusion into the annulus. Water intrusion into the annulus of a DST (especially if combined with inadequate ventilation) can cause increased corrosion of the outer wall of the primary tank and increased corrosion of the secondary tank steel liner.

The 5 year target frequency will provide adequate time to schedule the visual inspections before the 7 year deadline. This requirement resulted from DOE failure to comply with the M-32 TPA Milestone relating to DST Integrity Assessment (JUN 13, 2000 letter from Ecology to DOE). In response, DOE submitted a plan (M-48-05) to visually inspect the DSTs, "Visual examinations will be completed approximately every five years (not to exceed seven years)…" (APR 30, 2002 letter from DOE to Ecology). This plan was evaluated and commented as acceptable and recommended for continuation in the IQRPE report (RPP-RPT-28538). RPP-16922 recognizes

the IQRPE recommendation in Section 5.5.2 as satisfying TPA Milestone M48-14 and WAC 173-303-640 requirements for an integrity assessment that are necessary to ensure the DST system throughout the RPP mission.

The 30 month target frequency will provide adequate time to schedule the visual inspections before the 3 year deadline. The 3 year frequency was set to increase the likelihood of timely detection of water ingress in the DSTs annuli. Based on 241-AY farm, the ingress detected occurred in multiple tanks in the same farm. Therefore, detection of ingress in a tank in each farm may indicate water ingress for the farm itself.

## Table 1.6.1 Dome Loading Requirements

One of the parameters requiring a control in the field to assure the DSTs are operated within the associated design limits is the load at the surface (i.e., dome loading). The programmatic requirements established in Table 1.6.1 are designed to prevent excessive concentrated loads from being placed on DSTs.

Dome Elevation Survey frequency requirements are established as part of the DST Dome Survey Program in RPP-25782, *DST Dome Survey Program*. Other elements of the Dome Survey Program including review of elevation data, response to exceeding deflection limits, and protection of survey monuments are managed under TFC-ENG-FACSUP-C-10, *Control of Dome Loading and SSC Load Control*. Exceeding the required survey frequency warrants a recovery action plan to be developed as the 4 month grace period provides ample operational flexibility.

## Table 1.7.1 End-State Analysis for Tank Bump

Tank bumps are energetic events that could cause an overpressure in the primary tank headspace. This evaluation protects analysis assumptions leading to the conclusion that a tank bump is not a credible accident. Analysis of tank bump accidents including the criteria presented in Table 1.7.1 are documented in RPP-6213, *Hanford Waste Tank Bump Accident and Consequence Analysis*, and RPP-13438, *Technical Basis for the Tank Bump Accident and Associated Representative Hazardous Conditions*. The requirements in this operating specification document implement the Defense-In-Depth feature 19, End-State Analysis for Tank Bump in DSTs. The requirement of the Defense-In-Depth feature is to verify, prior to waste transfer, that the receiving DST meets one of the criteria. An additional measure of protection is included in the operating specification to review all DSTs against the criteria every two years. This review will address the low likelihood that new characterization information or new assumptions in the gas generation rate evaluation have changed the status of a DST.

The tank bump analysis for DST AN-106 receiving waste from SST C-107 is documented in RPP-46868, *Technical Basis for Temperature Control to Prevent Tank Bumps in 241-AN-106*. Conservative analysis indicates a supernatant temperature of 194 °F (18 °F below saturation) will prevent tank bumps in AN-106 after it receives C-107 waste. Calculations using conservative assumptions show that the time to reach temperature saturation is a minimum of 15 days. The only credible mechanism for reaching a supernatant temperature of 212 °F is an extended

ventilation outage, so active ventilation needs to be restored within 15 days after the supernatant temperature reaches 194 °F. Supernatant temperatures are examined weekly, which means at most a 14 day period between temperature measurements (i.e., weekly is defined as at least once in the period from 00:00 hours on Monday through 23:59 hours on the following Sunday). At a heat up rate of 1.2 °F/day, the hypothetical temperature rise over this 14 day period would be about 17 °F. Therefore, the supernatant temperature limit is set at 177 °F. A recovery plan is necessary if the 241-AN-106 supernatant temperature reaches 177 °F and active ventilation cannot be restored within 15 days.