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**Additional Information**

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# OPERATING SPECIFICATIONS

# FOR THE

# 241-AN, AP, AW, AY, AZ & SY TANK FARMS

J. P. HARRIS

Tank Farm Plant Engineering

OFFICIALLY RELEASED
FD

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## 7.1 INTRODUCTION

Operating specifications are limits and controls imposed upon a process or operation which, if violated, could jeopardize the safety of personnel; and could damage equipment, facilities, the environment, or adversely affect product quality.

The operating specifications in this section cover all processing and storage operations for the 241-AN, AP, AW, and SY Tank Farms. Tanks in 241-AY and AZ (aging-waste operations) are included under these operating specifications, and in OSD-T-151-00017.

The detailed requirements and authority for preparing, reviewing, releasing, and revising operating specifications are covered in GA-3.7, of WHC-CM-5-5, "Operations - General Administration."

Violations of specifications shall be reported immediately to the manager of Tank Farm Operations (TFO) by the responsible supervisor, and to managers of Process Engineering and Quality Engineering by Criticality Engineering and Analysis if a specification dealing with criticality is violated. Actions shall be taken per Accident Prevention Standard (APS #32) and WHC-MRP-5.14 for reporting and documentation.

Sections 7.1 and 7.2 describe the specification limits to be used for the safe and efficient operation of the 241-AN, AP, AW, AY, AZ, and SY underground storage tanks. Equipment directly involved with this section is referenced in the engineering drawing index for each project. The AW Tank Farm Drawing index is found in Drawing H-2-70300, the AN Tank Farm drawing index is found in Drawing H-2-71900, the AP Tank Farm drawing index is found in Drawing H-2-90435, the AY Tank Farm drawing index is found in Drawing H-2-64300, the AZ Tank Farm drawing index is found in Drawing H-2-68400, and the SY Tank Farm drawing index is found in Drawing H-2-37700. The specification limits in this section are set to prevent excessive corrosion and minimize structural stresses that the tanks and associated facilities are subjected to during operation. Also included are limits that restrict gaseous discharges to the environment.

Copies of all basis letters are found in SD-RE-TI-008, SD-WM-TI-047, SD-WM-TI-150, SD-RE-TI-041 and SD-RE-TI-064, which are available from the Engineering Document Control Group. Copies of manuals and other documents referenced as bases are available from Operating Document Control.

<u>NOTE:</u> In some sections no basis letters or retrievable documentation exists, therefore, specification limits for one or more farms not specifically listed is assumed valid. The basis for the specific assumption is developed in the "Basis for Limit" section.

## 7.2 UNDERGROUND STORAGE TANKS SPECIFICATION

### 7.2.1 TANK COMPOSITION

7.2.1.A Normal Operating Temperatures ($T \leq 212°F$)

| Variable | Specification Limit |
|---|---|
| For $NO_3^-$ $\leq 1.0M$: | |
| $OH^-$ | $0.010M \leq OH^- \leq 5.0M$ |
| $NO_2^-$ | $0.011M \leq NO_2^- \leq 5.5M$ |

(for solutions below 167°F, the $OH^-$ limit is 8.0M)

| | |
|---|---|
| For $1.0M < NO_3^- \leq 3.0M$: | |
| $OH^-$ | 0.1 ($NO_3^-$ Concentration) $\leq OH^- < 10M$ |
| $OH^- + NO_2^-$ | $\geq 0.4$ ($NO_3^-$ Concentration) |
| For $NO_3^- > 3.0M$: | |
| $OH^-$ | $0.3M \leq OH^- < 10M$ |
| $OH^- + NO_2^-$ | $\geq 1.2M$ |
| $NO_3^-$ | $\leq 5.5M$ |

7.2.1.B For High Operating Temperatures ($T > 212°F$) - normal operating temperature limits apply with the exception that $OH^-$ concentration must be $< 4M$.

7.2.1.C For the Transportable Grout Facility Feed Tanks (102-AP, 104-AP, and 106-AP) the following applies (with the exception that the solution temperatures are $\leq$ to 122°F:)

| | |
|---|---|
| Hydroxide ($OH^-$) | $0.001M < OH^- < 0.02M$ |
| Nitrite ($NO_2^-$) | $NO_2^- < 0.005M$ |

These composition limits are only valid for Hanford Facility Waste (HFW) phosphate and/or sulfate in the Grout Feed Tanks.

7.2 UNDERGROUND STORAGE TANKS SPECIFICATION (Cont.)

Basis for Limit: See SD-WM-TI-150, "Technical Basis for Waste Tank Corrosion Specification," and SD-RE-TI-008, Pg. 76, "AP Tank Farm Corrosion Specifications," for the TGF Feed Tanks. The nitrite, nitrate, and hydroxide concentrations are limited in order to inhibit uniform corrosion rates and stress corrosion cracking (SCC). If these phenomena are not controlled, deterioration of the primary tank will occur at a faster rate. Failure of these systems may occur under conditions that are out of specifications. The TGF feed tanks require lower limits because they are temporary storage for materials that must meet dangerous waste regulations under Washington Administration code 173-303, these specifications can only apply to HFW phosphate and sulfate wastes.

Detection/Control: The tank contents must comply with the given composition limits. Sampling of the tank contents is performed per FSS-T-080-00001, "Tank Farm Sample Schedule." Tank inputs will be controlled so that the tank contents comply with the composition limits.

Recovery Action: If the tank content concentrations are violated, the shift manager shall contact the manager of TFO and Tank Farm Plant Engineering (TFPE). Recovery actions will include adjusting the concentrations to inhibit uniform corrosion rates and stress corrosion cracking.

7.2.1.D Organic Material

| Variable | Specification Limit |
|---|---|
| d. Organic Material* (except lube oil) | Above 165°F, no separable organic phase |
| | Below 165°F, PUREX separable organic phase allowed |

* These specifications pertain to characterized PUREX waste which may contain tributyl phosphate (TBP) and/or normal paraffin hydrocarbon (NPH) in a separable organic phase. Other separable organic waste streams shall require complete characterization prior to incorporation into the specification.

Basis for Limit: If separable organics are allowed into the underground tanks where tank temperatures are above 165°F, organic vapors or distillates can accumulate in the tanks themselves, or in the overhead system or the condensate collection tank. An organic liquid fire or vapor explosion could result from the accumulations.

7.2.1.D Organic Material (Cont.)

Detection/Control: Sampling or knowledge of feed composition and temperature is required. If organic is introduced or detected in a tank, the temperature shall be maintained below 165°F. This can be assured by not shipping any waste stream which can potentially raise the liquid surface temperature above 165°F.

For 102-AW, if a separable organic phase is detected, the tank liquid level shall be maintained at least 36 in. above the pump suction level (SD-RE-TI-008, Pg. 79) and the temperature will be maintained below 165°F. Administrative controls will be in place which will not allow any PUREX waste to be received into 102-AW when the liquid level is below 36 in. and the evaporator is running.

Recovery Action: If this requirement is violated, all waste transfers to the affected tank shall be immediately terminated. The shift manager shall notify the manager of TFO and TFPE.

7.2.2 LIQUID LEVELS

| | Variable | Tanks | Specification Limit |
|---|---|---|---|
| a. | Primary Tank Liquid Level*** | AN, AP, AW and SY | Max: 422 in.<br>Min: 6 in.** |
| | | AY, AZ | Max: 364 in.<br>Min: 64 in.* |

* When the annulus ventilation system is operating. When the annulus ventilation system is not operating, the absolute minimum liquid level required is that level necessary to meet the hydrostatic head limitation discussed in OSD-T-151-00017 Para. 17.2.1.1.

** The ventilation system shall not be operated unless the liquid level is 6 in. Limiting Condition of Operation (LCO).

*** Liquid level is defined as the surface level irrespective of the amounts of sludge, supernate or solids/crust.

Basis for Limit: See (SD-RE-TI-008 and SD-RE-TI-041) for maximum liquid levels, and HW-39432 and HW-81666 for minimum liquid levels. The liquid level is kept below the maximum to prevent overfilling of the tank and prevent over stressing of the tank due to increased hydrostatic head. A minimum liquid level is set to provide extra protection against any bottom uplifting of the tank's steel liner.

7.2.2 LIQUID LEVELS (Cont.)

Detection/Control: Each tank is provided with an automatic liquid level measuring device. The reading is transmitted to a substation and then to the CASS Control Room in the 2750-E Building. In addition, each tank is provided with a high level alarm probe (which alarms in either 242-A or 242-S Control Rooms and on CASS) that will alarm when the liquid level reaches a certain level: 419 in. for SY, AW, AP, and AN tanks, and 360 in. for AY and AZ tanks. High level alarms for AY and AZ tanks are located in 271-A and on CASS.

A manual liquid level tape/zip cord reading may be taken at each tank as a backup to the automatic liquid level gauge. Like the automatic liquid level gauge, the manual liquid level tape measures liquid level through conductivity.

OSR Recovery Action: If the LCO is violated, the manager of TFO, TFPE and DWS shall be notified. Recovery actions include the addition of water and waste and/or manipulation of the primary exhaust system. If a surveillance requirement is violated, management shall take immediate corrective action to resolve the failure to perform the surveillance requirements.

| | Variable | Tanks | Specification Limit |
|---|---|---|---|
| b. | Leak Detection Pit Liquid Level | AN and AW | ≤66 in. |
| | | AZ and SY | ≤74 in. |
| | | AY | ≤79 in. |
| | | AP | ≤55 in. |
| c. | Encasement Leak Detection Pit Liquid Level | AY & AZ | ≤408 in. |

A level exceeding the specification will allow liquid to back into the drain slots in the structural slab. Flooding of the structural slab could cause a hydrostatic uplift pressure on the primary and secondary steel tank bottoms and therefore cause structural stress to the tank liners. The detection of a radioactive material leak at a liquid level above the specification would take a longer time because the material would not readily drain to the leak detection pit where radiation detection instrumentation is located.

7.2.2 LIQUID LEVELS (Cont.)

Basis for Limit: The leak detection pit liquid level corresponds to the bottom elevation of the drainage slots in the concrete foundation. See (SD-RE-TI-008, Pg. 18) for AW and AN tanks. See (SD-RE-TI-008, Pg. 28) for AY, AZ, and SY tanks. See (SD-RE-TI-008, Pg. 13) for AP Tanks.

In the encasement leak detection pits, a level exceeding the specification will cause liquid to flow into the side-fill transfer line encasements (see drawings H-2-64317, H-2-64428, H-2-67248 and H-2-68366). The detection of a leak of radioactive material could be delayed, since the material will not drain into the leak detection pit where the radiation monitoring equipment is located.

Detection/Control: Dip tubes are used to monitor the liquid level in the leak detection pit. The weight factor transmitter activates an alarm at the respective tank farm's instrument building if the liquid level exceeds a predetermined level. This level is 36 in. for AN, AP, and AW tank farms, 30 in. for AY and AZ tank farms, and 25 in. for SY tank farm.

Recovery Action: Recovery from a liquid level above the specification maximum requires reducing the liquid level by transferring a portion of the waste to a waste storage tank.

7.2.3 HYDROSTATIC HEAD

| Variable | Tanks | Specification Limit |
|---|---|---|
| Maximum Hydrostatic Head at Primary Tank Wall | AN, AP, AW and SY | 717 in. WG (water gauge) |
| | AY and AZ | 744 in. WG |
| Minimum Hydrostatic Head | AY and AZ | 0 in. WG |

Basis for Limit: See SD-RE-TI-008, SD-RE-TI-041 and SD-RE-TI-064 for hydrostatic head specification limits. The maximum hydrostatic head is limited to meet seismic design criteria. In an earthquake, a larger hydrostatic head could damage the tank due to the hydrodynamic loading of the waste sloshing in the vessel. The minimum hydrostatic head is limited to prevent high stress to and possible uplifting of the tank bottom, jeopardizing tank integrity.

For surveillance and audit requirements associated with the minimum specification limit, see SD-HS-SAR-010, OSR 11.4.

Detection/Control: Each tank is provided with an automatic liquid level gauge. Maximum hydrostatic head is obtained by multiplying the liquid level in inches by the waste SpG, and adding the tank vapor space pressure (in units of in. WG). Minimum hydrostatic head is obtained by adding the primary tank vapor space pressure and the liquid level. Stored wastes are sampled periodically per FSS-T-080-00001, and the waste SpG is obtained from the sample analyses. Tank pressure strip charts are maintained by TFPE.

Recovery Action: If this requirement is violated, all transfers to the affected tank shall be terminated. Hydrostatic head above the maximum shall be reduced by transfer of a portion of the stored waste to another tank, and dilution of the remainder to decrease the waste SpG, as necessary. Hydrostatic head below the minimum shall be increased by manipulation of the ventilation system and/or the addition of water or waste. For surveillance and audit requirements associated with the minimum specification limit, see SD-HS-SAR-010, OSR 11.4.

If the LCO requirement is violated, the shift manager shall contact the managers of TFO, TFPE and Safety.

7.2.4 DOME LOADING

| Variable | Tanks | Specification Limit |
|---|---|---|
| a. Soil Cover | AN, AP, AW, AY, AZ | ≤7 ft above tank dome crown* |
| | SY | ≤6.5 ft above tank dome crown |

* A limit of 7.3 ft has been set for 102-AZ.

Basis for Limit: See (SD-RE-TI-008, Pg. 38) for AN and AW tanks. See (SD-RE-TI-008, Pg. 31) for SY tanks, and letter, February 2, 1976, R. C. Roal to D. G. Harlow, "241-AY and 241-AZ Tank Dome Limits," for AY and AZ tanks. It should be noted that although the AY and AZ tanks were originally analyzed for soil cover of 6.5 ft, analyses on tanks of similar design (AW and AN) have shown that additional soil cover of .5 ft will not cause any problems. See (SD-RE-TI-008, Pg. I3) for AP Tanks.

Detection/Control: The tanks are surveyed to confirm the soil depth. A survey is taken before the tanks come on line and after each addition or disruption of soil cover (backfill permit required).

Recovery Action: Soil cover above the specification limit shall be removed as soon as it is discovered. An investigation into the cause of the violation shall be initiated.

| Variable | Specification Limit |
|---|---|
| b. Live Loads | ≤100 lb/ft$^2$ uniform load<br>≤50 tons concentrated load |

Basis for Limit: See (SE-RE-TI-008, Pg. I8) for AW. For the AY and AZ, see OSD-T-151-00017 and SD-RE-TI-041. See (SD-RE-TI-008, Pg. 13) for AP Tanks. These limits apply to AN and SY Tanks for consistency. The limits are set to prevent structural damage to the tank dome.

Detection/Control: Administrative controls will be used to keep live loads within the specification limit. A review will be made prior to each addition of equipment. Loads that are not in the original design of the Tank Farm Facility shall be properly evaluated and approved before placement on or in any part of the tank. The manager of the Waste Management Technology Department shall advise the manager of the Process Engineering Department if a special live load limit need be established for such tanks. Dome load limits shall be posted at the entrance of each tank farm.

7.2 OPERATING SPECIFICATIONS (Cont.)

Recovery Action: Loads in excess of the specification limits shall be removed as soon as they are discovered. An investigation into the cause of the violation shall be initiated.

7.2.5 VAPOR SPACE PRESSURE

Variable

See Table 7.2.5 for control variables.

Basis for Limit: These limits apply to all double shell tanks. Specifications 5.b and 5.c are required to maintain containment (see basis in SD-WM-SAR-016). The primary tank and annulus pressure is limited to prevent structural damage to the tank in the form of buckling or bottom uplift. See additional information on pages 18 and 31 of SD-RE-TI-008.

Detection/Control: Each of the underground storage tanks has a pressure control system that includes a high pressure (low vacuum) and a low pressure (high vacuum) alarm for the primary tank pressure. Alarm points are:

| | | |
|---|---|---|
| High alarm point | -0.25 in wg | all double-shell tanks |
| Low alarm point | -5.0 in wg | 241-AP |
| | -4.0 in wg | 241-AN, 241-AW, 241-SY |
| | -3.0 in wg | 241-AY, 241-AZ |

The HVAC system normally keeps the tanks and their annuli at a slightly negative pressure, which is required for vapor containment.

OSR Recovery Action: If the specification limit for the tank pressure alarm loop is violated, the shift manager shall contact the managers of Tank Farm Operations, Systems Engineering and Nuclear Safety. Such notification shall be utilized to alert tank farm operators to take the appropriate action (such as obtaining local pressure readings) or to take the appropriate precautions (such as evacuating the farm in the event of a pressurization event) until the alarm is operational. The alarm shall be repaired or replaced on a priority basis. If the specification limit for tank pressure duration is violated, the actual conditions involved in the pressurizations shall be evaluated to determine if the dose to personnel located at 100 m is approaching 100 mrem.

| TABLE 7.2.5 VAPOR SPACE PRESSURE | Page 1 | |
|---|---|---|
| a. Primary Tank Pressure (PTP) | | |
| OSD | MAXIMUM: 5.0 IN. WG**<br>MINIMUM: -6.0 IN. WG<br><br>**Structurally the tanks were designed for a maximum pressure of 60 in wg, but for confinement of radioactive material, and operational and safety concerns, a maximum pressure of 5.0 in wg is used. | |
| | PRIMARY INSTRUMENTS:<br>Tank pressure transmitter, recorder, high and low alarm interface to 242-A or 242-S and to CASS. | ALTERNATE INSTRUMENTS:<br>Local tank pressure indicator. |
| b. Tank Pressurization Alarm | | |
| OSR | 11.6 A tank pressure alarm loop (alarm audible in the farm) shall be operable and calibrated. In the event the alarm is not functional, an acceptable alternate is notification of the shift manager by the CASS operator of a tank pressurization event. | |
| OSD | a. A tank pressure alarm, audible in the farm, shall be operable at a set point below 0 in wg.<br>b. The tank high pressure alarm loop shall be calibrated annually not to exceed 13 mo. | |
| | PRIMARY INSTRUMENTS:<br>Tank pressure transmitter, redundant pressure switches and farm evacuation horn. | ALTERNATE INSTRUMENTS:<br>Tank pressure transmitter, recorder, local indicator, high/low pressure alarm interface at 242-S or 242-A and CASS interface with the following exceptions:<br><br>a. If horn is not operable:<br>1. CASS/242S operator notify shift manager if high pressure alarm event occurs.<br><br>b. If pressure alarm switch(es) (all if redundant) not operable:<br>1. Operator observe pressure recorder at least every two hours and notify shift manager if high pressure event has occurred. |

| TABLE 7.2.5 VAPOR SPACE PRESSURE (Cont.) | | Page 2 |
|---|---|---|
| | | c. If pressure transmitter is not operable or if instrument air loss or if recorder and pressure switch(es) not operable:<br>1. Operator observe local pressure indicator at least every two hours and notify shift manager if high pressure is observed (See section c below)<br>d. If recorder is not operable:<br>1. CASS/242S operator notify shift manager if high pressure alarm event occurs.<br>2. Operator observe local pressure indicator at least every two hours and notify shift manager if high pressure is observed. |
| c. Time of tank pressurization | | |
| OSR | 11.6 Tank Farm pressurization (per farm) shall be limited to a cumulative total of 40 h during the most recent 12 month period. | |
| OSD | a. Maximum cumulative total for 12 month period: 40 h (per farm).<br>b. Tank pressures continuously recorded on strip charts and reviewed quarterly. | |
| | PRIMARY INSTRUMENTS:<br>Tank pressure transmitter and recorder. | ALTERNATE INSTRUMENTS:<br>Tank pressure transmitter, pressure alarm switches, local pressure indicator.<br><br>a. If recorder is not operable:<br>1. CASS/242S operator notify shift manager if high pressure alarm event occurs.<br>2. Operator observe local pressure indicator at least every two hours and notify shift manager if high pressure observed. |

| TABLE 7.2.5 VAPOR SPACE PRESSURE (Cont.) | | Page 3 |
|---|---|---|
| | | b. If pressure transmitter failed or if instrument air loss or if recorder and pressure switch(es) not operable:<br>1. Operator observe local pressure indicator at least every two hours and notify shift manager if high pressure observed.<br>2. If no way to continuously verify tank pressure, total elapsed time for non-availability shall be added to the cumulative time for the 12 month period.<br>c. Charts not available:<br>1. Review operating logs and CASS reports for documentation of alarms on/off.<br>2. Review daily data sheets for observed pressure and level changes. |
| c. Annulus Pressure (AP) | | |
| OSD | Annulus Pressure Range: +66 in ≥ (PTP - AP*) ≥ -6 in with AP ≥ -20 in<br><br>*PTP - AP is defined as the Primary Tank Pressure minus the Annulus Pressure where vacuums are given a negative sign. | |
| | PRIMARY INSTRUMENTS:<br>Tank pressure transmitter and recorder, annulus local pressure indicator. | ALTERNATE INSTRUMENTS:<br>Local tank pressure indicator. |

7.2 OPERATING SPECIFICATIONS (Cont.)

Detection/Control: Each of the underground storage tanks has a pressure control system that includes a high and a low pressure alarm (loss of vacuum) for the primary tank pressure. High alarm points are -.25 in. WG for AN, AP, AW, AY, AZ, and SY tanks. Low alarm points are -5.0 in. WG for AP, -4.0 in. WG for AN, AW, and SY, and -3.0 WG for AY and AZ tanks. The HVAC system normally keeps the tanks and their annulus at a slightly negative pressure, which is required for vapor containment.

OSR Recovery Action: If the requirement for the tank pressure alarm loop is violated, the shift manager shall contact the managers of Tank Farm Operations, Tank Farms Plant Engineering, and Safety. Notification to the shift manager of tank pressurization events shall be utilized to alert tank farm operators until the alarm is operational. The alarm shall be installed, repaired, or replaced on a priority basis. If the requirement for tank pressure duration is violated, the actual conditions involved in the pressurizations shall be evaluated to determine if the dose to personnel located at 100 N is approaching 100 mrem.

7.2.6 SOLUTION TEMPERATURES FOR AN, AP, AW, AY, AZ, AND SY TANKS

| Variable | Specification Limit |
|---|---|
| a. Maximum Temperature of Solution in Tanks | For OH >4M<br>212°F at primary tank wall |
| | For OH <4M<br>236° at tank wall |
| In AY and AZ | 260°F at tank wall |
| b. Temperature Changeover Time for Solution in | <125°F: ≤10°F/hr*<br>≥125°F: ≤20°F/day* |

* Average bulk temperature. These temperature constraints are not applicable during initial tank filling (see SD-RE-TI-008, Pg. 54 and 55).

| | |
|---|---|
| c. Temperature Gradients of Solution in Tanks | |
| 1) Solution | ≤55°F/ft |
| 2) Solution/Vapor Interface | ≤55°F/ft |

7.2 OPERATING SPECIFICATIONS (Cont.)

Basis for Limit: See SD-RE-TI-008, Pg. 18 for AW Tanks, Pg. 29 for AN Tanks, Pg. 13 for AP Tanks, and OSD-T-151-00017. 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.

Detection/Control: Thermocouple trees are located in the AP, SY, AW, and AN primary tanks. Liquid, vapor, and solid temperatures can be read in the Tank Farms Instrument Building by use of a potentiometer. Selected thermocouple readouts are located in the 242-A Evaporator for AW and AN tanks, and in the 242-S Evaporator for SY tanks. AP tank temperatures are monitored by the microprocessor in the 271-AP Instrument Building. Tanks AY and AZ also have thermocouple probes (Refer to OSD-T-151-00017). During transfers, tank temperatures are monitored closely to avoid violating the specifications.

Recovery Action: Control of high waste temperatures may involve the manipulation of the ventilation system, and/or addition of dilution.

7.2.7 CONCRETE TEMPERATURE

| Variable | Specification Limit |
|---|---|
| a. Maximum Temperature for AN, AP, AW | 236°F<br>250°F (SY) |
| b. Temperature Change | < 125°F: ≤ 10°F/hr<br>≥ 125°F: ≤ 20°F/day |
| c. Temperature Gradient | ≤ 35°F/ft<br>≤ 18°F/ft (AY & AZ) |

NOTE: The vermiculite insulating concrete, which is considered a castable refractory, is exempt from concrete temperature limits.

Basis for Limit: See SD-RE-TI-008, Pgs. 7 and 78 for AN, AW and AY Tank basis. For AP Tank basis, see SD-RE-TI-008, Pg. 13, and for SY Tank basis, see SD-RE-TI-008, Pg. 31. Concrete temperatures are limited to prevent structural degradation of the concrete. High temperatures, rapid temperature cycling, and extreme temperature gradients can cause concrete deterioration and cracking.

7.2 OPERATING SPECIFICATIONS (Cont.)

Detection/Control: Thermocouples are located as pairs in the concrete dome and walls, and spaced singly in series in the concrete foundation and the insulating concrete, except for AY and AZ (see OSD-T-151-00017). They can be read using a potentiometer in each of the Tank Farm Instrument Buildings.

Recovery Action: Concrete temperatures in violation of the specification limits may be controlled by manipulating the temperature of the stored wastes. Manipulation of the stored waste temperature may involve operation or shutdown of the steam coil in AY and AZ only, addition of dilution, and/or manipulation of the ventilation system.

7.2.8 HEAT CONTENT

| Variable | Specification Limit |
|---|---|
| Maximum Heat Content | 70,000 BTU/hr, for 241-AN, AP and AW<br>40,000 BTU/hr, for 241-SY |

Basis for Limit: See SD-RE-TI-008, Pg. 42 for AN and AW; For AP, see SD-340-FDC-001; for SY see ARH-2930; and for AY and AZ see OSD-T-151-00017.

The heat content of the tank is limited to prevent localized boiling from occurring. The ventilating systems for AN, AP, AW, and SY were not designed for boiling, and internal boiling could cause a release of contamination. The heat content limit for the 241-SY-Farm is based on its design criteria which is more restrictive than the point at which internal boiling occurs. Ventilation systems for AY and AZ farm are designed for boiling; OSD-T-151-00017, defines the limits for AY and AZ.

Detection/Control: Stored wastes are sampled periodically per FSS-T-080-00001. The combination of the radionuclide analyses for the stored wastes and for waste transfers provides the basis for a tank heat balance. Tank heat content may also be estimated from boiling steam generation rate or ventilation system condensate generation rate.

Recovery Action: If this requirement is violated, all waste transfers into the affected tank shall be terminated. Waste heat content in excess of the specification limit shall be reduced by transferring a portion of the waste to another tank. If necessary, waste volume may be maintained by the addition of dilution.

7.2 OPERATING SPECIFICATIONS (Cont.)

7.2.9 PRIMARY TANK LEAK DETECTION FOR AN, AP, AW, AY, AZ, AND SY FARMS

| Variable | Specification Limit |
|---|---|
| Operable Primary Tank Leak Detection Devices | Minimum: one operable Leak Detection device in the annulus of each tank. |

Basis for Limit: Routine assessment of the integrity of the containment is required to comply with U.S. Department of Energy Order 5820.2. Leak detection in the annulus is necessary so that corrective action can be initiated if a primary waste tank develops a leak. Each annulus contains at least one conductivity probe leak detector and one annulus exhaust CAM.

Detection/Control: Leak detection devices include the annulus CAMs and conductivity probe leak detectors. The annulus CAMs and associated alarms are tested monthly, and leak detector and associated alarms are tested quarterly. Records of leak detector functional tests are maintained by Tank Farm Maintenance. Leak detectors are designed to alarm in the failed mode at a manned facility. Radiation Alarm set points are determined by WHC-CM-7-5. The annulus monitoring system is scanned by CASS. Alarms are displayed in the 242-A and 242-S Evaporators. Alarms for AY and AZ are displayed in 271-A.

OSR Recovery Action: If the requirement is violated, the manager of TFO, TFPE, and Safety shall be notified. Transfers shall not occur if leak detection capability cannot be provided and shall be terminated if lost. Recovery action shall include the use of temporary leak detection devices. Restoration of permanent leak detection systems shall be on a priority basis.

7.2.10 TRANSFER LEAK DETECTION

| Variable | Specification Limit |
|---|---|
| Transfer System Leak Detection | Transfer system leak detectors shall be verified as operable (not failed) before a transfer is initiated, or applicable diversion boxes/catch tanks shall be constantly surveyed with portable conductivity probes during the transfer. |

7.2 OPERATING SPECIFICATIONS (Cont.)

Basis for Limit: Immediate detection of liquid which has leaked from primary piping to encasements, pits, or diversion boxes allows corrective action to be taken promptly to minimize the risk of discharge of contaminants to the environment.

Detection/Control: Leak detector alarms and annunciators are tested as per Instrument Calibration Documents. Standard Operating Procedures require verification that the leak detector alarms are not active and that relays are not jumpered out prior to transfers (this is considered part of transfer route verification). Constant surveillance shall be provided if leak detectors are inoperable. Leak detectors are "Fail Safe" in that they are designed to alarm if there is a system failure.

OSR Recovery Action: If the requirement is violated, the manager of TFO, TFPE, and Safety shall be notified. Transfers will be canceled if leak detection capability cannot be provided, and shall be terminated if lost. Recovery action may include the use of temporary leak detection devices. Restoration of a permanent leak detector shall be completed on a priority basis.

7.3 VENTILATION SYSTEM - INTRODUCTION

This section describes the specification limits to be used for safe and efficient operation of the 241-AN, AP, AW, and SY ventilation systems. Equipment directly involved with this section is referenced in engineering drawings which are catalogued under HVAC (Heating, Ventilation, and Air Conditioning) in the drawing index for each tank farm: H-2-70300 for AW farm, H-2-71900 for AN farm, H-2-90514 for AP Farm, and H-2-37700 for SY farm.

The ventilation system for the AW, AN, AP, and SY tank farms consists of "K1" and "K2" subsystems. The "K2" subsystem is used to ventilate the annuli for each tank. The "K1" ventilation subsystem is used to cool the primary tank and to minimize radioactive vapor releases from the primary tank to the atmosphere by keeping a vacuum on the tank. The "K2" ventilation subsystem is used as a means of cooling the storage material and thus keeping the primary and secondary tanks within temperature specification limits. Of prime consideration is regulation of the concrete temperature in each tank.

For AY and AZ tanks, the primary tank vapor space is ventilated by the 702-A system, which is covered in OSD-T-151-00016. The AY and AZ annulus ventilation systems are also covered by that specification.

7.3.1 GENERAL REQUIREMENTS

| Variable | Specification Limit |
|---|---|
| 7.3.1.A HEPA Filters | |
| 1) Pressure Drop Across Filters at Rated Flow | |
| a) Pressure drop across first filter in a series | ≤5.9 in. WG |
| b) Pressure drop across any other filter | ≤4.0 in. WG |
| c) Total pressure drop across filters in a series | ≤5.9 in. WG |

Basis for Limit: See SD-RE-TI-008, Pg. 44 and WHC-CM-7-5 for detailed basis. HEPA filters will fail if the pressure drop across them becomes too great. The specification limits are well below the design limits of 10 in. wg pressure drop.

Detection/Control: Calibrated differential pressure gauges are used for each filter to monitor the pressure drop. The gauges are checked per Standard Operating Procedures (SOPs) TO-060-105 and TO-060-104 for AW Farm, TO-060-101 for AN Farm, TO-060-340, TO-060-341 for AP Farm, TO-060-230, and TO-060-240 for SY Farm. Gauges are read daily. Data sheets are maintained by TFPE.

Recovery Action: If the pressure drop across a filter or across filters in a series should exceed the specification limits, it shall be taken out of service and replaced. If the total pressure drop across a series filter assembly should exceed 10 in. wg, response shall be in accordance with WHC-MRP-5.14.

7.3 VENTILATION SYSTEM - INTRODUCTION (Cont.)

| Variable | | Specification Limit |
|---|---|---|
| 7.3.1.B | Air Inlet Temperature to HEPA Filter | ≤230°F |

Basis for Limit: The manufacturer gives the maximum operating temperature as 250°F. See SD-RE-TI-008, Pg. 44. The 230°F specification limit was chosen to provide an increased safety margin. Excessive temperatures in the air stream will cause weakening of the filter gaskets and lead to filter failure. If a failure occurs, equipment may become contaminated and radionuclides may be released to the atmosphere in quantities above the DCG-Public exposure limits (WHC-WM-7-5).

Detection/Control: Temperature controllers located at the air heaters of the HVAC system provide regulated air temperatures. Temperature indicators are calibrated as stated in PISCES and checked to determine the operating condition of the heater per SOPs TO-060-102 for AN Farm, TO-060-104 and TO-060-105 for AW Farm, TO-060-340 and TO-060-341 for AP Farm, and TO-060-230 and TO-060-240 for SY Farm.

Recovery Action: If these requirements are violated, waste transfers shall be immediately terminated, and the shift manager shall notify the manager of TFO, and TFPE.

If a failure occurs during a normal operation to the primary system, the fans shall be switched over to the standby system.

| Variable | Specification Limit |
|---|---|
| 7.3.1.C Filter Efficiency | |
| 1) Single HEPA Filter System | 99.95% of particles between 0.1 um and 3.0 um, and of average size 0.5 um, are removed per filter. |
| 2) Multiple HEPA Filter System | 99.95% of particles between 0.1 um and 3.0 um, and of average size 0.5 um, are removed per filter. |

Basis for Limit: HEPA filters are to have the removal efficiencies stated above in accordance with RHO-PS-MA-3, procedure 7-GN-46 (Standard for the In-Plant Efficiency Testing of Gaseous Effluent HEPA Filter System) and WHC-CM-7-5. Filters not removing the specified percentage of particles may release radionuclides in excess of DCG-Public Exposure limits (WHC-CM-7-5) and constitute an occupational hazard.

Detection/Control: DOP* testing per RHO-PS-MA-3, procedure 7-GN-46 and WHC-CM-7-5. AP, AW, AN, AY, AZ and SY Farm radiation alarms are activated at the Tank Farm's Instrument Building and the Evaporator if a radionuclide release occurs. The alarm system is interlocked to shut down the HVAC system.

Recovery Action: If a failure occurs during normal operation in any one of the HEPA filters, the HVAC system shall be switched over to the spare bank. If the specification limit is violated, waste transfers shall be immediately terminated, and the shift manager shall notify the manager of TFO, and TFPE.

*Dioctylphthalate

7.3 VENTILATION SYSTEMS (Cont.)

| Variable | | Specification Limit |
|---|---|---|
| 7.3.1.D | Temperature Change Across Air Heater | $\Delta T \geq 5°F$* |

*Except at 241-SY Farm during steam outages or when standby exhauster is operating then $\Delta T = 0°F$.

Basis for Limit: Psychrometric data and SD-RE-TI-008, Pg. 48. The moisture separators in the HVAC system are designed to remove entrained water droplets from the airstream. Therefore, any temperature rise should theoretically prevent moisture from condensing onto the HEPA filter, since the pressure drop across the filter (6 in. $H_2O$) won't change the dew point of the airstream. The main purpose of a minimum temperature rise across the air heater is to lower the relative humidity of the airstream. Materials entrained in the airstream (salts, etc.) will collect on the HEPA filter, absorb moisture from the air, and lead to filter deterioration. Keeping the airstream humidity at an acceptable level will extend filter life and minimize the possibility of filter failure.

Detection/Control: Temperature controllers are located at each heater for providing the correct airstream temperature rise according to the flow rate. Temperature indicators are located before and after the heater. The indicators are calibrated as stated in the applicable PCR or PISCES document and are checked per SOPs TO-060-104 and TO-060-105 for AW Farm, TO-060-101 for AN Farm, TO-060-340 and TO-060-341 for AP Farm, and TO-060-230 and TO-060-240 for SY Farm. The air stream temperature is maintained by a temperature controller. Inlet and outlet heater temperatures are recorded daily for the operating exhauster. Data Sheets are maintained by TFPE.

Recovery Action: If air stream temperatures cannot be maintained within the specification limit, ventilation shall be switched from the operating exhauster to the standby exhauster. If standby exhauster does not exist or does not provide heating capabilities, the filters shall be DOP tested (requalified) or changed when the heater outage exceeds four hours.

7.3 VENTILATION SYSTEMS (Cont.)

| Variable | Specification Limit |
|---|---|
| 7.3.1.E. Gaseous Discharges from Ventilation System | Maximum permissible concentration of radionuclides |
| 1) Annual Average Concentrations* | Not to exceed 1 time the DCG-Public Value of WHC-CM-7-5, Appendix A, at point of release. *(see exceptions) |
| 2) Weekly Average Concentrations* | Not to exceed 10 times the annual average ACV concentration for that stack at point of release.* |
| 3) Instantaneous Concentration | Not to exceed 5,000 times the DCG-Public Value of WHC-CM-7-5, Appendix A, averaged over any four hour period at point of release. |

a. Exceptions

| | |
|---|---|
| Stacks 296-A-17, 296-A-27, 296-A-29 | Not to exceed 10 times the DCG value of Appendix A at point of release.* |

(For other exceptions see compliance plans to WHC-CM-7-5.)

* Except for krypton-85: Not to exceed a combined release of 4 E+06 Ci/yr.

Basis for Limit: The basis for the concentration limits is the Environmental Compliance Manual, WHC-CM-7-5, Part D, Section D5.0, and also DOE Order 5480.1B. The concentration guides are used in evaluating the adequacy of health and environmental protection measures against airborne radioactivity in occupied areas.

7.3 VENTILATION SYSTEMS (Cont.)

7.3.1.E. (Cont.)

Detection/Control: For AW, AN, AP, and SY, the system is as follows: A Radiation Analyzer (RAN) and Effluent Record Sampler samples the air contained in the K1 and K2 Exhaust Stacks. One RAN and one Record Sampler are provided for each stack. Each of the annulus exhaust ducts is provided with an individual RAN, which will provide early warning in the event of contamination of the annulus. Both the RAN unit and the Record Sampler collect particulate samples on filter paper. The sample is then analyzed to determine conformance with DCG-Public limits (Environmental Compliance Manual, WHC-CM-7-5).

Control of the HVAC System is covered by SOPs TO-060-104 and TO-060-105 for AW Farm, TO-060-101 for AN Farm, TO-060-340 and TP-060-341 for AP Farm, and TO-060-230 and TO-060-240 for SY Farm.

Recovery Action: If the specification limits are violated, the shift manager shall notify the managers of TFO, TFPE and WMHP. Required monitoring and sampling shall be promptly re-established. Response to unplanned releases shall be according to WHC-ERM-001 and RHO-MA-111.

7.3.2 PRIMARY TANK VENTILATION (FOR AW, AN, AP, SY FARMS)

| Variable | Specification Limit |
|---|---|
| a. Active Ventilation | In the event that active ventilation cannot be maintained, operations in the affected tank farm shall be curtailed. |

Basis for Limit: Under normal operating conditions, active ventilation will be maintained for double-shell tanks. Active ventilation prevents tank vapors from escaping the tanks, and thereby releasing radionuclides to the atmosphere in excess of DCG-Public Exposure limits. Vapor releases may be caused by radiolytic heat converting water to steam, by displacement of air due to waste transfers, by natural breathing of the tank due to changes in atmospheric pressure, and by natural convection currents due to thermal gradients.

7.3.2 PRIMARY TANK VENTILATION (FOR AW, AN, AP, SY FARMS) (Cont.)

Detection/Control: If the ventilation system is shut down, annunciators will activate in those particular Instrument Buildings or Evaporator. Pressure alarms also activate in 2750-E on CASS. Data Sheets and Strip Charts are maintained by TFPE.

Recovery Action: If active ventilation cannot be immediately restored, all necessary steps as determined by Nuclear Safety and TFPE, will be taken to minimize effects, and operations in the specific farm will be curtailed. All efforts to restore ventilation shall be completed on a priority basis.

## SPECIFICATION BASIS DOCUMENTS


1. WHC-CM-4-3, Industrial Safety Manual, Westinghouse Hanford Company, Richland, Washington (October 1988).

2. WHC-CM-5-5, Operations - General Administration, Westinghouse Hanford Company, Richland, Washington (September 1988).

3. SD-RE-TI-008, Compilation of Basis Letters Referenced in 241-AN, AP, AW, AY, AZ, and SY Operating Specifications, Rockwell Hanford Operations, Richland, Washington.

4. T.G. Hanson, Compilation of Basis Letters Referenced in OSD-T-151-00017, SD-RE-TI-064, Rockwell Hanford Operations, Richland, Washington (December 1986).

5. J. H. L. Lawler, References to SD-WM-TI-050, SD-WM-TI-053, Rockwell Hanford Operations, Richland, Washington (December 1982).

6. DOE-RL, Radioactive Waste Management, DOE-RL Order 5820.2, U.S. Department of Energy, Richland Operations, Richland, Washington (July 1979).

7. D. J. Squires, Aging Waste Facility Safety Analysis Report, SD-HS-SAR-010, Rockwell Hanford Operations, Richland, Washington (February 1987).

8. F. R. Vollert, Thermal Creep and Ultimate Load Analyses of the 241-AY/AZ Reinforced Concrete Underground Waste Storage Tank, SD-RE-TI-041, Rockwell Hanford Operations, Richland, Washington (September 1982).

9. R. S. Pavlina, Tank Farm Sample Schedule, FSS-T-080-00001, Rockwell Hanford Operations, Richland, Washington (May 1986).

10. C. DeFigh-Price, Bibliography of Documents Related to Waste Tank Integrity, SD-WM-TI-015, Rockwell Hanford Operations, Richland, Washington (July 1982).

11. J. H. L. Lawler, Direct Neutralization Parameters for PUREX High-Level Wastes, SD-WM-TI-050, Rockwell Hanford Operations, Richland, Washington (November 1982).

12. N. W. Kirch, Technical Basis for Waste Tank Corrosion Specifications, SD-WM-TI-150, Rockwell Hanford Operations, Richland, Washington (August 1984).

13. WHC-CM-5-7, Tank Farm Surveillance & Operations Manual, Westinghouse Hanford Company, Richland, Washington (September 1988).

APPENDIX

## SAFETY BASED - SPECIFICATION TRACEABILITY MATRIX

| Source | Specification | Operating Procedure | Record of Documentation |
|---|---|---|---|
| SD-WM-TI-150<br>SD-RE-TI-008 | 7.2.1: Tank Composition | TO-080-030 | Sample Analysis |
| (FSS-T-080-00001) | 7.2.1: Organic Material | RHO-HS-SF-001 | Sample Analysis |
| 11.5 OSR: Primary Vessel Hydrostatic Head.<br>(SD-WM-SAR-016) | 7.2.2:Liquid Levels;Primary Tank Liquid Levels | TO-040-020<br>TO-040-180<br>TO-040-200 | Tank Farm Liquid Level Data Sheets And Tank Farm Pressure Strip Charts |
| SD-RE-TI-008<br>SD-RE-TI-041<br>HW-39432<br>HW-81666 | | TO-060-340<br><br>TO-060-104<br>TO-060-230 | |
| SD-RE-TI-008<br>SD-RE-TI-041<br>SD-RE-TI-064<br><br>(OSD-T-151-00017)<br><br><br><br><br><br>(FSS-T-080-00001) | 7.2.3:Hydrostatic Head | FSS-T-080-00001<br>TO-040-020<br>TO-040-180<br>TO-040-200<br>TO-060-100<br>TO-060-101<br>TO-060-104<br>TO-060-230<br>TO-060-340<br>TO-080-030 | Data Sheets; Sample Analyses; Tank Farm Pressure Strip Charts |
| SD-RE-TI-008<br>SD-RE-TI-041 | 7.2.4:Dome Loading | None | None |
| | Live Loads | TO-020-250<br>TO-020-270 | |

SAFETY BASED - SPECIFICATION TRACEABILITY MATRIX (Cont.)

| Source | Specification | Operating Procedure | Record of Documentation |
|---|---|---|---|
| 11.6 OSR:Tank Pressurization (SD-WM-SAR-016)<br><br>SD-RE-TI-008<br>OSD-T-151-00017 | 7.2.5 Tank Pressurization; Vapor Space Pressure | TO-040-020<br><br>TO-060-331<br>TO-200-400 | Pressure Strip Charts<br>Preventative maintenance record form |
| SD-RE-TI-008<br>SD-RE-TI-041 | 7.2.6:Primary Tank Temperatures | TO-200-463<br>TO-040-660<br>TO-040-680 | Tank Temperature Data Sheets |
| SD-RE-TI-041<br>SD-RE-TI-008 | 7.2.7:Concrete Temperature | TO-040-660 | Data Sheets |
| SD-RE-TI-008<br>SD-RE-TI-047 | 7.2.8:Heat Content | FSS-T-080-00001<br>TO-080-030 | Sample Analyses |
| 11.4 OSR:Primary Tank Leak Detection (SD-WM-SAR-016)<br>RHO-CD-253<br>RHO-CD-213<br>SD-RE-TI-008 | 7.2.9:Leak Detection - | TO-020-210<br>TO-020-190<br>TO-060-120<br>TO-060-140<br>TO-040-590<br>TO-200-400 | Tank Farm - Liquid Level Data Sheets |
| 11.7 OSR:Waste Transfer System Leak Detection (SD-WM-SAR-016)<br><br>RHO-CD-213 | 7.2.10:Leak Detection; Transfer Leak Detection | TO-025-001<br>TO-140-010 | Waste Tank Transfer Data Sheets |

SAFETY BASED - SPECIFICATION TRACEABILITY MATRIX (Cont.)

| Source | Specification | Operating Procedure | Record of Documentation |
|---|---|---|---|
| WHC-CM-7-5<br><br>SD-RE-TI-008 | 7.3.1:HEPA Filters<br>(a)Pressure Drop Across HEPA Filters | TO-060-101<br>TO-060-104<br>TO-060-105<br>TO-060-230<br>TO-060-240<br>TO-060-340<br>TO-060-341 | Procedure Data Sheets |
| | (b)Air Inlet Temperature to HEPA Filter | | |
| RHO-PS-MA-3,<br>7-GN-46 | (c)Filter Efficiency | | |
| | (d)Temperature Change Across Air Heater | | |
| WHC-CM-7-5, Part D<br>DOE Order 5480.1B | (e)Gaseous Discharges from Ventilation System | | |
| WHC-CM-7-5 | 7.3.2:Primary Tank Ventilation | TO-060-104<br>TO-060-340 | Procedure Data Sheets |

## LIST OF OPERATING PROCEDURES BY NUMBER & DESCRIPTION

| | NUMBER | DESCRIPTION |
|---|---|---|
| 1. | TO-040-020 | CASS Terminals |
| 2. | TO-020-190 | East Area Leak Detection Alarm System |
| 3. | TO-020-210 | West Area Leak Detection Alarm System |
| 4. | TO-040-180 | Operation of Auto. Liquid Level & Intrusion Gauges @ East & West Tank Farms |
| 5. | TO-040-200 | Manual Measurement of Liquid Level in Underground Waste Storage Tanks & Disposal Cribs |
| 6. | TO-040-590 | Leak Detection Wells & Annulus Leak Detection Systems |
| 7. | TO-040-660 | 241-A, AN, AP, AW, AX, AY & AZ Temperature Monitoring |
| 8. | TO-040-680 | 241-SY Temperature Monitoring |
| 9. | TO-060-070 | General Procedure for Changing Filters & Deentrainers in Tank Farm Exhausters |
| 10. | TO-060-101 | 241-AN Vessel Vent & Annulus Vent Systems |
| 11. | TO-060-104 | 241-AW Primary Tank Ventilation System |
| 12. | TO-060-105 | 241-AW Annulus Ventilation System |
| 13. | TO-060-120 | Operate AY Annulus Ventilation System |
| 14. | TO-060-130 | Placing the AY/AZ Tank Annuli on the 702-A Vent System |
| 15. | TO-060-140 | Operate 241-AZ Annulus Ventilation System |
| 16. | TO-060-150 | Operate Vessel Vent System |
| 17. | TO-025-001 | Tank Farm Transfer Procedure - General |
| 18. | TO-140-010 | Leak Checking Waste Transfer Lines |
| 19. | TO-200-463 | 241-AY and 241-AZ Temperature Monitoring |
| 20. | TO-010-001 | Tank Temperature Data Sheets |
| 21. | TO-060-340 | 241-AP Primary Ventilation System |
| 22. | TO-060-230 | 241-SY Primary Tank Ventilation System |
| 23. | TO-060-240 | 241-SY Annulus Ventilation System |
| 24. | TO-080-030 | Below Liquid Surface Supernatant Sampling Procedure for Underground Storage and Catch Tanks |
| 25. | TO-020-250 | In Farm Installation of New or Modified Large Equipment Items |
| 26. | TO-020-270 | Equipment Removal or Installation at Diversion Boxes or Pits |