

ENGINEERING CHANGE NOTICE

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(5/10/98 7/25/98)

Proj. ECN

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13a. Description of Change  
Modified the training section, reduced the number of operators.

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

14a. Justification (mark one)

Criteria Change [X]	Design Improvement [ ]	Environmental [ ]	Facility Deactivation [ ]
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14b. Justification Details  
Reevaluated the minimum number of operators to operate the WRSS. The results of the reevaluation are shown on the attached pages of this ECN.

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# W-320 Waste Retrieval Sluicing System Operational Start Up Plan

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Numatec Hanford Co., Richland, WA 99352  
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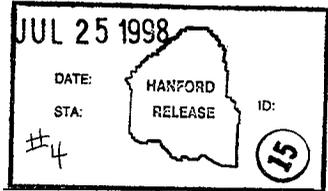
Abstract: Start up plan for project W-320.

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*R. R. Bevins*  
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7/25/98  
Date



Approved for Public Release



**W-320 WASTE RETRIEVAL SLUICING SYSTEM  
OPERATIONAL START UP PLAN  
JULY 1998**

Authors:

R. R. Bevins & G. N. Hanson

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## W-320 OPERATIONAL START UP PLAN

### 1.0 PURPOSE

This plan details the sequence of activities and identifies the organizational roles and responsibilities to ensure a safe start up of the Waste Retrieval Sluicing System (WRSS).

### 2.0 SCOPE

This start up plan identifies the activities necessary to perform initial start up of the WRSS and operational testing of the 296-C-006 ventilation system. The activities discussed in this plan will occur following the Department of Energy, Richland Operations Office (RL) Operational Readiness Review (ORR) and approval of Key Decision 4, Approval to Operate.

This start up plan identifies the activities which must be performed during the initial startup as well as the document which directs each step. This startup plan does not authorize or direct any specific field activities or authorize a change of configuration. As such, this plan does not require a USQ screening.

### 3.0 DESCRIPTION OF FACILITY

#### 3.1 SITE

Project W-320 activities are being conducted at the Hanford Site. Tanks 241-C-106 and 241-AY-102 are located in the 200 East Area of the Hanford Site. Tank 241-C-106 is a 2,000 m<sup>3</sup> (530,000 gal) capacity Single Shell Tank (SST) located in the C-Tank Farm. Tank 241-AY-102 is a 3,790 m<sup>3</sup> (1,000,000 gal) capacity Double Shell Tank (DST) located in the AY-Tank Farm.

#### 3.2 SLUICING PROJECT (W-320) BACKGROUND

Between mid-1963 and mid-1969, Tank 241-C-106 received approximately 500 m<sup>3</sup> (132,000 gal) of high-heat waste, including neutralized Plutonium-Uranium Extraction (PUREX) plant high-level waste and strontium-bearing solids from the strontium and cesium recovery program. A ventilation system is installed to cool the tank. In addition, approximately 23 m<sup>3</sup> (6,000 gal) of cooling water is added monthly to prevent overheating. Tank 241-C-106 was withdrawn from active service in 1979 and it is presently categorized as sound (i.e., not known to be leaking).

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The waste contained in Tank 241-C-106 consists of 746 m<sup>3</sup> (197,000 gal) of sludge and is stratified into two layers. The top layer consists of 655 m<sup>3</sup> (173,000 gal) of soft sludge containing a sufficient amount of strontium-90 which generates heat (high-heat layer). The bottom layer consists of 91 m<sup>3</sup> (24,000 gal) of hardened material from the dissolution of aluminum fuel cladding. A water cover is maintained over the solids to facilitate evaporative cooling.

The postulated safety hazard for high-heat Tank 241-C-106 involves the potential release of high-level nuclear waste because of overheating and degradation/failure of the tank-reinforced concrete structure. If the 23 m<sup>3</sup> (6,000 gal)/month cooling water additions were stopped, the tank waste would dry out, sludge temperatures could exceed established limits, and structural damage to the tank could occur. Should the tank start to leak, continuation of the water additions required to cool the waste could result in increased leakage to the soil column.

Project W-320 is intended to mobilize and remove the heat-generating sludge from Tank 241-C-106. Removing a portion of the heat-generating sludge may allow cooling water additions to cease. Without this remediation action, it is anticipated that this SST will require cooling water additions until calendar year 2045, when the heat generation rate of the sludge is expected to decline sufficiently to negate the need for cooling water additions. Tank-to-tank sluicing, an existing technology, will provide the earliest possible waste transfer and closure of the safety issue (high-heat load). The removal of soft sludge and cessation of cooling water additions will place Tank 241-C-106 in a safe, interim stabilized state.

Public Law 101-510, Section 3137 (Wyden Amendment), passed in November 1990, directs the Secretary of Energy to resolve and report to Congress all safety issues concerning waste tanks at the Hanford Site. Waste tanks with a serious potential for release of high-level nuclear waste must have action plans for resolution of safety concerns. In response to the Wyden Amendment, *A Plan to Implement Waste Tank Safety Issues at the Hanford Site* (Wilson 1993) was submitted to the U.S. Department of Energy, Richland Operations Office (RL) as part of the report to Congress. The high-heat waste stored in Tank 241-C-106 was identified as the fourth Priority 1 safety issue in the report to Congress.

#### 4.0 RESPONSIBILITIES

##### 4.1 SHIFT MANAGER:

The shift manager will interface with the WRSS Operating Engineer (OE) and perform the Building Emergency Director functions defined in HNF-IP-1178, *Tank Farms Event Response Manual*.

##### 4.2 WRSS OPERATING ENGINEER:

An Operating Engineer (OE) qualified on the WRSS will be assigned and will be present in the 200 East area at all times during the sluicing system operation. The OE is designated the WRSS OE and is responsible for all WRSS plant operations as well as providing technical direction of WRSS Nuclear Chemical Operators (NCO) and Stationary Operating Engineers (SOE) when they are operating the WRSS. The WRSS OE reports to the shift manager and will normally be stationed in MO-211 except when he determines his presence is required elsewhere.

##### 4.3 TECHNICAL REVIEW GROUP:

The Tank 241-C-106 Waste Retrieval Technical Review Group (TRG) is chartered to provide centralized responsibility for review of all monitoring data and analysis issues associated with operation of the Tank 241-C-106 Waste Retrieval Sluicing System. The TRG also interprets the requirements, prepares documentation, and coordinates approvals specified in the safety assessment for Project W-320.

The TRG is responsible for assisting the DST Operations Manager in making decisions concerning 241-C-106 and 241-AY-102 waste behavior and other matters relating to the safe operation.

##### 4.4 JOINT TEST REVIEW GROUP:

The Joint Test Review Group (JTRG) performs an oversight role. The group reviews selected Tank Farms tests to ensure compliance with applicable procedure requirements and ensures the tests meet the test objectives. The Joint Test Review Group, consists of; Chief Test Director, Operations Test Director, W-320 Project Manager, DST Engineering Manager and the Design Authority.

The JTRG will review Operational Test Procedure, OTP-320-011 *OPERATE WRSS 296-C-006 HVAC SYSTEM* prior to execution of the test

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and will then review the results of the OTP to confirm the test objectives were met. Following the acceptance of the test results by the JTRG the 296-C-006 system will be considered fully operational and will be operated as needed to support WRSS using operating procedure TO-320-009 *OPERATE WRSS 296-C-006 HVAC SYSTEM*.

4.5 SENIOR MANAGEMENT WATCH:

Operation of the WRSS is considered a high hazard activity, as such, TWRS Operations will conduct a "Senior Management Watch". The Senior Management Watch is described in HNF-IP-0842 (0842a). The Senior Management Watch Team will consist of Mr. T. (Tom) J. Kelley and Mr. G. (Greg) N. Hanson both from Lockheed Martin Hanford Company (LMHC).

4.6 GENERAL:

The remaining operational individual roles and responsibilities are defined in each operating procedure. The start up team will comply with the roles and responsibilities as defined in each procedure.

5.0 WRSS START UP

A schedule of start up activities is contained in section 8.0 of this document. The schedule dates included in this plan are current best estimate dates for starting and completing activities. The actual start and complete dates are expected to vary slightly from the dates shown in this plan. The Project W-320 maintains a schedule that is updated weekly. The Project schedule contains these activities and is the appropriate source for current status of these items.

5.1 OVERVIEW OF START UP SEQUENCE

Following the successful completion of the W-320 Operational Readiness Review and DOE-RL authorization of hot operations (KD-4) of the WRSS, several activities must be completed prior to actual sludge removal from Tank 241-C-106. These activities are described in sections 5.2 through 5.5 of this document and include 1) removal of the blank isolating the 296-C-006 ventilation system from Tank 241-C-106, 2) performing Operational Test OTP-320-011 on the 296-C-006 ventilation system, 3) completing the tasks described in Section 3.2 of the Process Control Plan (PCP) and Section 4.3 of Operating Procedure TO-320-005, "Waste Retrieval Sluicing System Startup and Process Control", and 4) Initiating

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start up of the WRSS using Tank Farm Procedure TO-320-005 *WASTE RETRIEVAL SLUICING SYSTEM STARTUP AND PROCESS CONTROL* and TO-320-006 *TK-241-C-106 WASTE RETRIEVAL SLUICING SYSTEM SLUICING OPERATIONS*.

5.2 POST KD-4 CONSTRUCTION

There is one post KD-4 construction activity, the removal of pancake blanks isolating the 296-C-006 ventilation system from Tank 241-C-106. The 296-C-006 ventilation system is connected to Tank 241-C-106, however pancake blanks were inserted between duct flanges to isolate the tank from the ventilation system. Prior to commencing operation of the system the blanks must be removed. After the blanks are removed the system will be run for a period of time so baseline data can be obtained on the system before sluicing begins. After completion of the run-in test, OTP-320-011, the last remaining FDNW construction work package will be closed.

5.3 296-C-006 VENTILATION SYSTEM TESTING

All pre-KD-4 testing will be completed prior to the completion of the Operational Readiness Review. The tests are described in the Project Test Plan, HNF-SD-W320-TP-001, Revision 1 (Bellomy 1998). The tests will be successfully completed and the results will be released as test reports. Pre KD-4 testing does not include the movement of any radioactive material by the pumps nor does it include operation of the 296-C-006 ventilation system while connected to tank 241-C-106.

Successful completion of the ORR and permission to Operate (KD-4) are required before the 296-C-006 ventilation system can be operated connected to Tank 241-C-106. Once permission to operate is granted the 296-C-006 ventilation system will be connected to the tank and OTP-320-011 will be performed on the ventilation system.

The objectives of OTP-320-011 are to test or demonstrate: a) the ventilation system will control tank pressure, b) the system flow and vacuum controls operate as designed, c) the heating and cooling functions operate as designed, d) the dehumidifying feature of the recirculation loop functions properly, e) the CAM interlock shuts down the fans (recirculation and exhaust), f) the CAM alarms on lost of power. A portion of the OTP-320-011 will include final tuning of the Tank 241-C-106 Pressure control loop. Additionally, the OTP will provide the Operators and Operating

Engineers with valuable experience before actual sludge removal begins.

Prior to operating the 296-C-006 ventilation system, radiation surveys of the 241-C-106 pits will be made to establish a baseline. After startup of the ventilation system a second survey of the pits and an initial survey of the 241-C-91 Process Building and the 296-C-006 exhauster will be made to ensure the radiation levels have not changed to unacceptable values, reference FDC, Appendix E. Again, after the system has operated for four hours, a third pit and ventilation system survey will be performed. The surveys will be looking for any fugitive emissions as a result of the 296-C-006 startup.

The OTP will operate the ventilation system for about five days to gather baseline operational data before sludge removal begins. System baseline data and system performance information will be recorded in the OTP. Coincidental with the OTP will be the first Volatile Organic Compound (VOC) measurement. The Notice Of Construction (NOC) requires three VOC measurements, one before sluicing begins, one during sluicing and a third when sluicing of tank 241-C-106 is completed. The VOC measurements will be made using procedure 6-VT-162 "*Organic Vapor Sampling for Tank Farm Exhaust Stacks*".

Following successful completion of the OTP, the ventilation system will be left operating and will be run using TO-320-009 "Operate WRSS 296-C-006 HVAC System".

#### 5.4 SYSTEM INITIAL CONDITIONS

The initial conditions to start sluicing shall be as described in section 4.1 "*Sluicing Process Control*" of the Process Control Plan (Carothers). Section 4.1 of the Process Control Plan (PCP) describes the equipment positions and tank conditions. The same conditions are described in section 4.3 of TO-320-005, "*Waste Retrieval Sluicing System Startup and Process Control*".

Prior to start up, all instrument calibrations will be complete and the following Functional Test Procedures will have been executed within the TSR completion time.

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- TF-FT-049-001, *Perform C-106 TMACS Functional Test Procedure*
- TF-FT-049-003, *Perform ENRAF Functional Test*
- TF-FT-259-007, *Perform Functional Test for AY Farm Transfer Leak Detectors*
- TF-FT-259-008, *Perform Aging Waste Tanks 241-AY/AZ Annulus Leak Detection Functional Test*
- TF-FT-259-016, *Perform AY/AZ Aging Waste Facility Annulus CAM Detection Functional Test*
- TF-FT-269-008, *Perform Aging Waste Tanks 241-AY/AZ 702-AZ Primary Exhaust Stack Monitor Functional Test*
- TF-FT-269-009, *Perform Aging Waste Facility 702-AZ-HEME Radiation Probe and Associated Alarms Functional Test*
- TF-FT-359-008, *Perform Single Shell Tanks C-105/106 Exhaust Stack Radiation Monitor Functional Test*
- TF-FT-359-009, *Perform Functional Test for C Farm Transfer Leak Detectors*
- TF-FT-359-010, *Perform Functional Test for 241-C-106 Ventilation Exhaust Stack 296-C-006*

5.5 START UP/SHUTDOWN OPERATING PROCEDURES

Operating Procedure T0-320-005 *Waste Retrieval Sluicing System Startup and Process Control* provides the direction for the initial start up and subsequent batch transfers from Tank 241-C-106 to Tank 241-AY-102. The procedure also contains the activities to be performed during short and long term shutdown. The procedure describes the activities to be completed prior to commencement of the sluicing process. Sluicing Operations will commence with the start of OTP-320-011.

The prerequisites will be verified by TWRS Process Engineering prior to the first batch transfer. If the supernatant temperature differential calculated in T0-320-005, step 5.2.1 is greater than 11° C (20° F) then a supernatant temperature adjustment transfer between 241-AY-102 and 241-C-106 must be made.

The "Temperature Equalization" activity will use the sluice pumping system P-0621/P-0622 to transfer supernate from tank 241-

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AY-102 to tank 241-C-106. During this operation the sluicer will be operated in the semi-automatic mode to sweep supernatant liquid into tank 241-C-106. When the supernatant is mixed the slurry pump system P-1361/P-1362 will transfer an equivalent amount of tank 241-C-106 supernatant back to tank 241-AY-102.

The "Temperature Equalization" activity will demonstrate the slurry and supernate pump operation, will verify supernate and slurry flow measuring instruments and will verify the slurry pump level interlocks. The activity will give the WRSS OEs and Operators experience with both pumping systems and sluicer operation prior to sludge transfer.

Procedure TO-320-009 *Operate WRSS 296-C-006 HVAC System* provides the direction for operation of the 296-C-006 ventilation system. The "Temperature Equalization" activity will generate both airborne moisture and radiation aerosols for hot testing of the 296-C-006 ventilation system prior to sludge transfer.

## 6.0 STAFFING AND TRAINING

### 6.1 STAFFING

The current staffing plan will require four Sluicing Qualified Nuclear Chemical Operators (NCOs) and one Sluicing Qualified Operations Engineer (OE) to operate the WRSS. One Operator will be stationed in the MO-211 Operating Station to control and operate the 241-C Farm Sluicing activity and one Operator will be stationed in the 241-AY-51 Operating Station to control and operate the 241-AY Farm Supernate activity. While sluicing activities are in progress, the MO-211 and 241-AY-51 Operating Stations will be "manned" continuously. The two remaining Operators will provide alarm response, data acquisition, and lunch relief for 241-C and 241-AY Tank Farms.

In addition, support will be required by Stationary Operating Engineers (SOEs), Maintenance personnel, Radiological Control Technicians (RCT) and Process Engineering (PE). The SOEs will operate the air and water supply systems. The Maintenance personnel will perform corrective and preventative maintenance activities on the WRSS equipment. TWRS will have a minimum of two HPTs trained on procedures for emergency response and routine surveillances associated with WRSS on each shift. This will ensure that at least one HPT will be available to support the 12 hour WRSS operating shifts. The Process Engineers (PEs) will provide data review and set point modifications.

## 6.2 TRAINING

A minimum of four operators and two Operations Engineers will maintain WRSS qualifications. This is based on the Process Control Plan (Carothers) which states that "a maximum of 12 hours will be allotted for any single sluicing period." These six people will be qualified in the operation of the 106-C Chiller, 296-C-006 Exhauster, and Sluicing Systems. Overtime will be utilized to fulfill the necessary complement of qualified personnel during the second shift of sluicing.

Training of personnel is described in the Waste Retrieval Sluicing System Training Plan (Natal 1998). The document identifies the job responsibilities for each major tank farm job function and the training provided to support operations of the WRSS.

## 7.0 ALARA PLAN

Prior to startup of the WRSS, the overall startup operation will be reviewed by the facility ALARA Committee per HNF-IP-0842 (0842b). The startup Plan (HNF-2955) and the main operating procedures (TO-320-005 and TO-320-006) will be presented to and reviewed by the ALARA Committee.

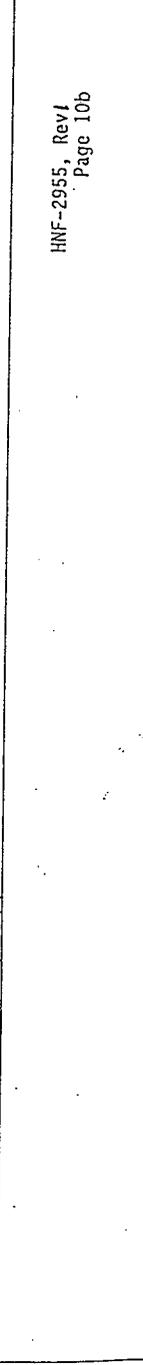
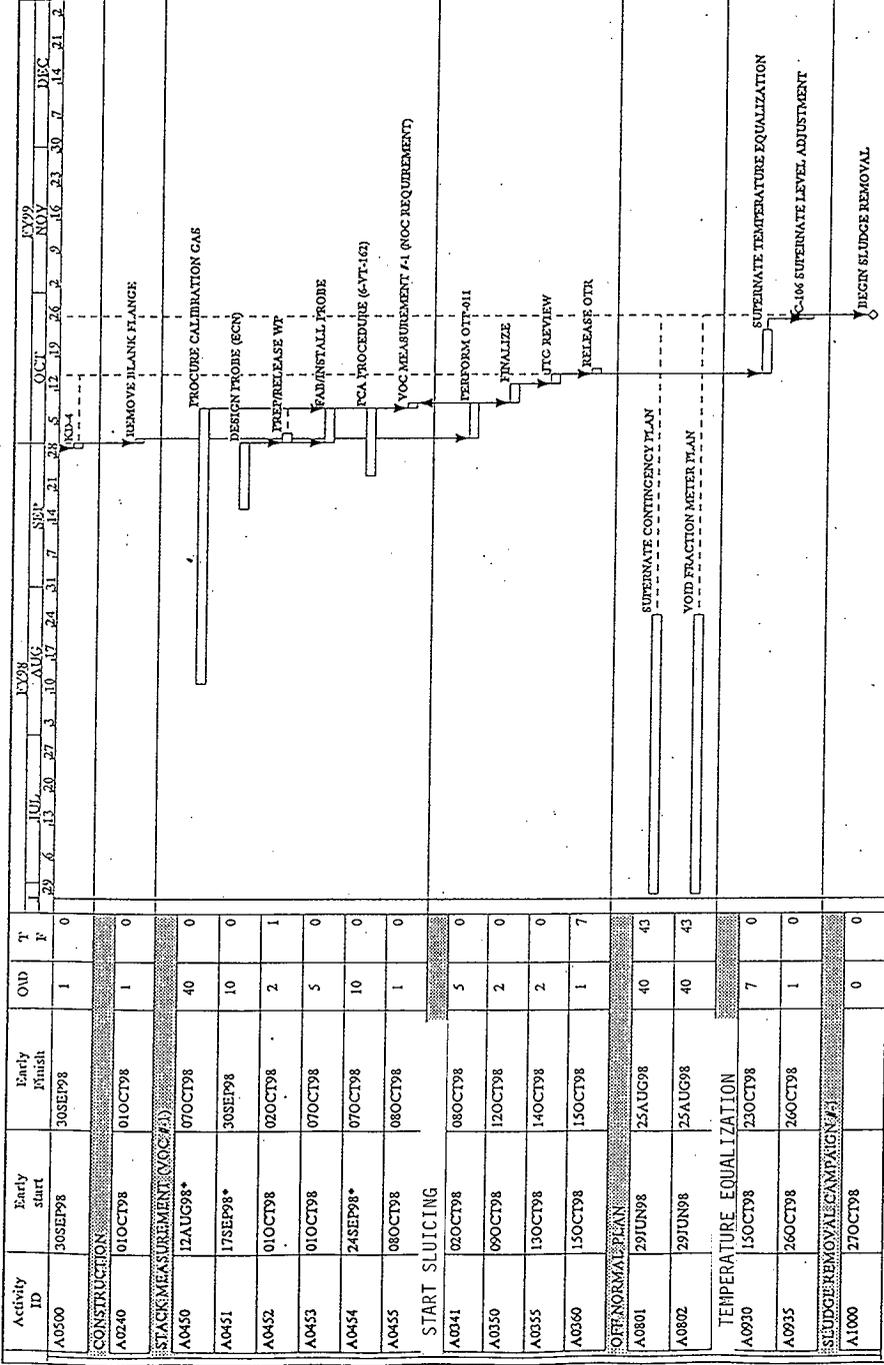
There is a potential for increased radiation levels in and around the exterior of the 241-C-91 Process Building and at the 296-C-006 exhauster. Requirements for radiological barriers, postings, surveys and other applicable controls will be contained in the WRSS operating procedures as both prerequisites and hold points. Radiological surveys shall be performed prior to each sluicing batch, periodically during sluicing operation and after each batch. Radiological surveys shall be taken both inside and outside the Process Building and around the 296-C-006 exhauster. The installed area radiation monitoring system and long reach survey instruments shall be used during sluicing as appropriate to reduce HPT personnel exposure.

During the initial one foot increment of sludge transfer, radiological surveys will be performed more frequently inside and outside the Process Building. If predicted radiation levels for subsequent batches/increments warrant, consideration will be given to reduction of source terms by flushing operations and installation of personnel access barriers and/or temporary or permanent shielding. RadCon Engineering has reviewed calculations W320-33-007, revision 1 and does not expect the area outside the doors or near the walls of the 241-C-91 Process Building to be an area of high radiation, therefore additional barriers around the building are not anticipated to be necessary.

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8.0 SCHEDULE





9.0 REFERENCES

- Bellomy, J. R., 1998, *Project W-320, Tank 241-C-106 Waste Retrieval Sluicing System Testing Plan*, HNF-SD-W320-TP-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.
- Carothers, K. G., 1998, *Tank 241-C-106 Waste Retrieval Sluicing System Process Control Plan*, HNF-SD-WM-PCP-013, Rev. 1, Westinghouse Hanford Company, Richland, Washington.
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- Wilson, G. R., 1993, *A Plan to Implement Waste Tank Safety Issues at the Hanford Site*, WHC-SP-0697, Westinghouse Hanford Company, Richland, Washington.
- 0842a, *TWRS Administration Manual*, HNF-IP-0842, Volume I, Section 2.10, Appendix F, Lockheed Martin Hanford Company, Richland, Washington.
- 0842b, *TWRS Administration Manual*, HNF-IP-0842, Volume III, Section 1.2, Lockheed Martin Hanford Company, Richland, Washington.
- Bailey, J.W., 1998, *Functional Design Criteria for Tank 241-C-106 Waste Retrieval, Project W-320*, HNF-SD-W320-FDC-001, Rev. 5, Appendix E. Numatec Hanford Company, Richland, Washington.