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ENGINEERING CHANGE NOTICE

1. ECN 611895

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.		4. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	C. A. Rieck, 7F520, R3-27, 372-2913		12/14/94
	5. Project Title/No./Work Order No. ITRS/W-211	6. Bldg./Sys./Fac. No. Tank Farms	7. Approval Designator ESQD
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-W211-FDC-001, Rev 0	9. Related ECN No(s). N/A	10. Related PO No. N/A

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	N/A	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

Change request W211-006, which authorized an integrated retrieval approach for tank 101-SY, was approved on September 27, 1994. The integrated retrieval approach allows deletion of the mixer pump related scope in the current Project W-211 baseline by utilizing the existing 101-SY mitigation pump for the sludge mobilization function. This revision 1 of the functional design criteria, WHC-SD-W211-FDC-001, provides the new technical baseline for the 101-SY retrieval system in accordance with the integrated retrieval approach. In addition, miscellaneous changes have been incorporated into the document to update the technical requirements based on knowledge gained during the conceptual and Title I design phases.

13a. Justification (mark one)			
	Criteria Change [X]	Design Improvement []	Environmental []
As-Found []	Facilitate Const. []	Const. Error/Omission []	Design Error/Omission []

13b. Justification Details

Utilizing the existing mitigation mixer pump for 101-SY retrieval instead of installing two W-211 mixer pumps and associated equipment will result in a potential $10,000,000 cost savings ($8,500,000 capital and $1,500,000 expense), as well as a $16,000,000 cost avoidance. Future scope modifications to other tank retrieval systems will be addressed when decisions are made on whether there is a need to install mitigation mixing pumps.

14. Distribution (include name, MSIN, and no. of copies)

Refer to Distribution Sheet.

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A-7900-013-1 (06/92)

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 611895

15. Design Verification Required	16. Cost Impact						17. Schedule Impact (days)		
	ENGINEERING			CONSTRUCTION					
[] Yes	Additional	[]	$	Additional	[]	$	Improvement	[X]	6 mo
[X] No	Savings	[X]	$2.5M	Savings	[X]	$6M	Delay	[]	

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[X]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

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

Document Number/Revision	Document Number/Revision	Document Number Revision
WHC-SD-W211-CDR-001/Rev 0		
WHC-SD-W211-CDR-002/Rev 0		

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog. Eng. C. A. Rieck	12/19/94	PE J. T. Koberg for	1/18/95
Cog. Mgr. J. E. Van Beek	12/19/94	QA N/A	
QA R. E. Clayton	12/12/94	Safety N/A	
Safety L. S. Krogsrud	1/18/95	Design N/A	
Environ. ~~R. A. Peterson~~ D. J. Carrell for DJC	1/10/95	Environ. N/A	
User D. A. Nunamaker	1/18/94	Other N/A	
Program G. A. Meyer	1/23/95		
		DEPARTMENT OF ENERGY	
		Signature or a Control Number that tracks the Approval Signature J. J. Davis	2/6/95
		ADDITIONAL	
		N/A	

RELEASE AUTHORIZATION

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This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz   February 7, 1995

Kara M. Broz

SUPPORTING DOCUMENT

1. Total Pages 163

2. Title

Functional Design Criteria, Project W-211, Initial Tank Retrieval Systems

3. Number

WHC-SD-W211-FDC-001

4. Rev No.

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5. Key Words

Retrieval, transfer, mitigation, DST, 101-SY, 103-SY, 101-AW, 103-AN, 104-AN, 105-AN, 106-AN, 102-AY, 102-AZ, 101-AP

6. Author

Name: C. A. Rieck

Signature

Organization/Charge Code 7F520/D2EL4

7. Abstract

This document provides the technical baseline for retrieval of waste from ten double-shell tanks in the SY, AN, AP, AW, AY, and AZ tank farms. In order to retrieve waste from these tanks, systems are needed to mix the sludge with the supernate and pump the waste mixture from the tank. For 101-SY, the existing mitigation pump will be used to mix the waste and Project W-211 will provide for waste removal. The retrieval scope for the other nine tanks includes both the waste mixing and removal functions.

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RECORD OF REVISION	(1) Document Number WHC-SD-W211-FDC-001	Page 1

(2) Title
Functional Design Criteria, Project W-211, Initial Tank Retrieval Systems

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Cog. Engr.	Authorized for Release (6) Cog. Mgr. Date
0	(7) Initial release by EDT 155415, dated 8/16/93.	N/A	N/A
1 RS	Revised Sections 1 through 7 to reflect a new technical baseline for the 101-SY retrieval system, whereby the existing mitigation pump will mix the waste and W-211 will provide for waste removal. Also, incorporated miscellaneous changes to update technical requirements based on knowledge gained during conceptual and Title I design phases. ECN 611895.	C. A. Rieck	J. E. Van Beek 12/19/94

FUNCTIONAL DESIGN CRITERIA

PROJECT W-211

INITIAL TANK RETRIEVAL SYSTEMS

TABLE OF CONTENTS

INITIAL TANK RETRIEVAL SYSTEMS

1.0 INTRODUCTION

1.1 BACKGROUND AND PURPOSE

Underground tanks have been used since the 1940s to store radioactive liquid waste generated during process facility operations at Hanford. There are currently 149 single-shell tanks (SST) and 28 double-shell tanks (DST) containing such waste. The Tank Waste Remediation System (TWRS) mission includes the responsibility for resolution of tank safety issues and disposal of tank waste in an integrated manner. Project W-211 is required for implementation of the Hanford Defense Waste Environmental Impact Statement - Record of Decision by providing a means of removing the waste from the double-shell tanks for processing. In addition, the project supports remediation of safety Watch List tanks concerns regarding flammable gases pursuant to the Wyden Bill.

Each type of waste has certain chemical properties and constituents that require specialized treatment and processing in order to minimize final disposal costs. The Safety Watch List tanks contain hydrogen generating waste, ferrocyanide waste, organics, and high heat waste. Waste from these tanks will eventually be retrieved for disposal. Disposal actions include waste treatment steps to separate low-level waste from transuranic (TRU) and high-level waste components. Both the low-level and high-level waste will be treated in future processing plants.

The primary purpose of the Project W-211 Initial Tank Retrieval Systems (ITRS) is to provide systems for retrieval of radioactive wastes stored in selected underground DSTs. The Safety Watch List DST tanks are included in this initial effort.

Tank contents consist of a large quantity of supernatant liquid plus solids that have settled to the bottom. There is presently no system in place that can remove the settled solids from these tanks. For retrieval, it is necessary to slurry the waste in order to transfer it from the tanks to facilities for evaporation, pretreatment, or disposal. Waste tanks have existing equipment in place that can remove only liquid solutions. New systems must be installed in order to provide mixing and retrieval capabilities for the waste storage tanks. Based primarily on successful retrieval operations at other Department of Energy sites, mixer pumps have been selected as the appropriate technology for Project W-211.

The ITRS will provide retrieval systems for 10 tanks in the AN, AP, AW, AY, AZ, and SY Tank Farms. Retrieval of wastes from safety Watch List tanks 101-SY, 103-SY, 103-AN, 104-AN, 105-AN, and 101-AW is necessary to allow remediation of safety issues. In 1990, these tanks were declared to have a potential safety problem because of periodic releases of hydrogen and nitrous oxide, and they are currently on the Hydrogen Tank Watch List. The existing Waste Tank Safety Program will mitigate the near-term safety issues. The ITRS will then provide systems for accomplishing long term remediation of the safety issues associated with the safety Watch list DSTs.

Retrieval of wastes from the four remaining tanks is required to support future waste pretreatment and processing plants, and waste consolidation efforts which will free up additional tank space for receipt of single shell tank waste. Currently there is no capability for retrieving waste sludges contained in these tanks. Failure to retrieve and consolidate the waste solids could result in tank space shortages or require mixing of other waste types, which could significantly increase treatment costs.

1.2 SCOPE

This document provides criteria for Waste Retrieval Systems (WRS) for tanks in the AN, AP, AW, AY, AZ, and SY Tank Farms. In this document, the term "retrieval system" includes not only the mixer and transfer pumps necessary to mobilize and remove solids and supernate from the DST, but also the support equipment and facilities needed for installation, operation, monitoring, and removal of the actual retrieval equipment. It also includes any project specific waste tank modifications and utility upgrades. In the case of tank 101-SY, an integrated retrieval approach will be implemented. In July 1993, the Hydrogen Mitigation Program (HMP) installed a 150 horsepower mixer pump in 101-SY to mix the waste in an attempt to alleviate the build-up and periodic releases of flammable concentrations of hydrogen gas from the tank. Based on the observed success of the mitigation pump in mixing the tank contents, a systems engineering review workshop was conducted April 5 through 7, 1994, to evaluate the possibility of utilizing the mitigation pump for the retrieval mixing function. The workshop was successful in identifying a strategy that uses the current mitigation pump for mixing the 101-SY waste prior to its transport to alternate storage or processing via the Project W-211 dilution and transfer system.

The scope of work to be accomplished by Project W-211 includes providing and installing the following:

- Sludge mobilization assemblies (mixer pumps) (reference Project W-151). For 101-SY, the existing mitigation pump will be used for the mobilization function.
- Operator station that includes functions to monitor, alarm and control retrieval systems for each tank as well as interface with tank farms and the cross site transfer lines (Project W-058).

- Means of determining the distance to the bottom of the tank where the pumps and equipment will be installed.

- Means of measuring the effects and results of mixer pump operation. For 101-SY, existing methods of determining mixing effectiveness will be used.

- Instrumentation to measure flow, pressure, viscosity, density, and temperature to determine the physical characteristics of the waste prior to and/or during transfer, dependant on the receiving station requirements.

- Interface with existing instrumentation critical to the mixing or transfer process to monitor tank waste, shell, and air space temperatures, and waste levels within the tank.

- Internal tank equipment upgrades, where required, with sufficient structural strength to withstand jet forces which will result from retrieval operation (reference Project W-151).

- Pump(s) for transfer of waste out of the tanks.

- Standard containers for disposal of contaminated components and soil. Equipment being provided by other projects will be used to wash and remove in-tank components. Reusable transport/storage containers being developed by the Long Length Contaminated Equipment program will be used to transport in-tank components to storage or disposal. For 101-SY, removal of existing equipment is limited to the velocity density temperature trees (VDTT).

- Utilities required for retrieval operations (electrical power, water, telecommunications, etc.).

- Site preparation.

- Administrative control and engineered designs which prevent tank loading in excess of allowable limits.

- Testing of mixer and transfer pumps in the Run-In Test Facility (in Material And Storage Facility [MASF]).

- Installation/removal demonstrations of retrieval equipment in the Cold Test Facility.

- Measurement of riser diameter to confirm riser dimensions, where tolerances are less than 1".

- System to maintain temperatures within the tank to acceptable levels, if required.

- Additional pump pits and extension of below grade risers as necessary.
- New cover blocks as necessary.
- Dilution capability to bring waste properties into acceptable range for transfer. Compliance with cross-site transfer line specifications is required for tanks that utilize the cross-site line.
- Routine flush capability to both the transfer pump and transfer piping. Emergency flush, if required, will be by others.
- Video monitoring systems shall be installed to status waste retrieval operations, as required.

The actual operation of the retrieval system will be performed by Tank Farm Operations and is not within the scope of Project W-211.

1.3 DEFINITIONS

SHALL CONSIDER: Requires an assessment

SHALL: Denotes a requirement

SHOULD: Denotes a recommendation

2.0 WASTE RETRIEVAL SYSTEM FUNCTIONAL CRITERIA

2.1 PROJECT INTERFACES

Numerous project activities which must be coordinated with W-211 include Projects W-028, W-030, W-058, W-151, W-236A, W-314, W-322, and safety Watch List tank mitigation efforts of the Waste Tank Safety Program. Note that ongoing tank farm maintenance and upgrades activities must also be coordinated. In addition, operation of the Project W-151 retrieval system will provide actual information on the effectiveness of the mixer pump retrieval system and the effect on tank operating parameters.

Project W-211 does not have a direct effect on all of these projects, but rather is a small piece of the current work effort associated with waste transfers on site. Following is a description of each project:

- <u>W-151, Tank 101-AZ Waste Retrieval System</u>

  Tank 241-AZ-101 has been selected as the first location for demonstration testing of a waste mobilization system. The tank contains considerably more in-tank components than a standard DST, including twenty-two air lift circulators, seven thermocouple assemblies, seven sludge radiation measurement drywells, and a steam coil. This in-tank equipment will cause unique interference problems during mixer pump retrieval operations. Waste mobilization and retrieval of waste under these conditions has not been demonstrated at Hanford.

Project W-151 will provide two 300 hp mixer pumps (the largest practical size which can be installed in the tank) along with essential ancillary equipment for a mixing demonstration test. The operational goal of this test is to achieve 90 percent mobilization of approximately 20 inches of solids which have settled to the tank bottom, and to demonstrate that a slurry suitable for transfer can be maintained within the tank. The information and experience gained during this functional test is expected to:

- Confirm the mobilization properties of the 241-AZ-101 waste sludge, as projected from simulated wastes studied in laboratory tests and from actual tank waste samples obtained and analyzed prior to the test.
- Provide a base to optimize the number and location of mixer pumps, and the cleanout time cycles needed for various other Hanford waste tanks.
- Provide final verification of models and laboratory data used to project forces on in-tank components and verification of effects of mixer pump operation on other DST operating parameters, including the ventilation system.
- Identify worthwhile design or operational improvements for future in-tank mixing or retrieval systems at Hanford.

Mixer pumps were chosen as the planned method of waste retrieval from DSTs, based on engineering technology studies, past experience with hydraulic sluicing at Hanford, experience with mixer pumps at the Savannah River Plant, and by the recommendations from two engineering studies. Safety, versatility, schedule, and cost considerations were the principal factors which led to the choice of in-tank mixer pumps rather than remotely operated hydraulic sluicing nozzles.

Project W-151 provides the equipment necessary to demonstrate mixing, it does not include a transfer system for removing waste from the tank. Upon conclusion of the test, (i.e., determination of the degree of mobilization and suspension of waste solids), the equipment will be left in place for use in retrieval operations.

- W-030, Tank Farm Ventilation Upgrade

  The new ventilation system for the AZ tanks and the AY tanks will be designed and constructed under Project W-030. This system will accommodate the effects from both radiolytic heat decay and mixer pump operation.

- W-058/028, Replacement of Cross Site Transfer System

  This project will provide compliant cross site transfer lines for waste transfers between 200 East and 200 West areas. The transfer interface point for W-211 is the existing tank farm valve pits.

- W-314, Tank Farm Restoration and Safe Operations The goal of this project is to improve reliability of safety related systems, reduce onsite health and safety hazards, and support waste retrieval and disposal activities by restoring and/or upgrading existing Tank Farms facilities and systems. The project is in the pre-conceptual phase so actual scope is currently indeterminate. However, the systems being evaluated for inclusion in the project scope include tank ventilation, tank farm instrumentation/data acquisition, transfer lines servicing the tank farms, and electrical power distribution.

- W-236A, Multi-Function Waste Tank Facility

  This project is to bring new DSTs to the Hanford site. Two of the new tanks are proposed to be located in the 200-West area near the S complex and the others are proposed to be located in the 200-East area.

- W-322, 242S Substation Upgrade

  This project would involve total replacement of the existing substation located north of the 242-S Evaporator. Two 750 kilo-volt-ampere (kVA) transformers would replace the current single 750-kVA transformer.

2.2 SITE LOCATION

The tank farms associated with this work are located in 200 West and East Areas. Equipment to control and monitor the retrieval process shall be housed in an environmentally controlled Instrument and Control (I&C) room at each tank farm.

The site integration criteria are listed below:

1. Portions of ITRS not placed directly over the waste tank shall be located to allow convenient access to existing roadways/utilities.

2. The following specific site factors shall be considered in locating the ITRS according to guidelines contained in DOE Orders 6430.1A and RL 4320.2C:

   - Utilities/site services.
   - Retrieval and transfer streams.
   - Site interferences.
   - Possible future use for other retrieval activities.
   - Environmental and safety considerations.
   - Cost.
   - Minimization of operator exposure resulting from tank farm background radiation levels and vapors (as low as reasonably achievable [ALARA]).
   - Contaminated soil disruption minimization.
   - Static and dynamic loading imposed on waste tanks located in the various Tank Farms.

2.3 DESIGN BASIS

Project W-211 shall provide a retrieval system based on the applicable components from Project W-151's current design.

Mixing and transfer pumps are the active components of the ITRS. The mixing pumps will mobilize the sludge in the tank bottom and maintain it in suspension to form a slurry. For 101-SY, the mitigation pump will serve as the mixer pump. The transfer pump(s) will then move the slurry (after possible additional dilution) from the tank and deliver it to the transfer line. Flush capability is required for the transfer pumps and the piping.

The existing transfer pumps shall be replaced, if necessary, with a pump meeting revised requirements to be defined during conceptual design. Suitable jumpers shall be provided to permit transfer of waste from the tanks. (Reference Project W-058 for cross-site transfer line interface).

The design of the retrieval subsystems shall be modular to the greatest extent practical. The design shall incorporate features which will facilitate and minimize fabrication, installation, removal, and disposal activities within the tank farm areas.

2.3.1 Design Life

The operating design life of the mixer and transfer pumps is 5000 hours of intermittent operation over five years. The design life of permanent modifications and non-replaceable ancillary and support equipment shall be consistent with the remaining life of the tanks and systems, which is through the year 2020. Replaceable equipment and components may have a design life of a lesser number of years, but generally not less than five years.

2.3.2 Degree of Reliability

The degree of reliability achieved by design shall permit new structures, equipment, piping, and utilities to function throughout the intended useful life without major repair (major repair is defined as removal from the tank for repair; reference Project W-151 current design basis) or replacement.

2.3.3 Operating Environment

All equipment exposed to ambient conditions outside the tank shall be designed to operate under adverse open field conditions as defined in Hanford Standards SDC 4.1.

Retrieval system components and assemblies located at or within the DST shall be designed to withstand the radiation environment shown in Appendix B. Radiation dose (unless submersible pump motors are used) is not expected to be a limiting factor on operating life of the mixer pumps.

Retrieval system components which contact the waste shall be compatible with the waste fluid properties presented in Appendix B. Those in-tank parts of the mixer pumps or other in-tank equipment which are not submerged in the liquid will be exposed to corrosive waste vapor at estimated temperatures from 10 to 93 °C (50 to 200 °F).

Pacific Northwest Laboratories (PNL) has conducted testing on carbon steel test coupons to evaluate the potential for erosion/corrosion to occur in DSTs during mixer pump operation. In general, the accelerated weight loss of carbon steel exposed to fluid jets was comparable with control coupons exposed to the same fluid and temperatures but under quiescent conditions.

2.4 EQUIPMENT DESIGN CRITERIA

2.4.1 Mixer Pumps

The mixer pumps shall be designed and fabricated using materials compatible with a temperature range 10 to 100 °C (50 to 212 °F). The pump design shall be similar to that of Project W-151. For 101-SY, the existing mitigation pump will serve as the mixer pump. Therefore, this section does not apply to the 101-SY retrieval system. (Reference WHC-SD-WM-ER-114, "Analysis of Tank Bump Potential During In-Tank Washing Operations Proposed for the 241-AZ Tanks", for information which supports the upper temperature limit).

The mixer pump head and capacity shall be capable of producing a U_oD=29.4 ft^2/sec (where U_o represents fluid discharge velocity in feet per second and D represents nozzle inside diameter in feet). For tank 241-AY-102, the maximum riser diameter of 34" may limit the mixer pump size and nozzle configuration. Detailed design shall evaluate the maximum U_oD that can be attained in this tank and consider increasing the number of mixer pumps, if necessary, to optimize the ability to mobilize sludges.

Each mixer pump shall be independently controlled and capable of operating between 25 and 100 percent of rated full speed during normal operation. Safety interlocks required for off-normal operation shall cause both pumps to stop.

Motor bearing temperature and pump vibration instrumentation will be provided to monitor for safe operation of the mixer pumps.

Each mixer pump assembly shall include a pump body, bottom center suction and two horizontally opposing discharge nozzles, and a pump drive motor with variable speed control. The assembly shall be suspended through the DST dome. The pump support column shall support the pump intake close to the tank bottom. The pump's discharge nozzles shall be 15 to 18 inches above the bottom of the tank (reference Project W-151 for mixer pump configuration).

Auxiliary sluice nozzles shall be provided as part of the pump intake to provide removal of waste sludge from below the pump as it is lowered into the tank.

The mixer pump materials of construction shall be compatible with strong alkaline waste solutions (pH 7 to 13+) and shall have a radiation resistance of about 4.4E07 rads (500 r/h for 10 years).

All metals below the pump pit riser flange (i.e. exposed to the in-tank waste vapor environment) shall be non-oxidizing type material suitable for the environment, and shall have a surface finish to facilitate decontamination for transport and storage/burial.

The mixer pump assembly shall include appropriate seals to prevent contamination spread from the DST tank interior to the pump pit or the external environment. Lifting bails shall be provided to allow handling of the mixer pump in the horizontal and vertical positions, and to allow straight vertical insertion of the assembly into the DST.

Support for the mixer pump assembly shall be provided to prevent loading the riser to an unacceptable level.

If the turntable drive motor and gearbox is located within the pump pit environment, it shall be capable of operating over a temperature range of -10 to +65 °C (14 to 150 °F), a humidity range of 0 to 100 percent, and atmospheric pressure without need for auxiliary environmental control. The pump drive motor and the turntable drive motor shall be 3 θ, 60 Hz, 480 Volt.

Pumps shall be installed through existing 42" riser penetrations (34" for tank 102-AY). For tolerances less than 1", riser as-built dimensions shall be confirmed prior to procurement.

If pits are used for installing the mixer pumps, all portions of the mixer pump assembly above the riser flange shall be designed to fit either within the pump pits or to mount on top of the pump pit cover blocks (note: in some cases new pump pits and cover blocks will have to be constructed). The pump pit cover blocks shall be designed to accommodate and support the drive motor if it is located above them. Alternate methods of supporting the mixer pumps, such as a concrete slab, are acceptable if technically feasible and cost effective.

The pump discharge nozzles shall direct the liquid in a horizontal direction at an angle of $90° ^{+5}_{-0}$ from the vertical pump support column (i.e., the nozzle discharge is at or below the horizontal).

2.4.2 Transfer Pump(s)

The transfer pump is used to transfer waste through the transfer line to the receiver. The design parameters for the waste to be transferred are in the following ranges:

Fluid Properties	Operating Range
Specific Gravity	1.0 to 1.5
Viscosity	1.0 to 30.0 centipoise
Solid Content	0.0 to 30% vol.
Miller number	<100
pH (transfer)	minimum 11.0
(flushes)	minimum 7.0
Temperature (operating)	80 to 200 °F (27 to 93 °C)
(flushes)	35 to 200 °F (2 to 93 °C)
Minimum Velocity	6 ft/sec

The waste retrieval system for each tank shall be designed for the actual waste parameters in the tank. For example, the 101-SY transfer system shall be designed for 120°F waste transfers, since that is the actual waste temperature.

The transfer pump shall be installed through an existing riser penetration without an interference fit. For tolerances less than 1", riser as-built dimensions shall be confirmed.

All portions of the transfer pump assembly above the riser flange shall be designed to fit within the pump pits or to mount on top of the pump pit cover blocks. If the transfer pump is to be located above the pit, the pit cover blocks shall be designed to support the transfer pump equipment.

2.4.3 Other Operating Requirements

The mixing pumps shall be designed for intermittent operation (campaigns of several weeks duration maximum, during which continuous full speed operation may be required). For 101-SY, the mitigation pump will be operated to the extent possible within the bounds of the safety documentation. Other ITRS items will see less severe duty cycle requirements.

A single failure prohibiting removal of the system from the DST or that could cause structural damage to the tank shall be precluded.

Tank waste level (maximum) and vapor space pressure shall be monitored and shall comply with approved operating procedures.

The ITRS instrument/control/electrical building shall be designed to be unmanned.

Existing provisions shall be maintained for access to waste tanks for chemical addition and/or tank sampling via bottle and string method.

The retrieval system shall be designed to minimize the generation of new liquid waste created as a result of retrieval operations.

The retrieval equipment shall be remotely operable from the instrument building located outside the tank farm radiation zone. Systems operation shall be in accordance with ALARA principles. Only limited hands-on activities will be required in the tank farms to facilitate operations of the ITRS. Human factors engineering shall be performed in accordance with DOE Order 6430.1A, to enhance assembly, operation, maintenance, and disassembly of the retrieval system, and to minimize potential for operator error.

During retrieval operations two or three operators and a process engineer will be required to man the instrument building which houses the monitoring and control system. Since this is an intermittent operation which should last only a few days, no additional staff will be required; Project W-151 operations performance data and scale model testing will provide information for evaluating run times.

The closed circuit television (CCTV) shall be provided in the tank to status the retrieval process and aid in the retrieval operations. For tanks that already have an existing CCTV, the existing camera will be integrated with the retrieval monitoring equipment.

2.4.4 Services

Support services in the form of raw water, electrical power, telecommunications, and hoisting hardware shall be provided. Chemical additions and sampling will be through existing risers and systems. The need for standby power and/or uninterruptable power supplies will be as determined by the safety classification of the systems.

Equipment to supply and control filtered raw water to the mixer pump bearings/seals shall be provided.

2.4.5 Maintenance Requirements

Ease of maintenance shall be a design goal. If special tools are required, the tools and instructions for use shall be provided with the equipment. All equipment and instruments shall be designed to be maintained with standard tools wherever practical.

The design shall consider minimizing hands-on contact maintenance. The design shall incorporate human factors for safety of operations in accordance with requirements in DOE Order 6430.1A. The layout of fences, instrumentation and electrical apparatus shall be arranged to accommodate the use of a crane, stacked cover blocks, and a 60 ft. trailer. Above ground equipment and systems shall be capable of in-place preventive maintenance, repair, and calibration, where applicable. Piping, equipment, and instrumentation located in pump pits shall be capable of being remotely removed and replaced or the area decontaminated such that hands on maintenance is feasible. New pump pit designs shall facilitate access to or removal of equipment and shall consider shielding requirements.

2.4.6 Shipping and Handling

Equipment required to enable successful transport, staging, and installation/removal of the ITRS shall be provided. If required, a lay-down pad shall be constructed to aid in equipment installation/removal.

The ITRS shall be designed to comply with all onsite packaging and shipping requirements. Features shall be incorporated which enhance the ability to control contamination spread during installation or removal of mixer pumps and all retrieval system supporting equipment, and existing in-tank components.

Removal equipment shall be designed with the goal of cleaning residual waste liquid and solids from the equipment as it is removed from each tank. In cleaning of equipment during removal, treatment reagents which are used for component cleaning and decontamination above a riser, and which may drain into the DST, must be compatible with the waste tank and internals, its ancillary equipment and containment system. This is to preclude rupture, leakage or other failures of the system, and to be compatible with future use of the tank for waste receipt and storage. Use of acid washes will not be acceptable. Treatment reagents which would cause the waste to be a "Dangerous Waste" as defined in Washington Administrative Code 173-303-080 shall also be avoided.

Appropriate equipment and containers shall be utilized for removal, transport, storage, and/or burial of retrieval system equipment, contaminated soil, and other equipment which must be taken from the tanks prior to or during waste retrieval activities. Reusable transport storage containers being developed by the Long Length Contaminated Equipment program will be used for in-tank components. Materials selection, fabrication, inspection, and testing of any other waste containers shall be in accordance with RL OPS Transportation Safety Manual, WHC-EP-0063 and HEDL-S-0167, and shielding requirements shall meet surface dose rates therein, or approved administrative controls shall be used for large size and/or weight packages. Dose rates to personnel and external surface contamination on reusable components shall be in accordance with WHC-EP-0063.

All structures and components which are intended for installation and removal via crane will have their weight permanently and prominently marked on the item and indicated on the definitive design media. All structures and components which require periodic installation and removal (e.g., pit valve handles, inspection port plugs, etc.) shall have their weight permanently and prominently marked on the item and indicated on the definitive design media. Unusual items (e.g., operating levers and winches, etc.) which require hands-on operation will be permanently and prominently marked to indicate the directions of operation and the information indicated on the definitive design media.

Amounts of waste and volumes of waste packages to be transported, stored and buried shall be minimized. The design shall utilize reusable shielding (e.g., overpacks, etc.), as far as practical, to minimize waste volumes in storage/burial.

Removal equipment shall be designed with the goal of cleaning residual waste liquid and solids from equipment as it is removed from each tank such that the resultant waste package can meet the requirements for Remote Handled-Low Level-Class C (RH-LLW-C) waste (DOE 5820.2A).

The quantity of residual waste on the equipment shall be determined by measurement of the equipment as it is withdrawn from the tank, or through the receiver container walls, and back-calculated based on known activity levels of waste samples from the DST.

During actual equipment removal, solid waste classification will be verified based on analysis of sludge samples.

2.4.7 Thermal Considerations

The requirement to provide a cooling system shall be evaluated in the conceptual design phase. The heat load from the tank contents and the heat load added through operation of the mixer pumps cannot exceed approved operating criteria.

2.4.8 Waste Tank Loading

Operation of the retrieval system shall not induce loading in the tank structure or associated equipment which exceeds allowables, nor cause damage to the structure which would result in loss of tank contents to the environment. Analyses shall be performed to ensure that mixer pump installation, possible pump pit and riser modifications, and installation/removal equipment do not compromise the structural integrity of the DST or DST equipment, or their ability to maintain confinement. Equipment design for SY-101 shall comply with dome loading criteria found in WHC-SD-WM-TA-141.

Equipment designs and modifications shall be provided, within allowable stress limits, to withstand the associated forces, to ensure control of radioactive materials and airborne particulates, and to control radiation exposure to operations personnel and the public. Mixer pump jet forces which impact on existing or added internal tank equipment shall be calculated. Reference Project W-151 data for verifying structural integrity of in-tank equipment (reference WHC-SD-W151-ER-001).

Removal, rotation or raising of some existing in-tank equipment items may be necessary because they cannot withstand the forces imposed on them by the liquid jets, including the fatigue stresses which result from either oscillatory or rotary motion jet streams (one of these methods will be selected to accomplish nozzle movement).

Liquid level, sludge level and other instrumentation above the liquid level are exempted from analyses because these devices will either be on or above the surface of the waste liquid, or removed entirely, and will not experience significant forces.

2.4.9 Monitor System

For tanks without an existing video system, a video monitoring system shall be installed to status waste retrieval operations. Additionally, the video monitors will support retrieval equipment installation and removal. New video systems shall be capable of providing images with a resolution at maximum in-tank range of 2 in. The system will be composed of:

- A monitor installed in the control room.
- A 360° rotating mechanism for viewing internal tank operations. The mechanism shall provide pan and tilt capabilities.
- A camera installed in the waste tank.
- Miscellaneous support equipment.
- A camera wash assembly and adapter.

The video monitoring system will be similar to that used on Project W-151.

2.4.10 Materials

Materials shall be compatible with the exposed environment. Where possible, radiation-resistant fabrication materials shall be specified for equipment to be located in radiation fields. Materials such as plastics, organic compounds, lubricants, and insulation that degrade in radiation environments shall be minimized and shall be used only where no substitutions are acceptable or costs preclude the use of other materials.

Installed materials shall be resistant to radiation, process solutions, acid and caustic vapors and solutions, and known decontamination agents; nonabsorbent, easily removable if not contamination resistant; and/or oversized to permit partial destruction without affecting structural integrity.

3.0 PROCESS DESIGN CRITERIA

3.1 INSTRUMENTATION AND CONTROL

All instrumentation and controls necessary to monitor and control operation of the mixer, transfer pumps, and support systems during the waste retrieval process shall be installed in facilities to be provided at each respective tank farm. Equipment to control, monitor, and record selected parameters, and to effect a complete mixer pump shutdown upon failure of the tank ventilation system or upon loss of DST vacuum, shall be provided. In addition, these and all other critical pump parameters that cause a pump shutdown shall be alarmed to a manned facility. The manned facility shall provide indication of any shutdown of the mixer pumps and the cause of the shutdown.

Operator stations shall be provided to monitor the parameters and to provide historical and real-time trending. The safety class will determine redundancy requirements. Provisions for expansion shall be provided for in the control building to accommodate future retrieval systems within the specific tank farm, if required.

Instrumentation to monitor and/or control the following parameters shall be designed and installed unless existing tank instruments can be utilized (note that for bullets 2 through 6, the 101-SY mitigation pump operating parameters and operating effectiveness will be measured and controlled by the mitigation program):

- Monitor tank level, temperature (waste and vapor space), pressure (vapor space), and gas concentrations.
- Determine the extent of mixing effectiveness.
- Monitor mixer pump motor amperage, rpm, and temperature.
- Monitor temperatures of mixer pump drive and bearing components.
- Monitor mixer pump bearing/seal lubrication water flow rate.
- Measure vibration of the mixer pump assembly.
- Monitor transfer pump motor amperage, rpm, and temperature.
- Measure transfer pump discharge pressure or flow rate.
- Monitor the flow, pressure, viscosity, density, and temperature of the waste being transferred.

Additional suspended solids monitoring instrumentation is required for tank 102-AZ to support in-tank sludge washing of the NCAW solids stored in this tank. The specific instrumentation is:

- Tank suspended solids profiler to determine solids settling behavior and solids liquid interface.
- Turbidity monitor on the outlet of the decant pump to indicate increased solids concentration in the supernate solutions.

Mixer pump control and monitoring equipment shall not interfere with the use of existing essential tank farm instrumentation. Instrumentation installed shall maintain tank confinement with minimal air leakage.

New critical alarms such as leak detections of the transfer lines and pits, tank pressure conditions and ventilation system pressure (if modified by this project), and any others identified as critical during subsequent design activities, shall be provided to the control room, and tied into the new ITRS interlock logic to maintain safe operations and accomplish a safe shutdown. Any existing tank farm critical alarms and interlocks pertinent to the retrieval system shall alarm in the retrieval control room and shall be tied into the new retrieval system interlocks to maintain safe operations and effect a safe shutdown.

Human factor-engineered graphical screens shall be designed to provide a complete Operator Interface System (OIS). The OIS, as a minimum, shall provide screens to depict the physical routing between the respective tank and receiver. The parameters such as transfer pump status (off-on), valve position (open-closed), and flowing status (flow-no flow) shall be included. The control system shall have a misrouting prevention system to provide alarms and interlocks for misrouting when attempting to start the transfer pump with valves in the wrong positions. The critical leak detection system associated with the transfer lines and pits shall be integrated with the misrouting prevention system. The misrouting prevention system interlock shall preclude the pumping system (mixing and/or transfer) from operating unless all pumping parameters are correct and to prevent unplanned or uncontrolled addition of water for flushing. The location associated with any critical alarm shall be displayed on the appropriate graphic display screen.

Systems shall be designed for "fail safe operation" in the event of an air or electrical outage and to alarm upon failure. Any new radiation monitoring instruments shall alarm on (low-low level) loss of ability to detect radiation. Radiation detectors may be used to detect misrouting. Instrument and power cable runs shall be housed in separate raceways for protection and for facilitating future modifications. Any outside alarms in the tank farm that are required to be visual shall have high-intensity strobe indicators. Radiation monitoring capabilities shall be provided on water lines that come in contact with a radioactive environment and have potential for spreading contamination into existing systems.

Instrumentation shall be designed for the intended service and shall be qualified for the environmental conditions in which it is required to function.

3.1.1 Miscellaneous

Instrumentation and monitoring equipment systems should be specified and designed to facilitate troubleshooting and replacement.

Upon loss of actuating power, active process components should assume a position or mode that will preclude an unsafe process condition. The ITRS design specifications, generated during definitive design, shall specify the fail safe configuration for the process and control systems. Instrumentation and monitoring systems should be designed to alert the operator when failure has occurred.

3.2 ELECTRICAL AND FLUID/PNEUMATIC SYSTEMS

Pipelines carrying radioactive liquids, dangerous wastes, or hazardous chemicals shall have secondary containment with leak detection (low point) and alarm capability. For piping in existing valve or transfer pits, the secondary containment function of the existing pits is beyond the scope of this project. Where new pits are provided as part of the waste retrieval system, the pits shall be designed to meet current requirements for secondary containment.

Piping and valve arrangements shall be designed to preclude misrouting liquids outside of confinement boundaries due to incorrect valve settings. Vessel and piping design shall accommodate accidental overflows and pressurization.

Equipment such as dip tubes, sample lines, transfer lines, and drains shall be designed to preclude the possibility of syphoning or backflow.

All electrical equipment or components shall be selected or protected to resist adverse affects of the environment in which they are installed. Electrical enclosures and junction boxes of the proper National Electrical Manufacturers Association (NEMA) rating and material shall be used to resist and protect internal components from the corrosive effects of moisture and chemicals.

Sensitive (e.g., calibration, corrosion, etc.) electronic devices should not be located in high radiation areas if possible. When required, the equipment shall be designed to withstand the demands of the environment and meet the specified design life requirements.

3.3 PIPING

The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section III, Class 2 is required for all new facility construction of Safety Class 1 systems in accordance with DOE Order 6430.1A, Section 1300-3.2. Applicable design criteria for Safety Class 2, 3 and 4 systems are listed in Table 3.3-1.

All piping, regardless of safety class, shall be arranged for gravity flow wherever possible and sloped to drain completely. The transfer lines shall include provisions for flushing. Process piping sizes shall be specified to prevent solids from accumulating. All piping shall be designed to preclude radioactive wastes from being syphoned or backflowed into nonradioactive lines.

TABLE 3.3-1

DESIGN CRITERIA FOR SAFETY CLASS 2, 3, AND 4 PIPING	
Pressure Vessels	**ASME B&PV Code, Section VIII, Division 1 or 2**
0 - 103.4 kPa 0 -15 psi (gauge) Storage Tanks	American Petroleum Institute (API), API-620
Atmospheric Storage Tanks	API-650, American Water Works Association (AWWA) D-100, D-103, or ANSI B96.1
Pumps	Manufacturer's standards
Valves	ANSI B16.5, B31.1 and B31.3
Piping (Steam)	ANSI B31.1
Piping (process)	ANSI B31.3
Piping (utility and nonsafety class)	ANSI B31.9
Heat Exchangers	ASME B&PV Code, Section VIII, Division 1 and TEMA "C," "B," or "R"
Jumper Design Guide and Fabrication Specifications	SD-RE-DGS-002, and HS-BS-0084

Cathodic protection shall be considered for any buried transfer piping associated with this project. Provisions shall be made to ensure that such a system will interface with existing 200 Area cathodic protection schemes.

3.4 GENERAL MECHANICAL PROCESS

Equipment shall be designed so no single failure of mechanical or electrical equipment will cause a loss of control that will result in an unrecoverable condition. Functions shall be provided which will facilitate placement of the equipment in the appropriate position to establish a safe configuration during a faulted condition.

Design of the equipment shall provide fail-safe operation in the event of loss of control system supply power. Critical functions and control circuits associated with safely maintaining the ventilation equipment in its normal operating condition shall be considered.

Equipment should be positioned away from potential leaks of corrosive liquids or provided with shielding. Rotating equipment, electrical components, and other high maintenance items should be located outside radiation areas to the extent practical.

Commercially available equipment and parts shall be used to the greatest extent practical. Equipment shall be designed for recovery from in-process failures. This criteria applies particularly to remotely operated in-tank equipment. Design shall consider loads seen throughout the entire product life cycle, including fabrication, storage, operation, and decommissioning.

The use of limit switches to control mechanical movement should be minimized. Valves with integral limit switches shall be preferred over those requiring separately mounted limit switches, provided all other valve requirements are met. Where it is necessary to use external limit switches for positive stop or position indication, the following guidelines should be observed:

- The limit switch shall be mounted in a stationary position, and the actuator should be mounted to the movable member. The limit switch will be protected to preclude damage from inadvertent bumping.

- The positioning and configuration shall prevent damage to the limit switch and actuator in the event of over-travel, misalignment, or malfunction.

- Failure of limit switches shall be addressed by the design. Failure detection circuitry can be included to disable the moving component or mechanical stops can be designed to protect equipment from over-travel due to limit switch failures.

- Fine adjustment should be accomplished with actuator with a positive means for securing the final position.

- Enclosed units shall be used with secondary actuation and bellows-type seals.

Elastomers shall be chosen for the chemical and radiation environments. There is no single best source for this selection. Elastomers have a finite life in environments where they are exposed to decontamination solutions and high radiation fields. Where possible, elastomers that will function for the useful life of the equipment should be used.

4.0 FACILITY DESIGN CRITERIA

4.1 ARCHITECTURAL

Preliminary and detailed design for supporting structures, housing modules, and services of the ITRS shall be in accordance with DOE Order 6430.1A and Section 6.0 of this document.

The control facility shall be constructed using the following criteria:

- The facility shall be sized appropriately for operators and equipment needs.

- Design shall consider standard pre-engineered metal building construction. Provision for either a mobile or permanent structure shall be considered. Structure design should be standardized, where cost effective, to allow duplication at other tank farm locations.

- Soil stabilization after site earthwork shall be implemented.

4.2 CIVIL

In cases where existing pump or valve pits and coverblocks can be used to accommodate retrieval equipment, the existing pits and coverblocks shall be used as-is, except for minor modifications such as core drills. New pits and coverblocks shall be designed to attenuate dose rates within ALARA criteria and to provide structural support for retrieval equipment/pumps. Intrusion prevention shall be incorporated in the design of new pit coverblocks.

Paved roads shall be upgraded/constructed to provide two-way traffic to support waste retrieval efforts and shall be suitable for loaded trailer vehicle access in accordance with appropriate design standards (such as the Washington State Department of Transportation [WSDOT]).

4.3 VENTILATION

A review of the current ventilation systems shall consider the effect of insertion and/or removal of equipment on tank negative pressure parameters. Similarly, allowable infiltration through any temporary confinement shall be reviewed for its effect on negative confinement pressures.

Conceptual design has determined that no changes are required to the current ventilation systems. (Note that increasing the air flow rate in AP tank farm from the current operating condition of 736 ft^3/min to the present system capability of 1170 ft^3/min has been suggested).

4.4 UTILITIES

Utility requirements for steam, raw water, and electrical power should be assessed in terms of available capacity and tie-in points. Water suppression type fire protection systems, if used, shall be supplied with raw water because existing sanitary water capacities are committed. Water and electrical requirements, which include service supply, are to be determined during the conceptual design phase. Upgrades to the utility distribution system necessary to support initial tank retrieval operations will be provided by the project.

4.4.1 Water

Backflow prevention shall be built into water supply systems which could possibly be contaminated. Selection and installation shall be in accordance with the following criteria:

- DOE 6430.1A, Section 1530-9, "Water Storage and Distribution"
- RL 5480.10A, Part D, "Cross-Connection Control Standard, Hanford Water System"
- WAC 246-290-490, "Cross Connection Control"
- AWWA, "Accepted Procedure and Practices in Cross Connection Control."

Raw or inhibited water shall be available for:

1. Flushing of transport lines and decontamination of equipment
2. Sluicing of waste sludge from beneath the mixer and transfer pump as it is lowered into the tank
3. Lubrication and cooling water to the mixer pump bearings and seals

Raw or inhibited water shall be supplied at the required design pressure (static pressure). Water lines shall have sufficient ground cover to prevent freezing, or employ other means of protection. Underground water pipe installation shall comply with HPS, Standard Design Criteria (SDC), 3.2, "Minimum Depth of Underground Water Lines."

Permanent potable water supply and sanitary/sewage systems will not be required, since the ITRS control building is an unmanned facility.

4.4.2 Instrument Air

Instrument air lines shall be installed as required.

4.4.3 Electrical

In general, the electrical distribution system shall provide power for mixing and transferring simultaneously (two mixer pumps operating at full speed and transfer pump(s)). However, the AY/AZ tank farms may have two tanks undergoing simultaneous sludge mobilization/washing, and the AY tanks may require four mixer pumps per tank.

Electrical design shall comply with the following codes and standards, as applicable:

- NFPA 70, "National Electrical Code."
- National Fire Codes.
- ANSI C2, "National Electrical Safety Code."
- Illuminating Engineering Society Lighting Handbook.
- Institute of Electrical and Electronics Engineers, Inc. Standards, Recommended Practices and Guides.
- Electrical power systems, components, and structures shall be portable or fixed in place depending on the intended use and cost.
- Safety Class 2 power systems components and structures shall be designed, fabricated, tested, and installed in accordance with the requirements of DOE Order 6430.1A.

4.4.4 Emergency Power

The requirements for emergency or standby power systems, per DOE Order 6430.1A, Section 1660-1, were evaluated during the conceptual design phase and determined not to be required.

4.5 LIGHTING

Design criteria for lighting is described in the following documents:

- ANSI/Illumination Engineering Society (IES) RP-7, "Industrial Lighting."
- ANSI/IES RP-1, "Office Lighting."

- National Fire Protection Association (NFPA) 70 and 101 on emergency lighting.

- RL 5480.1A, Appendix A, "DOE Energy Management Directives."

- GSA Bulletin, FPMR 10-D-44, "GSA Public Buildings and Space."

- Occupational Safety and Health Administration (OSHA), Code of Federal Regulations (CFR), 29 CFR 1910, "General Industry."

4.6 STRUCTURAL

At a minimum, the following Structural Design Criteria shall be met:

- All structural systems, components and structures shall be designed, fabricated, inspected, and installed in accordance with the requirements of DOE Order 6430.1A and SDC 4.1.

- All structural steel design shall meet the minimum requirements of the American Institute of Steel Construction (AISC) "Manual of Steel Construction," unless otherwise required by safety classification.

- All Safety Class 1 and 2 concrete design shall meet the minimum requirements of the American Concrete Institute (ACI), ACI 349, "Code Requirements for Nuclear Safety Related Concrete Structures."

- All Safety Class 1 and 2 steel structures shall meet the requirements of the AISC, AISC/ANSI N 690, "Nuclear Facilities-Steel Safety Related Structures for Design, Fabrication and Erection."

- All other (or SC3) concrete shall meet the minimum requirements of the American Concrete Institute (ACI), ACI-301, "Specifications for Structural Concrete for Buildings."

4.7 ENERGY CONSERVATION

The design shall consider general design guidelines for energy conservation and shall comply with DOE Order 6430.1A, Sections:

- 0110-12, "Energy Conservation"

- 1595-10, "Energy Management Systems"

- 1595-11, "Interior Electrical Power and Lighting Systems"

Consistent with DOE Order 6430.1A, Section 0110-12.8, paragraph 2, the preliminary (Title I) design report will not include an energy conservation report for process energy or building energy since the control building is significantly less than 10,000 square feet and total annual energy consumption is less than 500 million BTU. Life cycle cost analysis (LCCA) shall be performed for the caustic system and the control building for 101-SY in accordance with Office of Management and Budget (OMB) Circular A-94.

4.8 MAINTENANCE

4.8.1 Facility

The ITRS shall be designed and constructed to meet the maintenance requirements of DOE Orders 6430.1A and 4700.1 and the design requirements of DOE Order 4330.4A.

ITRS facilities and support systems should be designed, arranged, and constructed for efficient, cost effective operation and maintenance, with as low as reasonably achievable personnel radiation exposure. Decisions should be based on the radiation exposure to employees and the nature of the required maintenance, the need for remote maintenance capabilities where required, and the need to provide for personnel safety.

The acceptability of system design and operation under normal conditions, to include all features of performance alternates (e.g., redundancy, by-pass administrative controls), shall be evaluated by taking into consideration single active failures of components.

4.8.2 Equipment

Provisions shall be made for both radioactive and nonradioactive equipment maintenance to support ITRS operations and to minimize equipment downtime. The ITRS shall be designed to preclude the need for routine, hands-on maintenance in contaminated or high dose rate areas. The retrieval equipment design shall include features that will allow controlled removal of the equipment, intact, after failure.

Provisions shall be made for the remote replacement of system equipment that operates in a high radiation zone. The capability shall be provided to perform a preliminary decontamination, where practical, of equipment prior to repair or removal.

All mechanical equipment, windows, cameras, television monitors, and other equipment in areas of potential radioactivity shall, where practical, be sealed or otherwise protected from penetration by contamination and decontamination solutions. All electrical and instrumentation equipment shall be properly grounded for safety of personnel and protection of equipment.

5.0 GENERAL REQUIREMENTS

5.1 SAFETY

Safety analyses shall be performed in accordance with DOE Orders 5481.1B, 6430.1A, Section 0110-5.2, and WHC-CM-4-46. The Preliminary Safety Evaluation (PSE) for Project W-211 will be produced in a format consistent with those described in WHC-CM-4-46, Non-Reactor Facility Safety Analysis Manual and WHC-CM-6-32, Safety Analysis and Regulation Work Procedures, as appropriate. The safety analyses shall ensure that the risk to the public, environment and site workers during normal and anticipated accident conditions is below the limits set forth in DOE orders and applicable federal and state regulations. The hazard classification for these facilities is "moderate hazard."

The hazards needing special consideration and evaluation in the PSE include containment of radioactive/chemical materials and airborne particulates, radiation exposure, gasses and vapors of respiratory concern, and industrial hazards to personnel which are not already considered in the current safety analysis documentation for these facilities. New structures, equipment pits, equipment, and piping shall be designed to provide containment of radioactive solutions. Although personnel occupancy will not be continuous in the contaminated area, personnel shall be protected from radiation by adequate shielding provided by cover blocks or earth cover.

Safety class systems will be identified in the PSE and shall be verified or revised to ensure compliance with DOE Order 6430.1A, Section 1300-3.2, during the Safety Assessment, if required. A revision to the Double Shell Tank Farm Interim Safety Basis shall be prepared, completed, and approved prior to operation of the retrieval systems. The acceptability of system design and operation under normal conditions, to include all features of performance alternates (e.g., redundancy, by-pass administrative controls), shall be evaluated by taking into consideration single active failures of components. The effects of component failure, including control/monitoring and utility failure (e.g., power sources, air and vacuum supplies), shall also be evaluated. Special safety features shall be incorporated in the design in accordance with the requirements of DOE Order 6430.1A.

5.1.1 Criticality Safety

Criticality requirements shall be determined by the preliminary safety evaluation (PSE) and Safety Assessment generated during the life of the project. If a potential for criticality is found to exist, special features shall be provided by the design for prevention of criticality in accordance with DOE Order 6430.1A, Section 1323-3. Credit may be taken for administrative controls, as permitted by DOE regulations.

5.1.2 Safety Analysis

A PSE shall be conducted in accordance with DOE Orders 5480.23 and 6430.1A, Section 0110-5.2. The PSE will form the basis for assigning the appropriate safety class to the various systems which make up the ITRS. Recommendations resulting from the PSE shall be factored into the design and cost estimate. The Draft Safety Assessment shall be completed and approved prior to the start of construction.

5.1.2.1 Design Basis Accidents

The ITRS shall be designed to withstand the effects of design basis accidents (DBA), as delineated in DOE Order 6430.1A, without loss of containment and with confinement of radioactive and toxic materials within allowable limits. Simultaneous occurrences of more than one DBA shall be considered when a joint occurrence, causally related to a common-mode failure, is possible.

5.1.2.2 Component Failure Analysis

The design shall be such that no single credible component failure will result in unacceptable safety consequences. Unacceptable safety consequences to be evaluated include the following:

- Fire (other than localized minor fires such as caused by shorting of electrical equipment).
- Exposure of personnel to ionizing radiation exceeding DOE Order 5480.11 values.
- Exposure of personnel to toxic chemical agents exceeding Ceiling Threshold Limit Value of the American Conference of Governmental Industrial Hygienists.

The effects of component failure, including control and monitoring, and utilities failure (such as power sources, air, and vacuum supplies) shall be evaluated for unacceptable consequences and documented in the PSE. Special safety features shall be incorporated in the design in accordance with the requirements of DOE Order 6430.1A.

5.1.3 Contamination Control

Waste tank modifications shall be in accordance with the criteria given in DOE Order 6430.1A, Section 1300-7 by providing confinement barriers for contamination control.

The retrieval system shall be designed to confine contaminants within the combination of boundaries defined by the existing tank, the confinement surfaces of the retrieval system, and any other barriers that may be required. Air discharge shall be via existing ventilation systems, which are equipped with HEPA filters and a continuous release monitoring system.

The retrieval system shall have provisions for safe and effective decontamination and decommissioning of all associated waste transfer systems, hardware, tanks, and facilities.

5.1.4 Shielding

The design of the retrieval system equipment shall provide shielding in accordance with ALARA principles. The DOE "as low as reasonably achievable" (ALARA) guidelines shall be implemented in the design of equipment and during construction, installation, operation, maintenance, and decommissioning activities.

The maximum annual exposure to an individual from all sources must not exceed a cumulative 500 mrem, summed over all controlled access areas. The source term used for shielding design should be the maximum expected during normal operation. Consideration shall be given to normal operation, abnormal events, and maintenance activities. Where there is a potential for airborne contamination, allowance shall be made for internal deposition of radionuclides in determining the total dose. Source terms which may develop in operating areas, such as in pump pits, shall be considered.

Quantities and locations of radioactive materials shall be assumed such that the largest credible dose is used for the shielding design basis. The process streams resulting from the ITRS shall also be considered in the calculations. Requirements to maintain radiation exposure levels ALARA are provided in DOE Order 5480.11 (DOE 1988). Guidelines for achieving exposure levels that are ALARA are contained in DOE/EV/1830-T5 (DOE 1980). In addition, the retrieval system shall be designed to minimize personnel exposure to radioactive and hazardous materials to ALARA levels during assembly, installation, maintenance, and disposal.

5.1.5 Radiation Protection

5.1.5.1 General Radiation Protection

Existing direct radiation monitors and air contamination monitors, with alarms, are provided in accordance with DOE Radiological Control Manual DOE/EH-02565 (June 1992) and WHC-CM-1-6, "Radiological Control Manual." Signals from radiation and effluent monitoring systems shall be connected to the control system and alarmed/displayed in the control room.

5.1.5.2 Radiation Protection Optimization

Evaluations and cost-benefit analyses for determining that the radiation exposure levels are as low as reasonably achievable (ALARA) shall use the methodologies established in International Commission on Radiological Protection 37, "Cost-Benefit Analysis in the Optimization of Radiation Protection." The human factors engineering criteria of DOE Order 6430.1A, "General Design Criteria," Section 1300-12 shall be applied for work with equipment and facilities containing radioactive materials.

5.1.5.3 Criteria for Control of Occupational External Radiation Exposure

The radiation field at any continuously occupied locations shall comply with ALARA principles. All contributing sources shall be considered including, but not limited to, the waste tank, ancillary facilities, and transfer piping and equipment.

The radiation field at the surface of below-ground structures where they contact the soil in the controlled access areas shall not exceed 0.2 mrem/hr on average in accordance with DOE-RL Order 5480.11A.

Remote maintenance and inspection capabilities shall be incorporated in the design of facilities and equipment if needed to meet ALARA requirements. Radiation exposures associated with proposed alternatives shall be shown to meet ALARA requirements.

5.1.5.4 Criteria for Control of Occupational Internal Radiation Exposure

Airborne radioactivity and surface contamination shall be controlled by confinement of process solutions, aerosols, and gases, during all foreseen normal operation and maintenance activities. Release of radioactive/hazardous materials into accessible locations shall be minimized.

In no case shall the airborne radioactivity concentrations in accessible locations exceed one-tenth the derived air concentration values listed in the DOE Order 5480.11 "Radiation Protection for Occupational Workers," as adjusted for all radionuclides present.

5.1.5.5 Criteria for Control of Nonoccupational Radiation Exposure

Any leakage of process or decontamination solutions shall be contained and handled as radioactive waste.

No member of the public shall receive an effective dose equivalent greater than 100 mrem/yr (50 mrem/visit) from exposure during direct onsite access at a DOE facility. This limiting value includes the committed effective dose equivalent from internal irradiation and any external irradiation in accordance with DOE Order 5480.11 and DOE RL Order 5480.11.

5.1.5.6 Criteria for Radiation Exposure to Public

The maximum dose equivalent received by any member of the public shall be ALARA. The exposure of members of the public to radiation sources as a consequence of all routine DOE activities shall not cause, in a year, an effective dose equivalent greater than 100 mrem in accordance with DOE Order 5400.5, "Radiation Protection of the Public and the Environment."

5.1.6 Industrial Safety and Industrial Hygiene

Routine construction hazards will exist while the ITRS is under construction and during equipment installation at the tank farms. Field operations and construction operations shall be conducted to ensure a safe working environment in compliance with applicable OSHA and Washington Industrial Safety and Health Act (WISHA) standards.

Project design shall preclude, as far as possible, the need for confined space entry during construction and operations. If required, project systems, equipment, and modifications shall comply with lock and tag procedures.

The facilities shall not be designed to use hazardous material if practicable. The architect-engineer shall submit to WHC, for approval, the justification for use of any hazardous material prior to incorporating such material into the design.

5.1.7 Fire Protection

Fire protection systems in the facilities provided by this project, e.g. the ITRS control room, shall be designed to meet the following requirements as applicable:

- DOE Order 6430.1A.
- DOE Order 5480.4 Attachment 2, "Mandatory ES&H Standards," Section 2C, "Fire Protection."
- DOE Order 5480.7, "Fire Protection."
- DOE/EP 0108, "Standard for Fire Protection of DOE Electronic Computer and Data Processing Systems."
- DOE EV-0043, "Standards For Fire Protection for Portable Structures."
- Applicable codes and standards listed in Section 6.

The fire alarm system shall be compatible with and tie into the 200 Area Hanford radio fire alarm system.

In conjunction with the PSE, a Fire Hazard Analysis shall be performed in accordance with DOE Order 6430.1A, Section 0110-6, "Fire Protection." The analysis shall be documented in report form in the facility project files and referenced by the Safety Assessment.

5.1.8 Abnormal Operations

The waste retrieval system design shall include provisions to monitor and alarm on detection of abnormal conditions such as radioactive particulate release, liquid and gaseous release, abnormal radiation levels, fires, and overheating or pressurization. Process systems shall be designed to ensure safe channeling of energy and material flows (e.g., rupture disks, seal pots, electrical ground fault detection circuitry, siphon breaks, etc.).

5.1.9 Traffic Safety

The waste tank design modifications shall take into consideration traffic into, around, and out of the area; particularly during an emergency situation.

5.2 ENVIRONMENTAL PROTECTION

The environmental requirements for new and modified facilities, as defined in Section 9 of the Environmental Compliance manual (WHC-CM-7-5), shall be applicable to the design and operation of the ITRS. This project shall comply and obtain proper permits to satisfy the air emission regulation pursuant to the Clean Air Act, WAC-173-460; and RCRA under the existing Double-Shell Tank System Dangerous Waste Permit Applicant through the use of the permit modification process. In addition, NEPA and SEPA shall be addressed. Retrieval of waste from tanks 101-SY and 103-SY will be covered in the Safe Interim Storage Environmental Impact Statement (SIS-EIS), and all W-211 tanks will be covered in the TWRS-EIS.

An environmental requirements checklist shall be prepared identifying all applicable environmental and permitting requirements for the project. This checklist will serve as the basis for development of the project permitting plan. The permitting plan will identify the permitting alternatives and strategy for the project. This project shall be compatible with the ongoing environmental protection and compliance projects.

5.3 SAFEGUARDS AND SECURITY

The project will be within the 200 East and 200 West areas. No special security and safeguard requirements are needed beyond those currently in force. Control of personnel at the Hanford Site boundary is deemed adequate.

All new facilities shall be designed to comply with DOE Order RL 5632.6, "Physical Protection of DOE Property and Unclassified Facilities", as well as any other security and safeguards requirements defined in DOE orders and WHC policies and procedures. Fencing, access locks, and any other security/safeguard items necessary shall be provided to meet DOE requirements, environmental regulations, or WHC policies and procedures for installation and operation of the ITRS.

5.4 NATURAL FORCES

The ITRS and component modifications important to safety shall be designed taking into consideration the loads generated by seismic events and other natural phenomena. The methods given in HPS, Standard Design Criteria, SDC-4.1 shall be applied in analyzing structural integrity of those structures, systems, and components. The following naturally occurring design basis accident scenarios shall be considered during preparation of the safety analysis and project design phase.

5.4.1 Design Basis Earthquake

All systems components and structures shall be designed for the design basis earthquake (DBE) as specified in HPS, SDC 4.1 and DOE Order 6430.1A for Safety Class 1, 2, 3, and 4.

5.4.2 Design Basis Wind

The features necessary to protect onsite personnel and the public shall be designed to withstand the 100-year recurrence interval windloading according to HPS, SDC 4.1.

5.4.3 Design Basis Flood

The elevation of the 200 Area site has been judged to be outside the maximum extent of the Hanford Site design basis flood.

5.4.4 Volcanic Eruptions

The ITRS location suggests that volcanic action could provide ashfall that may affect operation. The ITRS safety class items design shall include as required by HPS, SDC 4.1, protection from ash resulting from volcanic eruption.

5.4.5 Design Basis Power Failure

The ITRS shall incorporate features so that the occurrence of a design basis power failure will maintain the waste retrieval system in a safe condition without undue risk to the health and safety of the public and onsite personnel.

5.4.6 Design Basis Fire

The features necessary to maintain the waste retrieval system in a safe condition shall be designed to withstand the design basis fire.

5.5 HUMAN FACTORS

Design will consider human factors for maintenance and operations activities, including the control system, equipment, valve location and orientation, secondary waste handling, and facility arrangement. The design will comply with DOE Order 6430.1A, Section 1300-12.

5.6 DESIGN FORMAT

Drawings shall be prepared according to the formats set forth in SDC-1.3, "Preparation and Control of Engineering and Fabrication Drawings." Two-way traceability shall be provided between project drawings and the reference drawings from which they were developed. Project drawings shall identify existing essential plant drawings that will be affected by the project. Project W-211 will update existing essential plant drawings that are affected by project design.

5.7 QUALITY ASSURANCE

Quality assurance/control activities for all contractors involved in design, construction, and acceptance testing shall be executed in accordance with the project specific Quality Assurance Program Plan (QAPP). The QAPP shall be developed during conceptual design. It shall be used by the design contractor to develop verification criteria in design documents (i.e., drawings, specifications, test procedures) and by all contractors to define quality assurance interfaces and specific quality requirements/responsibilities on the project.

The QAPP shall require compliance with the quality criteria of DOE Orders 5700.6C, 6430.1A, Section 0140, and RLIP 4700.1A.

The basis for establishing Quality Assurance Program requirements is Safety Classification as defined in MRP 5.46 "Safety Classifications of Systems, Components and Structures." The safety classifications of items provides a graded approach to application of quality requirements. This graded approach assigns requirements to items commensurate with the function of each system, component and structure in preventing or mitigating the consequences of hazards and postulated design basis accidents. The overall safety classification for this project will be defined in the preliminary safety evaluation and safety assessment documents.

5.8 DECONTAMINATION AND DECOMMISSIONING

The design of the ITRS shall facilitate decontamination so that the facility can be decommissioned at a future date. Guidance for retrieval equipment design to facilitate eventual decommissioning shall be obtained from American National Standards Institute (ANSI) N300, and DOE Order 4700.1, 6430.1A (Sections 1300-11.2 and 1321-7, and 5820.2A, Chapter V.

The following principles shall be employed to the extent practicable:

- Use of modular, separable confinements for radioactive and other hazardous materials to preclude contamination of fixed portions of the structure.

- Areas subject to contamination shall be designed to facilitate decontamination (example: washable paints or metal liners on new concrete surfaces which have potential for contamination). Liners and coatings shall be selected to withstand decontaminating agents and radiation degradation throughout the life of the facility.

- Penetrations shall be designed to minimize technical and construction problems in the structural closing and sealing of these penetrations at the time of decommissioning.

- Surfaces should be free of crevices, ledges, and/or protrusions which could collect radioactive material.

- Penetrations shall be waterproofed for protection during decontamination efforts.

- Fixtures and outlets shall be sealed.

- Drains and similar piping shall have provisions for cleaning.

- Piping systems shall be sloped and free of traps except as required for retrieval process isolation.

- Adequate clearance shall be provided for transfer of equipment.

- Use of lifting lugs on large tanks or equipment.

- Use of modular radiation shielding, where practical, in lieu of or in addition to monolithic shielding walls.

5.9 WASTE MINIMIZATION AND HAZARDOUS MATERIAL USAGE

The project design shall minimize hazardous and nonhazardous waste generation and the use of hazardous materials during construction, maintenance and operation, and decommissioning/closure (some materials used for construction and operation are not considered hazardous until they are designated as waste). Where materials are used that are hazardous or will become hazardous upon designation as a waste, a note or similar identification should be added to the definitive design media. Where lead or a similar hazardous material must be used for shielding or other purposes, the item will be encapsulated to prevent contamination and to allow future retrieval in an uncontaminated condition. The item will be permanently marked to identify the contents. Lead will not be allowed for use in remote components for counter-weighing. Material Safety Data Sheets will be supplied for all materials, i.e., paints, sealants, oils, lubricants, chemicals, fill fluids, used in the facility and for construction. No PCBs or asbestos are allowed. Transformers, lighting ballasts, etc, which use an insulating oil will be certified PCB-free.

5.10 COMMUNICATIONS AND TELECOMMUNICATIONS SYSTEMS

The ITRS control room shall be provided with phone and Hanford Local Area Network (HLAN) communication systems by site services. In addition, emergency notification and communication systems shall be provided and may include an evacuation siren. The number of telephones installed shall be determined in definitive design. A modem for the phone shall provide for transmission of recorded parameters to the process engineering group. The exact location and system design will be determined during definitive design.

5.11 AUTOMATIC DATA PROCESSING

The ITRS shall be provided with a centralized data acquisition and control system (DACS) which complies with the requirements of DOE Order 6430.1A, Section 0110-99.8.4. The DACS shall be used for data acquisition, data analysis, inventory control, and process control. The system shall allow stand-alone monitoring and control. Recording equipment shall be provided to make a permanent record of alarms and process conditions. For 101-SY, the mitigation program will control and monitor the mitigation pump.

6.0 CODES AND STANDARDS

The design and construction of the ITRS (a non-reactor nuclear facility) shall comply with the following codes and standards:

- American Concrete Institute (ACI)
- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- American Water Works Association (AWWA)
- Hanford Plant Standards (HPS)
- International Conference of Building Officials (ICBO)
- Institute of Electrical and Electronics Engineers (IEEE),
- Instrument Society of America (ISA)
- National Fire Protection Association (NFPA)

All applicable DOE orders and standards in effect at the start of the design shall be used. All Federal, State, and local laws and regulations shall apply. The latest edition of all codes, standards, and manuals shall be used.

6.1 U.S. CODE OF FEDERAL REGULATIONS

- 29 CFR 1910, Title 29, Part 1910, "Occupational Safety and Health Standards."
- 40 CFR 61, Sub-Part H, "National Emission Standards for Radionuclide Emissions from Department of Energy (DOE) Facilities."
- 40 CFR 260, "Hazardous Waste Management System General."
- 40 CFR 261, "Identification and Listing of Hazardous Waste."
- 40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."
- 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."

6.2 U.S. DEPARTMENT OF ENERGY - HEADQUARTERS

- "Radiation Standards for Protection of the Public in the Vicinity of DOE Facilities", William A. Vaughn Memorandum, 1985, U.S. Department of Energy.
- "A Guide to Reducing Radiation Exposure to As Low As Reasonable Achievable (ALARA), DOE/EV/1830.T5, U.S. Department of Energy." prepared by DOE.
- Department of Energy Order 4010.1, "Value Engineering."
- Department of Energy Order 4700.1, "Project Management System."
- Department of Energy Order 5400.5, "Radiation Protection of the Public and the Environment."
- Department of Energy Order 5632.6, "Physical Protection of DOE Property and Unclassified Facilities."
- Department of Energy Order 5480.1B, "Environmental, Safety, and Health Program for Department of Energy Operations."
- Department of Energy Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards."
- Department of Energy Order 5480.5, "Safety of Nuclear Facilities."
- Department of Energy Order 5480.7, "Fire Protection."

- Department of Energy Order 5480.10, "Contractor Industrial Hygiene Program."
- Department of Energy Order 5480.11, "Radiation Protection for Occupational Workers."
- Department of Energy Order 5481.1B, "Safety Analysis and Review System."
- Department of Energy Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements."
- Department of Energy Order 5700.6C, "Quality Assurance."
- Department of Energy Order 5820.2A, "Radioactive Waste Management."
- Department of Energy Order 6430.1A, "General Design Criteria."

  NOTE: On 6430.1A, "-99" sections and Division 13, "Special Facilities", only:

  - 1300, "General Requirements", and 1323, "Radioactive Liquid Waste Facilities", requirements are applicable.
  - 99.0, "Non-Reactor Nuclear Facilities - General", section and 99.17, "Radioactive Liquid Waste Facilities", section are applicable.

6.3 U.S. DEPARTMENT OF ENERGY FIELD OFFICE, RICHLAND

- "Hanford Site Hoisting and Rigging Manual"
- "Preparation and Control of Engineering and Fabrication Drawings," HPS, SDC-1.3.
- "Standard Arch-Civil Design Criteria," HPS, SDC-4.1.
- "Heating, Ventilating, and Air Conditioning," HPS, SDC-5.1.
- Department of Energy-Richland Operations Order RL 4320.2C, "Site Selection."
- Department of Energy-Richland Operations Order RLIP 4700.1A, "Project Management System."
- Department of Energy-Richland Operations Order RLIP 5300.1B, "Telecommunications."

- Department of Energy-Richland Operations Order RLIP 5400.1, "General Environmental Protection Program."
- Department of Energy-Richland Operations Order RL 5440.1A, "Implementation of the National Environmental Policy Act at RL."
- Department of Energy-Richland Operations Order RL 5480.1A, "Environmental Protection, Safety and Health Protection Program for RL."
- Department of Energy-Richland Operations Order RLIP 5480.7, "Fire Protection."
- Department of Energy-Richland Operations Order RLIP 5480.11, "Radiation Protection for Occupational Workers."
- Department of Energy-Richland Operations Order RL 5480.11A, "Requirements for Radiation Protection."
- Department of Energy-Richland Operations Order RL 5481.1, "Safety Analysis and Review System."
- Department of Energy-Richland Operations Order RLIP 5500.1B, "Vital Records Protection Program."
- Department of Energy-Richland Operations Order RL 6430.1C, "Hanford Plant Standards (HPS) Program."

6.4 INDUSTRY CODES AND STANDARDS

- "Sanitation in Places of Employment", ANSI 24.1.
- "Building Services Piping Code", ANSI B31.9.
- "American National Standard for Radioactive Materials-Leakage Tests on Packages for Shipment", ANSI N 14.5.
- "Design, Construction, and Operation of Ventilation Systems for Mixed Oxide UO_2-PuO_2 Fuel Fabrication Plants," ANSI N290, 1979.
- "Design Criteria for Decommission of Nuclear Fuel Preprocessing Plant," ANSI N300-1975 (R1981), 1975.
- "Hooks," ANSI/ASME B30.10, 1987.
- "Storage/Retrieval (S/R) Machines and Associated Equipment," ANSI/ASME B30.13, 1985.

- "Software Quality Assurance Plans," ANSI/IEEE 730-1984.
- "Local Area Networks Carrier Sense Multiple Access with Collision Detecting (CSMA/CD) Access Method and Physical Layer Specifications", ANSI/IEEE 802.3.
- "IEEE Guide to Software Requirements Specification", ANSI/IEEE 830.
- "IEEE Guide to Software Quality Assurance Planning", ANSI/IEEE 983.
- "Versatile Backplane Bus: VMEbus", ANSI/IEEE 1014.
- "Requirements for Instrument Transformers", ANSI/IEEE C57.13.
- "Practice for Office Lighting, ANSI/IES RP1.
- "Practice for Industrial Lighting", ANSI/IES RP7.
- "Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter," American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) 52-1976.
- "Human Engineering Design Criteria for Military Systems, Equipment and Facilities", DOD MIL-STD-1472d.
- "National Fire Codes," NFPA, 1990.
- "Occupational Safety and Health Administration Standards", OSHA.
- Munson, L. H., "Health Physics Manual of Good Practices for Reducing Radiation Exposure to Levels that are As Low As Reasonable Achievable (ALARA)," Pacific Northwest Laboratory 6577, 1988.
- "Technical Resource Document for the Storage and Treatment of Hazardous Waste in Tank Systems," EPA Document PB87-13439.

6.5 STATE REGULATIONS

- "Dangerous Waste Regulations," Chapter 173-303, Washington Administrative Code, 1991.
- "Minimum Functional Standards for Solid Waste Handling," Chapter 173-304, Washington Administrative Code.

- "Low-Level Radioactive Waste Disposal", Chapter 173-325, Washington Administrative Code.
- "General Requirements for Air Pollution Sources," Chapter 173-400, Washington Administrative Code.
- "Civil Sanctions under Washington Clean Air Act," Chapter 173-402, Washington Administrative Code.
- "Controls for New Sources of Toxic Air Pollutants," Chapter 173-460, Washington Administrative Code.
- "Ambient Air Quality Standards for Particulate Matter," Chapter 173-470, Washington Administrative Code.
- "Ambient Air Quality Standards for Carbon Monoxide, Ozone, and Nitrogen Dioxide," Chapter 173-475, Washington Administrative Code.
- "Ambient Air Quality Standards and Emission Limits for Radionuclides," Chapter 173-480, Washington Administrative Code.
- "Emission Standards and Controls for Sources Emitting VOCs", Chapter 173-490, Washington Administrative Code.
- "Radiation Protection - Air Emissions," Chapter 246-247, Washington Administrative Code.
- "On-Site Sewage System," Chapter 246-272, Washington Administrative Code.
- "Public Water Supplies," Chapter 246-290, Washington Administrative Code, 1989.
- "Monitoring and Enforcement of Air Quality and Emission Standards for Radionuclides," Chapter 402-80, Washington Administrative Code, 1989.
- "Standard Specifications for Road, Bridge & Municipal Construction," M41-10, Washington State Department of Transportation (WSDOT).
- "Washington Industrial Safety and Health Act, Safety and Health Standards," Washington Industrial Safety and Health Act (WISHA).

In addition to the above standards, applicable Hanford standards, Occupational Safety and Health Administration standards, the national consensus codes, and standards developed by such organizations as the

ASME, American Society of Testing Materials, ANSI, American Concrete Institute, Instrument Society of America, American Water Works Association, and IEEE shall be used as determined by subsequent design phases. In the event there is a conflict with applicable codes or standards, the most restrictive shall be used.

7.0 REFERENCES

- Shaw 1989 - C. P. Shaw, "Specification for Transfer Pump for Waste Tank 241-AZ-101," WHC-S-013, February 1989.
- H. D. Smith and M. R. Elmore, "Corrosion Studies of Carbon Steel Under Impinging Jets of Simulated Slurries of NCAW and NCRW," PNL 7816, January 1992.
- "A Safety Assessment for Proposed Pump Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-SY-101: Hanford Site, Richland, Washington," Los Alamos Report LA-UR-92-3196.
- "Analysis of Tank Bump Potential During In-Tank Washing Operations Proposed for the 241-AZ Tanks," WHC-SD-WM-ER-114.
- "Functional Design Criteria, Replacement of Cross-Site Transfer System," WHC-SD-W058-FDC-001.
- "Stress Cycles and Forces on In-Tank Components Resulting from Mixer Pump Operation in DST 101-AZ (Design Input)," WHC-SD-W151-ER-001.
- "Preliminary Safety Analysis Report for Project W-151," WHC-SD-W151-PSAR-001.
- "Double-Shell Tank Farm Facility Safety Analysis Report," WHC-SD-WM-SAR-016.
- "Aging Waste Facility Safety Analysis Report," WHC-SD-HS-SAR-010.
- "Project W-211 Initial Tank Retrieval Systems Engineering Study," WHC-SD-W211-ES-001.

8.0 APPENDICES

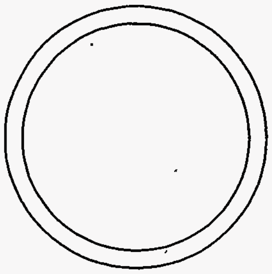
APPENDIX A

Tank Riser Information

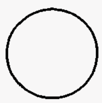
NOTE: The material contained in this appendix is for architect/engineer information, is nonbinding and, therefore, the signature of the Department of Energy is not required.

8.1 APPENDIX A, TANK RISER INFORMATION

APPENDIX A
KEY



6 inch circle is tank outline - outer circle shows annulus



<u>Risers</u>

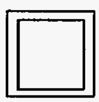
42 in.

10 in., 12 in., 24 in.

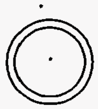
4 in., 6 in.

} In proportion to size

1, 2, 3, etc. — Riser Number - may not agree with field ID

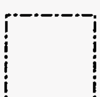


Various size rectangles are pits - may have label



Caisson (usually 72 inches in diameter) - Covered

MH — A 42 inch manhole at dome top - no riser to surface



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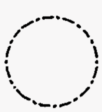


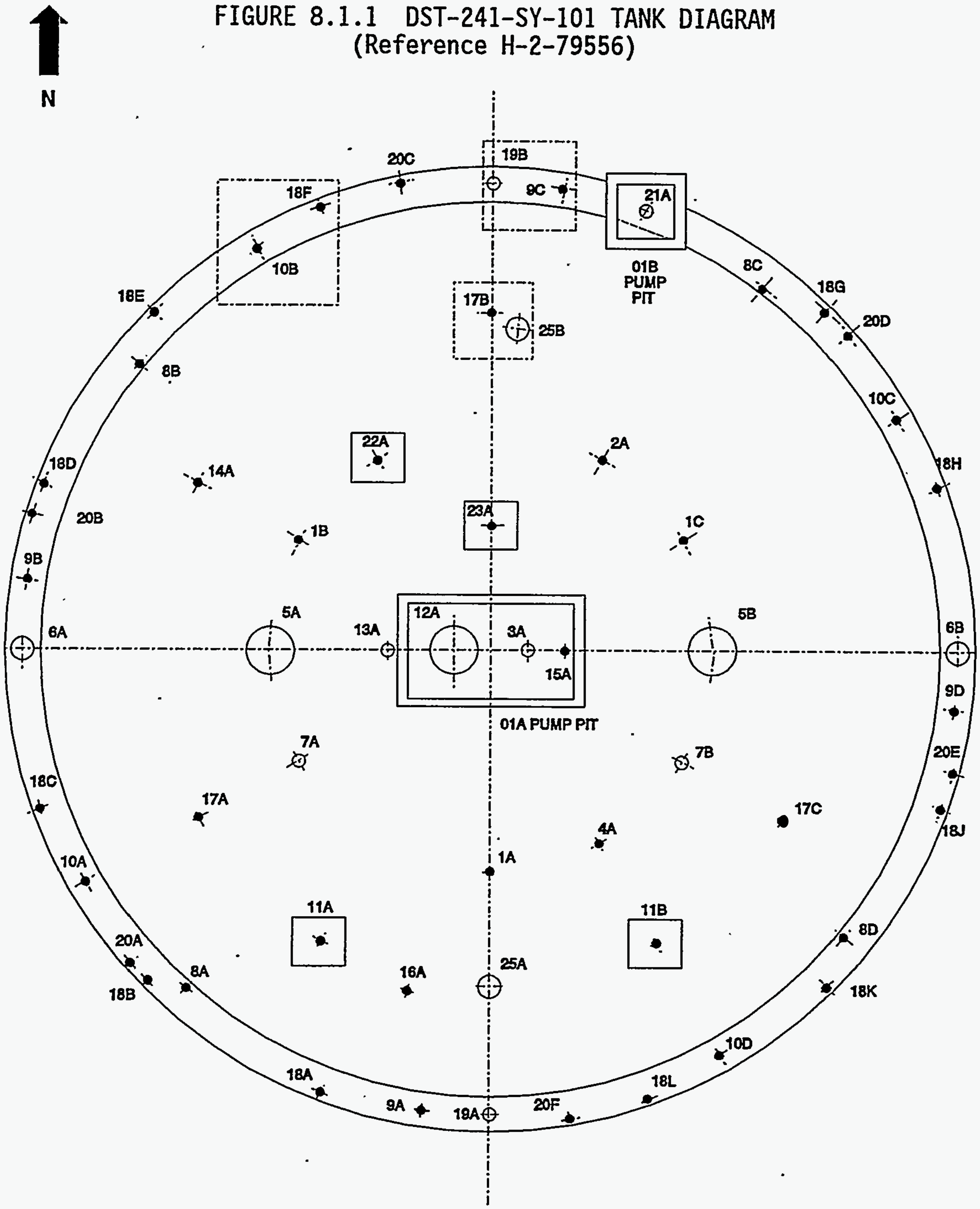
Cement pad with a plate (riser is under plate)

APPENDIX A
KEY - RISER DESCRIPTION

Riser:	Pipe leading into tank dome
Size:	Nominal pipe diameter of riser (in inches)
Elevation:	Surveyed at riser flange
Radius:	Distance of riser center from tank center
Nonfunctional:	Does not show at surface, not in a pit - no surface access
Spare:	Spare riser with no current function or planned use - possible concrete plug underneath plate
( ):	Riser is within a pit
P/CP:	Riser is recessed below a cement pad with an access plate at grade
SMP:	Sludge measurement port
LIT:	Automatic liquid indicator tape
LLI:	Manual liquid level indicator
Leak Detector:	Fixed liquid level sensor - type varies
Temp:	Temperature probe
TBX:	Instrument leads of several kinds - usually on annulus of tank
SpG:	Specific Gravity
LOW:	Liquid Observation Well
CVR:	Metal Cover Plate

APPENDIX A

FIGURE 8.1.1 DST-241-SY-101 TANK DIAGRAM
(Reference H-2-79556)



TANK SY 101

APPENDIX A
TABLE 8.1.1. WASTE TANK DOME PENETRATIONS

Tank 241-SY-101

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT - IN)	FUNCTION
1A	4	672.65	20 - 0	SPARE
1B	4	672.47	20 - 0	VELOCITY DENSITY TEMPERATURE TREE
1C	4	672.41	20 - 0	LEVEL MEASUREMENT
2A	4	672.49	20 - 0	SPARE (RISER IS BENT)
3A	12		3 - 0	SPARE (USED AS SUPERNATE PUMP)
4A	4	672.64	20 - 0	SPARE
5A	42	672.04	20 - 0	LIGHT ASSEMBLY
5B	42	672.24	20 - 0	CAMERA ASSEMBLY
6A	24	672.48	20 - 6-3/8	SPARE
6B	24	672.40	20 - 6-3/8	ANNULUS ACCESS
7A	12	672.06	20 - 0	VESSEL EXHAUST PORT (K1 EXHAUST SYSTEM)
7B	12	672.40	20 - 0	AIR INLET FILTER
8A	4	672.49	37 - 11	ANNULUS AIR INLET
8B	4	672.31	37 - 11	ANNULUS AIR INLET
8C	4	672.21	37 - 11	ANNULUS AIR INLET
8D	4	672.41	37 - 11	ANNULUS AIR INLET
9A	6	672.37	38 - 9	ANNULUS INSPECTION
9B	6	672.45	38 - 9	ANNULUS INSPECTION
9C	6	671.44	38 - 9	ANNULUS INSPECTION
9D	6	672.43	38 - 9	ANNULUS INSPECTION
10A	8	671.48	38 - 9	ANNULUS EXHAUST PORT (K2 EXHAUST SYSTEM)
10B	8	671.47	38 - 9	SPARE
10C	8	672.67	38 - 9	ANNULUS AIR INLET
10D	8	672.49	38 - 9	SPARE
11A	4	669.12	28 - 0	SPARE
11B	4	669.17	28 - 0	TANK PRESSURE PORT
12A	42		3 - 0	SUPERNATE ADDITION
13A	12	672.25	9 - 0	LEVEL MEASUREMENT
14A	4	672.25	28 - 0	VELOCITY DENSITY TEMPERATURE TREE

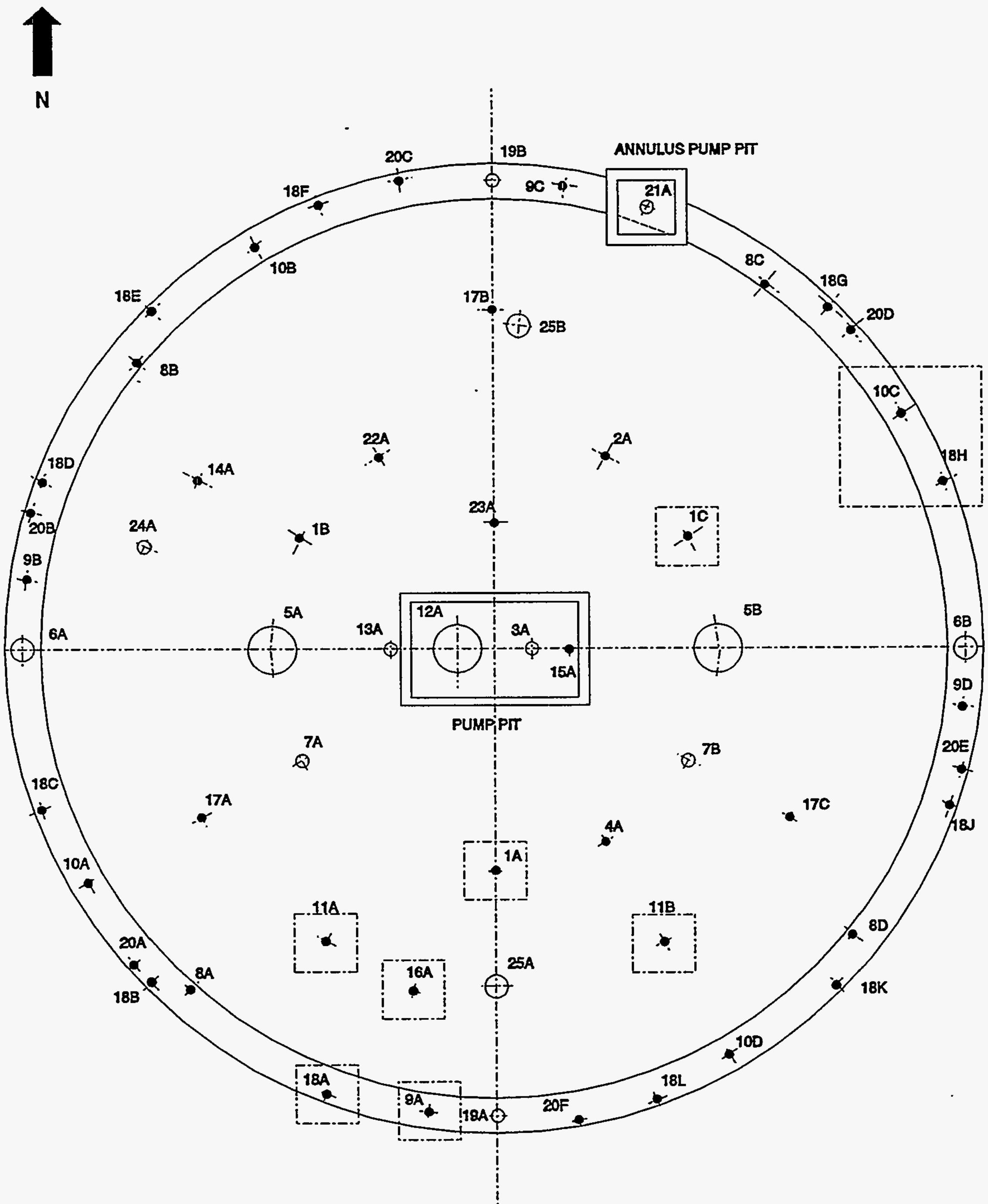
APPENDIX A

TABLE 8.1.1. WASTE TANK DOME PENETRATIONS

Tank 241-SY-101

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
15A	4		6 - 0	DROPLEG NOZZLE
16A	4	672.24	28 - 0	GAS MONITORING PROBE
17A	4	672.34	28 - 0	LEVEL MEASUREMENT
17B	4	671.49	28 - 0	MULTIFUNCTION INSTRUMENT TREE
17C	4	672.37	28 - 0	SPARE
18A	4	672.46	39 - 8	ANNULUS INSPECTION
18B	4	672.44	39 - 8	ANNULUS INSPECTION
18C	4	672.43	39 - 8	ANNULUS INSPECTION
18D	4	672.45	39 - 8	ANNULUS PRESS INDICATOR
18E	4	672.46	39 - 8	ANNULUS INSPECTION
18F	4	671.44	39 - 8	ANNULUS INSPECTION
18G	4	672.46	39 - 8	ANNULUS INSPECTION
18H	4	672.45	39 - 8	ANNULUS INSPECTION
18J	4	672.46	39 - 8	ANNULUS INSPECTION
18K	4	672.47	39 - 8	ANNULUS INSPECTION
18L	4	672.46	39 - 8	ANNULUS INSPECTION
19A	12	672.48	38 - 9	ANNULUS LEAK DETECTOR
19B	12	671.46	38 - 9	ANNULUS INSPECTION
20A	4	672.45	39 - 8	TERMINAL BOX TBX-101-4
20B	4	672.45	39 - 8	TERMINAL BOX TBX-101-5
20C	4	672.45	39 - 8	TERMINAL BOX TBX-101-6
20D	4	672.48	39 - 8	TERMINAL BOX TBX-101-1
20E	4	672.46	39 - 8	TERMINAL BOX TBX-101-2
20F	4	672.49	39 - 8	TERMINAL BOX TBX-101-3
21A	12		38 - 9	ANNULUS PUMP OUT
22A	4	671.23	20 - 0	GAS MONITORING PROBE
23A	4	671.20	10 - 0	SPARE
25A	20		27 - 0	NONFUNCTIONAL
25B	20		27 - 0	NONFUNCTIONAL

APPENDIX A
FIGURE 8.1.2 DST-241-SY-103 TANK DIAGRAM



TANK SY 103

APPENDIX A
TABLE 8.1.2 WASTE TANK DOME PENETRATIONS

Tank 241-SY-103

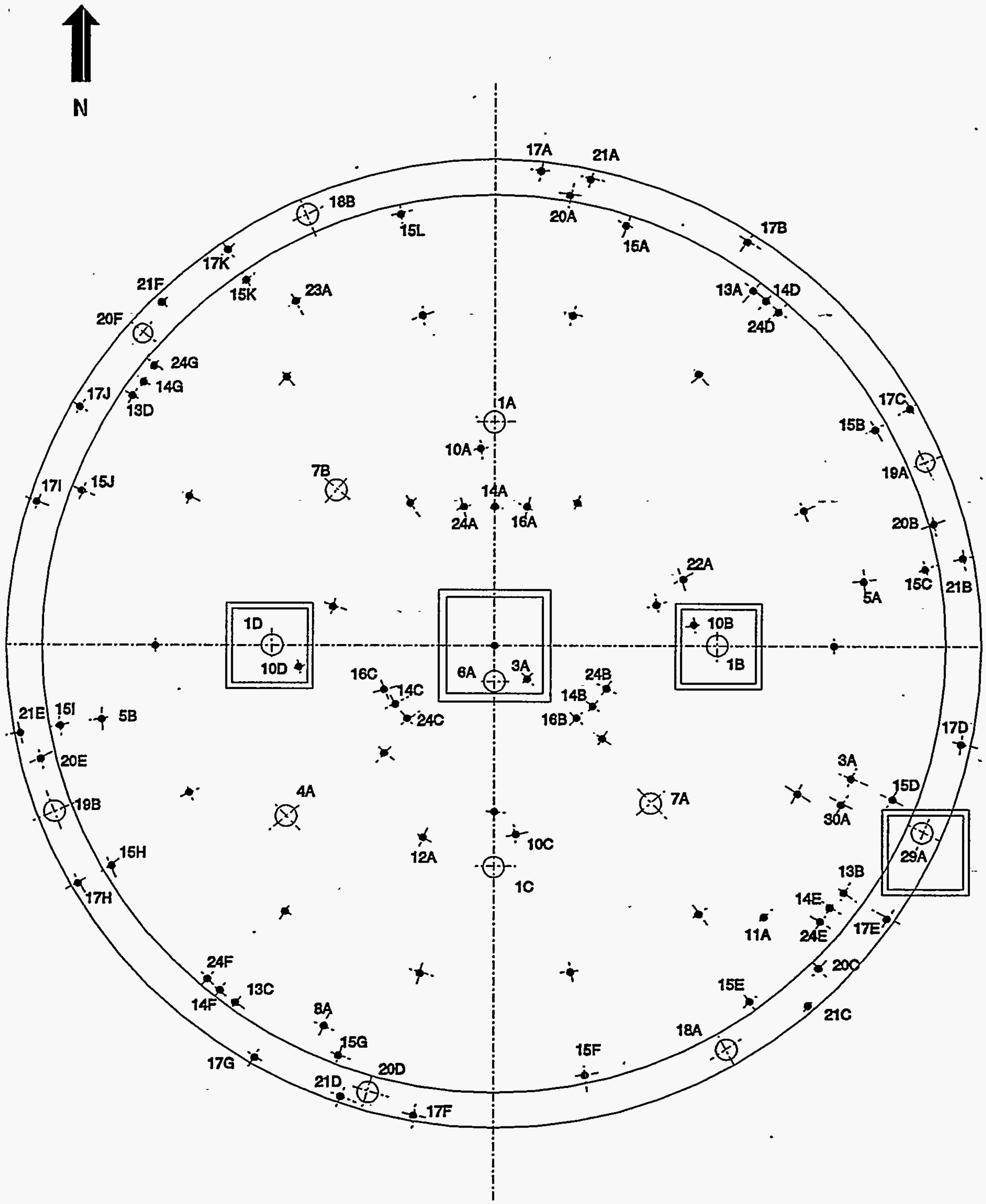
RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
1A	4	672.40	20 - 0	P/CP (12 in. CVR) - SPARE
1B	4	672.35	20 - 0	SMP
1C	4	671.10	20 - 0	P/CP (12 in> CVR) - SPARE
2A	4	672.50	20 - 0	LIT
3A	12		3 - 0	CENTRAL PUMP PIT SUPERNATE PUMP
4A	4		20 - 0	THERMOCOUPLE PROBE
5A	42	671.86	20 - 0	SPARE
5B	42	672.57	20 - 0	SPARE
6A	24	672.37	38 - 6 3/8	ANNULUS ACCESS
6B	24	672.40	38 - 6 3/8	ANNULUS ACCESS
7A	12	671.98	20 - 0	EXHAUSTER PORT
7B	12	672.63	20 - 0	SPARE
8A	4	672.86	37 - 11	ANNULUS AIR INLET
8B	4	672.69	37 - 11	ANNULUS AIR INLET
8C	4	672.13	37 - 11	ANNULUS AIR INLET
8D	4	672.87	37 - 11	ANNULUS AIR INLET
9A	6	670.95	38 - 9	P/CP (12 in. CVR) - ANNULUS INSPECTION
9B	6	672.39	38 - 9	ANNULUS INSPECTION
9C	6	672.41	38 - 9	ANNULUS INSPECTION
9D	6	672.34	38 - 9	ANNULUS INSPECTION
10A	8	672.42	38 - 9	ANNULUS INSPECTION
10B	8	672.43	38 - 9	ANNULUS EXHAUSTER PORT
10C	8	671.44	38 - 9	P/CP (18 in. CVR) - ANNULUS INSPECTION
10D	8	672.42	38 - 9	ANNULUS AIR INLET
11A	4		28 - 0	P/CP (18 in. CVR) - SPARE
11B	4	672.36	28 - 0	P/CP (18 in. CVR) SpG
12A	42		3 - 0	CENTRAL PUMP PIT SUPERNATANT ADDITION
13A	12	672.56	9 - 0	OBSERVATION PORT
14A	4	671.40	28 - 0	SPARE

APPENDIX A
TABLE 8.1.2 WASTE TANK DOME PENETRATIONS

Tank 241-SY-103

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
15A	4		28 - 0	CENTRAL PUMP PIT DROPLEG NOZZLE
16A	4	670.75	28 - 0	P/CP (12 in. CVR)
17A	4	672.19	28 - 0	LLI
17B	4	672.20	28 - 0	SMP
17C	4	672.26	28 - 0	SPARE
18A	4	670.95	39 - 8	P/CP (12 in. CVR) - ANNULUS INSPECTION
18B	4	672.41	39 - 8	ANNULUS INSPECTION
18C	4	672.43	39 - 8	ANNULUS INSPECTION
18D	4	672.41	39 - 8	(FIELD ID 18C) ANNULUS INSPECTION
18E	4	672.36	39 - 8	ANNULUS INSPECTION
18F	4	672.39	39 - 8	ANNULUS INSPECTION
18G	4	672.45	39 - 8	ANNULUS INSPECTION
18H	4	671.45	39 - 8	P/CP (12 in. CVR) - ANNULUS INSPECTION
18J	4	672.40	39 - 8	ANNULUS INSPECTION
18K	4	672.40	39 - 8	ANNULUS INSPECTION
18L	4	672.40	39 - 8	ANNULUS INSPECTION
19A	12	672.40	38 - 9	ANNULUS INSPECTION
19B	12	672.41	38 - 9	ANNULUS INSPECTION
20A	4	672.40	39 - 8	TRANSMITTER BOX 103-4
20B	4	672.38	39 - 8	TRANSMITTER BOX 103-5
20C	4	672.39	39 - 8	TRANSMITTER BOX 103-6
20D	4	672.46	39 - 8	TRANSMITTER BOX 103-1
20E	4	672.42	39 - 8	TRANSMITTER BOX 103-2
20F	4	672.41	39 - 8	TRANSMITTER BOX 103-3
21A	12		38 - 9	ANNULUS PUMP
22A	4	672.42	20 - 0	SPARE
23A	4	672.20	10 - 0	SMP
24A	12		30 - 0	NONFUNCTIONAL
25A	20		27 - 0	NONFUNCTIONAL
25B	20		27 - 0	NONFUNCTIONAL

APPENDIX A
FIGURE 8.1.3 DST-241-AZ-102 TANK DIAGRAM



TANK AZ 102

APPENDIX A
TABLE 8.1.3 WASTE TANK DOME PENETRATIONS

Tank 241-AZ-102

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
1A	42		22 - 0	SLUICE PIT - NONFUNCTIONAL
1B	42		22 - 0	SLUICE PIT
1C	42		22 - 0	SLUICE PIT - NONFUNCTIONAL
1D	42		22 - 0	SLUICE PIT
2	6			22 - AIR CIRCULATORS
3A	3		31 - 0	ANNULUS PUMP DISCHARGE
4A	20		23 - 0	TANK VENTILATION
5A	4		32 - 0	PRESSURE PROBE
5B	4		32 - 0	SPARE
6A	42		6 - 0	PUMP PIT
7A	42		20 - 0	STEAM COILS
7B	42		20 - 0	SPARE
8A	2		34 - 0	CONDENSATE ADDITION
9A	4		7 - 5	PUMP PIT DRAIN
10A	3		19 - 0	SLUICE PIT DRAIN - NONFUNCTIONAL
10B	3		19 - 0	SLUICE PIT DRAIN
10C	3		19 - 0	SLUICE PIT DRAIN - NONFUNCTIONAL
10D	3		19 - 0	SLUICE PIT DRAIN
11A	4		32 - 0	SPARE
12A	4	672.68	22 - 0	LEAK DETECTOR
13A	4	672.68	34 - 9	THERMOCOUPLE PROBE
13B	4	673.66	34 - 9	THERMOCOUPLE PROBE
13C	4	673.68	34 - 9	THERMOCOUPLE PROBE
13D	4	673.70	34 - 9	THERMOCOUPLE PROBE
14A	6	672.67	12 - 6	DRY WELL
14B	6	672.67	12 - 6	DRY WELL
14C	6	672.67	12 - 6	DRY WELL
14D	6	672.70	34 - 9	DRY WELL
14E	6	672.69	34 - 9	DRY WELL

APPENDIX A
TABLE 8.1.3 WASTE TANK DOME PENETRATIONS

Tank 241-AZ-102

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
14F	6	672.69	34 - 9	DRY WELL
14G	6	672.69	34 - 9	DRY WELL
15A	6	672.70	34 - 8	SPARE
15B	6	672.70	34 - 8	SPARE
15C	6	672.69	34 - 8	SPARE
15D	6	672.69	34 - 8	SPARE
15E	6	672.68	34 - 8	SPARE
15F	6	672.68	34 - 8	SPARE - FIELD ID 15E
15G	6	672.68	34 - 8	SPARE
15H	6	672.70	34 - 8	SPARE
15I	6	672.71	34 - 8	SPARE
15J	6	672.69	34 - 8	SPARE
15K	6	672.70	34 - 8	SPARE
15L	6	672.71	34 - 8	SPARE
16A	4	673.68	12 - 6	THERMOCOUPLE PROBE
16B	4	673.64	12 - 6	THERMOCOUPLE PROBE
16C	4	673.63	12 - 6	THERMOCOUPLE PROBE
17A	4	672.70	39 - 8	ANNULUS ACCESS - FIELD ID 17D
17B	4	672.69	39 - 8	ANNULUS ACCESS
17C	4	672.69	39 - 8	PORTABLE AIR SAMPLER
17D	4	672.68	39 - 8	LEAK DETECTOR
17E	4	672.66	39 - 8	ANNULUS ACCESS
17F	4	672.67	39 - 8	FIELD ID 17E
17G	4	672.69	39 - 8	ANNULUS ACCESS
17H	4	672.72	39 - 8	ANNULUS ACCESS
17I	4	672.68	39 - 8	ANNULUS ACCESS
17J	4	672.70	39 - 8	ANNULUS ACCESS
17K	4	672.69	39 - 8	ANNULUS ACCESS
18A	24	672.68	38 - 6 3/8	ANNULUS ACCESS

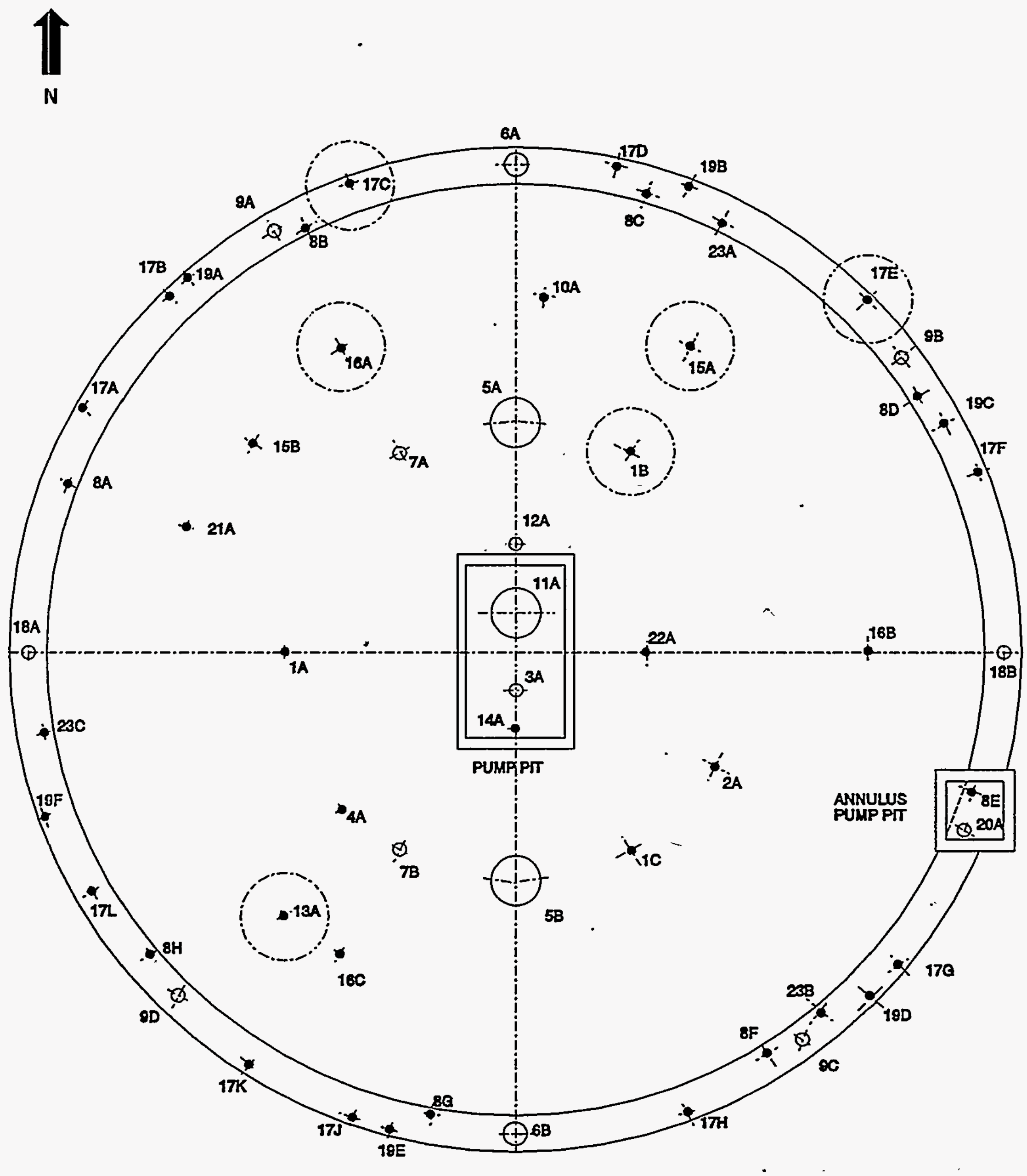
APPENDIX A
TABLE 8.1.3 WASTE TANK DOME PENETRATIONS

Tank 241-AZ-102

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
18B	24	672.67	38 - 6 3/8	ANNULUS ACCESS
19A	12		38 - 9	ANNULUS ACCESS
19B	12		38 - 9	ANNULUS ACCESS
20A	8		38 - 9	AIR OUTLET
20B	8		38 - 9	AIR OUTLET
20C	8		38 - 9	AIR OUTLET
20D	8		38 - 9	AIR OUTLET
20E	8		38 - 9	AIR OUTLET
20F	8		38 - 9	AIR OUTLET
21A	3		39 - 8	TRANSMITTER BOX 102-3
21B	3		39 - 8	TRANSMITTER BOX 102-4
21C	3		39 - 8	TRANSMITTER BOX 102-5
21D	3		39 - 8	TRANSMITTER BOX 102-6
21E	3		39 - 8	TRANSMITTER BOX 102-1
21F	3		39 - 8	TRANSMITTER BOX 102-2
22A	16	672.75	20 - 0	LIT
23A	4	672.70	31 - 0	LLI
24A	6	672.68	12 - 6	SMP - FUTURE SAMPLING PORT
24B	6	672.66	12 - 6	SMP
24C	6	672.67	12 - 6	SMP
24D	6	672.70	34 - 9	SMP
24E	6	672.69	34 - 9	SMP
24F	6	672.68	34 - 9	SMP
24G	6	672.70	34 - 9	SMP
29A	12		38 - 9	ANNULUS PUMP
30A	4		31 - 0	ANNULUS PUMP PIT DRAIN

APPENDIX A

TABLE 8.1.4 DST-241-AN-104 TANK DIAGRAM



TANK AN 104

APPENDIX A
FIGURE 8.1.4 WASTE TANK DOME PENETRATIONS

Tank 241-AN-104

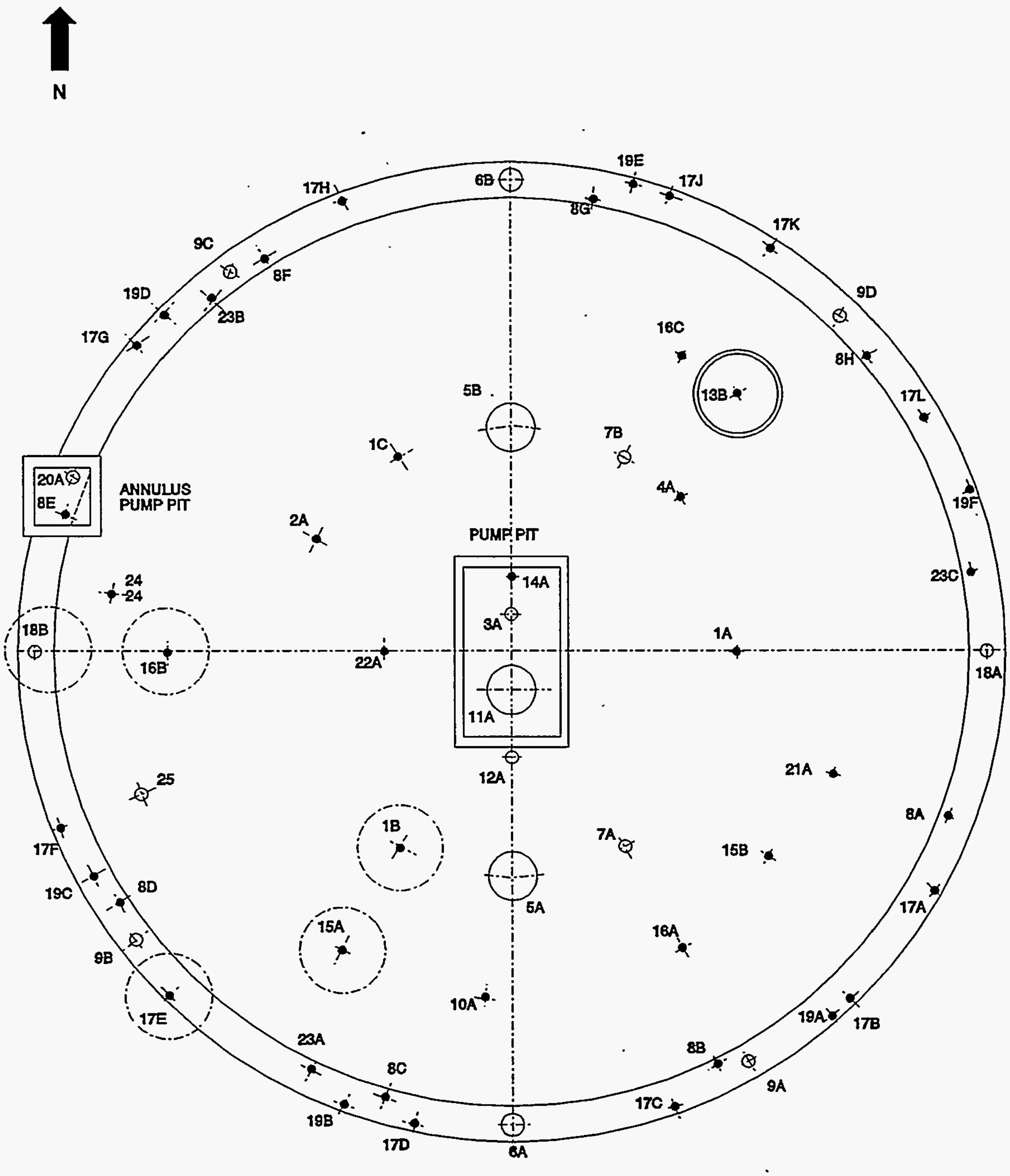
RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT-IN)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
1A	4	668 - 9	20 - 0	SMP
1B	4	667 - 3	20 - 0	P/CP (12 in. CVR) - SMP
1C	4	668 - 9	20 - 0	SMP
2A	4	668 - 9	20 - 0	LIT
3A	12		3 - 0	CENTRAL PUMP PIT SUPERNATANT PUMP
4A	4	668 - 9	20 - 0	THERMOCOUPLE PROBE
5A	42		20 - 0	NONFUNCTIONAL
5B	42		20 - 0	NONFUNCTIONAL
6A	24	668 - 9	38 - 6 3/8	SPARE
6B	24	668 - 9	38 - 6 3/8	SPARE
7A	12	667 - 3	20 - 0	P/CP (18 in. CVR) - SPARE
7B	12		20 - 0	TANK VENTILATION
8A	4		38 - 2	ANNULUS AIR INLET
8B	4		38 - 2	ANNULUS AIR INLET
8C	4		39 - 2	ANNULUS AIR INLET
8D	4		38 - 2	ANNULUS AIR INLET
8E	4		38 - 2	ANNULUS AIR INLET
8F	4		38 - 2	ANNULUS AIR INLET
8G	4		38 - 2	ANNULUS AIR INLET
8H	4		38 - 2	ANNULUS AIR INLET
9A	8		38 - 4	ANNULUS AIR OUTLET
9B	8		38 - 4	ANNULUS AIR OUTLET
9C	8		38 - 4	ANNULUS AIR OUTLET
9D	8		38 - 4	ANNULUS AIR OUTLET
10A	4	668 - 9	28 - 0	SPARE
11A	42		3 - 0	CENTRAL PUMP PIT SLURRY DISTRIBUTOR
12A	12	668 - 9	9 - 0	OBSERVATION PORT - SPARE
13A	4		28 - 0	TANK PRESSURE
14A	4		6 - 0	CENTRAL PUMP PIT DROPLEG NOZZLE

APPENDIX A
TABLE 8.1.4 WASTE TANK DOME PENETRATIONS

Tank 241-AN-104

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT-IN)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
15A	4	667 - 3	28 - 0	P/CP (12 in. CVR) - SPARE
15B	4	668 - 9	28 - 0	HIGH LEVEL SENSOR (FIELD ID 16B)
16A	4	667 - 3	28 - 0	P/CP (12 in. CVR) - SMP
16B	4	668 - 9	28 - 0	SMP
16C	4	668 - 9	28 - 0	SMP
17A	4	668 - 9	39 - 4	ANNULUS INSPECTION
17B	4	668 - 9	39 - 4	ANNULUS INSPECTION
17C	4	667 - 3	39 - 4	P/CP (12 in. CVR) - ANNULUS INSPECTION
17D	4	668 - 9	39 - 4	ANNULUS INSPECTION
17E	4	667 - 3	39 - 4	P/CP (12 in. CVR) - ANNULUS INSPECTION
17F	4	668 - 9	39 - 4	ANNULUS INSPECTION
17G	4	668 - 9	39 - 4	ANNULUS INSPECTION
17H	4	668 - 9	39 - 4	ANNULUS INSPECTION
17J	4	668 - 9	39 - 4	ANNULUS INSPECTION
17K	4	668 - 9	39 - 4	ANNULUS INSPECTION
17L	4	668 - 9	39 - 4	ANNULUS INSPECTION
18A	12	668 - 9	38 - 9	ANNULUS ACCESS
18B	12	668 - 9	38 - 9	ANNULUS ACCESS
19A	4	668 - 9	39 - 4	TRANSMITTER BOX 104-4
19B	4	668 - 9	39 - 4	TRANSMITTER BOX 104-5
19C	4	668 - 9	39 - 4	TRANSMITTER BOX 104-6
19D	4	668 - 9	39 - 4	TRANSMITTER BOX 104-1
19E	4	668 - 9	39 - 4	TRANSMITTER BOX 104-2
19F	4	668 - 9	39 - 4	TRANSMITTER BOX 104-3
20A	12		38 - 9	ANNULUS PUMP
21A	4	668 - 9	28 - 0	SPARE
22A	4	668 - 9	10 - 0	SMP
23A	4	668 - 9	38 - 9	LEAK DETECTOR 104-4
23B	4	668 - 9	38 - 9	LEAK DETECTOR 104-2
23C	4	668 - 9	38 - 9	LEAK DETECTOR 104-3

APPENDIX A
FIGURE 8.1.5 DST-241-AN-106 TANK DIAGRAM



TANK AN 106

APPENDIX A
TABLE 8.1.5 WASTE TANK DOME PENETRATIONS

Tank 241-AN-106

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT-IN)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
1A	4	668 - 9	20 - 0	SMP
1B	4	667 - 3	20 - 0	P/CP (12 in. CVR) - SMP
1C	4	668 - 9	20 - 0	SMP
2A	4	668 - 9	20 - 0	LIT
3A	12		3 - 0	SUPERNATANT PUMP
4A	4	668 - 9	20 - 0	THERMOCOUPLE PROBE
5A	42		20 - 0	NONFUNCTIONAL
5B	42		20 - 0	NONFUNCTIONAL
6A	24	668 - 9	38 - 6 3/8	SPARE
6B	24	668 - 9	38 - 6 3/8	SPARE
7A	12	668 - 9	20 - 0	SPARE
7B	12		20 - 0	TANK VENTILATION
8A	4		38 - 2	ANNULUS AIR INLET
8B	4		38 - 2	ANNULUS AIR INLET
8C	4		38 - 2	ANNULUS AIR INLET
8D	4		38 - 2	ANNULUS AIR INLET
8E	4		38 - 2	ANNULUS AIR INLET
8F	4		38 - 2	ANNULUS AIR INLET
8G	4		38 - 2	ANNULUS AIR INLET
8H	4		38 - 2	ANNULUS AIR INLET
9A	8		38 - 4	ANNULUS AIR OUTLET
9B	8		38 - 4	ANNULUS AIR OUTLET
9C	8		38 - 4	ANNULUS AIR OUTLET
9D	8		38 - 4	ANNULUS AIR OUTLET
10A	4	668 - 9	28 - 0	SPARE
11A	42		3 - 0	CENTRAL PUMP PIT SLURRY DISTRIBUTOR
12A	12	668 - 9	9 - 0	OBSERVATION PORT - SPARE
13A	4		28 - 0	TANK PRESSURE
14A	4		6 - 0	CENTRAL PUMP PIT DROPLEG NOZZLE

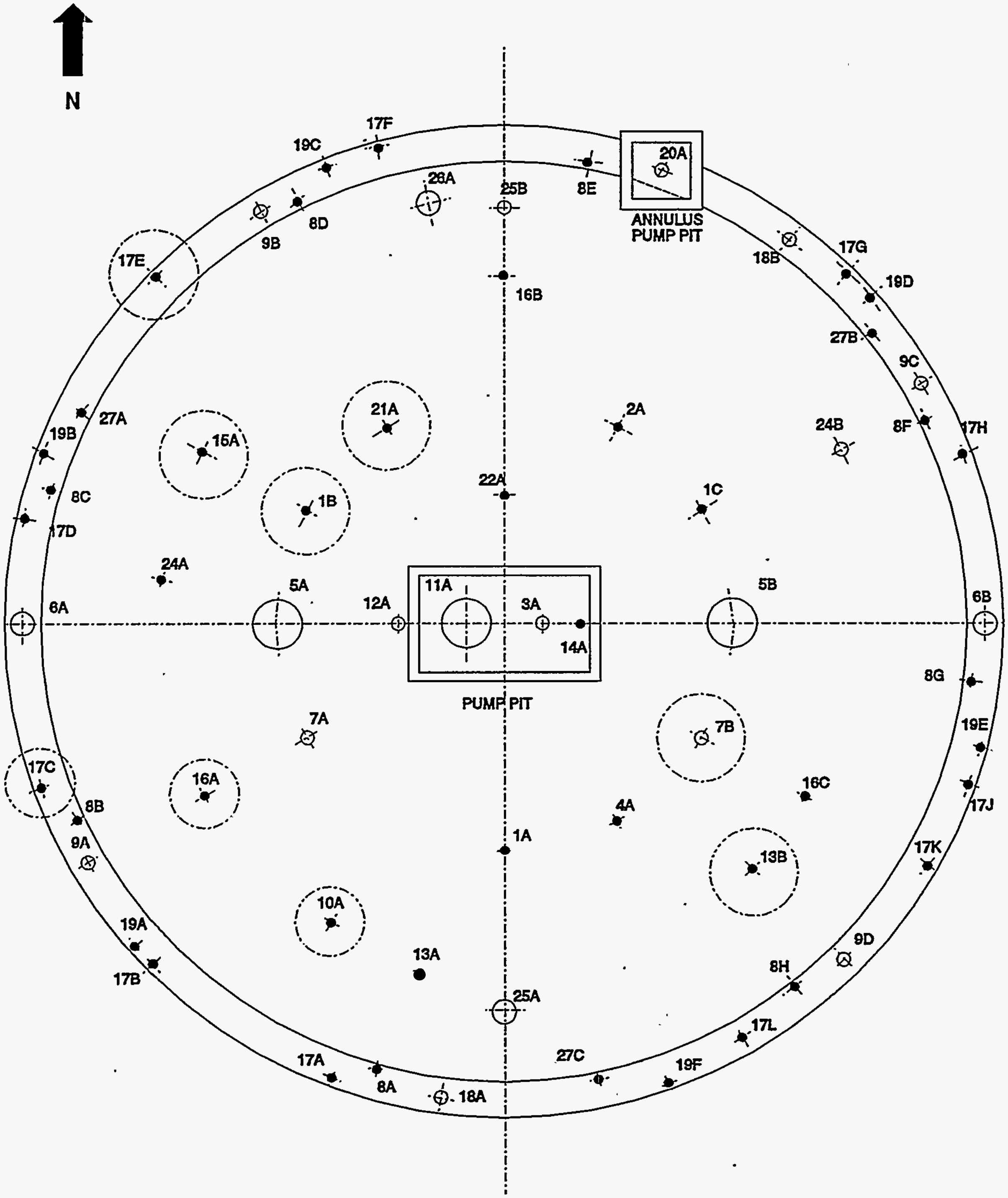
APPENDIX A
TABLE 8.1.5 WASTE TANK DOME PENETRATIONS

Tank 241-AN-106

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT-IN)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
15A	4	667 - 3	28 - 0	P/CP (12 in. CVR) - SPARE
15B	4	668 - 9	28 - 0	HIGH LEVEL SENSOR
16A	4	668 - 9	28 - 0	SMP
16B	4	667 - 3	28 - 0	P/CP (12 in. CVR) - SMP
16C	4	668 - 9	28 - 0	SMP
17A	4	668 - 9	39 - 4	ANNULUS INSPECTION
17B	4	668 - 9	39 - 4	ANNULUS INSPECTION
17C	4	668 - 9	39 - 4	ANNULUS INSPECTION
17D	4	668 - 9	39 - 4	ANNULUS INSPECTION
17E	4	667 - 3	39 - 4	P/CP (12 in. CVR) - ANNULUS INSPECTION
17F	4	668 - 9	39 - 4	ANNULUS INSPECTION
17G	4	668 - 9	39 - 4	ANNULUS INSPECTION
17H	4	668 - 9	39 - 4	ANNULUS INSPECTION
17J	4	668 - 9	39 - 4	ANNULUS INSPECTION
17K	4	668 - 9	39 - 4	ANNULUS INSPECTION
17L	4	668 - 9	39 - 4	ANNULUS INSPECTION
18A	12	668 - 9	38 - 9	ANNULUS ACCESS
18B	12	667 - 3	38 - 9	P/CP (18 in. CVR) - ANNULUS ACCESS
19A	4	668 - 9	39 - 4	TRANSMITTER BOX 106-4
19B	4	668 - 9	39 - 4	TRANSMITTER BOX 106-5
19C	4	668 - 9	39 - 4	TRANSMITTER BOX 106-6
19D	4	668 - 9	39 - 4	TRANSMITTER BOX 106-1
19E	4	668 - 9	39 - 4	TRANSMITTER BOX 106-2
19F	4	668 - 9	39 - 4	TRANSMITTER BOX 106-3
20A	12		38 - 9	ANNULUS PUMP
21A	4	668 - 9	28 - 0	SPARE
22A	4	668 - 9	10 - 0	SMP
23A	4	668 - 9	38 - 9	LEAK DETECTOR 106-5
23B	4	668 - 9	38 - 9	LEAK DETECTOR 106-2
23C	4	668 - 9	38 - 9	LEAK DETECTOR 106-3

APPENDIX A

FIGURE 8.1.6 DST-241-AW-101 TANK DIAGRAM



TANK AW 101

APPENDIX A

TABLE 8.1.6 WASTE TANK DOME PENETRATIONS

Tank 241-AW-101

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
1A	4	687.75	20 - 0	LLI
1B	4	686.33	20 - 0	P/CP (12 in. CVR) - SMP
1C	4	687.75	20 - 0	SMP
2A	4	687.75	20 - 0	LIT
3A	12	681.70	3 - 0	CENTRAL PUMP PIT SUPERNATANT PUMP
4A	4	687.75	20 - 0	THERMOCOUPLE PROBE
5A	42		20 - 0	SPARE
5B	42		20 - 0	SPARE
6A	24	687.75	38 - 6	SPARE
6B	24	687.75	38 - 6	SPARE
7A	12	681.00	20 - 0	TANK VENTILATION
7B	12	687.75	20 - 0	SPARE
8A	4		38 - 2	ANNULUS AIR INLET
8B	4		38 - 2	ANNULUS AIR INLET
8C	4		38 - 2	ANNULUS AIR INLET
8D	4		38 - 2	ANNULUS AIR INLET
8E	4		38 - 2	ANNULUS AIR INLET
8F	4		38 - 2	ANNULUS AIR INLET
8G	4		38 - 2	ANNULUS AIR INLET
8H	4		38 - 2	ANNULUS AIR INLET
9A	8		38 - 9	ANNULUS AIR OUTLET
9B	8		38 - 9	ANNULUS AIR OUTLET
9C	8		38 - 9	ANNULUS AIR OUTLET
9D	8		38 - 9	ANNULUS AIR OUTLET
10A	4	686.33	28 - 0	P/CP (12 in. CVR) - SPARE
11A	42	682.49	3 - 0	CENTRAL PUMP PIT SLURRY DISTRIBUTOR
12A	12	687.75	9 - 0	OBSERVATION PORT - SPARE
13A	4	687.75	28 - 0	SPARE
13B	4	684.58	28 - 0	P/CP (24 in. CVR) - TANK PRESSURE

APPENDIX A
TABLE 8.1.6 WASTE TANK DOME PENETRATIONS

Tank 241-AW-101

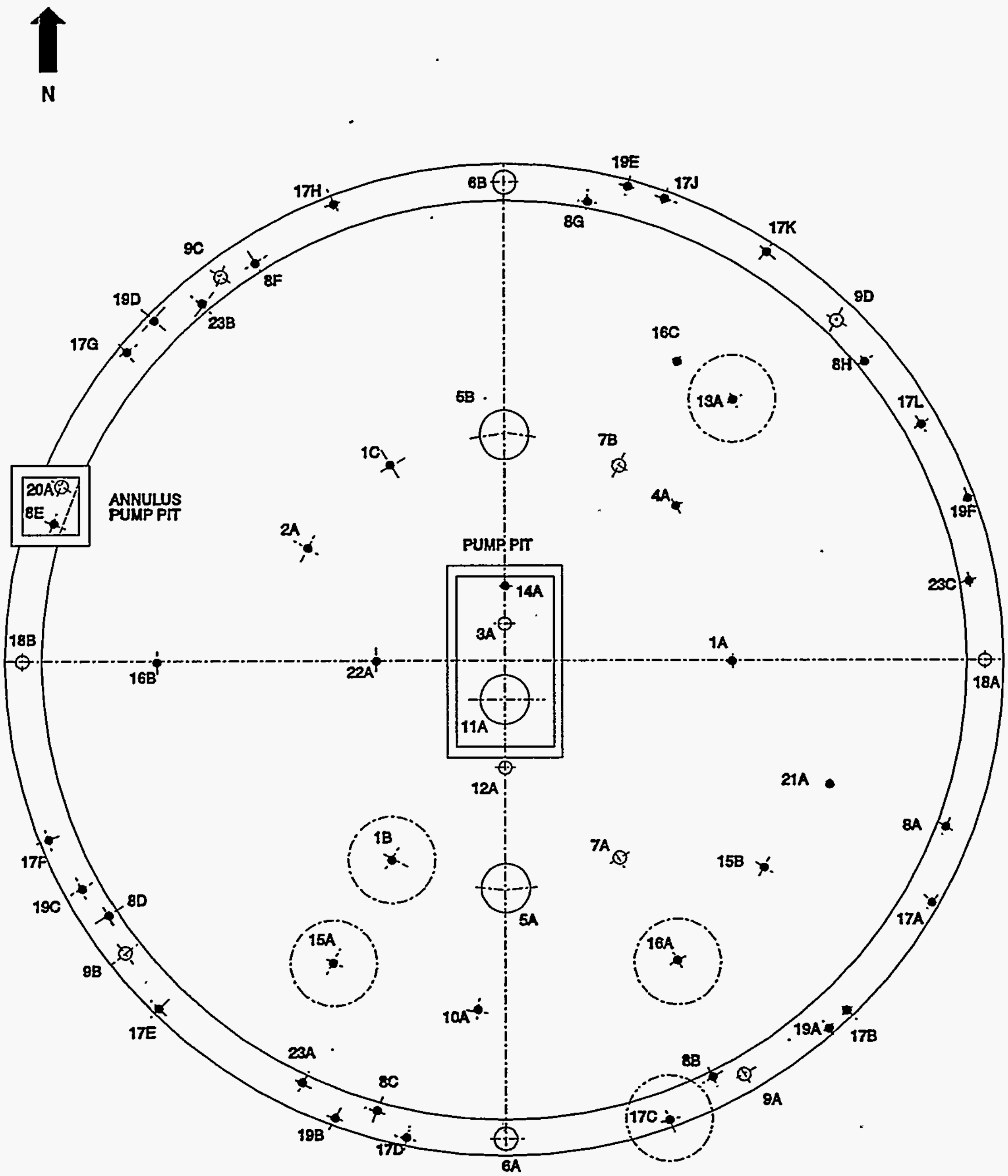
RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
14A	4	682.73	6 - 0	CENTRAL PUMP PIT DROPLEG NOZZLE
15A	4	686.33	28 - 0	P/CP (12 in. CVR) - SPARE
16A	4	686.33	28 - 0	P/CP (12 in. CVR) - SMP
16B	4	687.75	28 - 0	PRESSURE INDICATOR
16C	4	687.75	28 - 0	SMP
17A	4	687.75	28 - 0	ANNULUS OBSERVATION
17B	4	687.75	39 - 4	ANNULUS OBSERVATION
17C	4	686.33	39 - 4	P/CP (12 in. CVR) - ANNULUS OBSERVATION
17D	4	687.75	39 - 4	ANNULUS OBSERVATION
17E	4	686.33	39 - 4	P/CP (12 in. CVR) - ANNULUS OBSERVATION
17F	4	687.75	39 - 4	ANNULUS OBSERVATION
17G	4	687.75	39 - 4	ANNULUS OBSERVATION
17H	4	687.75	39 - 4	ANNULUS OBSERVATION
17J	4	687.75	39 - 4	ANNULUS OBSERVATION
17K	4	687.75	39 - 4	ANNULUS OBSERVATION
17L	4	687.75	39 - 4	ANNULUS OBSERVATION
18A	12	687.75	38 - 9	ANNULUS ACCESS
18B	12	687.75	38 - 9	ANNULUS ACCESS
19A	4	687.75	39 - 4	TRANSMITTER BOX 101-4
19B	4	687.75	39 - 4	TRANSMITTER BOX 101-5
19C	4	687.75	39 - 4	TRANSMITTER BOX 101-6
19D	4	687.75	39 - 4	TRANSMITTER BOX 101-1
19E	4	687.75	39 - 4	TRANSMITTER BOX 101-2
19F	4	687.75	39 - 4	TRANSMITTER BOX 101-3
20A	12	677.88	38 - 9	ANNULUS PUMP
21A	4	686.33	38 - 0	P/CP (12 in. CVR) - HIGH LEVEL SENSOR
22A	4	687.75	10 - 0	SMP
24A	12	687.75	30 - 0	SPARE
24B	12	687.75	30 - 0	SPARE
25A	20	687.75	33 - 0	SPARE
25B	20	687.75	33 - 0	SPARE

APPENDIX A
TABLE 8.1.6 WASTE TANK DOME PENETRATIONS

Tank 241-AW-101

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
26A	36	687.75	33 - 8	SPARE
27A	4	687.75	38 - 9	LEAK DETECTOR 101-4
27B	4	687.75	38 - 9	LEAK DETECTOR 101-2
27C	4	687.75	38 - 9	LEAK DETECTOR 101-3

APPENDIX A
FIGURE 8.1.7 DST-241-AN-103 TANK DIAGRAM



TANK AN 103

APPENDIX A
TABLE 8.1.7 WASTE TANK DOME PENETRATIONS

Tank 241-AN-103

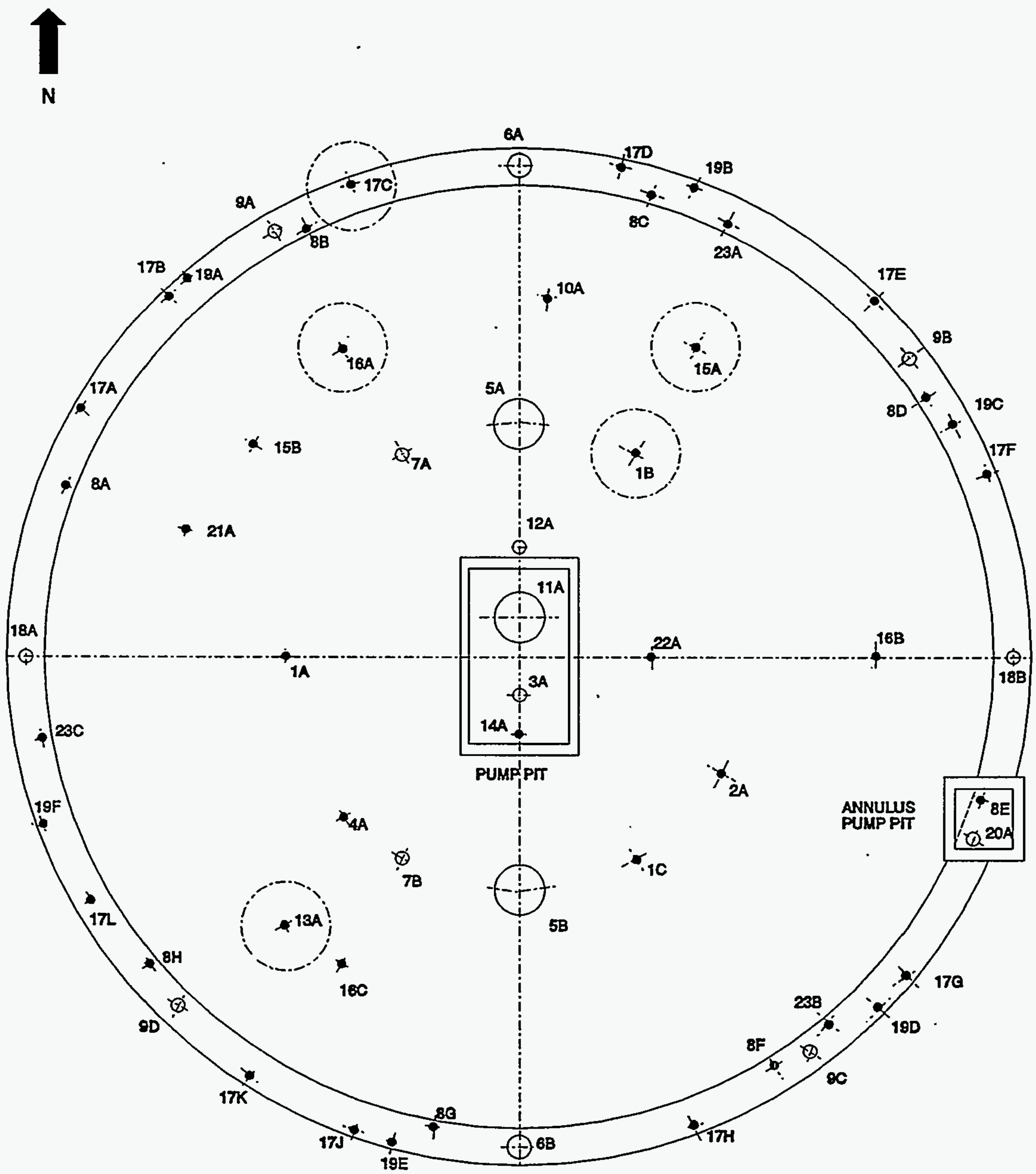
RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT-IN)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
1A	4	668 - 9	20 - 0	SMP
1B	4	667 - 3	20 - 0	P/CP (12 in. CVR) - SMP
1C	4	668 - 9	20 - 0	SMP
2A	4	668 - 9	20 - 0	LIT
3A	12		3 - 0	CENTRAL PUMP PIT SUPERNATANT PUMP
4A	4	668 - 9	20 - 0	THERMOCOUPLE PROBE
5A	42		20 - 0	NONFUNCTIONAL
5B	42		20 - 0	NONFUNCTIONAL
6A	24	668 - 9	38 - 6 3/8	SPARE
6B	24	668 - 9	38 - 6 3/8	SPARE
7A	12		20 - 0	TANK VENTILATION
7B	12	668 - 9	20 - 0	SPARE
8A	4	668 - 9	38 - 2	ANNULUS AIR INLET
8B	4	668 - 9	38 - 2	ANNULUS AIR INLET
8C	4	668 - 9	39 - 2	ANNULUS AIR INLET
8D	4	668 - 9	38 - 2	ANNULUS AIR INLET
8E	4	668 - 9	38 - 2	ANNULUS AIR INLET
8F	4	668 - 9	38 - 2	ANNULUS AIR INLET
8G	4	668 - 9	38 - 2	ANNULUS AIR INLET
8H	4	668 - 9	38 - 2	ANNULUS AIR INLET
9A	8	668 - 9	38 - 4	ANNULUS AIR OUTLET
9B	8	668 - 9	38 - 4	ANNULUS AIR OUTLET
9C	8	668 - 9	38 - 4	ANNULUS AIR OUTLET
9D	8	668 - 9	38 - 4	ANNULUS AIR OUTLET
10A	4	668 - 9	28 - 0	SPARE
11A	42		3 - 0	CENTRAL PUMP PIT SLURRY DISTRIBUTOR
12A	12	668 - 9	9 - 0	OBSERVATION PORT - SPARE
13A	4		28 - 0	TANK PRESSURE
14A	4		6 - 0	CENTRAL PUMP PIT DROPLEG NOZZLE

APPENDIX A
TABLE 8.1.7 WASTE TANK DOME PENETRATIONS

Tank 241-AN-103

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT-IN)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
15A	4	668 - 9	28 - 0	P/CP (12 in. CVR) - SPARE
15B	4	668 - 9	28 - 0	HIGH LEVEL SENSOR
16A	4	667 - 3	28 - 0	P/CP (12 in. CVR) - SMP
16B	4	668 - 9	28 - 0	SMP
16C	4	668 - 9	28 - 0	SMP
17A	4	668 - 9	39 - 4	ANNULUS INSPECTION
17B	4	668 - 9	39 - 4	ANNULUS INSPECTION
17C	4	667 - 3	39 - 4	P/CP (12 in. CVR) - ANNULUS INSPECTION
17D	4	668 - 9	39 - 4	ANNULUS INSPECTION
17E	4	668 - 9	39 - 4	ANNULUS INSPECTION
17F	4	668 - 9	39 - 4	ANNULUS INSPECTION
17G	4	668 - 9	39 - 4	ANNULUS INSPECTION
17H	4	668 - 9	39 - 4	ANNULUS INSPECTION
17J	4	668 - 9	39 - 4	ANNULUS INSPECTION
17K	4	668 - 9	39 - 4	ANNULUS INSPECTION
17L	4	668 - 9	39 - 4	ANNULUS INSPECTION
18A	12	668 - 9	38 - 9	ANNULUS ACCESS
18B	12	668 - 9	38 - 9	ANNULUS ACCESS
19A	4	668 - 9	39 - 4	TRANSMITTER BOX 103-4
19B	4	668 - 9	39 - 4	TRANSMITTER BOX 103-5 (NO FIELD ID)
19C	4	668 - 9	39 - 4	TRANSMITTER BOX 103-6
19D	4	668 - 9	39 - 4	TRANSMITTER BOX 103-1
19E	4	668 - 9	39 - 4	TRANSMITTER BOX 103-2
19F	4	668 - 9	39 - 4	TRANSMITTER BOX 103-3
20A	12		38 - 9	ANNULUS PUMP
21A	4	668 - 9	28 - 0	SPARE
22A	4	668 - 9	10 - 0	SMP
23A	4	668 - 9	38 - 9	LEAK DETECTOR 103-4
23B	4	668 - 9	38 - 9	LEAK DETECTOR 103-2
23C	4	668 - 9	38 - 9	LEAK DETECTOR 103-3

APPENDIX A
FIGURE 8.1.8 DST-241-AN-105 TANK DIAGRAM



TANK AN 105

APPENDIX A
TABLE 8.1.8 WASTE TANK DOME PENETRATIONS

Tank 241-AN-105

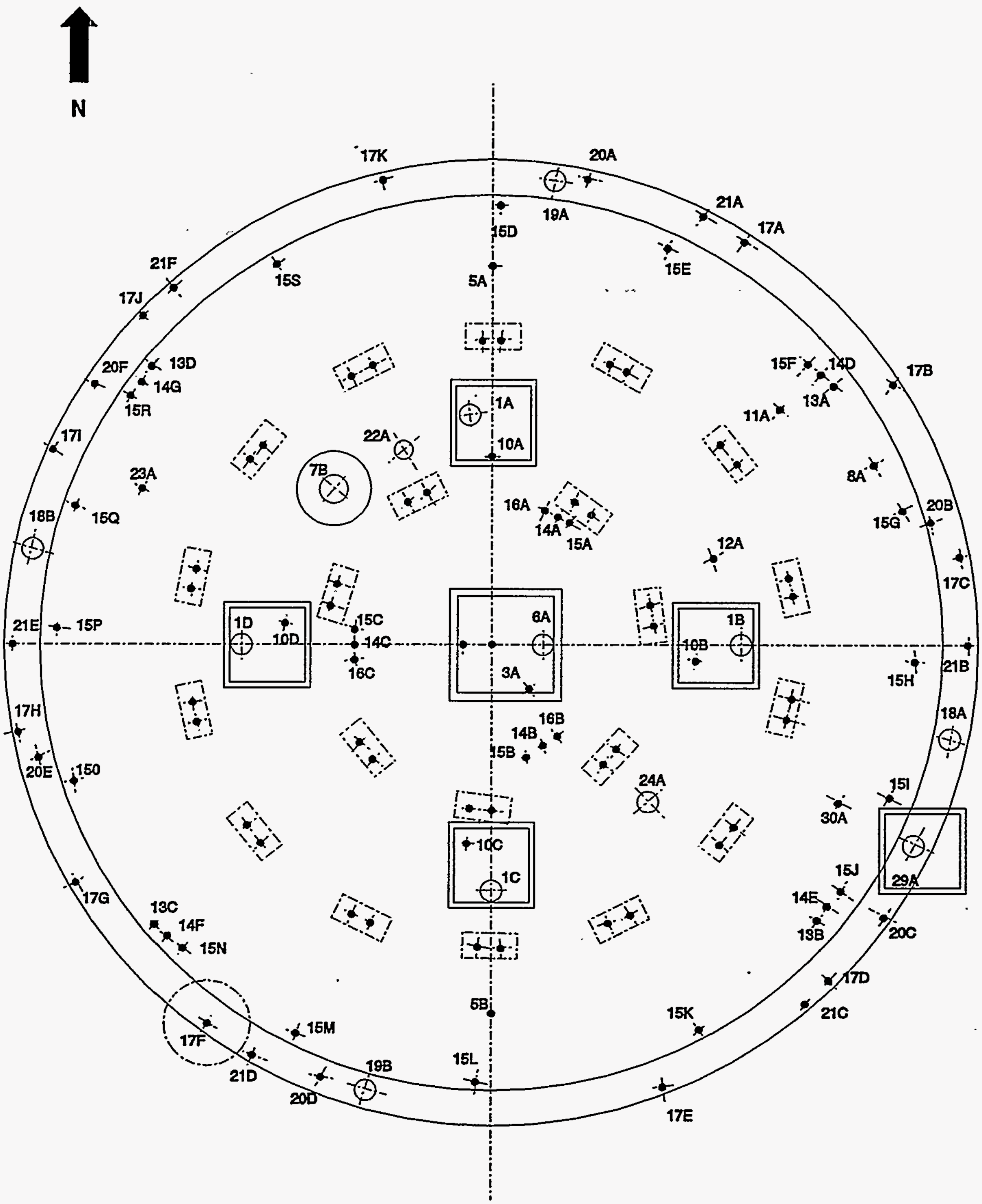
RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT-IN)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
1A	4	668 - 9	20 - 0	SMP
1B	4	667 - 3	20 - 0	P/CP (12 in. CVR) - SMP
1C	4	668 - 9	20 - 0	SMP
2A	4	668 - 9	20 - 0	LIT
3A	12		3 - 0	SUPERNATANT PUMP
4A	4	668 - 9	20 - 0	THERMOCOUPLE PROBE
5A	42		20 - 0	NONFUNCTIONAL
5B	42		20 - 0	NONFUNCTIONAL
6A	24	668 - 9	38 - 6 3/8	SPARE
6B	24	668 - 9	38 - 6 3/8	SPARE
7A	12		20 - 0	TANK VENTILATION
7B	12	668 - 9	20 - 0	SPARE
8A	4		38 - 2	ANNULUS AIR INLET
8B	4		38 - 2	ANNULUS AIR INLET
8C	4		39 - 2	ANNULUS AIR INLET
8D	4		38 - 2	ANNULUS AIR INLET
8E	4		38 - 2	ANNULUS AIR INLET
8F	4		38 - 2	ANNULUS AIR INLET
8G	4		38 - 2	ANNULUS AIR INLET
8H	4		38 - 2	ANNULUS AIR INLET
9A	8		38 - 4	ANNULUS AIR OUTLET
9B	8		38 - 4	ANNULUS AIR OUTLET
9C	8		38 - 4	ANNULUS AIR OUTLET
9D	8		38 - 4	ANNULUS AIR OUTLET
10A	4	668 - 9	28 - 0	SPARE
11A	42		3 - 0	CENTRAL PUMP PIT SLURRY DISTRIBUTOR
12A	12	668 - 9	9 - 0	OBSERVATION PORT - SPARE
13A	4		28 - 0	TANK PRESSURE
14A	4		6 - 0	CENTRAL PUMP PIT DROPLEG NOZZLE

APPENDIX A
TABLE 8.1.8 WASTE TANK DOME PENETRATIONS

Tank 241-AN-105

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT-IN)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
15A	4	667 - 3	28 - 0	P/CP (12 in. CVR) - SPARE
15B	4	668 - 9	28 - 0	HIGH LEVEL SENSOR
16A	4	667 - 3	28 - 0	P/CP (UNDER 12 in. CVR) - SMP
16B	4	668 - 9	28 - 0	SMP
16C	4	668 - 9	28 - 0	SMP
17A	4	668 - 9	39 - 4	ANNULUS INSPECTION
17B	4	668 - 9	39 - 4	ANNULUS INSPECTION
17C	4	667 - 3	39 - 4	P/CP (12 in. CVR) - ANNULUS INSPECTION
17D	4	668 - 9	39 - 4	ANNULUS INSPECTION
17E	4	667 - 3	39 - 4	P/CP (12 in. CVR) - ANNULUS INSPECTION
17F	4	668 - 9	39 - 4	ANNULUS INSPECTION
17G	4	668 - 9	39 - 4	ANNULUS INSPECTION
17H	4	668 - 9	39 - 4	ANNULUS INSPECTION
17J	4	668 - 9	39 - 4	ANNULUS INSPECTION
17K	4	668 - 9	39 - 4	ANNULUS INSPECTION
17L	4	668 - 9	39 - 4	ANNULUS INSPECTION
18A	12	668 - 9	38 - 9	ANNULUS ACCESS
18B	12	668 - 9	38 - 9	ANNULUS ACCESS
19A	4	668 - 9	39 - 4	TRANSMITTER BOX 105-4
19B	4	668 - 9	39 - 4	TRANSMITTER BOX 105-5
19C	4	668 - 9	39 - 4	TRANSMITTER BOX 105-6
19D	4	668 - 9	39 - 4	TRANSMITTER BOX 105-1
19E	4	668 - 9	39 - 4	TRANSMITTER BOX 105-2
19F	4	668 - 9	39 - 4	TRANSMITTER BOX 105-3
20A	12		38 - 9	ANNULUS PUMP
21A	4	668 - 9	28 - 0	SPARE
22A	4	668 - 9	10 - 0	SMP
23A	4	668 - 9	38 - 9	LEAK DETECTOR 105-4
23B	4	668 - 9	38 - 9	LEAK DETECTOR 105-2
23C	4	668 - 9	38 - 9	LEAK DETECTOR 105-3

APPENDIX A
FIGURE 8.1.9 DST-241-AY-102 TANK DIAGRAM



TANK AY 102

APPENDIX A
TABLE 8.1.9 WASTE TANK DOME PENETRATIONS

Tank 241-AY-102

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
1A	34		22 - 0	SLUICE PIT B
1B	34		22 - 0	SLUICE PIT C
1C	34		22 - 0	SLUICE PIT D
1D	34		22 - 0	SLUICE PIT E
2	6			22 - AIR CIRCULATORS
3	3/4			22 - TEMP ELEMENTS
4A	20		25 - 0	TANK VENTILATION
5A	4		32 - 0	SPARE
5B	4		32 - 0	TANK PRESSURE
6A	42		6 - 0	PUMP PIT
7A	42		20 - 0	STEAM COILS
8A	2		34 - 0	CONDENSATE ADDITION
9A	4		7 - 5	PUMP PIT DRAIN
10A	3		19 - 0	SLUICE PIT B DRAIN
10B	3		19 - 0	SLUICE PIT C DRAIN
10C	3		19 - 0	SLUICE PIT D DRAIN
10D	3		19 - 0	SLUICE PIT E DRAIN
11A	4		32 - 0	CONDENSATE ADDITION
12A	4		22 - 0	LEAK DETECTOR
13A	4	680.08	34 - 9	THERMOCOUPLE PROBE
13B	4	680.08	34 - 9	THERMOCOUPLE PROBE
13C	4	680.09	34 - 9	THERMOCOUPLE PROBE
13D		680.11	34 - 9	THERMOCOUPLE PROBE
14A	6	679.95	12 - 6	DRY WELL
14B	6	679.99	12 - 6	DRY WELL
14C	6	679.98	12 - 6	DRY WELL
14D	6	680.09	34 - 9	DRY WELL
14E	6	680.12	34 - 9	DRY WELL
14F	6	680.08	34 - 9	DRY WELL

APPENDIX A
TABLE 8.1.9 WASTE TANK DOME PENETRATIONS

Tank 241-AY-102

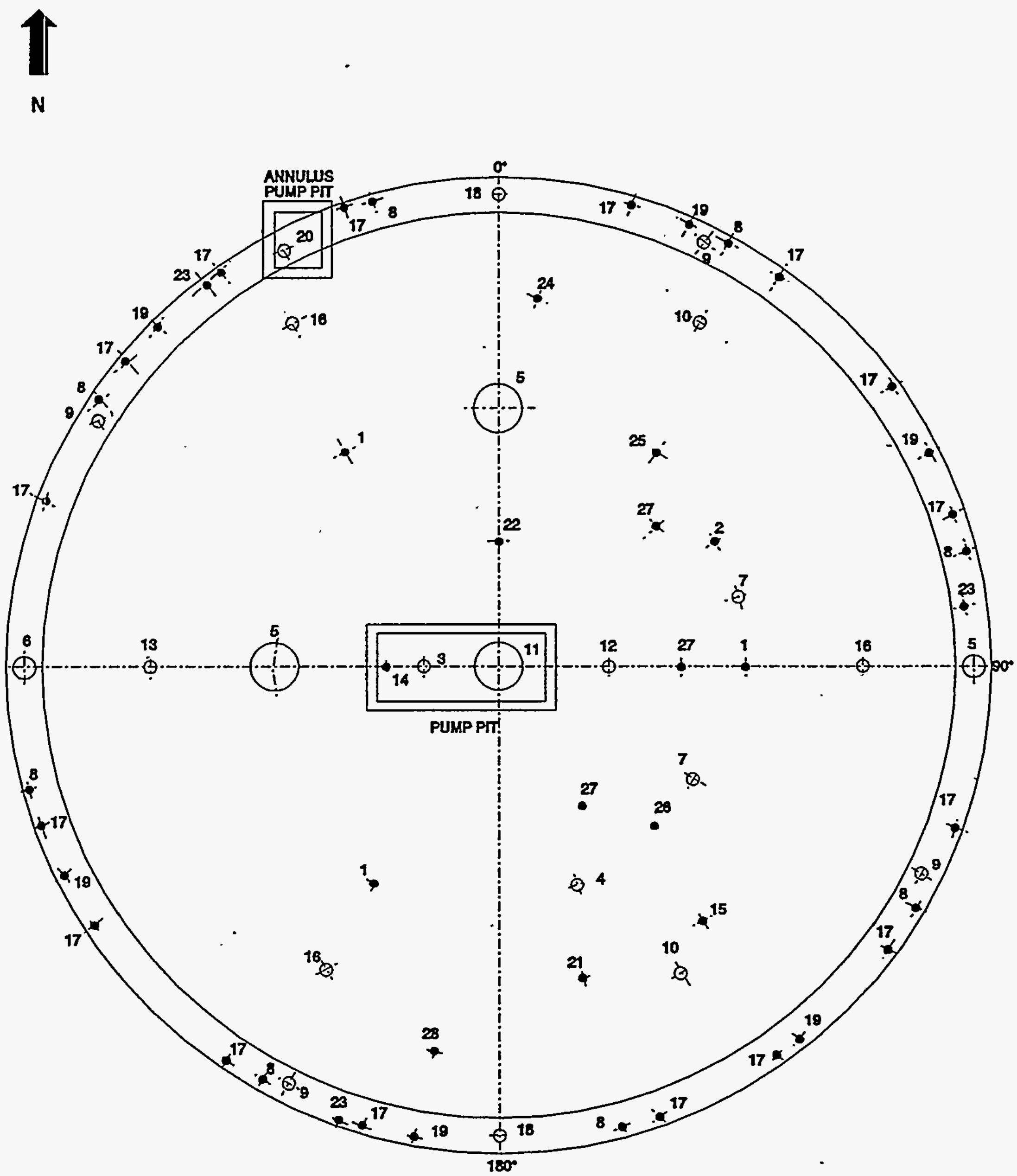
RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
14G	6	680.13	34 - 9	DRY WELL
15A	6	679.94	12 - 6	SPARE
15B	6	679.99	12 - 6	SMP
15C	6	679.97	12 - 6	SMP
15D	6	680.08	34 - 9	SMP W/MAGNEHELIX
15E	6		34 - 9	SPARE
15F	6	680.09	34 - 9	SMP
15G	6	680.09	34 - 9	SPARE
15H	6		34 - 9	SMP
15I	6	680.11	34 - 9	SPARE
15J	6	680.07	34 - 9	SMP
15K	6	680.08	34 - 9	SPARE
15L	6	679.98	34 - 9	SMP
15M	6	680.07	34 - 9	SPARE
15N	6	680.10	34 - 9	SMP
15O	6	680.09	34 - 9	SPARE
15P	6	680.08	34 - 9	SMP
15Q	6	680.10	34 - 9	SPARE
15R	6	680.11	34 - 9	SMP
15S	6	680.11	34 - 9	SPARE
16A	4	679.93	12 - 6	SLUDGE TEMP
16B	4	679.97	12 - 6	SLUDGE TEMP
16C	4	680.01	12 - 6	SLUDGE TEMP
17A	3	680.04	39 - 8	ANNULUS ACCESS
17B	3	679.99	39 - 8	ANNULUS ACCESS
17C	3	679.95	39 - 8	ANNULUS ACCESS
17D	3	680.02	39 - 8	ANNULUS ACCESS
17E	3	680.03	39 - 8	ANNULUS PRESSURE GAUGE

APPENDIX A
TABLE 8.1.9 WASTE TANK DOME PENETRATIONS

Tank 241-AY-102

RISER	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT.)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
17F	3		39 - 8	P/CP (12 in. CVR)
17G	3	680.01	39 - 8	ANNULUS ACCESS
17H	3	680.03	39 - 8	ANNULUS ACCESS
17I	3	680.02	39 - 8	PORTABLE AIR SAMPLER
17J	3	680.00	39 - 8	ANNULUS ACCESS
17K	3	679.97	39 - 8	ANNULUS ACCESS
18A	24		38 - 6 3/8	ANNULUS ACCESS
18B	24		38 - 6 3/8	ANNULUS ACCESS
19A	12		38 - 9	LEAK DETECTOR
19B	12		38 - 9	ANNULUS ACCESS
20A	8		38 - 9	AIR OUTLET
20B	8		38 - 9	AIR OUTLET
20C	8		38 - 9	AIR OUTLET
20D	8		38 - 9	AIR OUTLET
20E	8		38 - 9	AIR OUTLET
20F	8		38 - 9	AIR OUTLET
21A	3		39 - 8	TRANSMITTER BOX 102-3
21B	3		39 - 8	TRANSMITTER BOX 102-4
21C	3		39 - 8	TRANSMITTER BOX 102-5
21D	3		39 - 8	TRANSMITTER BOX 102-6
21E	3		39 - 8	TRANSMITTER BOX 102-1
21F	3		39 - 8	TRANSMITTER BOX 102-2
22A	16		20 - 0	LIT
23A	4		31 - 0	LLI
24A	42		20 - 0	SPARE
29A	12		38 - 9	ANNULUS PUMP
30A	4		31 - 0	ANNULUS PUMP DISCHARGE

APPENDIX A
FIGURE 8.1.10 DST-241-AP-101 TANK DIAGRAM



TANK AP 101

APPENDIX A
TABLE 8.1.10 WASTE TANK DOME PENETRATIONS

Tank 241-AP-101

RISER	LOCATION (DEGREES)	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
1	90	4	678.12	20 - 0	SMP (NO TAPE)
1	210	4	678.12	20 - 0	SMP (NO TAPE)
1	330	4	678.12	20 - 0	SMP (NO TAPE)
2	60	4	679.70	20 - 0	LIT
3	270	12		6 - 0	CENTRAL PUMP PIT PUMP RISER
4	160	12	676.70	20 - 0	THERMOCOUPLE PROBE
5	0	42	677.52	20 - 9	SPARE (RISER PLUG)
5	270	42	677.51	20 - 9	SPARE (RISER PLUG)
6	90	24	677.65	38 - 6 3/8	ANNULUS ACCESS
6	270	24	677.64	38 - 6 3/8	ANNULUS ACCESS
7	75	12		20 - 0	SPARE (RISER PLUG) NONFUNCTIONAL
7	120	12	678.10	20 - 0	PRIMARY TANK EXHAUST
8	30	4		39 - 3	ANNULUS AIR INLET (NONFUNCTIONAL)
8	75	4		39 - 3	ANNULUS AIR INLET (NONFUNCTIONAL)
8	120	4		39 - 3	ANNULUS AIR INLET (NONFUNCTIONAL)
8	165	4		39 - 3	ANNULUS AIR INLET (NONFUNCTIONAL)
8	210	4		39 - 3	ANNULUS AIR INLET (NONFUNCTIONAL)
8	255	4		39 - 3	ANNULUS AIR INLET (NONFUNCTIONAL)
8	300	4		39 - 3	ANNULUS AIR INLET (NONFUNCTIONAL)
8	345	4		39 - 3	ANNULUS AIR INLET (NONFUNCTIONAL)
9	27	8		38 - 9	ANNULUS AIR EXHAUST (NONFUNCTIONAL)
9	117	8		38 - 9	ANNULUS AIR EXHAUST (NONFUNCTIONAL
9	207	8		38 - 9	ANNULUS AIR EXHAUST (NONFUNCTIONAL)
9	297	8		38 - 9	ANNULUS AIR EXHAUST (NONFUNCTIONAL)
10	30	12	678.12	30 - 0	SPARE (RISER PLUG)
10	150	12	678.12	30 - 0	SPARE (RISER PLUG)
11	CENTER	42			CENTRAL PUMP PIT SLURRY DISTRIBUTOR
12	90	12	678.12	9 - 0	OBSERVATION PORT - SPARE
13	270	12		30 - 0	TANK PRESSURE (NONFUNCTIONAL)
14	270	4		9 - 0	CENTRAL PUMP NOZZLE G

APPENDIX A
TABLE 8.1.10 WASTE TANK DOME PENETRATIONS

Tank 241-AP-101

RISER	LOCATION (DEGREES)	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
15	140	4	678.13	28 - 0	SPARE (RISER PLUG)
16	90	12	678.13	30 - 0	SMP (TAPE)
16	210	12	678.12	30 - 0	SMP (TAPE)
16	330	12	678.12	30 - 0	SMP (TAPE)
17	18	6	678.14	38 - 3	ANNULUS ACCESS
17	36	6	678.14	38 - 3	ANNULUS ACCESS
17	54	6	678.14	38 - 3	ANNULUS ACCESS
17	72	6	678.13	38 - 3	ANNULUS ACCESS
17	108	6	678.13	38 - 3	ANNULUS ACCESS
17	126	6	678.13	38 - 3	ANNULUS ACCESS
17	144	6	678.12	38 - 3	ANNULUS ACCESS
17	162	6	678.13	38 - 3	ANNULUS ACCESS
17	198	6	679.70	38 - 3	ANNULUS ACCESS
17	216	6	678.13	38 - 3	ANNULUS ACCESS
17	236	6	678.13	38 - 3	ANNULUS ACCESS
17	252	6	678.13	38 - 3	ANNULUS ACCESS
17	288	6	678.13	38 - 3	ANNULUS ACCESS
17	306	6	678.14	38 - 3	ANNULUS ACCESS
17	324	6	679.71	38 - 3	ANNULUS ACCESS
17	342	6	678.12	38 - 3	ANNULUS ACCESS
18	0	12	678.16	39 - 0	ANNULUS ACCESS
18	180	12	678.12	39 - 0	ANNULUS ACCESS
19	26	4	676.47	39 - 4	ANNULUS THERMOCOUPLE
19	63	4	676.46	39 - 4	ANNULUS THERMOCOUPLE
19	139	4	676.47	39 - 4	ANNULUS THERMOCOUPLE
19	191	4	676.46	39 - 4	ANNULUS THERMOCOUPLE
19	243	4	676.46	39 - 4	ANNULUS THERMOCOUPLE
19	312	4	676.47	39 - 4	ANNULUS THERMOCOUPLE
20	333	12		38 - 9	ANNULUS PUMP PIT PUMP RISER
21	165	4	678.13	28 - 0	SPARE (RISER PLUG)
22	0	4	678.20	10 - 0	SMP (TAPE)
23	81	4	679.71	38 - 9	ANNULUS LEAK DETECTOR

APPENDIX A

TABLE 8.1.10 WASTE TANK DOME PENETRATIONS

Tank 241-AP-101

RISER	LOCATION (DEGREES)	SIZE DIAMETER (IN.)	ELEVATION TO TOP OF FLANGE (FT)	RADIUS FROM ℄ OF TANK TO ℄ OF RISER (FT-IN)	FUNCTION
23	201	4	679.72	38 - 9	ANNULUS LEAK DETECTOR
23	321	4	679.70	38 - 9	ANNULUS LEAK DETECTOR
24	10	4	678.12	30 - 0	SPARE (RISER PLUG)
25	30	4	676.46	20 - 0	HIGH LEVEL SENSOR
26	135	4	679.70	20 - 0	SPARE (RISER PLUG)
27	450	4	678.12	15 - 0	SPARE (RISER PLUG)
27	90	4	678.12	15 - 0	SPARE (RISER PLUG)
27	150	4	678.11	15 - 0	SPARE (RISER PLUG)
28	187	4	678.13	33 - 0	SPARE (RISER PLUG)

APPENDIX B

Tank Data Sheets

NOTE: The material contained in this appendix is for architect/engineer information, is nonbinding and, therefore, the signature of the Department of Energy is not required.

8.2 APPENDIX B, TANK DATA SHEETS

APPENDIX B

8.2.1 DST-241-SY-101 Data Sheets

8.2.1.1 DESCRIPTION

8.2.1.1.1 Location - The SY Tank Farm Complex is located in the 200 West Area and consists of three underground tanks.

8.2.1.1.2 Construction - Last tank completed in 1976.

8.2.1.1.3 Physical data - Double-shell, underground tank for waste storage

Total capacity - 1,160,000 gallons

Operation capacity - 1,140,000 gallons

Material - carbon steel

Size - 80-foot outside diameter and 75-foot inside diameter, 46 feet 9½ inches high, encased in a concrete shell, about six and one-half feet below grade.

Heat load - 40,000 BTU/hr Maximum tank limit. However, existing radiolytic heat load is 41,900 BTU/hr (12.3 kW). Reference "radiolytic Heat Load in 241-SY-101", D. A. Reynolds (7K210-92-449), and Appendix AI of the Safety Assessment for the remediation pump installation in SY-101.

8.2.1.1.4 Riser configurations, see Appendix A (H-2-79556)

Total number of risers = 58 - Most risers are used for various tank penetrations however, there are some risers that are not used or listed as spares. See Appendix A for details.

42" Dia.= 3	8" Dia.= 4
24" Dia.= 2	6" Dia.= 4
20" Dia.= 2	4" Dia.= 36
12" Dia.= 7	

8.2.1.1.5 Major Internal components, see Figure 8.2.1 (WHC-EP-0182)

Mixing Pump - Special instrumentation and a 150 HP submersible pump may be installed in the near term in this tank for the Hydrogen Mitigation Test. In-tank components are identified and shown in Figure 8.2.1.

Vertical piping - for drains, risers, transfer lines, mixing feed, etc.; must be analyzed to determine if any fatigue damage will occur from forces induced by the mixer operation.

Lances (air) - The four lances which were in the tank have been removed (part of the hydrogen mitigation effort). These lances were installed to blow air into the tank bottom to mix the waste.

8.2.1.1.6 Major External components (see Appendix A)

Annulus pump and pit - One at Riser 21A, see Drawing H-2-37710

Leak detection - Riser 19A, see Drawing H-2-37709

8.2.1.1.7 Facility Interfaces

Elect power supply - Tie into existing 13.8 KV overhead distribution lines and install transformer size as required. Electrical upgrade is planned to provide sufficient capacity to operate 2 large mixer pumps in 2 of the 3 tanks.

Water - 1½" Raw Water Line, see Drawing H-2-37778 sh.2

Service Air - 80 to 100 lb/in^2 available

Ventilation/HVAC - Installed, active and automatic, See Drawings H-2-37744 through -37747. P-28 portable and generator for K-1. An interim exhaust unit is in planning for SY-K-1.

Transfer lines - V561 & V562 in valve boxes 241-SY-A & B. Project W-058 is a proposed project that will install new cross site transfer lines.

External contamination levels

Vapor Space - 200 R/Hr
Surface at ground level - NA
Surface at crown of concrete dome - NA

8.2.1.2.0 CLASSIFICATION

8.2.1.2.1 Criticality concerns - Analysis required by safety prior to removing tank contents.

8.2.1.2.2 Waste sampling schedule - Most recent core and crust samples taken 6/91 and 12/91 for chemical, physical, and radionuclides analyses.

8.2.1.3.0 CHARACTERIZATION

8.2.1.3.1 Waste type - Complexed concentrate (CC) waste product from the cesium/strontium recovery process. It is rich in complexants such as ethylenediaminetetraacetic acid (EDTA), n-(hydroxyethyl)-ethylenediaminetetraacetic acid (HEDTA), citric and hydroxyacetic acid. These soluble organics were concentrated with the waste stream to a high total organic carbon.

The "convective layer" is that region of waste that appears, from in-tank thermocouple data, to be thermally convective. The temperature of the waste is reasonably uniform through this region of the tank.

The "nonconvective layer" is that region of waste that appears, from in-tank thermocouple data, to be thermally nonconvective. It is the bottom layer of waste in the tank. The temperature of the waste in this region varies as a function of depth.

8.2.1.3.2 Waste Composition

Property	Convective Layer	Nonconvective Layer
Volume	572,000 gal	463,000 gal
Depth	210 inches	170 inches
Composition	See Table 8.2.1	See Table 8.2.1
pH	13	NA
Specific Gravity	1.43 to 1.58	1.55 to 1.67
Viscosity	55 cP @ 32ºC 8 cP @ 65ºC	See WHC-EP-0628
Shear strength	<530 dynes/cm^2	15,000 dynes/cm^2 @ 32°C 5,000 dynes/cm^2 @ 80°C
Temperature	125°F **(52°C)**	135°F **(57°C)**
Solids (Vol.%)	19	81
H_2O%	83	19
Miller No(abrasiveness)	<25	<50

Erosion/Corrosion

Erosion/corrosion studies can be found in H. D. Smith and M. R. Elmore, "Corrosion Studies of Carbon Steel Under Impinging Jets of Simulated Slurries of NCAW and NCRW", document No. PNL 7816, January 1992.

8.2.1.3.3 Internal radiation levels

Vapor space - 200 R/hr
Supernate - NA
Sludge (settled solids) ROM average - NA

8.2.1.3.4 Stored capacity - Approximately 1,090,000 gallons of liquid which includes 20 inches of crust and 380 inches of slurry at the bottom of the tank.

8.2.1.4.0 EXISTING EQUIPMENT AND SYSTEMS

8.2.1.4.1 Process monitoring systems - This is a safety Watch Listed tank and continuously monitored.

Level - Monitored continuously by radar and daily by hand, FIC gage
Temperature - continuously and recorded
GAS - continuously and recorded, grab samples on irregular schedule

8.2.1.4.2 Ventilation/HVAC systems - The three tanks in SY Farm have a common ventilation system. This is an active system with control valves and filters for each tank. A malfunction is alarmed in the control room. There is a smaller backup system that is also common for all tanks. See Dwg. H-2-37744, Rev. 6, sh. 1. There is a proposed project to provide a separate ventilation system for SY-101.

8.2.1.4.3 Special instrumentation systems - Monitoring systems such as video monitoring, gas composition etc. have been installed to monitor the safety conditions of this tank, CR9699.

8.2.1.5.0 OPERATING CONDITIONS

8.2.1.5.1 Safety mitigation - Special instrumentation and a 150 HP submersible pump may be installed in this tank for the Hydrogen Mitigation Test. In-tank components are identified and shown in Figure 8.2.1, for special instrumentation use H-2-87275, Hydrogen Monitoring System Drawing Index Tree. An environmentally controlled structure is planned for data acquisition and includes control and monitoring functions. It will be located just outside the tank farm fence directly north of the tank.

8.2.1.5.2 Ventilation Systems - The existing system shares a common ventilation system with the other two tanks. Changes to this system may be required and will be determined during conceptual design.

8.2.1.5.3 Sampling techniques - Full depth core samples were collected in May 1991, and December 1991. The core samples were obtained using a 19-inch core sampler by pushing into the waste and changing samplers every 19-inch increment.

8.2.1.5.4 Ventilation Control - None. Common exhaust system for the SY tank farm, with separate sensing for each tank. Sensing for all three tanks are located in building, 241-SY-271.

8.2.1.6.0 <u>D & D REQUIREMENTS</u>

D & D of this tank will not take place until after all wastes from single-shell tanks have been retrieved. Waste removed from this tank (minimum 90% solids by weight) will permit this tank to be used as a receiver to store wastes from other tanks.

8.2.1.6.1 <u>Decommissioning</u> - DOE 6430.1A, Section 1300-11 & 1321-6

8.2.1.6.2 <u>Demolition</u> - DOE 6430-1A, Section 0205-1

8.2.1.6.3 <u>Decommissioning Surplus Facilities</u> - WHC-CM-7-5, Part Z

8.2.1.7.0 REFERENCES

a) SD-W-058-FDC-001, Rev. 0, Replacement of Cross-Site Transfer System

b) SD-W-058-CDR-001, Rev. 0

c) WHC-EP-0182-45, DEC 1991, Tank Farm Surveillance and Waste Status Summary Report for December 1991

d) OSD-T-151-00007, H-5, Operating Specifications for 242-AN, AP, AW, AY, AZ & SY Tank Farms

e) WHC-SD-WM-DTR-024, Laboratory Characterization of Samples Taken in May 1991 from Hanford Waste Tank 241-SY-101

f) Drawings, H-2-37700, Rev. 4, Sh 1; H-2-72213, Rev. 2, Sh 1; H-2-37732, Rev. 5, Sh. 1; H-2-37744, Rev. 6, Sh. 1; H-2-37772, Rev. 2, Sh. 1; H-2-37778, Rev. 5, Sh. 1 & 2; H-2-79556, Rev. 0, Sh. 1

g) WHC-SD-WM-SEL-026, Rev. 0 (draft), Safety Classification of DST Systems and Major Equipment.

h) SD-WM-ER-029, Rev. 15, Operational Waste Volume Projection, 4/91

i) Internal Memo, 7K220-92-030, 5/22/92, Characterization Data on Selected Tanks in Support of the Initial Pretreatment Module.

j) WHC-EP-0628, "Tank 101-SY Window E Core Sample: Interpretation of Results, 2/93.

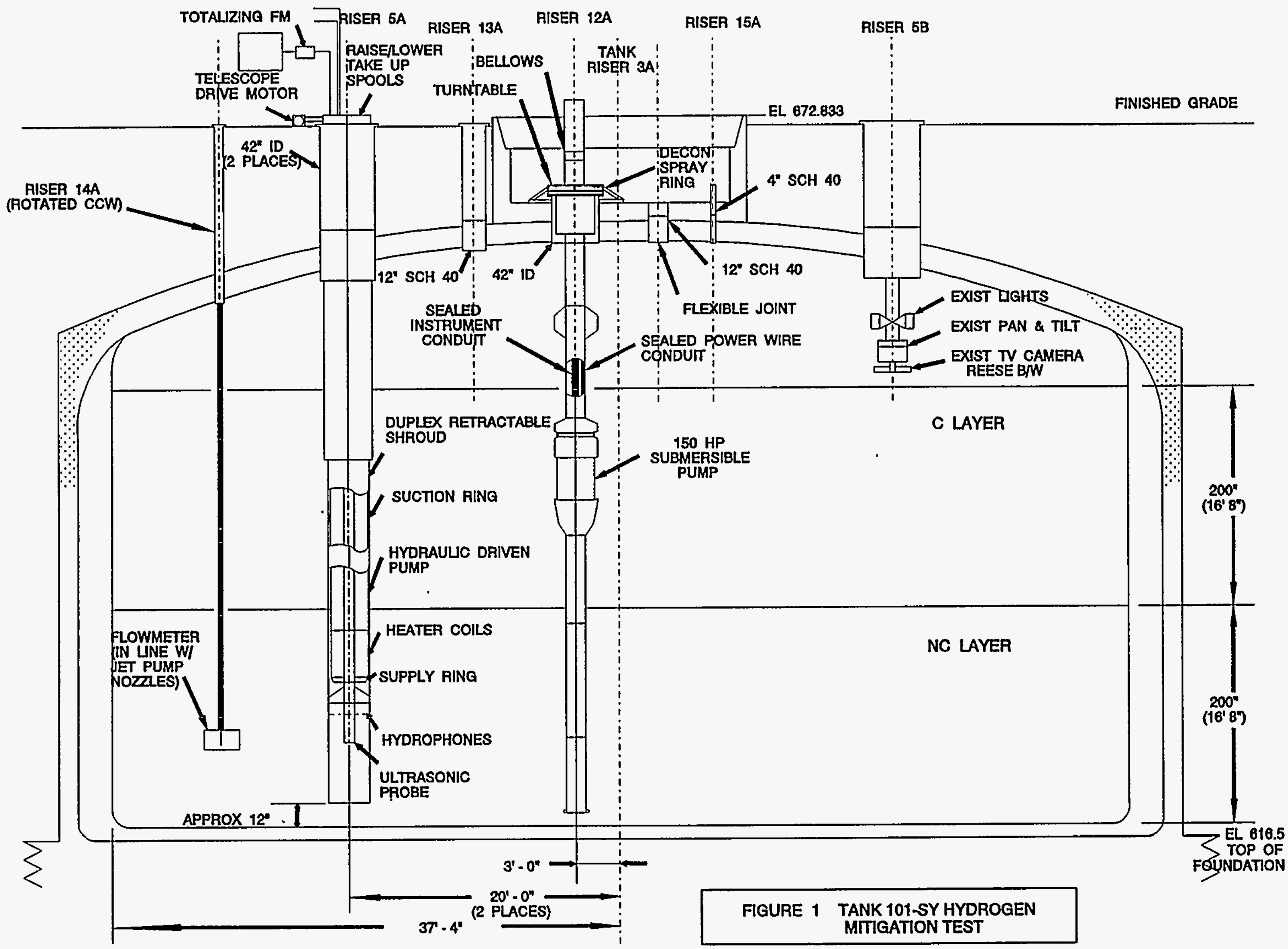


FIGURE 1 TANK 101-SY HYDROGEN MITIGATION TEST

TABLE 1
CHEMICAL ANALYSIS OF COMPOSITE SAMPLE LIQUID PHASE
(WEIGHT PERCENT EXCEPT WHERE NOTED)

SPECIES	CONVECTIVE LAYER			NON-CONVECTIVE LAYER		
	4 - 8	9 - 14 TOP	AVERAGE	14 BOTTOM - 18	19 - 22	AVERAGE
NO_3	16.1	15.0 b	15.6	11.9	12.2	12.1
NO_2	13.7	13.0 b	13.4	9.9	8.7	9.3
Cl	0.87	1.02 b	0.95	0.92	0.70	0.81
F	NR	NR	NA	0.07	0.04	0.06
PO_4	0.53	0.56 b	0.55	0.91	0.91 a	0.91
SO_4	0.13	0.05 b	0.09	0.08	0.28	0.18
TIC	0.26	0.66 b	0.46	1.60 b	1.60 a	1.60
TOC	0.94	0.94 a	0.94	1.14	0.94	1.04
NH_3/NH_4	0.01	0.01	0.01	0.02	NR	NA
OH	2.82	2.82 a	2.82	3.08	1.98	2.53
CN (ppm)	90	91	91	90	394	242
Na	19.3	17.7	18.5	21.1	17.9	19.5
Al	3.07	2.75	2.91	3.38	2.96	3.17
Cr	0.006	0.005	0.006	0.013	0.022	0.017
Fe	NR	0.003	NA	0.006	NR	NA
Ca	0.046	0.058	0.052	0.052	0.119	0.085
K	0.361	0.312	0.337	0.380	0.338	0.359
Mo	0.011	0.009	0.010	0.012	0.009	0.011
Ni	0.004	0.003	0.004	0.010	0.006	0.008
Zn	0.009	0.005	0.007	0.009	0.022	0.016
U (μg/g)	NR	1.1	NA	1.2	NR	NA
Pu-239,40 (μCi/g)	0.0001	0.0001	0.0001	NR	NR	NA
Am-241 (μCi/g)	0.0006	0.0005	0.0006	0.0021	0.0019	0.0020
Sr-90 (μCi/g)	3.3	2.6	3.0	2.8	2.7	2.8
Cs-137 (μCi/g)	403	427	415	498	358	428

a - Value not determined; assumed to be same as composite from same layer
b - One or more duplicate sample results discarded
NR - Not reported
NA - Not applicable

APPENDIX B

8.2.2 DST-241-SY-103 Data Sheets

8.2.2.1 DESCRIPTION

8.2.2.1.1 Location - The SY Tank Farm Complex is located in the 200 West Area and consists of three underground tanks.

8.2.2.1.2 Construction - Last tank was completed in 1976.

8.2.2.1.3 Physical data - Double-shell, underground tank for storage of high-level radioactive wastes.

Total capacity - 1,160,000 gallons

Operation capacity - 1,140,000 gallons

Material - carbon steel

Size - 80-foot outside diameter and 75-foot inside diameter, 46 feet 9½ inches high, encased in a concrete shell, about six and one-half feet below grade.

Loading Over Tank Dome - 40 psi uniform

Heat load - 40,000 BTU/hr Maximum tank limit

8.2.2.1.4 Riser configurations (see Appendix A and H-2-37773 thru -37778)

Total number of risers = 59 - Most risers are used for various tank operations however, there are 17 risers that are not used or listed as spares. Most of the seventeen risers listed as spares are 4" diameter, however, two of the seventeen are 42" dia. risers.

42" Dia.= 3	8" Dia.= 4
24" Dia.= 2	6" Dia.= 4
20" Dia.= 2	4" Dia.= 36
12" Dia.= 8	

8.2.2.1.5 Major Internal components

Thermocouple probes - One thermocouple probe assembly is installed in Riser 4A, 4" dia., to measure in-tank temperatures. The assembly cannot withstand the stresses set up during mixing operations and must be replaced with more rigid design.

Vertical piping - Drains, risers, transfer lines, mixing feed pipe, etc. must be analyzed to determine if any fatigue damage will occur from forces induced by the mixer operation.

8.2.2.1.6 Major External components

Transfer Pump - Pump located in the central pump pit, Riser 3A (12" dia) used to remove tank slurry.

Annulus Pump - Located at Riser 21A, 12" dia.

Leak detection - Located at riser 19A, Ref Drawing H-2-37709

Transfer lines - The existing cross-site transfer line does not meet current environmental regulations and cannot be used to transfer waste from this tank to the 200 East Area tanks. Project W-058, Replacement Of The Cross-Site Transfer System, will replace the existing system.

8.2.2.1.7 Facility Interfaces

Elect power supply - Install transformer per this project (see Tank 101-SY) to provide sufficient capacity to operate 2 large mixer pumps in two of the three tanks.

Facility transfer lines - In valve pits 241-SY-A & B, must comply with transfer specs for Project W-058, cross-site transfer lines, Ref f.

Steam Supply - 225 lb/in^2 gauge is supplied in insulated, buried lines

Water - 125 lb/in^2 raw water

Air Supply Systems - 80 to 100 lb/in^2 gauge reduced to 20 lb/in^2

Ventilation/HVAC - The SY tank farm consists of two ventilation, subsystems K1 and K2. The K1 subsystem is used to ventilate cool the primary tank and to minimize radioactive vapor releases into the atmosphere by maintaining a negative pressure in the tank. The K2 subsystem is used to ventilate the annulus.

Facility Transfer Interfaces

V561 & V562 in valve boxes 241-SY-A & B. Project W-058 is a proposed project that will install new cross-site transfer lines.

Average transfer flow rates - 65 to 70 gal/min.

ALARA Concerns -
Radiation level - >5 mR @ surface above tank, not including shine through above the risers.
Contamination level - TBD

8.2.2.2.0 Classification

8.2.2.2.1 Criticality concerns - Analysis required by safety prior to removing tank contents.

8.2.2.2.2 Waste sampling schedule - Stored waste are sampled periodically per FSS-T-080-0001. Most recent samples for chemical, physical, and radionuclides analyses were taken 9/1/86 for PNL, Ref. DE-AC06-76RLO-1830.

8.2.2.3.0 CHARACTERIZATION

8.2.2.3.1 Waste type - The contents of SY-103 include double-shell slurry (DSS), complexant concentrate (CC), and uranium sludge from ion exchange processes.

8.2.2.3.2 Waste Composition - Slurry samples were measured for physical, rheological, chemical, and radiochemical properties. The waste is classified as TRU wastes because the amounts of ^{241}Am and ^{238}Pu exceeds the limit of 110 nCi per gram of waste. The basis for average composition data in this tank was taken from Ref (b). Twelve core samples were retrieved in 1986 to be analyzed. More recent data on waste chemical composition was taken from Ref (g).

Property	Convective Layer (Slurry)	Nonconvective Layer (Sludge)
Volume	169,000 gal	573,000 gal
Depth	61.4 inches	208 inches
Chemical composition	Table 8.2.2.3.2	Table 8.2.2.3.2
pH	12 to 14	12 to 14
Specific Gravity	1.3	1.5 to 1.9
Viscosity(design basis)	1 - 15 cP	NA
Temperature	100°F	120°F
Solids (Vol.%)	NA	60 to 80%
Density	1.3 g/ml	1.8 g/ml
Miller No.	<50	<50
Shear strength	NA	31,000 dyne/cm^2

8.2.2.3.3 Stored capacity - Approximately 746,000 gallons (271.2 inches) of total waste which includes a crust of 4,000 gallons, 169,000 gallons (61.4 inches) of drainable liquid plus 573,000 gallons of settled solids at the bottom of the tank. Approximately 394,000 gallons of tank space is available for use.

8.2.2.4.0 EXISTING EQUIPMENT AND SYSTEMS

8.2.2.4.1 Process monitoring systems

Level - Monitored continuously by radar and daily by hand
Temperature - continuously and recorded
GAS - continuously and recorded, grab samples on irregular schedule

8.2.2.4.2 Ventilation/HVAC systems - The existing ventilation system for this tank shares a common exhaust system with the other two tanks in the SY tank farm. This system, as presently configured, does not meet current environmental or operational requirements. A new ventilation system has been proposed to maintain safe levels of hydrogen concentrations and prevent unfiltered air from escaping the waste tank during storage and retrieval phases.

8.2.2.4.3 Special instrumentation systems - None

8.2.2.5.0 OPERATING CONDITIONS

Safety mitigation - Internally generated hydrogen is removed by the existing exhaust system.

Ventilation Systems - Shares common exhaust ventilation system with other two tanks.

Sampling techniques - Waste samples, assumed to be representative of the three waste types contained in the tank, were taken in September 1986. Samples were obtained from near the surface for the uranium sludge, for the DSS approximately at mid-depth of the tank, and near the bottom of the tank for CC type waste. Both core samples and bottle-on-string samples methods were used for obtaining samples.

Ventilation Control - Common HVAC system for the SY tank farm. With sensing and control for each tank.

8.2.2.6.0 D & D REQUIREMENTS

D & D of this tank will not take place until after all wastes from single-shell tanks have been retrieved. Waste removed from this tank (minimum 90% solids by weight) will permit this tank to be used as a receiver to store wastes from other tanks.

8.2.2.6.1 Decommissioning - DOE 6430.1A, Section 1300-11 & 1321-6

8.2.2.6.2 Demolition - DOE 6430-1A, Section 0205-1

8.2.2.6.3 Decommissioning Surplus Facilities - WHC-CM-7-5, Part Z

8.2.2.7.0 REFERENCES

a) SD-W-058-FDC-001, REV. 0, Replacement of Cross-Site Transfer System

b) WHC-EP-0182-45, DEC 1991, Tank Farm Surveillance and Waste Status Summary Report, 2/92

c) OSD-T-151-00007, H-5, Operating Specifications for 242-AN, AP, AW, AY, AZ & SY Tank Farms

d) WHC-SD-WM-DTR-024, Laboratory Characterization of Samples Taken in May 1991 from Hanford Waste Tank 241-SY-101

e) Drawing Index, H-2-3700, SY Tank Farm

f) WHC-SD-W058-CDR-001, Rev. 0 (Issue H), Replacement of the Cross-Site Transfer System, 5/91

g) Internal Memo, 7K220-92-030, 5/22/92, Characterization Data on Selected Tanks in Support of the Initial Pretreatment Module.

Table 8.2.2.3.2

Tank 103-SY

Chemical and Radionuclide Composition
Concentration, Wt% (a)

Species	Uranium Sludge	Complexant Concentrate	Double-Shell Slurry	Weighted Average
Al	4.45	4.15	4.77	4.59
B	0.015	0.012	0.009	0.011
Ba	ND	0.0005	0.0004	NA
Ca	0.020	0.027	0.016	0.019
Cr	0.30	-.59	0.58	0.54
Fe	0.094	0.16	0.20	0.18
K	0.38	0.34	0.26	0.30
La	0.002	0.005	0.002	0.003
Mg	0.001	0.003	0.0009	0.0014
Mn	0.023	0.047	0.051	0.046
Mo	0.013	0.012	0.009	0.010
Na	21.7	20.7	29.7	26.6
Nd	ND	0.008	ND	NA
Ni	0.008	0.013	0.012	0.012
Si	0.016	0.034	0.060	0.048
Sr	ND	0.0003	ND	NA
Zn	ND	0.004	0.042	NA
Zr	0.002	0.003	0.002	0.002
CO_3	1.64	2.70	2.44	2.37
F	<0.15	<0.15	<0.11	NA
Cl	0.73	0.68	0.53	0.59
NO_2	8.35	7.91	7.31	7.60
PO_4	0.31	0.38	0.42	0.39
NO_3	10	10	25	20
SO_4	0.24	0.46	0.38	0.38
OH	2.1(N)	2.06(N)	1.55(N)	1.90(N)
Pu-239,40 (mCi/g)	3.81E-05 ± 1.91E-06	7.03E-05 ± 1.84E-06	7.38E-05 ± 1.87E-06	6.75E-05
Am-241+Pu-238 (mCi/g)	3.21E-04 ± 2.19E-05	5.15E-04 ± 2.30E-05	6.35E-04 ± 3.74E-05	5.61E-04
Pu-241 (mCi/g)	4.59E-03 ± 1.87E-03	<5.15E-03	<5.37E-03	NA
Co-60 (mCi/g)	8.32E-05 ± 2.60E-05	1.47E-04 ± 3.36E-05	3.64E-04 ± 2.66E-05	2.75E-04
Cs-137 (mCi/g)	4.95E-01 ± 8.12E-03	4.78E-01 ± 1.38E-02	3.46E-01 ± 6.07E-03	3.97E-01
Eu-154 (mCi/g)	7.75E-04 ± 9.33E-05	1.49E-03 ± 1.56E-04	2.12E-03 ± 1.07E-03	1.78E-03
Eu-155 (mCi/g)	6.21E-04 ± 2.23E-04	1.84E-03 ± 2.62E-04	<1.36E-03	NA

(a) - With the exception of OH
ND - Not detectable
NA - Not applicable

APPENDIX B

8.2.3 DST-241-AZ-102 DATA SHEETS

8.2.3.1 DESCRIPTION

8.2.3.1.1 Location - The AZ Tank Farm Complex is located in the 200 East Area and consists of two underground tanks.

8.2.3.1.2 Construction - Last tank was completed in 1977.

8.2.3.1.3 Physical data - Double-shell, underground tank for storing high level, aging type wastes.

Total capacity - 1,000,000 gallons

Operation capacity - 980,000 gallons

Material - carbon steel bottom thickness ranges from 3/8 to 1", primary tank wall thickness ranges from 1/2 to 3/4", and dome thickness 1/4 to 1/2".

Size - 80-foot OD, 75-foot ID, 47 feet high, encased in a reinforced concrete shell 18 inches thick. Crown of tank is seven feet below grade. An 8-inch slab of insulating concrete is sandwiched between the primary and secondary tank bottoms.

Heat content - 4,000,000 BTU/hr Maximum tank limit

8.2.3.1.4 Riser configurations (see Appendix A and H-2-67314 & 15)

Total number of risers = 84 - Most risers are used for various tank penetrations however, there are some risers that are not used or listed as spares. See Appendix A for details.

42" Dia.= 7	8" Dia.= 6
24" Dia.= 2	6" Dia.= 27
20" Dia.= 1	4" Dia.= 25
16" Dia.= 1	3" Dia.= 11
12" Dia.= 3	2" Dia.= 1

8.2.3.1.5 Major Internal components (see Figure 8.2.3.1.5)

Steam Heater Coil Assembly - The tank is equipped with a large steam coil that is hung from the top of the tank. The bottom of the assembly is 4.8 feet above the tank bottom. It was used to provide additional heat to maintain the tank contents during initial filling and is no longer used.

Air lift circulators - There are 22 air-lift circulators installed. They are dispersed throughout the tank to minimize the buildup of a solids layer on the bottom of the tank. The bottom of the air lift circulators are 2.5 feet above the tank bottom.

Thermocouple probe assemblies - There are seven thermocouple trees plus other instrumentation probes. They cannot withstand the stresses set up by mixing operations and must be removed. New temperature measuring devices will be required that can measure the temperature profile inside the tank.

Dry Wells - There are several dry wells installed. They require internal stiffeners in order to withstand forces induced by large the mixer pumps.

Vertical piping - for drains, transfer lines, mixing feed, etc. were determined by analyses to have negligible fatigue damage from forces induced by the mixer pumps.

8.2.3.1.6 Major External components (see Figure 8.2.3.1.5)

Waste removal pump & pit - See Drawing H-2-68420

Mixing equipment & pit - See Drawing H-2-68422 for pit, air lift circulators are internal components and will remain in place during mixing and removal operations.

Annulus pump pit - See Drawing H-2-68421

Leak detection pit - Leak detection for the primary tank is provided in the annulus. Leak detection devices include continuous air monitors (CAMs) and conductivity probes to detect radiation and liquid conditions.

8.2.3.1.7 Facility Interfaces

Electric power supply - AZ tank farm is provided with normal, single line, interruptible electrical power. Normal power is distributed at 120/240 V and 480 V. Project W-066 has been proposed to increase electrical power capability for the AZ tank farm to handle two larger mixer pumps operating in each tank.

Steam Supply - 225 lb/in^2 gauge is supplied in insulated, buried lines

Water - 125 lb/in^2 raw water

Air Supply Systems - 80 to 100 lb/in^2 gauge reduced to 20 lb/in^2 for use.

Ventilation/HVAC - Common system with DST AZ-101 (SD-RE-SS-001)

Facility transfer Interfaces (See PFD-T-200-00001 for more details)

Primary route - Diversion pit, AX-155, via 4510 (4" line)
Secondary route - Diverter station, AX-152, via 4511(4" line)
Average transfer flow rates - 65 to 70 gal/min.
New cross site waste transfer lines will be installed for aging waste tanks by Project W-028/058

External contamination levels - (Info due 6/12)

Surface at ground level - less than 5 mR
Surface at crown of concrete dome - TBD

8.2.3.2.0 CLASSIFICATION

8.2.3.2.1 Criticality concerns - Analysis required by safety prior to removing tank contents.

8.2.3.2.2 Waste sampling schedule - TBD

8.2.3.3.0 CHARACTERIZATION

8.2.3.3.1 Waste Composition - Neutralized Current Acid Waste (NCAW) is classified as high level radioactive waste. It contains the majority of the fission products and TRU components from the PUREX facility. NCAW is generated by the addition of NaOH to the aqueous raffinate from the decontamination cycle of the PUREX Plant. The below analysis is from Reference (p) which was based on samples, 20 vol% of settled solids, taken from AZ-101. The NCAW composition is given in Table 8.2.3.3.1.

8.2.3.3.2 Waste Properties

Property	Supernate	Sludge
Volume	878,000 gal	91,000 gal
Depth	319 inches	33 inches
Composition	NA	See Table 8.2.3.3.1
pH	≥12	NA
Specific Gravity	10cP @20/sec shear	50cP @20/sec shear
Sludge settling rate	(Avg. 30 hr rate)	0.1 cm/hr
Viscosity	1.0 - 4.0 cP	50 cP
Temperature	150 °F	165 °F
Solids	NA	20% by vol.
H_2O	100%	50%
Miller No.	>10	>10
Shear strength	15,000 dynes/cm^2	10 - 20,000 dynes/cm^2

8.2.3.3.3 Internal radiation levels

In Settled Sludge Layer - 500 R/hr
In homogeneous Slurry - 500 R/hr
At pump pit with homogeneous slurry - 50 R/hr (external, above cover block)
Above cover blocks, homogeneous slurry - 50 R/hr (external)

8.2.3.3.4 Stored capacity - Approximately 970,000 gallons of liquid which includes 33 inches of settled solids at the bottom of the tank.

8.2.3.4.0 EXISTING EQUIPMENT AND SYSTEMS

8.2.3.4.1 Waste removal pump - The existing pump capability can only remove supernate and not the heavier solids. It will be removed and disposed

8.2.3.4.2 Process monitoring systems - (See PFD-T-200-00001 for more details)

Temperature - Temperature profiles are determined from thermocouple assemblies inserted vertically in 4" dia. risers.
Level - Both liquid and solid levels are monitored
Pressure - Part of the ventilation system
Leak detection - Located in the annulus space

8.2.3.4.3 Ventilation/HVAC systems - Both the primary tank vapor space is ventilated by the 702-A system. Each tank has its own system to ventilate the annulus spaces.

8.2.3.4.4 Special instrumentation systems - Special instrumentation is currently under development for DST 101-AZ. They include tank corrosion rates, stress levels for internal components, video monitoring equipment, etc. These systems will be considered for use in this retrieval system.

8.2.3.5.0 OPERATING CONDITIONS

8.2.3.5.1 Safety considerations - Aging waste tanks have experienced "bumps" during previous operations which cause a rapid release of vapor into the tank vapor space and exceeded tank ventilation capacity that results in tank pressurization. A tank "bump" does not endanger the public and safety class equipment is not required for this tank (Ref SD-HS-SAR010).

8.2.3.5.2 Evaporation processing - This facility is currently scheduled to be restarted sometime in fiscal 1993

8.2.3.5.3 Sampling techniques - Manually retrieved

8.2.3.5.4 Ventilation Systems - Shares common ventilation system, #702-A, with 241-AY and 241-AZ Tank Farms (SD-WM-TI-363)

8.2.3.5.5 Process parameters

Temperature - 260°F, solution, maximum
Temperature - 240°F, concrete dome, maximum
Temperature - 420°F, sludge, maximum
Vapor Space Pressure - Slightly negative, maintained below atmospheric pressure
Primary tank pressure range, from +5.0 in. W.G. to -6.0 in. W.G.

8.2.3.6.0 D & D REQUIREMENTS

D & D of this tank will not take place until after all wastes from single-shell tanks have been retrieved. Waste removed from this tank (minimum 90% solids by weight) will permit this tank to be used as a receiver to store wastes from other tanks.

8.2.3.6.1 Decommissioning - DOE 6430.1A, Section 1300-11 & 1321-6

8.2.3.6.2 Demolition - DOE 6430-1A, Section 0205-1

8.2.3.6.3 Decommissioning Surplus Facilities - WHC-CM-7-5, Part Z

8.2.3.7.0 REFERENCES

a) Operating Specifications Document # OSD-T-151-00007 & OSD-T-151-00017

b) Drawing Index - H-2-68400 & H-2-67240

c) WHC-EP-0182, Tank Farm Surveillance and Status Report, 1/92

d) WHC-SD-WM-RPT-040, DST-AZ-101 Internals Vibration Analysis (Interim), 4/92

e) WHC-SD-W151-CDR-001, Conceptual Design Report for DST 101-AZ Waste Retrieval System, Project W-151, 4/90

f) WHC-SD-WM-ER-125, Rev. 0, Preliminary Evaluation - Washing of NCAW Solids in Aging Waste Tanks, 9/91

g) SD-WM-TI-302, Rev. 0, Hanford Waste Tank Sluicing History, 9/87

h) WHC-SD-WM-EV-040, Rev. 1, DST Ancillary Equipment Secondary Containment Evaluation, 9/90

i) SD-RE-TI-093, Rev. 2, Double-Shell Underground Waste Storage Tanks Riser Survey, 11/91

j) WHC-SD-WM-ES-195, Rev. 0, Mixer Pump Study for Project W-151, 2/92

k) WHC-SD-ER-ER-001, Rev. 0, Single-Shell Tank Waste Technologies, 10/90

l) QX-90-01, Hanford SST Waste Retrieval Methodology, Industry Survey, 3/90

m) WHC-S-0001, Rev. 1, Specification for Mixer Pumps for DST-AZ-101, 10/88

n) WHC-S-013, Rev. 0, Specification for Transfer Pump for DST-AZ-101, 12/88

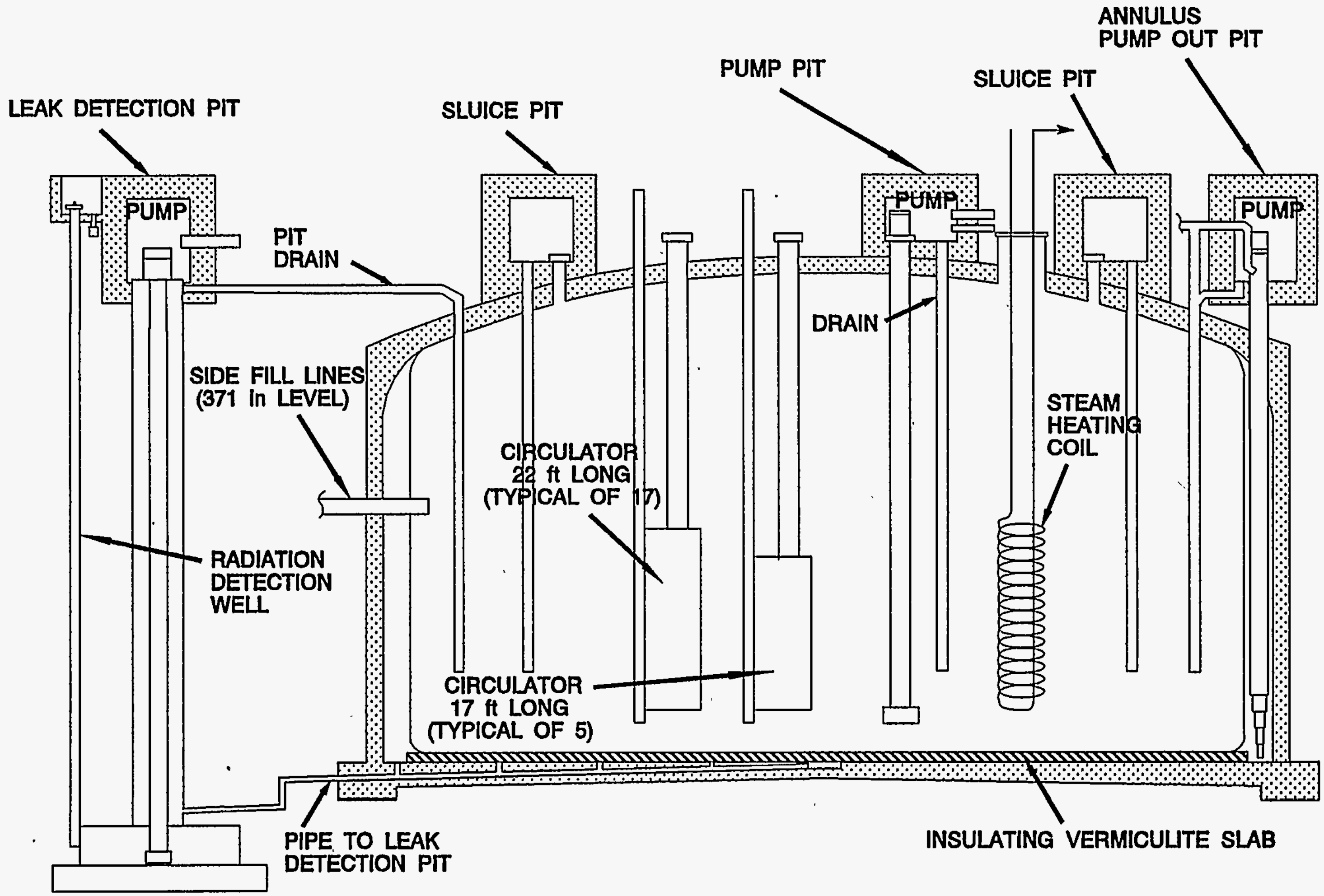
o) SD-WM-TPP-041, Rev. 0, TPP for Retrieval of Solid Waste from DSTs, 11/88

p) SD-WM-TA-015, Rev. 0, Process and Facility Options for Pretreatment of Hanford Site Tank Wastes, 8/89

q) WHC-SD-ER-TRP-004, Rev. 0, Air/Water Jet Scarifier Feature test, Interim Test Report, 9/90

Table 8.2.3.3.1
Composition of Neutralized Current Acid Waste

Component	Concentration (g-mol/L)
OH-	1.57
F	0.136
NO_2	0.675
NO_3	2.67
SO_4^2	0.235
CO_3^3	0.361
Na-	7.85
AlO_2	0.785
Cr^{-3}	0.019
Fe^{-3}	0.104
Zr^{-4}	0.069
K-	0.188
Component	**Concentration (g/l)**
U	1.45
TOC[b]	2.67
^{239}Pu	0.0041
^{241}Am	0.0040
^{237}Np	0.0180
Component	**Concentration (Ci/L)**
$^{90}Sr-^{90}Y$	3.66
$^{137}Cs-^{137}Ba$	3.11
$^{106}Ru-^{106}Rh$	0.078
$^{144}Ce-^{144}Pr$	0.274


ANNULUS
PUMP OUT PIT
PUMP PIT
SLUICE PIT
LEAK DETECTION PIT
SLUICE PIT
PUMP
PIT
DRAIN
PUMP
PUMP
DRAIN
SIDE FILL LINES
(371 In LEVEL)
STEAM
HEATING
COIL
CIRCULATOR
22 ft LONG
(TYPICAL OF 17)
RADIATION
DETECTION
WELL
CIRCULATOR
17 ft LONG
(TYPICAL OF 5)
PIPE TO LEAK
DETECTION PIT
INSULATING VERMICULITE SLAB

APPENDIX B

8.2.4 DST-241-AN-104 Data Sheets

8.2.4.1 DESCRIPTION

8.2.4.1.1 Location - The AN Tank Farm complex is located in the 200 East Area and consists of seven underground tanks.

8.2.4.1.2 Construction - Last tank was completed in 1981.

8.2.4.1.3 Physical data - Double-shell, underground tank for storing radioactive wastes.

<u>Total capacity</u> - 1,160,000 gallons

<u>Operation capacity</u> - 1,140,000 gallons

<u>Material</u> - carbon steel bottom thickness ranges from 3/8 to 1", primary tank wall thickness ranges from 1/2 to 3/4", and dome thickness 1/4 to 1/2".

<u>Size</u> - 80-foot OD, 75-foot ID, 48 feet high, encased in a reinforced concrete shell 18 inched thick. Crown of tank is seven feet below grade. An 8-inch slab of insulating concrete is sandwiched between the primary and secondary tank bottoms.

<u>Heat content</u> - 70,000 BTU/hr, Maximum tank limit

<u>Primary tank pressure range</u> - +5.0 in. W.G. to -6.0 in. W.G.

8.2.4.1.4 Riser configurations (Appendix A and H-2-71976)

<u>Tank Penetration Risers</u> - 59 total, range from 4" dia. to 42" dia.

Most risers are used for various tank penetrations however, there are some risers that are not used or listed as spares. See Appendix A for details. One 42 inch diameter riser is located in the central pump pit. The other two 42 inch risers are spare and have no surface access. They are located 180 degrees apart on a 20-foot radius.

42" Dia.= 3
24" Dia.= 2
12" Dia.= 7
8" Dia.= 4
4" Dia.= 43

8.2.4.1.5 Major Internal components

Thermocouple probe assembly - There is one thermocouple probe located in riser 4A.

Leak detectors - There are three leak detectors in the annulus and are located in risers 23A, 23B, and 23C.

Sludge measurement - There are seven sludge measurement probes which are located in risers 1A, 1B, 1C, 16A, 16B, 16C, and 22A.

Liquid level measurement - There is one liquid level probe located in riser 2, H-2-71976.

Vertical piping - for drains, transfer lines, mixing feed, etc. were determined by analyses to have negligible fatigue damage from forces induced by the large mixer pumps.

8.2.4.1.6 Major External components

Waste removal pump & pit - See drawing H-2-71998 Rev. 3 for piping plan for central pump pit which includes transfer pump 64 PTX-4.

Leak detection pit - Leak detection for the primary tank is provided in the annulus. Leak detection devices include continuous air monitors (CAMs) and conductivity probes to detect radiation and liquid conditions. See Drawing H-2-71987, Rev 4, for piping to annulus pump pit 241-AN-04B and leak detection pit 241-AN-04C.

8.2.4.1.7 Facility Interfaces

Electric power supply - AN tank farm is provided with normal, single line, interruptible electrical power. Normal power is distributed at 120/240 V and 480 V.

Steam Supply - 225 lb/in^2 gauge is supplied in insulated, buried lines

Water - 125 lb/in^2 raw water

Air Supply Systems - 80 to 100 lb/in^2 gauge reduced to 20 lb/in^2

Ventilation/HVAC - Drawing Index, H-2-90514 - Consists of K1 and K2 subsystems. The K1 ventilation subsystem is used to cool the primary tank to minimize radioactive vapor releases. The K2 subsystem is used to ventilate the annulus.

Facility Transfer Interfaces (Ref. H-2-71989 & 72008)

Primary route - Central pump pit, Valve A (2" line)
Secondary route - Central pump pit, Valve B (2" line)
Average transfer flow rates - 65 to 70 gal/min.
New cross site waste transfer lines have been proposed for DSTs by Project W-028/058.

ALARA Concerns -

Radiation level - <5 mR @ surface above tank, not including shine through above the risers.

Contamination level - TBD

8.2.4.2.0 CLASSIFICATION

8.2.4.2.1 Criticality concerns - Analysis required by safety prior to removing tank contents.

8.2.4.2.2 Waste sampling schedule - Taking samples for waste characterization has not been identified or planned for this tank.

8.2.4.3.0 CHARACTERIZATION

8.2.4.3.1 Waste type - Double-shell Slurry Feed (DSSF) is non-complexed waste that has been concentrated by the evaporator to conserve DST space. The supernate liquid on top of the DSSF waste can be sent directly to the Grout Treatment Facility without a pretreatment process.

A very limited amount of characterization data is available for waste in tank AN-104. Composition data were taken from Reference (1) and results were from samples taken in 7/84. The solids results, listed in Table 8.2.4.3.2, are not believed to be representative of the waste, however this information is considered the best average concentrations currently available. In addition, volume transfers into and out of this tank may have significantly altered the liquid composition since the samples were taken.

8.2.4.3.2 Waste Composition

Property	Supernate	Sludge
Volume	800,000 gal	264,000 gal
Depth	290 inches	96 inches
Composition	See Table 8.2.4.3.2	See Table 8.2.4.3.2
pH	<12	<12
Specific Gravity	TBD	TBD
Viscosity	Non-newtonian	1 - 15 cP
Density	1.3 gm/ml	1.3 gm/ml
Temperature	95°F	<150°F
Solids	NA	NA
H_2O	NA	NA
Miller No.(abrasiveness)	<50	<100
Shear strength (Range)	10,000 dyne/cm^2	25,000 dyne/cm^2

8.2.4.3.3 Internal radiation levels

Vapor space - NA
Supernate - NA
Sludge - NA

8.2.4.3.4 Stored capacity - Approximately 1,064,000 gallons of liquid which includes 96 inches (264 Kgal) of settled solids (sludge) at the bottom of the tank, Ref. e.

8.2.4.4.0 EXISTING EQUIPMENT AND SYSTEMS

8.2.4.4.1 Transfer pump - The existing transfer pump is located in the central pump pit and installed in Riser 3A. It can only remove supernate liquid and not the heavier solids. It will be removed and replaced with a larger capacity pump.

8.2.4.4.2 Process monitoring systems

Temperature - Temperature profiles are measured by a thermocouple probe assembly installed in riser 4A (4" dia. riser).

Level - Both liquid and solid levels can be measured by different methods from various risers.

Pressure - instrumentation located in Riser 13A (4" dia. riser)

Leak detection - Located in annulus space, Risers 23A, 23B, and 23C(4" dia. riser)

8.2.4.4.3 Ventilation/HVAC systems - The primary tank vapor space is ventilated by the H-1 system; the H-2 system ventilates the annulus space.

8.2.4.4.4 Special instrumentation systems - There are several unused or spare risers that are available for special instrumentation and monitoring equipment. They include tank corrosion rates, stress levels for internal components, video monitoring equipment, etc. These systems should be identified and included as part of the retrieval system configuration.

8.2.4.5.0 OPERATION CONDITIONS

8.2.4.5.1 Safety considerations - Waste contained in this tank is classified as DSSF (grout feed) and no safety considerations are necessary except to maintain containment.

8.2.4.5.2 Evaporation processing - This facility is currently scheduled to be restarted sometime in fiscal 1993

8.2.4.5.3 Sampling techniques - Believed to be bottle-on-a-string method rather than a core sample.

8.2.4.5.4 Ventilation Systems - Shares common ventilation system with other tanks.

8.2.4.5.5 Process parameters - (Reference SD-RE-TI-008)

Solution Temperatures - 212°F, maximum, for OH >4M
- 236°F, maximum, for OH <4M

Concrete temperature - 236°F, maximum

Sludge temperature - 350°F, maximum

Vapor Space Pressure - Slightly negative, maintained below atmospheric pressure

8.2.4.6.0 D & D REQUIREMENTS

D & D of this tank will not take place until after all wastes from single-shell tanks have been retrieved. Waste removed from this tank (minimum 90% solids by weight) will permit this tank to be used as a receiver to store wastes from other tanks.

8.2.4.6.1 Decommissioning - DOE 6430.1A, Section 1300-11 & 1321-6

8.2.4.6.2 Demolition - DOE 6430-1A, Section 0205-1

8.2.4.6.3 Decommissioning Surplus Facilities - WHC-CM-7-5, Part Z

8.2.4.7.0 REFERENCES

a) Operating Specifications Document # OSD-T-151-00007

b) SD-RE-TI-008, Rev. 1 thru Rev. 5, Specification Changes

c) RHO-LD-146, West Valley Waste Removal Study, 8/81

d) Drawing Index - H-2-68400 & H-2-67240

e) WHC-EP-0182, Tank Farm Surveillance and Status Report, 2/92

f) WHC-SD-WM-RPT-040, DST-AZ-101 Internals Vibration Analysis (Interim Report), 4/92

g) SD-WM-TI-302, Rev. 0, Hanford Waste Tank Sluicing History, 9/87

h) WHC-SD-WM-EV-040, Rev. 1, DST Ancillary Equipment Secondary Containment Evaluation, 9/90

i) SD-RE-TI-093, Rev. 2, Double-Shell Underground Waste Storage Tanks Riser Survey, 11/91

j) WHC-SD-WM-ES-195, Rev. 0, Mixer Pump Study for Project W-151, 2/92

k) WHC-SD-ER-ER-001, Rev. 0, Single-Shell Tank Waste Technologies, 10/90

l) Internal Memo, 7K220-92-030, KC Strong to AL Shord, "Characterization Data on Selected Tanks In Support Of The Pretreatment Module", 5/92

m) WHC-MCE-SVV-18681, BNFL Developed Mixing Technologies to Support Organics Tank Program - Report, 6/17/92

Table 8.2.4.3.2 Double Shell Tank Inventory

Input Chemical	NCAW Liquid (Kgs)	NCAW Solid (Kgs)	DSS/DSSF Liquid + Solids (Kgs)	NCRW Solid (Kgs)	NCRW Liquid (Kgs)	PFP Solid (Kgs)	PFP Liquid (Kgs)	CC Solid (Kgs)	CC Liquid (Kgs)	Total* (Kgs)
Ag +	2.93E+01	3.22E+02				8.98E+01				1.19E+02
Al + 3	3.07E+04	3.67E+04	1.38E+06	1.53E+04	5.24E+02	1.69E+04	2.91E+02	2.78E+04	5.28E+05	2.00E+06
As + 5	1.82E+02	3.48E+02				3.12E+02				4.94E+02
B + 3	8.13E+01	2.38E+02		1.40E+03	1.19E+00	9.00E+01		3.69E+01	7.00E+02	2.31E+03
Ba + 2	9.82E+00	3.80E+02	2.68E+02	5.33E+02	4.75E-02			5.40E+01	4.86E+02	1.35E+03
Be + 2	7.17E-01	9.23E+00								7.17E-01
Ca + 2	4.21E+01	1.62E+03	2.56E+03	1.43E+03	2.59E+01	2.50E+03		7.71E+02	6.94E+03	1.43E+04
Cd + 2	1.80E+01	6.07E+03	2.52E+02			3.74E+02				6.44E+02
Co + 3	3.28E+01	7.81E+02	9.75E-04	7.93E+04	6.70E-07	7.37E-05				3.28E+01
Cr + 3,+ 6	4.97E+03	1.28E+03	1.98E+04	4.10E+03	8.82E+01	9.31E+03		1.28E+03	2.43E+04	6.38E+04
Cu + 2	1.04E+01	2.33E+02	1.89E+02			7.94E+02				9.93E+02
Fe + 3	8.53E+01	5.94E+04	9.95E+02	2.89E+03	2.11E+00	9.30E+03		1.44E+03	2.74E+04	4.21E+04
Hg + 2			2.53E+02							2.53E+02
K +	1.92E+04	2.88E+03	9.66E+05	5.13E+04	1.81E+04	1.30E+03	5.91E+02	3.13E+02	3.10E+04	1.09E+06
Mg + 2	1.12E+01	4.63E+02	4.53E+02	4.11E+02	1.07E+00	7.08E+02		3.28E+02	2.95E+03	4.86E+03
Mo + 6	4.59E+02	7.16E+01	2.50E+03	3.60E+01	4.10E-02	3.99E+01		2.52E+02	4.79E+03	8.08E+03
Na +	5.31E+05	5.78E+04	1.00E+07	4.43E+05	1.10E+04	5.74E+04	4.22E+03	4.51E+04	4.46E+06	1.56E+07
Ni + 3	1.39E+01	3.43E+03	5.03E+02	4.16E+02	3.40E-01	2.44E+02		2.95E+02	5.60E+03	7.07E+03
Pb + 4	3.42E+01	4.83E+02	2.39E+03			5.18E+02				2.94E+03
Rare Earths + 3	6.09E+01	4.55E+03		2.00E+03	4.80E+02	5.82E+02		4.43E+02	3.99E+03	7.07E+03
Rh + 3	1.07E+01	7.53E+01		1.41E+02	1.46E-01	2.14E+02				3.66E+02
Ru + 3	2.43E+01	2.66E+02	1.12E+01	5.21E+01	3.01E-02	2.10E+02				2.87E+02
Si + 4	2.14E+03	3.19E+03	6.38E+03	1.46E+04	1.05E+02	9.36E+02	2.42E+01	3.09E+04		5.50E+04
Th + 4	1.98E+01	5.16E+02				2.90E+02				3.10E+02
Ti + 4	4.59E+00	2.21E+02		1.60E+02	1.43E-01	5.98E+01				2.24E+02
UO_2 + 2	5.28E+03	3.41E+03	7.07E+03	2.65E+04	3.21E+00	1.12E+03		3.20E+00	6.08E+01	4.01E+04
Zn + 2	4.33E+01	1.63E+02	7.56E+02	6.39E+01	1.22E-01	1.91E+02		1.05E+02	9.42E+02	2.10E+03
Cl -	7.41E+02	9.77E+01	2.77E+05	2.50E+03	2.13E+03	2.21E+03	1.53E+02	1.10E+02	1.10E+05	3.94E+05
CO_3 - 2	3.44E+04	7.57E+03	2.36E+05	2.07E+04	9.39E+02	1.50E+04	6.47E+02	7.57E+02	7.56E+05	1.06E+06
F -	7.64E+03	1.42E+03	1.16E+04	2.29E+05	1.95E+03	2.37E+03	1.64E+02	3.89E+01	3.88E+04	2.91E+05
$FeCN_6$ - 3			1.23E+03							1.23E+03
NO_2 -	1.27E+05	1.63E+04	3.73E+06	3.70E+04	1.81E+04	1.53E+04	4.96E+02	8.27E+02	8.27E+05	4.76E+06
NO_3 -	3.76E+05	1.81E+04	7.83E+06	1.02E+05	1.35E+04	7.75E+04	5.35E+03	4.15E+03	4.14E+06	1.26E+07
OH -	2.35E+05	1.70E+05	6.65E+06	1.74E+05	3.45E+03	4.94E+04	1.63E+03	1.63E+05	2.33E+06	9.60E+06
PO_4 - 3	4.54E+04	4.50E+03	3.11E+04			2.37E+04	1.02E+02	1.08E+02	1.08E+05	2.09E+05
SO_4 - 2	1.04E+05	1.00E+04	1.03E+05	2.37E+03	6.01E+02	4.00E+03	1.66E+02	1.32E+02	1.32E+05	3.46E+05
TOC	8.24E+03	4.39E+03	1.37E+05					9.00E+03	4.41E+05	5.95E+05
H_2O	6.54E+06		3.38E+07		1.72E+05		2.09E+05		1.26E+07	5.33E+07
MnO_2	8.67E+00	2.77E+03	7.17E+02	1.61E+03		5.43E+03		5.83E+02	1.11E+04	1.94E+04
ZrO_2:$2H_2O$	5.39E+01	2.76E+04		5.16E+05		2.65E+02		1.83E+02	1.65E+03	5.19E+05
Total, Kg	8.07E+06	4.49E+05	6.52E+07	1.65E+06	2.43E+05	2.99E+05	2.22E+05	2.88E+05	2.66E+07	1.03E+08

Input Radio-nuclides**	NCAW Liquid Ci	NCAW Solid Ci	DSS/DSSF Total Ci	NCRW Solid Ci	NCRW Liquid Ci	PFP Solid Ci	PFP Liquid Ci	CC Total Ci	Total Ci
C-14	3.50E+02		1.00E+03					1.00E+03	2.35E+03
Cs,Ba-137	2.52E+07		2.58E+07	7.66E+05	4.80E+03	3.72E+05		1.42E+07	6.63E+07
I-129	5.00E+00		1.50E+01					7.00E+00	2.70E+01
Sr,Y-90		2.16E+07	6.12E+04	1.40E+05		1.76E+05		3.78E+06	2.58E+07
Tc-99	2.20E+03	2.20E+03	9.30E+03			2.85E+02		1.00E+04	2.18E+04
Am-241		6.00E+04	9.00E+02	6.80E+02		2.40E+04		1.30E+04	3.86E+04
Pu-239,240		8.70E+02	1.10E+03	2.30E+03		1.50E+04		3.90E+03	2.23E+04
Total Ci	2.52E+07	2.17E+07	2.59E+07	9.09E+05	4.80E+03	5.87E+05		1.80E+07	9.22E+07

	NCAW Liquid	NCAW Solid	DSS/DSSF	NCRW Solid	NCRW Liquid	PFP Solid	PFP Liquid	CC Solid	CC Liquid	Total
Volume, gal	1.78E+06	1.51E+05	1.19E+07	5.92E+05	4.80E+04	1.10E+05	5.70E+04	9.12E+04	4.76E+06	1.93E+07

* Totals may be higher since analytical data are not available for some elements
** Radionuclides decayed to 1991 to be consistant with the Integrated Data Base; decay daughters are included for Cs-137 and Sr-90
*** NCRW and PFP radionuclide data are based on unwashed sludge core sample analyses

APPENDIX B

8.2.5 DST-241-AN-106 Data Sheets

8.2.5.1 DESCRIPTION

8.2.5.1.1 Location - The AN Tank Farm complex is located in the 200 East Area and consists of seven underground tanks.

8.2.5.1.2 Construction - Last tank was completed in 1981.

8.2.5.1.3 Physical data - Double-shell, underground tank for dilute non-complexed waste storage.

Total capacity - 1,160,000 gallons

Operation capacity - 1,140,000 gallons

Material - carbon steel bottom ranges from 3/8 to 1", primary tank wall thickness ranges from 1/2 to 3/4", and dome is 1/4 to 1/2".

Size - 80-foot OD, 75-foot ID, 48 feet high, encased in a reinforced concrete shell 18 inched thick. Crown of tank is seven feet below grade. An 8-inch slab of insulating concrete is sandwiched between the primary and secondary tank bottoms.

Heat content - 70,000 BTU/hr, Maximum tank limit

Primary tank pressure range - +5.0 in W.G. to -6.0 in W.G.

8.2.5.1.4 Riser configurations (Appendix A)

Tank Penetration Risers - 59 total, range from 4" dia. to 42" dia.

Most risers are used for various tank penetrations however, there are some risers that are not used or listed as spares. See Appendix A for details. One 42 inch diameter riser is located in the central pump pit. The other two 42 inch risers are spare and have no surface access. They are located 180 degrees apart on a 20-foot radius.

42" Dia.= 3
24" Dia.= 2
12" Dia.= 7
8" Dia.= 4
4" Dia.= 43

8.2.5.1.5 Major Internal components. This section requires major changes!

Thermocouple probe assembly - There is one thermocouple probe located in riser 4A.

Leak detectors - There are three leak detectors in the annulus and are located in risers 23A, 23B, and 23C.

Sludge measurement - There are seven sludge measurement probes which are located in risers 1A, 1B, 1C, 16A, 16B, 16C, and 22A.

Liquid level measurement - There is one liquid level probe located in riser 2A, H-2-71976.

Vertical piping - for drains, transfer lines, mixing feed, etc. were determined by analyses to have negligible fatigue damage from forces induced by the large mixer pumps.

8.2.5.1.6 Major External components

Transfer Pump - Used to pump supernatant, located in Riser 3A.

Annulus pump pit - Installed in Riser 20A, 12-inch diameter

Leak detection pit - Leak detection for the primary tank is provided in the annulus. Leak detection devices include continuous air monitors (CAMs) and conductivity probes to detect radiation and liquid conditions.

8.2.5.1.7 Facility Interfaces

Electric power supply - AN tank farm is provided with normal, single line, interruptible electrical power. Normal power is distributed at 120/240 V and 480 V.

Steam Supply - 225 lb/in^2 gauge is supplied in insulated, buried lines

Water - 125 lb/in^2 raw water

Air Supply Systems - 80 to 100 lb/in^2 gauge reduced to 20 lb/in^2 for use.

Ventilation/HVAC - Drawing Index, H-2-90514

Consists of K1 and K2 subsystems. The K1 ventilation subsystem is used to cool the primary tank to minimize radioactive vapor releases. The K2 subsystem is used to ventilate the annulus.

Facility Transfer Interfaces (Ref. H-2-71989 & 72008)

Primary route - Central pump pit, Valve A, (2" line)
Secondary route - Central pump pit, Valve B, (2" line)
Average transfer flow rates - 65 to 70 gal/min.
New cross site waste transfer lines have been proposed for DSTs by Project W-028/058.

ALARA Concerns -

Radiation level - <5mR @ surface above tank, not including shine through above the risers. Contamination level - TBD

8.2.5.2.0 CLASSIFICATION

8.2.5.2.1 Criticality concerns - Analysis required by safety prior to removing tank contents.

8.2.5.2.2 Waste sampling schedule - Taking samples for waste characterization has not been identified or planned for this tank.

8.2.5.3.0 CHARACTERIZATION

8.2.5.3.1 Waste type - Concentrated Phosphate Waste (CP). Waste originating from the decontamination of 100 N Area reactor. Concentration of this waste produces CP waste.

8.2.5.3.2 Waste Composition

Property	Supernate	Sludge
Volume	998,000 gal	17,000 gal
Depth	363 inches	6 inches
Composition	Table 8.2.4.3.2	Table 8.2.4.3.2
pH	<12	<12
Specific Gravity	NA	NA
Density	1-1.3 gm/ml	1.3 gm/ml
Viscosity	1 - 15 cP	NA
Temperature (Avg.)	75°F	75°F
Solids (Vol.%)	NA	NA
H_2O%	NA	NA
Miller No(abrasiveness)	<50	<100
Shear strength	NA	25,000 dyne/cm^2

8.2.5.3.3 Internal radiation levels

Vapor space - NA
Supernate - Table 8.2.4.3.2
Sludge - Table 8.2.4.3.2

8.2.5.3.4 Stored capacity - Total stored volume is approximately 1,015,000 gallons of waste which includes 17,000 gallons (6 inches) of settled solids (sludge) at the bottom of the tank, Ref. e. This provides 125,000 gallons, maximum, available tank space.

8.2.5.4.0 EXISTING EQUIPMENT AND SYSTEMS

8.2.5.4.1 Waste removal pump - The existing pump capability can only remove supernate and not the heavier solids. It will be removed for disposal.

8.2.5.4.2 Process monitoring systems

Temperature - Temperature profiles are measured by a thermocouple probe assembly installed in riser 4A (4" dia. riser).

Level - Both liquid and solid levels can be measured by different methods from various risers.

Pressure - instrumentation located in Riser 13A (4" dia. riser)

Leak detection - Located in annulus space, Risers 23A, 23B, and 23C(4" dia. riser)

8.2.5.4.3 Ventilation/HVAC systems - The primary tank vapor space is ventilated by the H-1 system; the H-2 system ventilates the annulus space.

8.2.5.4.4 Special instrumentation systems - There are several unused or spare risers that are available for special instrumentation and monitoring equipment. They include tank corrosion rates, stress levels for internal components, video monitoring equipment, etc. These systems should be identified and included as part of the retrieval system configuration.

8.2.5.5.0 OPERATION CONDITIONS

8.2.5.5.1 Safety considerations - Waste contained in this tank is classified as type CP for grout feed and no safety considerations are necessary except to maintain confinement.

8.2.5.5.2 Evaporation processing - This facility is currently scheduled to be restarted sometime in fiscal 1993

8.2.5.5.3 Sampling techniques - Believed to be bottle-on-a-string method rather than a core sample.

8.2.5.5.4 Ventilation Systems - Shares common ventilation system with other tanks.

8.2.5.5.5 Process parameters - (Reference SD-RE-TI-008)

Solution Temperatures - 212°F, maximum, for OH >4M
- 236°F, maximum, for OH <4M

Concrete temperature - 236°F, maximum

Sludge temperature - 350°F, maximum

Vapor Space Pressure - Slightly negative, maintained below atmospheric pressure

8.2.5.6.0 D & D REQUIREMENTS

D & D of this tank will not take place until after all wastes from single-shell tanks have been retrieved. Waste removed from this tank (minimum 90% solids by weight) will permit this tank to be used as a receiver to store wastes from other tanks.

8.2.5.6.1 Decommissioning - DOE 6430.1A, Section 1300-11 & 1321-6

8.2.5.6.2 Demolition - DOE 6430-1A, Section 0205-1

8.2.5.6.3 Decommissioning Surplus Facilities - WHC-CM-7-5, Part Z

8.2.5.7.0 REFERENCES

a) Operating Specifications Document # OSD-T-151-00007

b) SD-RE-TI-008, Rev. 1 thru Rev. 5, Specification Changes

c) RHO-LD-146, West Valley Waste Removal Study, 8/81

d) Drawing Index - H-2-68400 & H-2-67240

e) WHC-EP-0182, Tank Farm Surveillance and Status Report, 2/92

f) WHC-SD-WM-RPT-040, DST-AZ-101 Internals Vibration Analysis (Interim Report), 4/92

g) SD-WM-TI-302, Rev. 0, Hanford Waste Tank Sluicing History, 9/87

h) WHC-SD-WM-EV-040, Rev. 1, DST Ancillary Equipment Secondary Containment Evaluation, 9/90

i) SD-RE-TI-093, Rev. 2, Double-Shell Underground Waste Storage Tanks Riser Survey, 11/91

j) WHC-SD-WM-ES-195, Rev. 0, Mixer Pump Study for Project W-151, 2/92

k) WHC-SD-ER-ER-001, Rev. 0, Single-Shell Tank Waste Technologies, 10/90

l) Internal Memo, 7K220-92-030, KC Strong to AL Shord, "Characterization Data on Selected Tanks In Support Of The Pretreatment Module", 5/92

m) WHC-MCE-SVV-18681, BNFL Developed Mixing Technologies to Support Organics Tank Program - Report, 6/17/92

n) WHC-MCE-SVV-18681, BNFL Developed Mixing Technologies to Support Organics Tank Program - Report, 6/17/92

o) Battelle (PNL) Report, Results of the Characterization of 102-AY Waste Solids, Washed Solids and Supernate, 2/90

APPENDIX B

8.2.6 DST-241-AW-101 Data Sheets

8.2.6.1 DESCRIPTION

8.2.6.1.1 Location - The AW Tank Farm complex is located in the 200 East Area and consists of six underground tanks.

8.2.6.1.2 Construction - Last tank was completed in 1980.

8.2.6.1.3 Physical data - Double-shell, underground tank for dilute non-complexed radioactive waste storage.

Total capacity - 1,160,000 gallons

Operation capacity - 1,140,000 gallons

Material - carbon steel bottom thickness ranges from 3/8 to 1", primary tank wall thickness ranges from 1/2 to 3/4", and dome thickness 1/4 to 1/2".

Size - 80-foot OD, 75-foot ID, 48 feet high, encased in a reinforced concrete shell 18 inches thick. Crown of tank is seven feet below grade. An 8-inch slab of insulating concrete is sandwiched between the primary and secondary tank bottoms.

Heat content - 70,000 BTU/hr, Maximum tank limit

Primary tank pressure range - +5.0 in W.G. to -6.0 in W.G.

8.2.6.1.4 Riser configurations (Appendix A)

Tank Penetration Risers - 64 total, range from 4" dia. to 42" dia.

Most risers are used for various tank penetrations however, there are some risers that are not used or listed as spares. See Appendix A for details. One 42 inch diameter riser is located in the central pump pit. The other two 42 inch risers are spare and have no surface access. They are located 180 degrees apart on a 20-foot radius.

42" Dia.= 3
36" Dia.= 1
24" Dia.= 2
20" Dia.= 2
12" Dia.= 9
8" Dia.= 4
4" Dia.= 43

8.2.6.1.5 Major Internal components

Thermocouple probe assembly - There is one thermocouple probe located in riser 4A.

Leak detectors - There are three leak detectors in the annulus and are located in risers 27A, B, and C.

Sludge measurement - There are five sludge measurement probes which are located in risers 1B, 1C, 16A, 16C, and 22A.

Liquid level measurement - There is one manual liquid level indicator located in riser 2A, H-2-71976.

Vertical piping - for drains, transfer lines, mixing feed, etc. were determined by analyses to have negligible fatigue damage from forces induced by the large mixer pumps.

8.2.6.1.6 Major External components

Transfer Pump - Used to pump supernatant, located in Riser 3A.

Annulus pump pit - Installed in Riser 20A, 12 inch-diameter

Leak detection pit - Leak detection for the primary tank is provided in the annulus. Leak detection devices include continuous air monitors (CAMs) and conductivity probes to detect radiation and liquid conditions.

8.2.6.1.7 Facility Interfaces

Electric power supply - AW tank farm is provided with normal, single line, interruptible electrical power. Normal power is distributed at 120/240 V and 480 V.

Steam Supply - 225 lb/in^2 gauge is supplied in insulated, buried lines

Water - 125 lb/in^2 raw water

Air Supply Systems - 80 to 100 lb/in^2 gauge reduced to 20 lb/in^2 for use.

Ventilation/HVAC - Drawing Index, H-2-70300

Consists of K1 and K2 subsystems. The K1 ventilation subsystem is used to cool the primary tank to minimize radioactive vapor releases. The K2 subsystem is used to ventilate the annulus.

Facility Transfer Interfaces (Ref. H-2-71989 & 72008)

Primary route - Central pump pit, Valve A, (2" line)
Secondary route - Central pump pit, Valve B, (2" line)
Average transfer flow rates - 65 to 70 gal/min.
New cross site waste transfer lines have been proposed for DSTs by Project W-028/058.

ALARA Concerns -

Radiation level - <5mR @ surface above tank, not including shine through above the risers.

Contamination level - TBD

8.2.6.2.0 CLASSIFICATION

8.2.6.2.1 Criticality concerns - Analysis required by safety prior to removing tank contents.

8.2.6.2.2 Waste sampling schedule - Taking samples for waste characterization has not been identified or planned for this tank.

8.2.6.3.0 CHARACTERIZATION

8.2.6.3.1 Waste type - Double-shell Slurry Feed (DSSF) is non-complexed waste that has been concentrated by the evaporator to conserve DST space. This waste has been evaporated to just below the sodium aluminate saturation boundary or 6.5M hydroxide. Contents of this tank has been classified as grout feed and will be sent directly to the GTF facility.

8.2.6.3.2 Waste Composition

A limited amount of characterization data is available for DSSF type wastes. Composition data were taken from References (l and m) and some of the physical properties were provided by Retrieval Technology. This information is considered the best average data currently available for this tank. In addition, volume transfers into and out of this tank may have significantly altered the liquid composition since the samples were taken.

Property	Supernate	Sludge
Volume	1,042,000 gal	84,000 gal
Depth	379 inches	30.5 inches
Composition	Table 8.2.4.3.2	Table 8.2.4.3.2
pH	<12	<12
Specific Gravity	NA	NA
Density	1.3 g/ml	1.5-1.8 g/ml
Viscosity	1-15 cP	NA
Temperature (Avg.)	>90°F	>90°F
Solids (Vol.%)	NA	NA
H_2O%	NA	NA
Miller No(abrasiveness)	<50	<100
Shear strength	NA	25,000 dyne/cm^2

8.2.6.3.3 Internal radiation levels

Vapor space - NA
Supernate - NA
Sludge - NA

8.2.6.3.4 Stored capacity - Total stored volume is approximately 1,126,000 gallons of waste which includes 84,000 gallons (30 inches) of settled solids (sludge) at the bottom of the tank, Reference (c). This provides 14,000 gallons, maximum, available tank space.

8.2.6.4.0 EXISTING EQUIPMENT AND SYSTEMS

8.2.6.4.1 Waste removal pump - The existing pump has the capability to remove only supernate and not the heavier solids. It will be removed, disposed, and replaced with a new pump.

8.2.6.4.2 Process monitoring systems

Temperature - Temperature profiles are measured by a thermocouple probe assembly installed in riser 4A (4" dia. riser).

Level - Both liquid and solid levels can be measured by different methods from various risers.

Pressure - instrumentation located in Riser 13B (4" dia. riser)

Leak detection - Located in annulus space, Risers 27A, B, and C(4" dia. risers)

8.2.6.4.3 Ventilation/HVAC systems - The primary tank vapor space is ventilated by the H-1 system; the H-2 system ventilates the annulus space.

8.2.6.4.4 Special instrumentation systems - There are several unused or spare risers that are available for special instrumentation and monitoring equipment. They include tank corrosion rates, stress levels for internal components, video monitoring equipment, etc. These systems should be identified and included as part of the retrieval system configuration.

8.2.6.5.0 OPERATION CONDITIONS

8.2.6.5.1 Safety considerations - This tank is a holding tank for concentrated waste (DSSF) for grout feed. The primary safety consideration is to maintain waste confinement while stored and during transfers.

8.2.6.5.2 Evaporation processing - This facility is currently scheduled to be restarted sometime in fiscal 1993

8.2.6.5.3 Sampling techniques - Manual

8.2.6.5.4 Ventilation Systems - Shares common ventilation system with other tanks.

8.2.6.5.5 Process parameters - (Reference OSD-T-151-00007)

Solution Temperatures - 212°F, maximum, for OH >4M
- 236°F, maximum, for OH <4M

Concrete temperature - 236°F, maximum

Sludge temperature - 350°F, maximum

Vapor Space Pressure - Slightly negative, maintained below atmospheric pressure

8.2.6.6.0 D & D REQUIREMENTS

D & D of this tank will not take place until after all wastes from single-shell tanks have been retrieved. Waste removed from this tank (minimum 90% solids by weight) will permit this tank to be used as a receiver to store wastes from other tanks.

8.2.6.6.1 Decommissioning - DOE 6430.1A, Section 1300-11 & 1321-6

8.2.6.6.2 Demolition - DOE 6430-1A, Section 0205-1

8.2.6.6.3 Decommissioning Surplus Facilities - WHC-CM-7-5, Part Z

8.2.6.7.0 REFERENCES

a) Operating Specifications Document # OSD-T-151-00007

b) SD-RE-TI-008, Rev. 1 thru Rev. 5, Specification Changes

c) RHO-LD-146, West Valley Waste Removal Study, 8/81

d) Drawing Index - AW Tank Farms, H-2-70300

e) WHC-EP-0182, Tank Farm Surveillance and Status Report, 3/92

f) WHC-SD-WM-RPT-040, DST-AZ-101 Internals Vibration Analysis (Interim Report), 4/92

g) SD-WM-TI-302, Rev. 0, Hanford Waste Tank Sluicing History, 9/87

h) WHC-SD-WM-EV-040, Rev. 1, DST Ancillary Equipment Secondary Containment Evaluation, 9/90

i) SD-RE-TI-093, Rev. 2, Double-Shell Underground Waste Storage Tanks Riser Survey, 11/91

j) WHC-SD-WM-ES-195, Rev. 0, Mixer Pump Study for Project W-151, 2/92

k) WHC-SD-ER-ER-001, Rev. 0, Single-Shell Tank Waste Technologies, 10/90

l) Internal Memo, 7K220-92-030, KC Strong to AL Shord, "Characterization Data on Selected Tanks In Support Of The Pretreatment Module", 5/92

m) Internal Memo, 01120-92-020, 6/24/92

n) WHC-MCE-SVV-18681, BNFL Developed Mixing Technologies to Support Organics Tank Program - Report, 6/17/92

o) Battelle (PNL) Report, Results of the Characterization of 102-AY Waste Solids, Washed Solids and Supernate, 2/90

APPENDIX B

8.2.7 DST-241-AN-103 Data Sheets

8.2.7.1 DESCRIPTION

8.2.7.1.1 Location - The AN Tank Farm complex is located in the 200 East Area and consists of seven underground tanks.

8.2.7.1.2 Construction - Last tank was completed in 1981.

8.2.7.1.3 Physical data - Double-shell, underground tank used for radioactive waste storage.

Total capacity - 1,160,000 gallons

Operation capacity - 1,140,000 gallons

Material - carbon steel, bottom thickness ranges from 3/8 to 1", primary tank wall thickness ranges from 1/2 to 3/4", and dome thickness 1/4 to 1/2".

Size - 80-foot OD, 75-foot ID, 48 feet high, encased in a reinforced concrete shell 18 inches thick. Crown of tank is seven feet below grade. An 8-inch slab of insulating concrete is sandwiched between the primary and secondary tank bottoms.

Heat content - 70,000 BTU/hr, Maximum tank limit

Primary tank pressure range - +5.0 in W.G. to -6.0 in W.G.

8.2.7.1.4 Riser configurations (Appendix A)

Tank Penetration Risers - 59 total, range from 4" dia. to 42" dia.

Most risers are used for various tank penetrations however, there are some risers that are not used or listed as spares. See Appendix A for details. One 42 inch diameter riser is located in the central pump pit. The other two 42 inch risers are spare and have no surface access. They are located 180 degrees apart on a 20-foot radius.

42" Dia.= 3
24" Dia.= 2
12" Dia.= 7
8" Dia.= 4
4" Dia.= 43

8.2.7.1.5 Major Internal components

Thermocouple probe assembly - There is one thermocouple probe located in riser 4A.

Leak detectors - There are three leak detectors in the annulus and are located in risers 23A, B, and C.

Sludge measurement - There are seven sludge measurement probes which are located in risers 1A, 1B, 1C, 16A, 16B, 16C, and 22A.

Liquid level measurement - There is one liquid level probe located in riser 2, H-2-71976.

Vertical piping - for drains, transfer lines, mixing feed, etc. were determined by analyses to have negligible fatigue damage from forces induced by the large mixer pumps.

8.2.7.1.6 Major External components

Transfer Pump - This pump is located in the central pump pit and used to pump supernatant only.

Annulus pump pit - Installed in Riser 20A, 12-inch diameter

Leak detection pit - Leak detection for the primary tank is provided in the annulus. Leak detection devices include continuous air monitors (CAMs) and conductivity probes to detect radiation and liquid conditions.

8.2.7.1.7 Facility Interfaces

Electric power supply - AW tank farm is provided with normal, single line, interruptible electrical power. Normal power is distributed at 120/240 V and 480 V.

Steam Supply - 225 lb/in^2 gauge is supplied in insulated, buried lines

Water - 125 lb/in^2 raw water

Air Supply Systems - 80 to 100 lb/in^2 gauge reduced to 20 lb/in^2 for use.

Ventilation/HVAC - Drawing Index, H-2-90514

Consists of K1 and K2 subsystems. The K1 ventilation subsystem is used to cool the primary tank to minimize radioactive vapor releases. The K2 subsystem is used to ventilate the annulus.

Facility Transfer Interfaces (Ref. H-2-71989 & 72008)
Primary route - Central pump pit, Valve A, (2" line)
Secondary route - Central pump pit, Valve B, (2" line)
Average transfer flow rates - 65 to 70 gal/min.
New cross site waste transfer lines have been proposed for DSTs by Project W-028/058.

ALARA Concerns - Radiation level <5mR @ surface above tank, not including shine through above risers. Contamination level - TBD

8.2.7.2.0 CLASSIFICATION

8.2.7.2.2 Criticality concerns - Analysis required by safety prior to removing tank contents.

8.2.7.2.3 Waste sampling schedule - Taking samples for waste characterization has not been identified or planned for this tank.

8.2.7.3.0 CHARACTERIZATION

8.2.7.3.1 Waste type - Double-shell Slurry (DSS) is non-complexed waste that has been concentrated by the evaporator to conserve DST space. The supernate liquid waste can be sent directly to the Grout Treatment Facility without a pretreatment process.

A very limited amount of characterization data is available for waste in tank AN-103. Composition data were taken from Reference (1). The solids results, listed in Table 8.2.9.3.2, are not believed to be representative of the waste, however this information is considered the best average concentrations currently available. In addition, volume transfers into and out of this tank may have significantly altered the liquid composition since the samples were taken.

8.2.7.3.2 Waste Composition

Property	Supernate	Sludge (DSS)
Volume	15,000 gal	937,000 gal
Depth	5.5 inches	340.7 inches
Composition	Table 8.2.9.3.2	Table 8.2.9.3.2
pH	<12	<12
Specific Gravity	NA	NA
Density	1.0 g/ml	1.4 g/ml
Viscosity	NA	NA
Temperature (Avg.)	>90°F	>90°F
Solids (Vol.%)	0	100
H_2O%	NA	54.4
Miller No(abrasiveness)	NA	<100
Shear strength	NA	Range 16,000 to 54,000 dyne/cm^2

8.2.7.3.3 Internal radiation levels

Vapor space - NA
Supernate - Table 8.2.4.3.2
Sludge - NA

8.2.7.3.4 Stored capacity - Aproximately 952,000 gallons of waste which includes (937 Kgal) DSS, Reference (e).

8.2.7.4.0 EXISTING EQUIPMENT AND SYSTEMS

8.2.7.4.1 Waste removal pump - The existing pump, located in the central pump pit, has the capability to remove supernate only and not the heavier solids. It will be removed, disposed and replaced with new a pump.

8.2.7.4.2 Process monitoring systems

Temperature - Temperature profiles are measured by a thermocouple probe assembly installed in riser 4A (4" dia. riser).

Level - Both liquid and solid levels can be measured by different methods from various risers.

Pressure - instrumentation located in Riser 13A (4" dia. riser)

Leak detection - Located in annulus space, Risers 23A, 23B, and 23C (4" dia. riser)

8.2.7.4.3 Ventilation/HVAC systems - The primary tank vapor space is ventilated by the H-1 system; the H-2 system ventilates the annulus space.

8.2.7.4.4 Special instrumentation systems - There are several unused or spare risers that are available for special instrumentation and monitoring equipment. They include tank corrosion rates, stress levels for internal components, video monitoring equipment, etc. These systems should be identified and included as part of the retrieval system configuration.

8.2.7.5.0 OPERATION CONDITIONS

8.2.7.5.1 Safety considerations - Waste contained in this tank is classified as DSS and no safety considerations are necessary except to maintain containment.

8.2.7.5.2 Evaporation processing - This facility is currently scheduled to be restarted sometime in fiscal 1993

8.2.7.5.3 Sampling techniques - Believed to be bottle-on-a-string method rather than a core sample.

8.2.7.5.4 Ventilation Systems - Shares common ventilation system with other tanks.

8.2.7.5.5 Process parameters - (Reference SD-RE-TI-008)

Solution Temperatures - 212°F, for OH >4M
(Maximum) - 236°F, for OH <4M

Concrete temperature - 236°F, maximum

Sludge temperature - 350°F, maximum

Vapor Space Pressure - Slightly negative, maintained below atmospheric pressure

8.2.7.6.0 D & D REQUIREMENTS

D & D of this tank will not take place until after all wastes from single-shell tanks have been retrieved. Waste removed from this tank (minimum 90% solids by weight) will permit this tank to be used as a receiver to store wastes from other tanks.

8.2.7.6.1 Decommissioning - DOE 6430.1A, Section 1300-11 & 1321-6

8.2.7.6.2 Demolition - DOE 6430-1A, Section 0205-1

8.2.7.6.3 Decommissioning Surplus Facilities - WHC-CM-7-5, Part Z

8.2.7.7.0 REFERENCES

a) Operating Specifications Document # OSD-T-151-00007

b) SD-RE-TI-008, Rev. 5, Specification Changes

c) RHO-LD-146, West Valley Waste Removal Study, 8/81

d) Drawing Index, AW Tank Farms, H-2-70300

e) WHC-EP-0182, Tank Farm Surveillance and Status Report, 2/92

f) WHC-SD-WM-RPT-040, DST-AZ-101 Internals Vibration Analysis (Interim Report), 4/92

g) SD-WM-TI-302, Rev. 0, Hanford Waste Tank Sluicing History, 9/87

h) WHC-SD-WM-EV-040, Rev. 1, DST Ancillary Equipment Secondary Containment Evaluation, 9/90

i) SD-RE-TI-093, Rev. 2, Double-Shell Underground Waste Storage Tanks Riser Survey, 11/91

j) WHC-SD-WM-ES-195, Rev. 0, Mixer Pump Study for Project W-151, 2/92

k) WHC-SD-ER-ER-001, Rev. 0, Single-Shell Tank Waste Technologies, 10/90

l) Internal Memo, 7K220-92-030, KC Strong to AL Shord, "Characterization Data on Selected Tanks In Support Of The Pretreatment Module", 5/92

m) Internal Memo, 01120-92-020, 6/24/92

n) WHC-MCE-SVV-18681, BNFL Developed Mixing Technologies to Support Organics Tank Program - Report, 6/17/92

o) Battelle (PNL) Report, Results of the Characterization of 102-AY Waste Solids, Washed Solids and Supernate, 2/90

APPENDIX B

8.2.8 DST-241-AN-105 Data Sheets

8.2.8.1 DESCRIPTION

8.2.8.1.1 Location - The AN Tank Farm complex is located in the 200 East Area and consists of seven underground tanks.

8.2.8.1.2 Construction - Last tank was completed in 1981.

8.2.8.1.3 Physical data - Double-shell, underground tank for storing radioactive wastes.

Total capacity - 1,160,000 gallons

Operation capacity - 1,140,000 gallons

Material - carbon steel bottom thickness ranges from 3/8 to 1", primary tank wall thickness ranges from 1/2 to 3/4", and dome thickness 1/4 to 1/2".

Size - 80-foot OD, 75-foot ID, 48 feet high, encased in a reinforced concrete shell 18 inched thick. Crown of tank is seven feet below grade. An 8-inch slab of insulating concrete is sandwiched between the primary and secondary tank bottoms.

Heat content - 70,000 BTU/hr, Maximum tank limit

Primary tank pressure range - +5.0 in W.G. to -6.0 in W.G.

8.2.8.1.4 Riser configurations (Appendix A)

Tank Penetration Risers - 59 total, range from 4" dia. to 42" dia.

Most risers are used for various tank penetrations however, there are some risers that are not used or listed as spares. See Appendix A for details. One 42 inch diameter riser is located in the central pump pit. The other two 42 inch risers are spare and have no surface access. They are located 180 degrees apart on a 20-foot radius.

42" Dia.= 3
24" Dia.= 2
12" Dia.= 7
8" Dia.= 4
4" Dia.= 43

8.2.8.1.5 Major Internal components

Thermocouple probe assembly - There is one thermocouple probe located in riser 4A.

Leak detectors - There are three leak detectors in the annulus and are located in risers 23A, B, and C.

Sludge measurement - There are seven sludge measurement probes which are located in risers 1A, 1B, 1C, 16A, 16B, 16C, and 22A.

Liquid level measurement - There is one manual liquid level indicator located in riser 2A, H-2-71976.

Vertical piping - for drains, transfer lines, mixing feed, etc. were determined by analyses to have negligible fatigue damage from forces induced by the large mixer pumps.

8.2.8.1.6 Major External components

Transfer Pump - Used to pump supernatant, located in Riser 3A.

Annulus pump pit - Installed in Riser 20A, 12 inch-diameter

Leak detection pit - Leak detection for the primary tank is provided in the annulus. Leak detection devices include continuous air monitors (CAMs) and conductivity probes to detect radiation and liquid conditions.

8.2.8.1.7 Facility Interfaces

Electric power supply - AW tank farm is provided with normal, single line, interruptible electrical power. Normal power is distributed at 120/240 V and 480 V.

Steam Supply - 225 lb/in^2 gauge is supplied in insulated, buried lines

Water - 125 lb/in^2 raw water

Air Supply Systems - 80 to 100 lb/in^2 gauge reduced to 20 lb/in^2 for use.

Ventilation/HVAC - Drawing Index, H-2-90514

Consists of K1 and K2 subsystems. The K1 ventilation subsystem is used to cool the primary tank to minimize radioactive vapor releases. The K2 subsystem is used to ventilate the annulus.

Facility Transfer Interfaces (Ref. H-2-71989 & 72008)
Primary route - Central pump pit, Valve A, (2" line)
Secondary route - Central pump pit, Valve B, (2" line)
Average transfer flow rates - 65 to 70 gal/min.
New cross site waste transfer lines have been proposed for DSTs by Project W-028/058.

ALARA Concerns - Radiation level <5mR @ surface above tank, not including shine through above risers. Contamination level - TBD

8.2.8.2.0 CLASSIFICATION

8.2.8.2.1 Criticality concerns - Analysis required by safety prior to removing tank contents.

8.2.8.2.2 Waste sampling schedule - Taking samples for waste characterization has not been identified or planned for this tank.

8.2.8.3.0 CHARACTERIZATION

8.2.8.3.1 Waste type - Double-shell Slurry Feed (DSSF) is non-complexed waste that has been concentrated by the evaporator to conserve DST space. The supernate liquid can be sent directly to the Grout Treatment Facility without a pretreatment process.

A very limited amount of characterization data is available for waste in tank AN-105. Composition data were taken from Reference (1). The solids results, listed in Section 8.2.8.3.2, are not believed to representative of the waste, however this information is considered the best average concentrations currently available. In addition, volume transfers into and out of this tank may have significantly altered the liquid composition since the samples were taken.

8.2.8.3.2 Waste Composition

Property	Supernate	Sludge
Volume	1,131,000 gal	0
Depth	411.3 inches	0
Composition	Table 8.2.4.3.2	NA
pH	<12	NA
Specific Gravity	NA	NA
Density	1.3 g/ml	NA
Viscosity	1 - 15 cP	NA
Temperature (Avg.)	90°F	NA
Solids (Vol.%)	NA	NA
H_2O%	NA	NA
Miller No(abrasiveness)	<50	NA
Shear strength	NA	NA

8.2.8.3.3 Internal radiation levels

Vapor space - NA
Supernate - Table 8.2.4.3.2
Sludge - NA

8.2.8.3.4 Stored capacity - Total stored volume is approximately 1,131,000 gallons of liquid in the tank, Ref. e.

8.2.8.4.0 EXISTING EQUIPMENT AND SYSTEMS

8.2.8.4.1 Waste removal pump - The existing pump, located in the central pump pit, has the capability to remove supernate only and not the heavier solids. It will be removed, disposed and replaced with new pump.

8.2.8.4.2 Process monitoring systems

Temperature - Temperature profiles are measured by a thermocouple probe assembly installed in riser 4A (4" dia. riser).

Level - Both liquid and solid levels can be measured by different methods from various risers.

Pressure - instrumentation located in Riser 13A (4" dia. riser)

Leak detection - Located in annulus space, Risers 23A, 23B, and 23C (4" dia. riser)

8.2.8.4.3 Ventilation/HVAC systems - The primary tank vapor space is ventilated by the H-1 system; the H-2 system ventilates the annulus space.

8.2.8.4.4 Special instrumentation systems - There are several unused or spare risers that are available for special instrumentation and monitoring equipment. They include tank corrosion rates, stress levels for internal components, video monitoring equipment, etc. These systems should be identified and included as part of the retrieval system configuration.

8.2.8.5.0 OPERATION CONDITIONS

8.2.8.5.1 Safety considerations - Waste contained in this tank is classified as DSSF (grout feed) and no safety considerations are necessary except to maintain waste confinement.

8.2.8.5.2 Evaporation processing - This facility is currently scheduled to be restarted sometime in fiscal 1993

8.2.8.5.3 Sampling techniques - Believed to be bottle-on-a-string method rather than a core sample.

8.2.8.5.4 Ventilation Systems - Shares common ventilation system with other tanks.

8.2.8.5.5 Process parameters - (Reference SD-RE-TI-008)

Solution Temperatures - 212°F, for OH >4M
(Maximum) - 236°F, for OH <4M

Concrete temperature - 236°F, maximum

Sludge temperature - 350°F, maximum

Vapor Space Pressure - Slightly negative, maintained below atmospheric pressure

8.2.8.6.0 D & D REQUIREMENTS

D & D of this tank will not take place until after all wastes from single-shell tanks have been retrieved. Waste removed from this tank (minimum 90% solids by weight) will permit this tank to be used as a receiver to store wastes from other tanks.

8.2.8.6.1 Decommissioning - DOE 6430.1A, Section 1300-11 & 1321-6

8.2.8.6.2 Demolition - DOE 6430-1A, Section 0205-1

8.2.8.6.3 Decommissioning Surplus Facilities - WHC-CM-7-5, Part Z

8.2.8.7.0 REFERENCES

a) Operating Specifications Document # OSD-T-151-00007

b) SD-RE-TI-008, Rev. 5, Specification Changes

c) RHO-LD-146, West Valley Waste Removal Study, 8/81

d) Drawing Index, AW Tank Farms, H-2-70300

e) WHC-EP-0182, Tank Farm Surveillance and Status Report, 2/92

f) WHC-SD-WM-RPT-040, DST-AZ-101 Internals Vibration Analysis (Interim Report), 4/92

g) SD-WM-TI-302, Rev. 0, Hanford Waste Tank Sluicing History, 9/87

h) WHC-SD-WM-EV-040, Rev. 1, DST Ancillary Equipment Secondary Containment Evaluation, 9/90

i) SD-RE-TI-093, Rev. 2, Double-Shell Underground Waste Storage Tanks Riser Survey, 11/91

j) WHC-SD-WM-ES-195, Rev. 0, Mixer Pump Study for Project W-151, 2/92

k) WHC-SD-ER-ER-001, Rev. 0, Single-Shell Tank Waste Technologies, 10/90

l) Internal Memo, 7K220-92-030, KC Strong to AL Shord, "Characterization Data on Selected Tanks In Support Of The Pretreatment Module", 5/92

m) Internal Memo, 01120-92-020, 6/24/92

n) WHC-MCE-SVV-18681, BNFL Developed Mixing Technologies to Support Organics Tank Program - Report, 6/17/92

o) WHC-SD-WM-TRP-055, Rev. 0, Tank 241-AW-101 Charaterization Results, 12/91

APPENDIX B

8.2.9 DST-241-AY-102 Data Sheets

8.2.9.1 DESCRIPTION

8.2.9.1.1 Location - The AY Tank Farm complex is located in the 200 East Area and consists of two underground tanks.

8.2.9.1.2 Construction - Last tank was completed in 1970.

8.2.9.1.3 Physical data - Double-shell, underground tank for storing high level, aging waste however, it is currently being used as dilute reciever tank.

Total capacity - 1,160,000 gallons

Operation capacity - 984,500 gallons for aging wastes(29 ft,10 in)

Material - carbon steel bottom thickness ranges from 3/8 to 1", primary tank wall thickness ranges from 1/2 to 3/4", and dome thickness 1/4 to 1/2".

Size - 80-foot OD, 75-foot ID, 48 feet high, encased in a reinforced concrete shell 18 inched thick. Crown of tank is seven feet below grade. An 8-inch slab of insulating concrete is sandwiched between the primary and secondary tank bottoms.

Heat content - 4,000,000 BTU/hr, Maximum tank limit

Primary tank pressure range - +5.0 in W.G. to -6.0 in W.G.

8.2.9.1.4 Riser configurations (Appendix A)

Tank Penetration Risers - 84 total, range from 4" dia. to 42" dia.

Most risers are used for various tank penetrations however, there are some risers that are not used or listed as spares. See Appendix A for details. One 42 inch diameter riser is located in the central pump pit and one is used for the steam coils. The other 42 inch riser is listed as a spare and has no surface access.

42" Dia.= 3	8" Dia.= 6
34" Dia.= 4	6" Dia.= 27
24" Dia.= 2	4" Dia.= 14
20" Dia.= 1	3" Dia.= 21
16" Dia.= 1	2" Dia.= 1
12" Dia.= 3	3/4" Dia.= 1

8.2.9.1.5 Major Internal components (See Figure 2)

Steam Heater Coil Assembly - The tank is equipped with a large steam coil assembly (Riser 7A, 42" dia) that is hung from the top of the tank. The bottom of the assembly is 4.8 feet above the tank bottom. Its function was to provide additional heat, if required, to maintain desired temperature of the tank contents during initial filling and is no longer used.

Air lift circulators - Twenty-Two air-lift circulators (ALC) are installed in 6" diameter risers. Each ALC has a temperature element installed in a 3/4" diameter riser. The ALC is used to minimize the buildup of a solids layer on the bottom of the tank. The bottom of the air lift circulators are approximately 2.5 feet above the tank bottom.

Thermocouple probe assemblies - There are four thermocouple probes to measure the tank temperature profile and three probes to measure sludge temperatures. The temperature probes cannot withstand the stresses set up by large mixer pumps and must be replaced.

Dry Wells - There are several dry wells installed, Risers 14A through 14G (6" dia). They require internal stiffeners in order to withstand forces induced when operating the large mixer pumps.

Vertical piping - for drains, transfer lines, mixing feed, etc. were determined by analyses to have negligible fatigue damage from forces induced by the mixer pumps.

Leak detectors - There are two leak detectors in the annulus and are located in risers 12A and 19A (4" dia).

Sludge measurement Ports - There are nine sludge measurement ports that are located in 6" dia. risers.

Liquid level measurement - An automatic liquid indicator tape is installed riser 22A and a manual liquid level indicator located in riser 23A.

8.2.9.1.6 Major External components

Transfer Pump - Used to pump supernatant, located in the central pump pit, Riser 3A (42" dia).

Sluice Pits - There are four sluice pits located in above risers 1A, 1B, 1C, and 1D (34" dia). Each pit has a return drain line to the tank, risers 10A, 10B, 10C, and 10D (3" dia).

Annulus pump pit - The pump is installed in Riser 29A (12" dia), and the discharge line in Riser 30A (4" dia).

Leak detection pit - Leak detection for the primary tank is provided in the annulus. Leak detection devices include continuous air monitors (CAMs) and conductivity probes to detect radiation and liquid conditions.

8.2.9.1.7 Facility Interfaces

Electric power supply - The AY tank farm is provided with normal, single line, interruptible electrical power. Normal power is distributed at 120/240 V and 480 V.

Steam Supply - 225 lb/in^2 gauge is supplied in insulated, buried lines

Water - 125 lb/in^2 raw water

Air Supply Systems - 80 to 100 lb/in^2 gauge reduced to 20 lb/in^2 for use.

Ventilation/HVAC - Shares common system, 241-A-702, with DST AY-101, for complete description see document, SD-RE-SS-001. The primary ventilation system provided confinement of radioactivity by maintaining a slight vacuum in the tank space. It also removes heat and water vapor. Heat removal rates vary up to 2,000,000 BTU/hr, and water boil-off varies up to 3 to 4 gal/min. The annulus of each aging waste tank is ventilated to provide leak detection within the annulus. Normal air flow in the annulus is 400 to 600 ft^3/min and maximum air flow is 2200 ft^3/ min.

Facility transfer Interfaces (See PED-T-200-00001 for more details)

Primary route - From tank via 4506, (4" line) to diversion pit, 241-AX-155, via PW-4506-M9 (3" line)

Secondary route - From tank via 4505, (4" line) to diverter station, 241-AX-152, via PW-4505-M9 (4" line)

Backup route - From tank via 4504, (4" line) to diverter station, 241-AX-152, via PW-4505-M9 (4" line)

Average transfer flow rates - 65 to 70 gal/min.

New cross site waste transfer lines will be installed for aging waste tanks by Project W-028/058

ALARA Concerns - Radiation level - <5mR @ surface above tank, not including shine through above the risers.

Contamination level - TBD

8.2.9.2.0 CLASSIFICATION

8.2.9.2.1 Criticality concerns - Analysis required by safety prior to removing tank contents.

8.2.9.2.2 Waste sampling schedule - Taking samples for waste characterization has not been identified or planned for this tank.

8.2.9.3.0 CHARACTERIZATION

8.2.9.3.1 Waste type - Dilute Non-complexed Waste (DN), Low activity liquid waste originating from T and S Plants, the 300 and 400 Areas, PUREX facility (decladding supernatant and miscellaneous wastes), 100N Area (sulfate waste), B Plant, saltwells, and PFP (supernatant).

Contents of this tank can be used for blending DSSF type wastes to reduce viscosity, specific gravity, and sodium concentrations. Waste volume could be reduced approximately 4:1 by the evaporization process.

8.2.9.3.2 Waste Composition

A limited amount of characterization data is available for DN type wastes. Physical and chemical properties data were taken from Reference (o). The chemical and radiochemical analyses were performed by PNL Chemistry and Analysis Section on samples taken from this tank. This information is considered the best data currently available and will be used as baseline for DN type waste stored in double-shell tanks.

Property	Supernate	Sludge
Volume	392,000 gal	32,000 gal
Depth	142.6 inches	11.6 inches
Composition	Table 8.2.9.3.2	Table 8.2.9.3.2
pH	<12	<12
Specific Gravity	NA	NA
Density	1.0 gm/ml	1.4 gm/ml
Viscosity	NA	NA
Temperature (Avg.)	>90°F	>90°F
Solids (Vol.%)	0	100
H_2O%	NA	54.4
Miller No(abrasiveness)	NA	<100
Shear strength	NA	Range 16,000 to 54,000 dyne/cm^2

8.2.9.3.3 Internal radiation levels

Vapor space - NA
Supernate - Table 8.2.9.3.3
Sludge - Table 8.2.9.3.3

8.2.9.3.4 Stored capacity - Total stored volume is approximately 424,000 gallons of waste all of which is supernatant except about 32,000 gallons of settled solids (sludge) at the bottom of the tank, Reference (e). This leaves approximately 202 inches (556,000 gallons) of available tank space.

8.2.9.4.0 EXISTING EQUIPMENT AND SYSTEMS

8.2.9.4.1 Waste removal pump - The existing pump has the capability to remove only supernate and not the heavier solids. It will be removed, disposed, and replaced with a new pump.

8.2.9.4.2 Process monitoring systems

Temperature - Temperature profiles are measured by thermocouple probe assemblies installed in risers 13A, B, C & D (4" dia).

Level - Both liquid and solid levels can be measured by different methods from risers 22A and 23A.

Pressure - Tank pressure measurements are made from riser 5B (4" dia)

Leak detection - Located in annulus space, Riser 19A (4" dia)

8.2.9.4.3 Ventilation/HVAC systems - The primary tank vapor space is ventilated by the 702-A System with a 10,000,000 Btu/hr maximum design limit.

8.2.9.4.4 Special instrumentation systems - There are several unused or spare risers that are available for special instrumentation and monitoring equipment. They include tank corrosion rates, stress levels for internal components, video monitoring equipment, etc. These systems should be identified and included as part of the retrieval system configuration.

8.2.9.5.0 Operation Conditions

8.2.9.5.1 Safety considerations - DN type wastes are stored in this tank is considered low level waste for grout feed. The primary safety consideration is to maintain waste confinement during storage and subsequent transfers.

8.2.9.5.2 Evaporation processing - This facility is currently scheduled to be restarted sometime in fiscal 1993

8.2.9.5.3 Sampling techniques - Manual

8.2.9.5.4 Ventilation Systems - Shares common ventilation system, #702-A, with 241-AY and 241-AZ Tank Farms (SD-WM-TI-363)

8.2.9.5.5 Process parameters

Solution Temperatures - 260°F, maximum

Concrete temperature - 240°F, maximum

Sludge temperature - 420°F, maximum

Vapor Space Pressure - Slightly negative, maintained below atmospheric pressure

Primary tank pressure range, from +5.0 in W.G. to -6.0 in W.G.

8.2.9.6.0 D & D REQUIREMENTS

D & D of this tank will not take place until after all wastes from single-shell tanks have been retrieved. Waste removed from this tank (minimum 90% solids by weight) will permit this tank to be used as a receiver to store wastes from other tanks.

8.2.9.6.1 Decommissioning - DOE 6430.1A, Section 1300-11 & 1321-6

8.2.9.6.2 Demolition - DOE 6430-1A, Section 0205-1

8.2.9.6.3 Decommissioning Surplus Facilities - WHC-CM-7-5, Part Z

8.2.9.7.0 REFERENCES

a) Operating Specifications Document # OSD-T-151-00007 & OSD-T-151-00017

b) SD-RE-TI-008, Rev. 1 thru Rev. 5, Specification Changes

c) RHO-LD-146, West Valley Waste Removal Study, 8/81

d) Drawing Index - H-2-68400 & H-2-67240

e) WHC-EP-0182, Tank Farm Surveillance and Status Report, 3/92

f) WHC-SD-WM-RPT-040, DST-AZ-101 Internals Vibration Analysis (Interim Report), 4/92

g) SD-WM-TI-302, Rev. 0, Hanford Waste Tank Sluicing History, 9/87

h) WHC-SD-WM-EV-040, Rev. 1, DST Ancillary Equipment Secondary Containment Evaluation, 9/90

i) SD-RE-TI-093, Rev. 2, Double-Shell Underground Waste Storage Tanks Riser Survey, 11/91

j) WHC-SD-WM-ES-195, Rev. 0, Mixer Pump Study for Project W-151, 2/92

k) WHC-SD-ER-ER-001, Rev. 0, Single-Shell Tank Waste Technologies, 10/90

l) Internal Memo, 7K220-92-030, KC Strong to AL Shord, "Characterization Data on Selected Tanks In Support Of The Pretreatment Module", 5/92

m) WHC-MCE-SVV-18681, BNFL Developed Mixing Technologies to Support Organics Tank Program - Report, 6/17/92

o) Battelle (PNL) Report, Results of the Characterization of 102-AY Waste Solids, Washed Solids and Supernate, 2/90

TABLE 8.2.9.3.2
ELEMENTAL CONCENTRATIONS IN 102-AY WASTE

Anion	Supernate, M		Interstitial Solution, M		Composite Solids mmol/g		Washed Solids mmol\g		Wash, M	
	1st Analysis	2nd Analysis	1st Analysis	2nd Analysis	1st Analysis	2nd Analysis	1st Analysis	2nd Analysis	1st Analysis	2nd Analysis
Ag	NM	6.4E-05	NM	5.7E-04	NM	6.7E-02	NM	7.2E-03	NM	1.6E-04
Al	5.9E-05	(5.1E-05)	5.6E-04	(2.3E-04)	1.2E+00	1.6	1.1E+00	9.4E-01	2.4E-04	<6.6E-05
B	3.8E-04	7.7E-04	1.8E-03	7.2E-03	7.2E-02	0.44	9.5E-02	4.3E-01	3.1E-04	1.9E-03
Ba	2.9E-06	2.5E-06	1.1E-06	7.2E-05	1.5E-02	1.4E-02	1.7E-02	1.7E-02	5.0E-06	3.3E-05
Ca	1.1E-04	8.3E-05	1.0E-05	6.5E-05	4.2E-01	2.8E-01	4.6E-01	3.1E-01	2.5E-06	4.0E-05
Cd	NM (a)	<1E-06	NM	<1E-06	4.0E-03	3.4E-03	3.2E-03	3.5E-03	NM	<1E-06
Ce	<4E-06	<4E-06	4E-05	<1E-05	8.6E-03	7.2E-03	7.1E-03	6.2E-03	<4E-06	<3E-06
Cr	2.1E-04	2.5E-04	4.6E-03	5.1E-03	7.2E-02	6.3E-02	7.1E-02	7.3E-02	1.3E-03	1.6E-03
Dy	<1E-07	<1E-07	<1E-06	<1E-06	ND (b)	ND	ND	<5E-05	<1E-07	<1E-06
Fe	7.2E-06	(1.2E-06)	5.4E-05	<4E-06	1.6E+00	1.4	1.5E+00	1.4	<7E-06	<4E-06
Hg	NM	NM	NM	NM	3.8E-04	NM	2.0E-04	NM	NM	NM
K	1.1E-03	1.1E-03	1.4E-03	1.6E-02	1.5E-02	5.9E-02	2.6E-02	2.1E-02	4.1E-03	5.0E-03
La	<4E-07	>4E-07	<4E-06	<2E-06	3.0E-02	2.7E-02	3.5E-02	3.5E-02	<4E-07	<4E-07
Li	(Be-06)	<1E-05	<1E-04	<3E-05	ND	ND	ND	<1E-03	(3E-05	<3E-05
Mg	2.3E-05	1.7E-05	1.8E-04	<4E-06	3.0E-01	2.6E-01	3.5E-01	3.5E-01	5.3E-05	8.7E-06
Mn	<2E-07	<2E-07	<2E-06	<5E-07	1.7E-01	1.5E-01	1.9E-01	1.8E-01	2E-07	<1E-07
Mo	1.1E-06	4.3E-06	4.0E-05	8.0E-05	(9E-04)	(2E-03)	(9E-04)	(1E-03)	9.9E-06	2.4E-05
Na	9.1E-02	9.6E-02	1.3E+00	1.4	(d)	1.8	(d)	1.2	3.8E-01	5.0E-01
Nd	<7E-07	<7E-07	<7E-06	<7E-07	1.9E-02	1.6E-02	1.8E-02	1.7E-02	<7E-07	<1E-06
Ni	(1.4E-06)	<2E-06	(1E-05)	<2E-05	5.6E-02	4.7E-02	6.5E-02	5.7E-02	<1E-06	<6E-06
P	1E-04	(1E-04)	7E-03	7.5E-03	1.6E-01	2.3E-01	1.7E-01	2.5E-01	2.9E-03	3.4E-03
Rh	<2E-06	<2E-06	<2E-05	<1E-05	ND	ND	ND	<4E-04	<2E-06	<2E-06
Ru	<1E-06	<1E-06	<1E-05	<1E-05	ND	ND	ND	<4E-04	<1E-06	<2E-06
Si	4.6E-03	5.9E-03	2.4E-02	5.2E-03	4.3E-01	4.3E-01	4.1E-01	4.1E-01	3.0E-02	2.8E-02
Sr	2.6E-06	1.6E-06	1.0E-05	<1E-08	9.0E-03	7.7E-03	9.8E-03	9.4E-03	3.0E-06	<2E-09
Te	<2E-06	<2E-06	<2E-05	<2E-05	(4E-03)	ND	3.9E-03	(3E-03)	2.4E-06	<4E-06
Ti	<4E-07	<4E-07	<4E-06	<4E-06	7.1E-03	7.0E-03	7.7E-03	7.2E-03	4.2E-07	<7E-07
U	3.3E-03	3.5E-03	3.8E-02	4.4E-02	6.5E-02	5.9E-02	5.8E-02	5.8E-02	1.2E-03	1.4E-02
Zn	5.0E-06	3.7E-06	1.7E-05	1.6E-05	5.8E-03	8.1E-03	7.0E-03	7.9E-03	(3E-06)	1.3E-05
Zr	<4E-07	(7.6E-07)	4.1E-05	<1E-05	(e)	6.3E-03	(e)	5.2E-03	3.9E-06	(1.9E-06)

(a) NM = Not measured. Analysis not requested for sample.
(b) ND = Not detected
(c) ( ) indicates at detection
(d) Sodium peroxide fusion
(e) Zirconium crucible used

TABLE 8.2.9.3.3
CONCENTRATION OF RADIOISOTOPES IN 102-AY WASTE AND WASH COMPONENTS

Radioisotope	Supernate µCi/ml	Std ±%	Wash Solution µCi/ml	Std ±%	Interstitial Solution µCu/ml	Std ±%	Composite Solids µCi/g	Std ±%	Washed Solids µCi/g	Std ±%
Am-241	1.5E-06		6.67E-06		1.9E-04		1.82E+01		1.57E+01	
C-14	NM(a)		NM		NM		<1.0E-03		<3.2E-03	
Cm-242	ND(b)		ND		ND		ND		5.41E-02	
Cm-243+244	ND		ND		ND		6.31E-01		5.41E-01	
Co-60	ND		ND		1.7E-02	4.5	1.44E+00	5.7	1.17E+00	8.3
Cs-134	4.95E-03	11.0	5.41E-03	13.0	2.1E-02	3.9	ND		ND	
Cs-137	4.32E+00	3.5	1.09E+01	3.5	4.4E+01	3.4	2.65E+02	3.6	2.62E+02	3.5
Eu-154	ND		ND		ND		5.14E+01	3.1	4.38E+01	3.6
I-129	NM		NM		NM		<1.2E-03		<1.3E-03	
Pu-238	ND		ND		1.25E-04	5.7	1.14E+00	5.2	9.82E-01	5
Pu-239+240	2.34E-04	3.9	1.21E-05	6.9	3.91E-04	4.2	3.61E+00	3.1	3.36E+00	3.1
Ru-106	ND		1.89E-01	10.0	6.8E-01	4.1	ND		ND	
Sb-125	ND		ND		1.1E-01	13.4	9.91E+00	6.2	1.0E+01	7.7
Se-79	NM		NM		NM		<5.40E-03		<5.9E-03	
Sr-90	6.58E+00	5.9	1.26E+00	5.7	2.52E+00		2.95E+04		3.09E+04	
Tc-99	NM		NM		NM		2.5E-02		1.8E-02	

(a) Not measured. Analysis was not requested for this sample.
(b) ND = Not detected.

APPENDIX B

8.2.10 DST-241-AP-101 Data Sheets

8.2.10.1 DESCRIPTION

8.2.10.1.1 Location - The AP Tank Farm complex is located in the 200 East Area and consists of eight underground tanks.

8.2.10.1.2 Construction - Last tank was completed in 1986.

8.2.10.1.3 Physical data - Double-shell, underground tank used for radioactive storage.

Total capacity - 1,160,000 gallons

Operation capacity - 1,140,000 gallons

Material - carbon steel bottom thickness ranges from 3/8 to 1", primary tank wall thickness ranges from 1/2 to 3/4", and dome thickness 1/4 to 1/2".

Size - 80-foot OD, 75-foot ID, 48 feet high, encased in a reinforced concrete shell 18 inches thick. Crown of tank is seven feet below grade. An 8-inch slab of insulating concrete is sandwiched between the primary and secondary tank bottoms.

Heat content - 40,000 BTU/hr, Maximum tank limit

Primary tank pressure range - +5.0 in W.G. to -6.0 in W.G.

8.2.10.1.4 Riser configurations (Appendix A)

Tank Penetration Risers - 71 total, range from 4" dia. to 42" dia.

Most risers are used for various tank penetrations however, there are some risers that are not used or listed as spares. See Appendix A for details. One 42 inch diameter riser is located in the central pump pit. The other two 42 inch risers are listed as spares and have no surface access. They are located 90° apart on a 20-foot radius.

42" Dia.= 3	8" Dia.= 4
24" Dia.= 2	6" Dia.= 16
12" Dia.= 14	4" Dia.= 32

8.2.10.1.5 Major Internal components

Thermocouple probe assemblies - There is one thermocouple probe located in Riser 4.

Vertical piping - for drains, transfer lines, mixing feed, etc. were determined by analyses to have negligible fatigue damage from forces induced by the mixer pumps.

Leak detectors - There are three leak detectors in the annulus and are located in risers numbered 23.

Sludge measurement Ports - There are seven sludge measurement probes which are located in risers numbered 1, 16, and 22.

Liquid level measurement - There is one liquid level probe located in riser 2.

8.2.10.1.6 Major External components

Transfer Pump - Used to pump supernatant, located in the central pump pit, Riser 3 (42" dia).

Annulus pump pit - The pump is installed in Riser 20 (12" dia).

Leak detection pit - Leak detection for the primary tank is provided in the annulus. Leak detection devices include continuous air monitors (CAMs) and conductivity probes to detect radiation and liquid conditions.

8.2.10.1.7 Facility Interfaces

Electric power supply - The AP tank farm is provided with normal, single line, interruptible electrical power. Normal power is distributed at 120/240 V and 480 V.

Steam Supply - 225 lb/in^2 gauge is supplied in insulated, buried lines

Water - 125 lb/in^2 raw water
Air Supply Systems - 80 to 100 lb/in^2 gauge reduced to 20 lb/in^2 for use.

Facility transfer Interfaces

Average transfer flow rates - 65 to 70 gal/min.
New cross site waste transfer lines will be installed for aging waste tanks by Project W-028/058

ALARA Concerns - Radiation level <5mR @ surface above tank, not including shine through above risers. Contamination level - TBD

8.2.10.2.0 CLASSIFICATION

8.2.10.2.1 Criticality concerns - Analysis required by safety prior to removing tank contents.

8.2.10.2.2 Waste sampling schedule - Taking samples for waste characterization has not been identified or planned for this tank.

8.2.10.3.0 CHARACTERIZATION

8.2.10.3.1 Waste type - Dilute Non-complexed Waste (DN), Low activity liquid waste originating from T and S Plants, the 300 and 400 Areas, PUREX facility (decladding supernatant and miscellaneous wastes), 100N Area (sulfate waste), B Plant, saltwells, and PFP (supernatant).

Contents of this tank can be used for blending DSSF type wastes to reduce viscosity, specific gravity, and sodium concentrations. Waste volume could be reduced approximately 4:1 by the evaporization process.

8.2.10.3.2 Waste Composition

A limited amount of characterization data is available for DN type wastes. Physical and chemical properties data were taken from Reference (o). The chemical and radiochemical analyses were performed by PNL Chemistry and Analysis Section on samples taken from this tank. This information is considered the best data currently available and will be used as baseline for DN type waste stored in double-shell tanks.

Property	Supernate	Sludge
Volume	1,062,000 gal	0
Depth	386.2 inches	0
Composition	Table 8.2.9.3.2	NA
pH	<12	NA
Specific Gravity	NA	NA
Density	1.0 gm/ml	NA
Viscosity	NA	NA
Temperature (Avg.)	>90°F	NA
Solids (Vol.%)	0	NA
H_2O%	NA	NA
Miller No(abrasiveness)	NA	NA
Shear strength	NA	NA

8.2.10.3.3 Internal radiation levels

Vapor space - NA
Supernate - Table 8.2.9.3.3
Sludge - NA

8.2.10.3.4 Stored capacity - Total stored volume is approximately 1,062,000 gallons of waste all of which is supernatant.

8.2.10.4.0 EXISTING EQUIPMENT AND SYSTEMS

8.2.10.4.1 Waste removal pump - The existing pump has the capability to remove only supernate and not the heavier solids. It will be removed, disposed, and replaced with a new pump.

8.2.10.4.2 Process monitoring systems

Temperature - Temperature profiles are measured by a thermocouple probe assembly installed in riser 4 (12" dia).

Level - Both liquid and solid levels can be measured by different methods from various risers.

Pressure - Tank pressure measurements are made from riser 13 (12" dia)

Leak detection - Located in annulus space, Risers numbered 23

8.2.10.4.3 Ventilation/HVAC systems - HEPA filtered exhaust system

8.2.10.4.4 Special instrumentation systems - There are several unused or spare risers that are available for special instrumentation and monitoring equipment. They include tank corrosion rates, stress levels for internal components, video monitoring equipment, etc. These systems should be identified and included as part of the retrieval system configuration.

8.2.10.5.0 Operation Conditions

8.2.10.5.1 Safety considerations - DN type wastes are stored in this tank is considered low level waste for grout feed. The primary safety consideration is to maintain waste confinement during storage and subsequent transfers.

8.2.10.5.2 Evaporation processing - This facility is currently scheduled to be restarted sometime in fiscal 1993

8.2.10.5.3 Sampling techniques - Manual

8.2.10.5.4 Ventilation Systems - Shares common ventilation system with other AP tanks.

8.2.10.5.5 Process parameters

Vapor Space Pressure - Slightly negative, maintained below atmospheric pressure

Primary tank pressure range, from +5.0 in W.G. to -6.0 in W.G.

8.2.10.6.0 D & D REQUIREMENTS

D & D of this tank will not take place until after all wastes from single-shell tanks have been retrieved. Waste removed from this tank (minimum 90% solids by weight) will permit this tank to be used as a receiver to store wastes from other tanks.

8.2.10.6.1 Decommissioning - DOE 6430.1A, Section 1300-11 & 1321-6

8.2.10.6.2 Demolition - DOE 6430-1A, Section 0205-1

8.2.10.6.3 Decommissioning Surplus Facilities - WHC-CM-7-5, Part Z

8.2.10.7.0 REFERENCES

a) Operating Specifications Document # OSD-T-151-00007 & OSD-T-151-00017

b) SD-RE-TI-008, Rev. 1 thru Rev. 5, Specification Changes

c) RHO-LD-146, West Valley Waste Removal Study, 8/81

d) Drawing Index - H-2-68400 & H-2-67240

e) WHC-EP-0182, Tank Farm Surveillance and Status Report, 3/92

f) WHC-SD-WM-RPT-040, DST-AZ-101 Internals Vibration Analysis (Interim Report), 4/92

g) SD-WM-TI-302, Rev. 0, Hanford Waste Tank Sluicing History, 9/87

h) WHC-SD-WM-EV-040, Rev. 1, DST Ancillary Equipment Secondary Containment Evaluation, 9/90

i) SD-RE-TI-093, Rev. 2, Double-Shell Underground Waste Storage Tanks Riser Survey, 11/91

j) WHC-SD-WM-ES-195, Rev. 0, Mixer Pump Study for Project W-151, 2/92

k) WHC-SD-ER-ER-001, Rev. 0, Single-Shell Tank Waste Technologies, 10/90

l) Internal Memo, 7K220-92-030, KC Strong to AL Shord, "Characterization Data on Selected Tanks In Support Of The Pretreatment Module", 5/92

m) WHC-MCE-SVV-18681, BNFL Developed Mixing Technologies to Support Organics Tank Program - Report, 6/17/92

APPENDIX C

Westinghouse Hanford Company Procedures

NOTE: The material contained in this appendix is for architect/engineer information, is nonbinding and, therefore, the signature of the Department of Energy is not required.

8.3 APPENDIX C, WHC PROCEDURES

WESTINGHOUSE HANFORD COMPANY PROCEDURES

- "Management Requirements and Procedures Manual", document No. WHC-CM-1-3.
- "WHC Radiological Control Manual," document No. WHC-CM-1-6.
- "Hazardous Materials Packaging and Shipping," document No. WHC-CM-2-14.
- "Quality Assurance Manual," document No. WHC-CM-4-2.
- "Industrial Safety Manual," document No. WHC-CM-4-3, Vols 1, 2, and 3.
- "Radiological Design," document No. WHC-CM-4-9.
- "ALARA Program Manual," document No. WHC-CM-4-11.
- "Nuclear Criticality Safety," document No. WHC-CM-4-29.
- "Security Manual," document No. WHC-CM-4-33.
- "Nonreactor Facility Safety Analysis Manual," document No. WHC-CM-4-46.
- "Standard Engineering Practices," document No. WHC-CM-6-1.
- "Project Management", document No. WHC-CM-6-2.
- "Hanford Hoisting and Rigging Manual," document No. WHC-CM-6-4.
- "Safety Analysis and Regulation Work Procedured," document No. WHC-CM-6-32.
- "Environmental Compliance," document No. WHC-CM-7-5.
- "Operation Support Services", document No. WHC-CM-8-7.
- "Design Specification for Burial Boxes for Radioactive Solid Low-Level Waste," document No. HEDL-S-0167, 1/26/88.
- "Hanford Radioactive Solid Waste Packaging, Storage, and Disposal Requirements," document No. WHC-EP-0063.
- "Jumper Fabrication," document No. HS-BS-0084.

- "Backup Electric Power System Definitions and Design Criteria," document No. WHC-SD-GN-DGS-303.
- "Double Shell Waste Tank In-tank Corrosion Monitoring Program," document No. WHC-SD-WM-EV-054.
- "Waste Tanks Administration", document No. WHC-IP-0842.
- "In-Place Efficiency Testing of Gaseous Effluent HEPA Filter System", document No. HWS-10278.

APPENDIX D

Mixer Pump Data

NOTE: The material contained in this appendix is for architect/engineer information, is nonbinding and, therefore, the signature of the Department of Energy is not required.

8.4 APPENDIX D, MIXER PUMP DATA

MIXER PUMP DATA

TANK	WASTE TYPE	SLUDGE DEPTH (FEET)	NO. & LOCATION OF MIXER PUMPS
101-SY	CC & DSS	<2	2 @ 20 ft off-center & 180° apart
103-SY	CC & DSS	<1	2 @ 20 ft off-center & 180° apart
104-AN	DSSF	8	2 @ 20 ft off-center & 174° apart
103-AN	DSS & DSSF	11	2 @ 20 ft off-center & 174° apart
105-AN	DSSF	0	2 @ 20 ft off-center & 174° apart
101-AW	DSSF	3	2 @ 20 ft off-center & 174° apart
101-AP	DN	0	1 @ center of tank & 1 @ 20.75 ft off-center
102-AZ	NCAW	3	2 @ 22 ft off-center
102-AY	DN sludge & 106-C ^{90}Sr sludge	1 6	Design: 4 @ 22 ft off-center (34 inch riser dia)
106-AN	CP	<1	2 @ 20 ft off-center & 174° apart

NOMENCLATURE:
- CC: COMPLEXANT CONCENTRATES
- DSS: DOUBLE SHELL SLURRY
- DSSF: DOUBLE SHELL SLURRY FEED
- DN: DILUTE NON-COMPLEXED WASTE
- NCAW: NEUTRALIZED CURRENT ACID WASTE
- DP: CONCENTRATE PHOSPHATE