Department of Energy
Washington, DC 20585
JUL 14 2003

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW
Suite 700
Washington, D.C. 20004-2901

Dear Mr. Chairman:

The purpose of this letter is to forward to you Revision 2 to the Savannah River Site High Level Waste Tank In-Service Inspection Program. This revised document incorporates the revised schedule to inspect all of the Type III/IIIA waste tanks by the end of 2007. Additionally, reporting criteria has been referenced for the inspection of the secondary containment. A copy of the revised plan has been provided to your staff. The Department remains committed to adjusting the inspection program as necessary should inspection results indicate the existence of, or potential for, accelerated degradation in the Type III/IIIA waste tanks at Savannah River.

If you have any further questions, please contact me at (202) 586-0738.

Sincerely,

Paul M. Golan
Chief Operating Officer
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In-Service Inspection Program for High Level Waste Tanks

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DISCLAIMER

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Record of Revisions

Rev.	Date	Description
2	June 2003	Global: Changed CSTE to LWATPS and CSTM to LWAMPS to reflect organizational changes. Sec. 4.3.3.1: Removed surveillance and monitoring. Sec. 4.3.4: Changed ultrasonic requirement from ASME Section V Article 4 to ASME Section V Article 5. Removed ISIRC validation requirement. Sec. 5.1: Changed statement regarding Tank 15 to reflect that tank has been inspected. Sec. 5.2: Changed 27 tanks to 22 tanks to reflect that the augmented inspection will be performed on 22 tanks. Modified Figure 1 to reflect the new FY07 schedule. Sec. 6.0: Added paragraph with regard to the disposition of data obtained on the secondary tanks.
1	July 2002	Sec. 3.1: Defined the role of the ISIRC. Sec. 3.3 and 3.4: Combined SRTC and Quality Services to reflect organizational changes. Sec. 4.2.2: Added Level III inspector to the requirement. Sec. 4.3.2: Table 1 (rev. 0) moved to section 5.2 and re-labeled Table 2. Added additional detail on mechanism. Sec. 4.3.4: Added ISIRC validation. Sec. 5.1: Added 5 tanks for routine schedule. Added augmented one-time inspection discussion. Table 2 (rev. 0) re-labeled Table 1 and inserted in this section. Sec. 5.2: Added all Type III tanks to be inspected by FY12. Figure 1 schedule added. Added FY07 inspection for Tank 15. Added formal review of program by the ISIRC.
0	February 2002	Initial issue for use.

1 INTRODUCTION

In-service inspection of the Savannah River Site (SRS) High Level Waste (HLW) tanks is an essential element in the demonstration of their structural integrity to maintain the function of waste confinement throughout the desired service life. A revised, code-based in-service inspection (ISI) program (which includes both visual (VT) and ultrasonic (UT) inspections) of the SRS Double Shell (DS)-HLW Tanks has been developed. The current ISI program for the HLW tanks is limited to VT of the tank walls. The program herein provides details for UT inspections that will augment the current ISI program. The prioritization of tanks for UT inspection, the extent, frequency, schedule of UT inspections, and equipment for UT inspection are included.

2 SCOPE

An important element in the demonstration of structural integrity of tanks is an ISI program to provide in-situ material condition information. Inspection also provides early detection of degradation, and allows for an appropriate response to maintain structural integrity. The current ISI program for the HLW tanks consists of the visual inspection of the primary tank wall exteriors for Type I, Type II, and Type III and Type IIIA waste tanks, via accessible annulus risers. For purposes of this document, references to Type III tanks are inclusive of Type IIIA tanks. The UT examinations to be done for selected Type III tanks will be used to augment the existing ISI program, and to validate current general thinning, pitting, and stress corrosion cracking models. Validation will be done by establishing an Ultrasonic baseline for specific areas of selected tanks and then periodically re-examining those areas for any detectable changes. The ISI program includes visual inspection of the interior tank walls of the single-shell Type IV waste tanks, but not UT inspection of Type IV waste tanks.

This document details the complete upgraded inspection program. Elements of the complete program include the following:

1. Enhanced Visual Inspection, Including Inspection of Secondary Tank
2. Organizational Responsibilities
3. Tanks Selection for UT Inspection
4. Extent of Inspection
5. Frequency of Inspection
6. Schedule of Inspection
7. Equipment
8. Inspector Qualifications
9. Acceptance Criteria/Action Limits
10. Records Management

This inspection plan includes the UT inspection program and a brief summary of the current VT program. The current VT program will be implemented as outlined in WSRC-TR-95-0076, "HLWE Structural Integrity Inspection and Monitoring Program". A summary of HLW tank design and construction is included within the Appendix for reference.

3 RESPONSIBILITIES

3.1 Liquid Waste Area Technical Project Services (LWATPS)

LWATPS shall:

1. Develop and maintain plans for inspections, structural integrity, and indication investigations.

2. Generate, review, and authenticate inspection records.

3. Review, validate, report, and disposition inspection results via the In-Service Inspection Review Committee (ISIRC).

4. Maintain records, including index(s) of inspections.

3.2 Liquid Waste Area Maintenance Project Services (LWAMPS)

LWAMPS shall:

1. Perform applicable inspections in accordance with qualified inspection procedure(s).

2. Perform surveillance and monitoring as directed by LWATPS.

3. Operate and maintain surveillance and monitoring equipment.

4. Perform work and complete records with guidance from LWATPS.

5. Maintain records as appropriate.

3.3 Savannah River Technology Center (SRTC)

SRTC shall:

1. Support disposition of inspection results with guidance from LWATPS.

2. Assist in testing and qualification of specific equipment when requested.

3. Perform inspections in accordance with qualified inspection procedure(s).

4. Perform work and complete records with guidance from LWATPS.

5. Administer SRS Operations Non-Destructive Examination (NDE) Certification Program.

6. Perform NDE as requested [Including automated ultrasonic and remote (crawler) visual inspection of HLW tanks] using certified Level II and Level III inspectors.

7. Maintain records as appropriate.

4 INSPECTION REQUIREMENTS AND METHODS

4.1 Scope

This section details the VT and UT inspection requirements, including inspector qualifications, examination methods, and equipment qualification.

4.2 Qualifications of Inspectors

This section establishes a requirement for certification of personnel who perform or assist in the surveillance, monitoring, and inspection of HLW tanks.

4.2.1 VT Inspector(s)

Personnel interpreting and/or reviewing data shall be certified to at least VT Level II-L in visual examination, in accordance with NDEP 2.1.

All certified personnel shall pass an annual eye examination given by SRS Medical personnel or SRS Level III personnel. Personnel shall meet the following eye examination requirements:

1. Distance vision of 20/30 in at least one eye either corrected or uncorrected.
2. Near vision capability to read Jaeger type 1 letters at a distance not less than 12 inches on a Jaeger Test Chart or Snellen Equivalent.
3. Color vision must be acceptable for the NDE method in which certification is sought.

4.2.2 UT Inspector(s)

Personnel performing UT examinations shall be certified to Level II or Level III in the method(s) being used, in accordance with NDEP 2.1.

4.2.3 Data Collector(s)

Data collectors are not required to be certified, but they are required to be proficient in equipment operation and data collection in accordance with the applicable procedures.

4.3 Examination Methods

4.3.1 Visual Examinations (VT)

The following summarizes the current visual examination program. As UT data is acquired and the degradation models and performance of the HLW tanks are validated, recommendations for modifications of this plan will be identified and presented to the DOE for review and approval.

Inspection plans shall be prepared for each inspection period (1 year) prior to the actual inspection and shall include the following:

1. Tank identification
2. Access (opening)
3. Bases for each inspection
4. Frequency
5. Access constraints
6. Inspection type (general or detailed)

The visual inspection (VT) interval shall be a maximum of two calendar years using all accessible annulus risers for Type I, Type II, and Type III HLW tanks. Increased surveillance may be necessary to monitor relevant conditions pending disposition.

An addition to the current VT program is the detailed examination of the secondary pan. A detailed inspection through an accessible riser in one quadrant of the tank shall be performed during a detailed VT inspection of the tank. All four quadrants of the secondary shall be inspected within 4 calendar years.

4.3.2 Ultrasonic Examination (UT)

The following summarizes the UT examination program. Inspection plans shall be prepared for each inspection prior to the actual inspection and shall include the following as a minimum:

1. Tank Identification

2. Access (opening) through which inspection(s) will take place
3. Basis for inspection
4. Frequency (as listed below)
5. Access constraints
6. Inspection type(s) to be performed (thickness mapping or weld inspection)
7. Extent of examination - minimum area and location to be examined with each inspection type.

4.3.3 Equipment Qualification

Equipment includes, but is not limited to cameras (film, digital and video), remote cameras, fiberscopes, ultrasonic inspection instruments and delivery systems. This equipment shall be used for surveillance, monitoring, and determination of structural integrity and in-service inspection of HLW tanks. Equipment used for surveillance, monitoring or inspection (annual detailed inspections, NDE, structural integrity) shall be qualified for use by performance demonstration.

4.3.3.1 Camera/Video/Visual Imaging Equipment

All equipment used for structural integrity and in-service inspection of HLW tanks shall be qualified to assure it meets the lighting and resolution requirements of ASME Section V, Article 9.

4.3.3.2 Ultrasonic testing equipment

The UT system (instrument, transducer, scanning device, and cables) shall have the following detection limits (tested at ½ inch nominal thickness):

1. General corrosion/thinning detection within 0.020 inches.
2. Pitting detection within 0.050 inches. (elliptical or hemispherical)
3. Crack depth detection within 0.100 inches, $\geq$ 0.5 inches long, $<$ 6 inches long. In the absence of an acceptable cracked sample, a machined notch 0.05 inches deep x 1inch long can be used instead of a crack.

4.3.4 Procedures

All inspections shall be performed according to the appropriate procedures. Inspection procedures shall be written in accordance with ASME Section V Article 5 for ultrasonics and Article 9 for visual inspection.

5 PRIORITIZATION, FREQUENCY, AND EXTENT OF UT INSPECTIONS

5.1 Prioritization of Tanks for UT Inspection

All 27 Type III and IIIA tanks will be inspected by UT over the next 5 years (i.e., by FY07). Five of the 27 tanks were selected for routine inspections, while an augmented inspection is planned for the balance of the tanks. The tanks selected for the routine inspections will provide data for trending any active corrosion mechanisms that may occur during their remaining service life. The basis for selection of these tanks was presented within WSRC-TR-2001-00469. Categories were constructed to identify tanks with similar risks for corrosion. The features considered in the categorization were materials of construction, service history, tank function, and projected future use. A ranking system was developed

that provided input into the selection of the tanks for the routine inspection. The tanks that were selected for routine inspection are shown in Table 1.

The augmented inspection is scheduled as a one-time inspection and will be utilized to verify that no unexpected accelerated corrosion is occurring in the remaining tanks. The same categorization document was utilized to prioritize the order in which the tanks will be inspected.

One Type II tank will be inspected by UT (see Table 1). Tank 15 will be inspected twice to validate known corrosion models (e.g., stress corrosion cracking). The results of the UT inspection performed on Tank 15 will be applied to the family of Type I and II tanks, both leaking and non-leaking tanks.

Table 1: Tanks Selected for UT Examination

Category	*Tank Category*	*Tanks Selected*	*Year of 1st Inspection*
Type I and II Tanks	*Leakage Observed*	Tank 15	FY 02
	No-Leakage Observed	None	
Type III Tanks	*Fresh Waste Receiver*	Tank 32	FY 03
	Waste Processing	Tank 48	FY 04
	Unconcentrated Salt Solution	Tank 47	FY 06
	Evaporator System		
	Evaporator Bottoms Receipt (H-Area)	Tank 29	FY 05
	Evaporator Feed (F-Area)	Tank 26	FY 04

5.2 Frequency and Extent of UT Inspection

The following inspection frequency shall be used for UT examination of Type I, Type II, and Type III HLW tanks:

1. Tank 32, a fresh waste receiver for the majority of its service history, shall be inspected every 7 years.

2. The remaining Type III tanks that are part of the routine UT inspection program shall be inspected every 10 years.

3. Tanks selected for the augmented UT inspection shall be scheduled such that all 22 tanks are inspected once within 5 years (i.e, by the end of FY07).

4. Tank 15 shall be inspected two times within a five-year time span to validate current degradation models. Known leak sites will be characterized in addition to the normal extent of examination. The first inspection was performed in FY02.

5. A formal review of the ISI program shall be performed every three years to determine if adjustments to the routine or augmented program are necessary. Changes to the program may be made due to discovery of any instances of accelerated corrosion or changes in the tank closure schedule. The first review will be performed in FY06 and will be conducted by the In-Service Inspection Review Committee (ISIRC).

The combined schedule for the routine and augmented inspections are shown in Figure 1. Tanks that are part of the routine program are indicated with number that show each successive inspection, while tanks included in the augmented program are shown by an "x" or "xx". Tanks included in the routine program will be inspected prior to FY06 and the first formal review. The tank closure schedule is based on the High Level Waste System Plan.

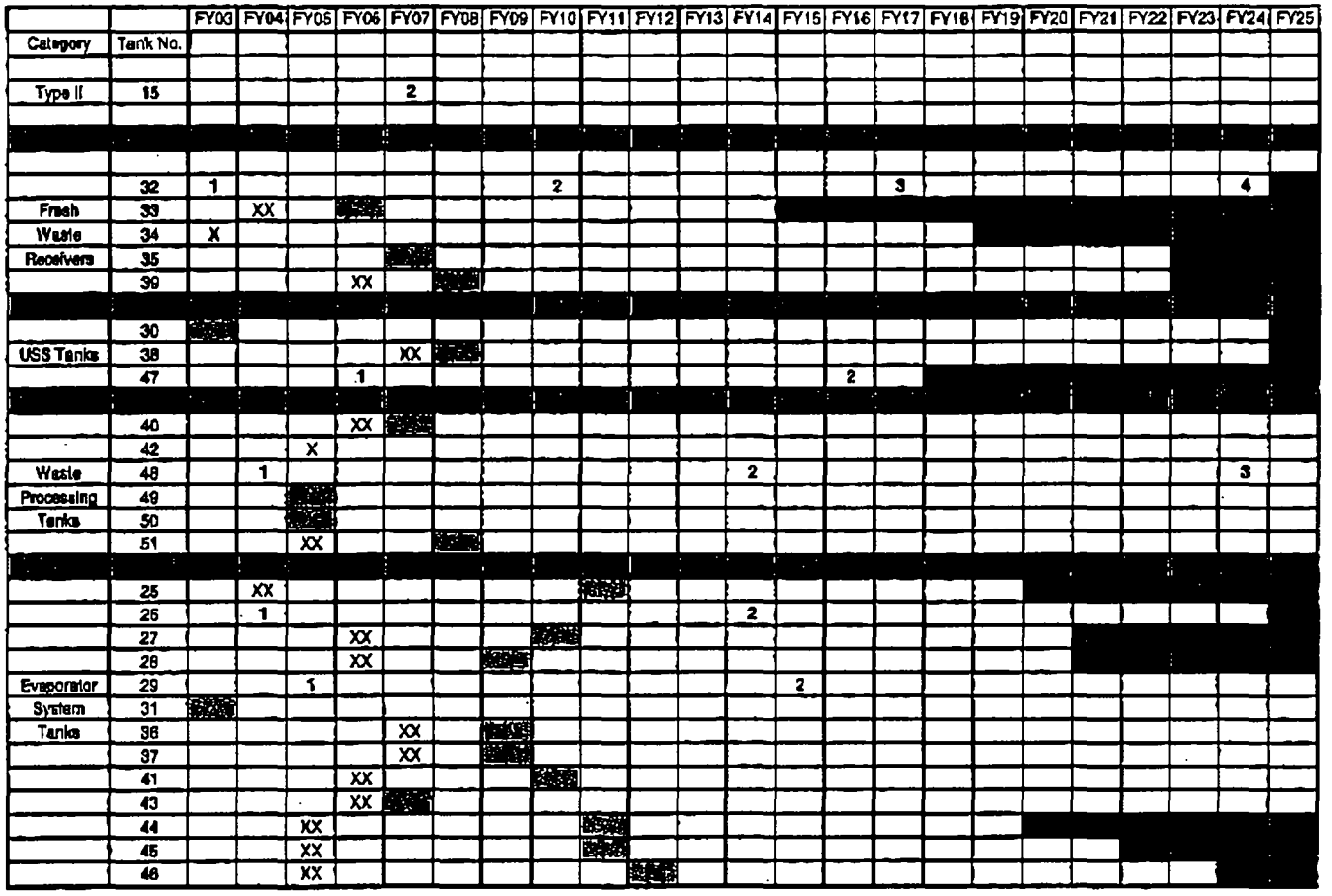

Figure 1. Schedule for Routine and Augmented Inspections for Type III and IIIA Tanks.

Figure 2 shows the extent of a routine UT examination. Table 2 summarizes the extent of the routine UT examination.

Table 2: Extent of Routine UT Examination of SRS Waste Tanks

Inspection Region	*Extent of Examination*	*Mechanism*
1. Liquid-Vapor Interface	See External Surface	Thinning, pitting, and cracking
2. Liquid-Sludge Interface	See External Surface	Thinning, pitting, and cracking
3. Upper Weld of Lower Knuckle of Primary Tank	5% of accessible circumference of the upper weld of the lower knuckle	Cracking
4. Lower Knuckle Base Metal	See External Surface	Cracking
5. External surface of primary tank	Four, vertical strips along the accessible height of the tank. Two strips in each semi-circle (180° arc) of the tank for the accessible vertical section.	Thinning, pitting, and cracking
6. Bottom Plate of the Tank	Feasibility of obtaining access to the tank bottom will be determined.	Thinning, pitting
7. Vertical and horizontal welds other than the lower knuckle weld	One vertical course section and 5% of middle horizontal weld.	Cracking
8. Secondary Tank	Extent of examination of the bottom plate and sidewall will be determined.	Thinning, pitting

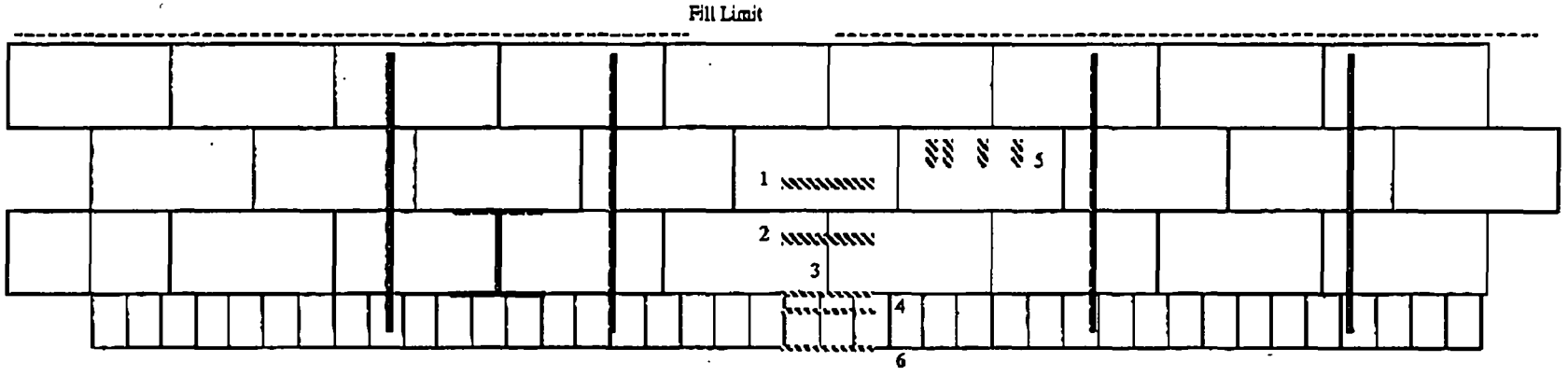

Figure 2: Unwrapped Surface of a Typical Type III Waste Tank, Illustrating TSIP Inspection Requirements (- - - -) and Planned Inspection Extent (——) at SRS.

Note: Numbers correspond to TSIP Regions for inspection shown in Table 2.

For the augmented inspections a single vertical strip along the accessible height of the tank will be chosen. The inspection will be for thinning, pitting, and stress corrosion cracking.

6 ACCEPTANCE CRITERIA

The results of the inspections shall be disposed of in accordance with the set of standards, or acceptance criteria, detailed in WSRC-TR-2002-00063, "Acceptance Criteria for Disposition of Inspection Results of SRS Type III High Level Waste Tanks." This set of standards provides actions in response to indications from ultrasonic testing (UT), and the visual testing (VT) inspections, based on the characteristics or size of the indications. Indications that are below the criteria for successive examination, yet above the detection limit of the UT instrument will be noted in the inspection reports. These indications will be reviewed and dispositioned by the ISIRC.

The decision logic shown in Figures 3 and 4 will be used to disposition inspection results in accordance with the acceptance criteria. Figure 3 shows the decision logic for general thinning, pitting, and local thinning. Figure 4 shows the decision logic for service induced flaws.

Successive examinations decrease the inspection interval to 5 years for pitting and thinning and shall be repeated at that interval until three such examinations reveal no additional degradation. For flaws, successive examinations decrease the inspection interval to 3 years and shall be done at that interval, until three consecutive examinations show no additional flaw growth. Additional examinations double the extent of the region of the scheduled examination within a single service category. This shall be accomplished by inspection of an additional 50% in the degraded tank, and inspection of 50% of a regular inspection in another tank within the same category. The additional tank shall be chosen in accordance with the selection criteria. Degradation found in the additional tank shall be disposed of in accordance with the same acceptance criteria.

The results of the inspections will be presented to LWDP management. The management will identify the appropriate controls, and acceptable operating envelope in accordance with "S/RID Functional Area 16 (Waste Management) Requirement".

The criteria of WSRC-TR-2003-00063 will also be used to determine the reportability of any UT data acquired from the secondary tanks. The ISIRC will determine the applicability of the decision logic to the results of any secondary tank data.

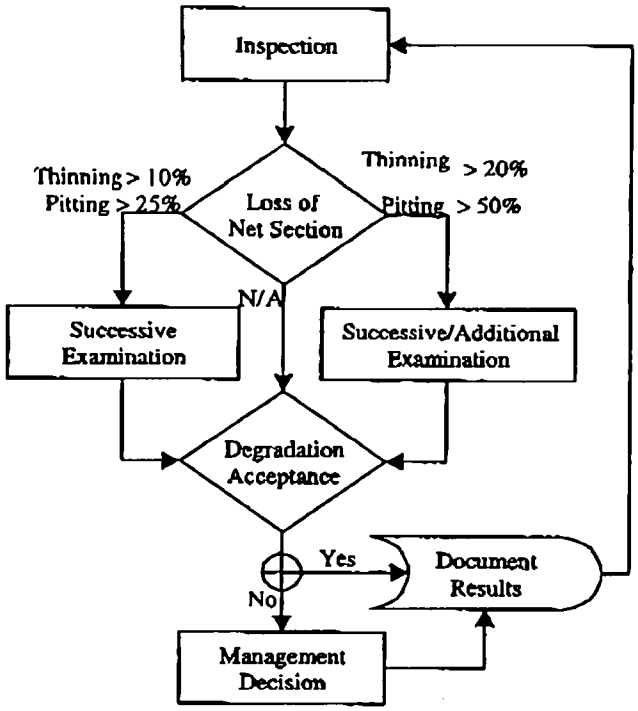

Figure 3: Decision Logic for Disposition of General Thinning, Pitting, and Local Thinning

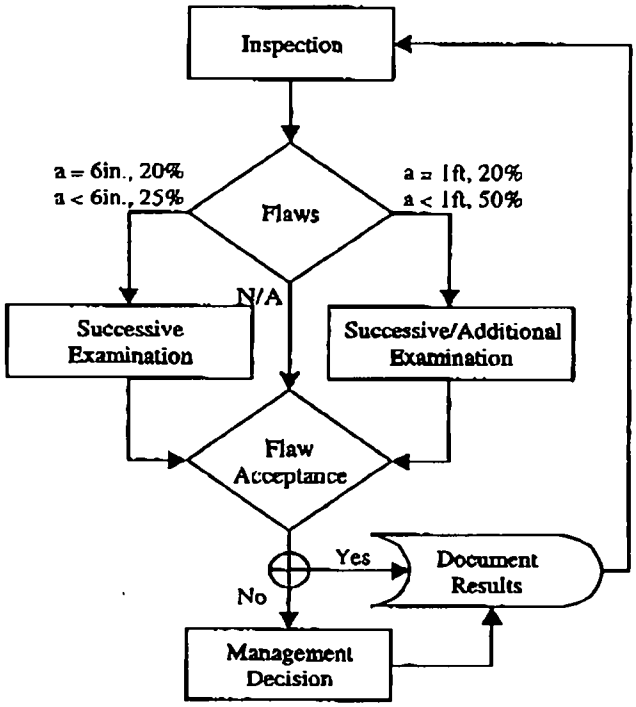

Figure 4: Decision Logic for Disposition of Service Induced Flaws

7 RECORDS

7.1 Purpose

This section establishes requirements for the identification, administration and storage of documents and data generated during the performance of surveillance, monitoring and inspection of HLW Tanks.

7.2 Scope

The requirements herein are applicable to data compiled in surveillance, monitoring, structural integrity and in-service inspection of HLW tanks. Written reports, inspection plans, photographs, slides, videotapes, and other such information are subject to the requirements of this section.

7.3 Procedure

Records shall be protected from loss, damage, and unauthorized access, and must be retrievable and legible. Each employee is responsible for assuring that the records(s) he creates are properly authenticated, and plans for adequate retention are implemented. Records shall be maintained as specified; when the retention period has expired.

7.4 Classification

The product(s) of work on the following items shall be considered records and handled in accordance with this section: HLW Type I/II and III primary tank.

7.5 Maintained Records

1. An index of records
2. Inspection plans
3. Repair records
4. Inspection procedures
5. Inspection results/reports shall be maintained by LWDP and distributed as appropriate.
6. Images of inspection activities (videotapes, disks, photographs, slides, digital images, etc).

7.6 Storage Facility Requirements

Records shall be stored in a facility that complies with site storage facility requirements.

7.7 Report & Letter storage/records

Paper records shall be stored in accordance with site requirements for records.

7.8 Video Tape, Photographs, Slides, Magnetic Media

Non-paper media are considered specially processed records and require the following additional storage and special handling requirements:

1. Store in such a manner so as to prevent damage from excessive light, stacking, electromagnetic fields (electronic media), temperature, and humidity.
2. Store records separately in individual sleeves, envelopes, or folders. If these sleeves, envelopes, or folders contain adhesives, the adhesive portion must not come into contact with the media.

3. Handle film media outside of its protective enclosure utilizing white cotton low-lint or lint-free gloves.

7.9 NDE Reports

NDE group generated records shall be maintained in the NDE Group files and/or at their option or sent to document control. Records maintained by the NDE Group shall meet the requirements of this section.

8 REFERENCED STANDARDS AND SPECIFICATIONS

BNL-52527 – UC-406, "Guidelines for Development of Structural Integrity Programs for DOE High Level Waste Storage Tanks, January 1997.

HLWM-16004, "Crane Operations in High Level Waste".

NDEP 2.1, "Qualification and Certification of NDE Personnel".

NDEP 2.5, "Qualification of NDE Procedures (U)".

NDEP 4.2, "Visual Examination VT-1 and VT-3 (U)".

NDEP 7.9, "Automated Ultrasonic Thickness Examination (U)".

NDEP 7.11, "Automated Ultrasonic Examination of Ferritic Welded Components".

S/RID FA-16 "S/RID Functional Area 16 (Waste Management) Requirements," WSRC-RP-94-1128-016, Revision 01-19.

WSRC-TR-1995-0076, Rev. 0, "SRS High Level Waste Tank and Piping Systems – Structural Integrity Program and Topical Report (U)," June 1995.

WSRC-TR-2001-00469, "Selection of Representative High Level Waste Tanks for Ultrasonic Examination," September 2001.

WSRC-TR-2002-00063, "Acceptance Criteria for UT Examination of SRS HLW Tanks," February 2002.

APPENDIX: TANK DESIGN AND CONSTRUCTION

This section summarizes pertinent information on the Type II, and III High Level Waste Tanks.

a) Type II Tanks (see Figure 5)

Constructed – 1955 through 1956

Capacity – 1,030,000 gallons

Material – ASTM A285, Grade B Carbon Steel

Construction Code – ASME-52

Project Number – 8980 PWO

Four Tanks total. H-Area Tanks 13-16

Five-foot steel secondary containment pan. Material is A285, Grade B carbon steel

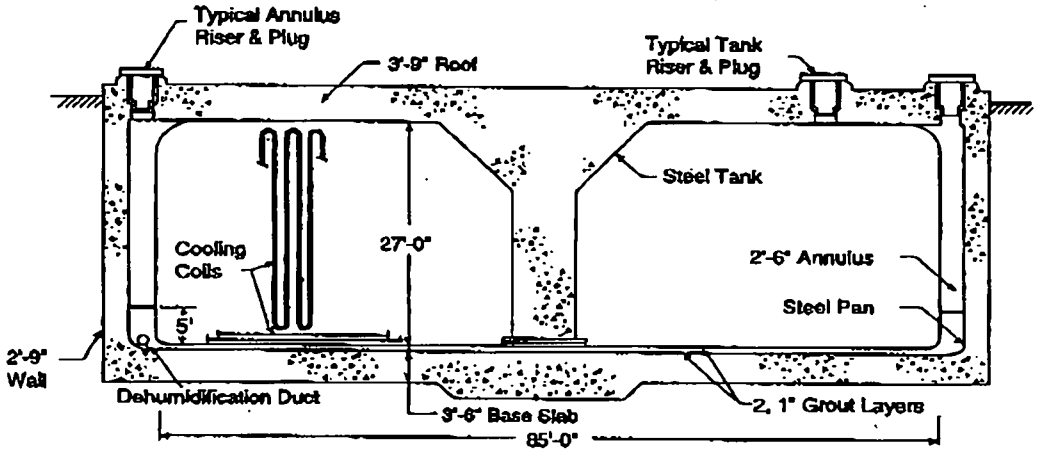

Figure 5: Type II High Level Waste Tank

b) Type III Tanks (See Figure 6)

Constructed – 1967 through 1972

Capacity – 1,300,000 gallons

Material – ASTM A516, Grade 70 Carbon Steel

Construction Code – ASME-56

Project Numbers – 9S1232 and 9S0974

Six Tanks total. H-Area Tanks 29-32. F-Area Tanks 33-34

Single wall secondary liner. Material is ASTM A516 Grade 70 carbon steel

c) Type IIIA Tanks (See Figure 6)

Constructed – 1974 through 1981

Capacity – 1,300,000 gallons.

Material – ASTM A516, Grade 70 Normalized (Tanks 25-28, 35-37) and ASTM A537, Class I (Tanks 38-51) Carbon Steel

Construction Code – ASME-56

Project Numbers – 9S1463, 9S1493, 9S1618, 9S1747, 9S1828

21 Tanks total. H-Area Tanks 35-43 and 48-51. F-Area Tanks 25-28 and 44-47.

Single wall secondary liner. Material is ASTM A516 Grade 70 carbon steel

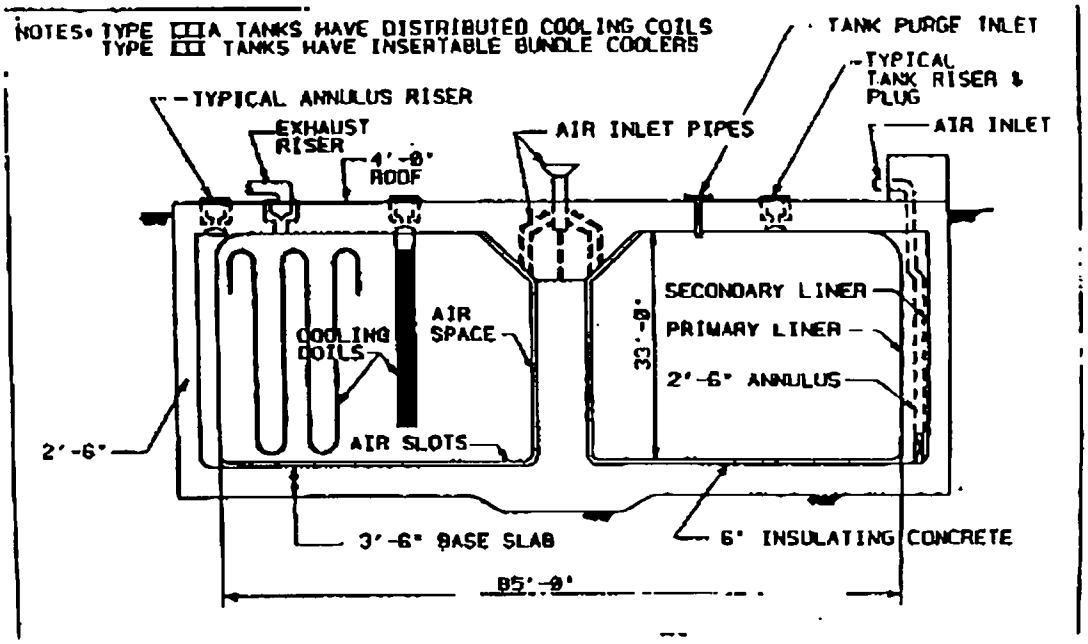

Figure 6: Type III High Level Waste Tank

GLOSSARY

Acceptance Standards - Limits to geometric condition indicators to avoid a structural instability by maintaining specified minimum margins against instability.

Additional Examination Standards - Limits on geometric condition indicators that trigger additional examination regions in the examined tank and/or additional tanks within a tank service category

Certification – Written testimony of qualification.

Certifying Authority – The representative of the WSRC who performs the function of NDE personnel certification.

Data Collector – Personnel responsible for equipment set-up, operating camera and collecting/decoding visual surveillance or monitoring data.

Equipment Qualification – The act of testing an item, such as a camera system, to determine that the item meets (or exceeds) the stated requirements. The record of this test is referred to as equipment qualification.

Evaluation - The process of determining the acceptability of a part or item based on a set of acceptance criteria.

Geometric Condition Indicator - Planar Flaw: The characterized length and depth of a planar flaw from an UT examination. If the distance between a pair of co-linear flaws is less than or equal to 6 inches, the pair of flaws shall be considered to be a single flaw of effective length equal to the distance between the farthest flaw ends. If two flaws are parallel but not co-linear, and the perpendicular distance between them is less than or equal to 0.5 inches, then the above rule shall also apply to determine the effective flaw length. This procedure may result in the combination of several pairs of flaws into a single effective flaw.

Geometric Condition Indicator - Thickness: Measurements of the thickness in a region of the tank wall from UT examination.

In-service Inspection Review Committee (ISIRC) – A committee that will develop the tank specific in service inspection plan and review, validate, report and disposition the inspection results.

Inspection – Evaluation of an item utilizing visual, ultrasonic or some other NDE method, to a procedure by personnel certified to perform the inspection.

Inspector – Personnel responsible for implementation of appropriate sections of in-service inspection program. Responsibilities include the development and issuance of inspection plans and inspection results.

Interpretation - The process of judging the cause of an indication and the nature of a discontinuity.

Monitoring – Ongoing or periodic observation of an item to detect and/or track changes.

NDE – Nondestructive examination: Inspection, testing, examination of an item to determine physical soundness or acceptability.

Qualification – Demonstrated skill, training, knowledge, and experience required for personnel to properly perform the duties of a specific job.

Record - A completed document or other medium that provides objective evidence of an item, service, or process.

Reporting Standard - Condition indicators that exceed a specified level, above that associated with the sensitivity of the method of examination, that indicate service-induced degradation of the tank and are of interest to the tank structural integrity. A condition indicator at or exceeding the Reporting Standard is a relevant condition as determined in the inspection of the tank.

Successive Examination Standards - Limits on geometric condition indicators that trigger more frequent examinations in the examined tank. The Successive Examination Standards are more limiting than the Acceptance Standards to account for degradation rates, NDE condition indicator uncertainties, etc.

Surveillance – Observation of an item or process to provide immediate information on the item or process.

Training – The structured classroom training, laboratory exercises, and / or assigned self-study materials as approved by the assigned NDE Level III, which encompasses the required knowledge necessary for qualification in a given NDE method.