FEB 09 1996 (21) Sta. 21

ENGINEERING DATA TRANSMITTAL

Page 1 of ___

1. EDT 153621

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Distribution	Tank Systems Integration	N/A
5. Proj./Prog./Dept./Div.:	**6. Cog. Engr.:**	**7. Purchase Order No.:**
101-SY VDTT REMOVAL	D. E. Legare	N/A
8. Originator Remarks: Functional Design Criteria document for 241-SY-101 Velocity Density Temperature Tree Removal System.		**9. Equip./Component No.:** N/A
		10. System/Bldg./Facility: 241-SY-101
11. Receiver Remarks:		**12. Major Assm. Dwg. No.:** N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date:

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-WM-FDC-049		0	VDTT Removal System Functional Design Criteria	ESQ	1,4		

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1	1	Cog.Eng. D.E. Legare		2/5/96	H5-68	CM KEUER		2-9-96	H5-57	6	
1	1	Cog. Mgr. R.K. Brown		2-9-96	H5-68						
1	1	QA R.R. True		2-5-96	T4-08						
1	1	Safety L.S. Krogsrud		2-5-96	R3-08						
1	1	Env.		2/7/96							
1	1	J.W. Lentsch		2/6/96	S7-15						
1	1	W.G. Brown SY Cog Engr		2/6/96	T4-07						

18.	19.	20.	21. DOE APPROVAL (if required)
Signature of EDT Originator — Date	Authorized Representative for Receiving Organization — Date	Cognizant Manager — Date	Ctrl. No. [ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments

BD-7400-172-2 (04/94) GEF097

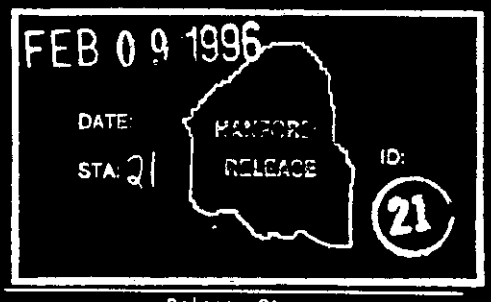
VDTT Removal System Functional Design Criteria

D. E. Legare
Westinghouse Hanford Company, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

EDT/ECN: 153621 UC: 2030
Org Code: 74420 Charge Code: N2224
B&R Code: 35EW31207 Total Pages: 12

Key Words: Velocity Density Temperature Tree, Flexible Receiver, VDTT Removal System, Liquid Removal Tool

Abstract: Two Velocity Density Temperature Trees (H-2-815016) are to be removed from risers 14A and 1B of tank 241-SY-101. This document provides functional design criteria for the removal system. The removal system consists of a Liquid Removal Tool, Flexible Receiver (H-2-79216), Burial Container, Transport Trailers, and associated equipment.



Release Approval

2/9/96
Date

Release Stamp

Approved for Public Release

WHC-SD-WM-FDC-049
Rev. 0

VDTT REMOVAL SYSTEM FUNCTIONAL DESIGN CRITERIA

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February 5, 1996

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1.0 INTRODUCTION

The two Velocity Density Temperature Trees (VDTT's) currently installed in waste tank 101-SY require removal due to failure of their differential pressure transducers which may have allowed tank waste to enter the VDTT internals. A removal system will be developed providing the equipment necessary to perform the task in a safe and acceptable manner. The removal system will be comprised of various components and subsystems which are either existing, under development by another program, or will be designed per criteria contained herein. This document provides functional criteria for the special equipment to be designed and the equipment removal hardware as a system. Activities, responsibilities, and commitments for VDTT removal and disposal are contained in *101-SY VDTT Removal Work Plan* (Legare 1995).

It is proposed that removal of the VDTT's be performed using Flexible Receiver equipment developed by Project W-151 with burial containers, transport trailers, and procedures developed by the Long Length Contaminated Equipment (LLCE) program. Possibility of VDTT internal contamination requires that they also be drained of trapped liquids and internally flushed with water prior to complete removal and disposal. Equipment will be designed to perform the drain and flush operation. Other components will be designed as necessary to utilize the flexible receiver equipment as part of the VDTT removal system. Once the equipment is drained, flushed, and removed from the waste tank it will be loaded into an approved burial container. The burial container and special trailers for handling and transport of the removed equipment are being designed by the LLCE program. Removed equipment and container will be transported to a selected storage or disposal location.

The VDTT removal system will be comprised of the following items:

- Flexible Receiver (Existing Equipment, Project W-151)
- External decontamination system (Existing Equipment, Project W-151)
- Lifting Bail
- Liquid Removal Tool
- Internal decontamination system
- Burial Containers (To be designed by LLCE program)
- Equipment Skid (To be designed by LLCE program)
- Tilt and transport trailers (To be provided by the LLCE program)

The following provides a description of the anticipated VDTT removal and disposal process. Changes to existing documentation as a result of the VDTT removal will be in accordance with EP-2.2 *Engineering Document Change Control Requirements* (WHC-CM-6-1 *Standard Engineering Practices*). Procedures will be provided for removal and disposal or storage of the VDTT's and their associated equipment. The upper portion of the VDTT's consisting of the wiring trough (H-2-815017) and associated hardware will be removed. The wiring trough and associated above ground equipment will be removed and disposed of, or stored for future use. Electrical cabling will be cut as necessary to allow removal of the wiring trough. Cut electrical cables exiting a VDTT will be left in place for removal and disposal with the VDTT. Components of the water flush system will be attached to the open end of the VDTT to provide a seal and a flush water connection point.

The VDTT will then be unbolted from the riser flange and raised using existing lifting attachments about 1 m (3 ft) for installation of the liquid removal tool and decontamination wash ring. The liquid removal tool is anticipated to bolt directly to the riser flange with the wash ring mounted above it. The VDTT will be lowered to rest on the wash ring and a permanent lifting bail installed. It is anticipated that the lifting bail will bolt directly to the VDTT mounting flange.

The flexible receiver assembly (fig 1) is installed and the receiver bag connected to the VDTT lifting bail. A crane hook is then connected to the receiver bag external lifting bail. The VDTT will be raised while performing an external water wash decontamination until the lower end is above the tank riser. The liquid removal tool is then operated to penetrate the VDTT exterior at a chosen location. After completing the penetration, the VDTT will be lowered about 1 m (3 ft) so that the liquid removal opening is sufficiently down into the riser. The water flush operation is performed for a determined length of time.

Complete VDTT removal and closing of the receiver bag is then performed. The removed VDTT is lowered to a horizontal position by a tilting trailer for subsequent loading into a disposal container. The loaded container is transported to a designated burial or storage location and unloaded.

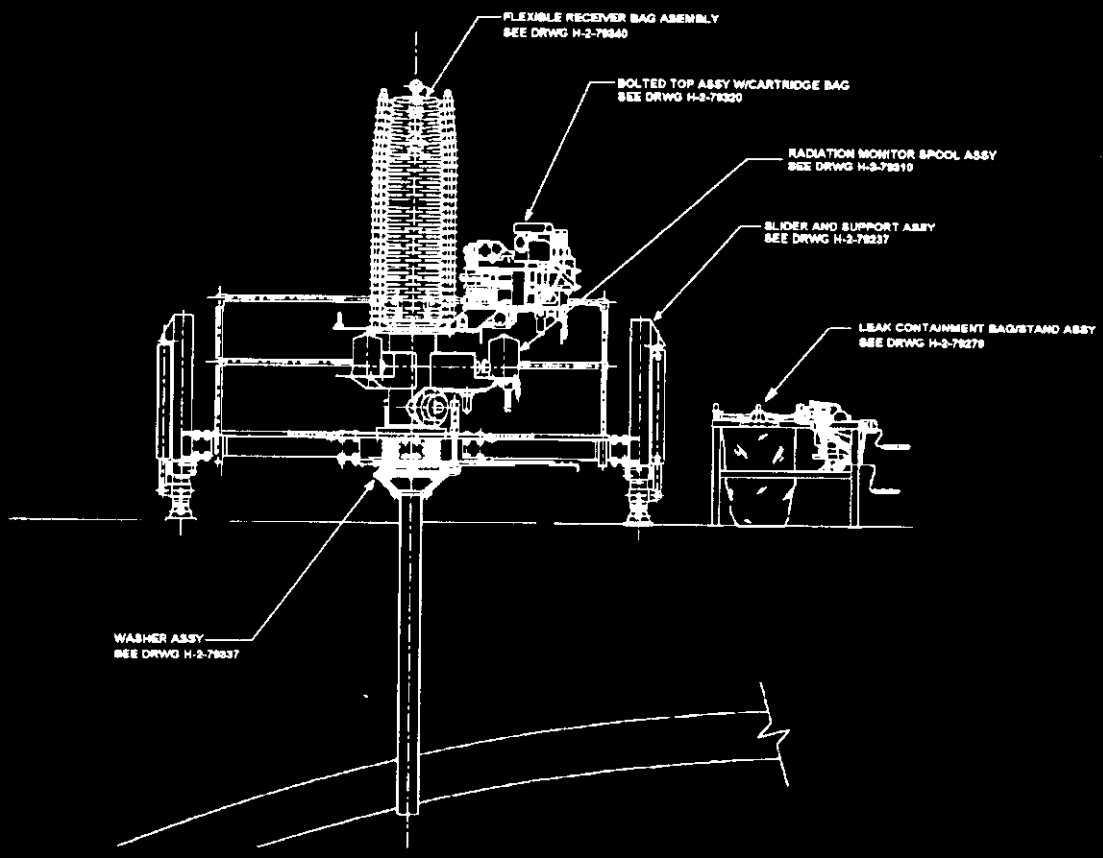

FIGURE 1: TYPICAL 4/6" FLEXIBLE RECEIVER CONFIGURATION

2.0 SYSTEM DESIGN REQUIREMENTS

The removal system is required to provide the capabilities for removing the VDTT's in a safe, efficient, and acceptable manner while minimizing radiation and hazardous material exposure to operations personnel and the environment. The system shall meet the following minimum criteria.

- The removal system shall be designed for decontamination of surfaces exposed to the tank waste. This shall include minimizing ledges, rough surfaces, and proper material selection. It is anticipated that items not intended for disposal will be available for re-use following decontamination efforts.
- The system shall not present an ignition hazard for flammable gases or materials that could be present in the waste tank. Compliance with this requirement will be documented in the Safety Assessment.
- All equipment which will be installed in, or in connection with, the tank vapor space shall be designed to meet the requirements of NFPA 70 Class 1, Division 1, Group B, or current requirements at the time of operation.
- The system shall remove most waste material from the internal and external VDTT surfaces using water wash and flush methods.
- The system shall provide primary containment of contaminated VDTT surfaces during the removal process.
- The system shall comply will all requirements identified in Safety Assessments for VDTT removal, packaging, and storage or disposal.

3.0 EQUIPMENT DESIGN REQUIREMENTS

3.1 FLEXIBLE RECEIVER

A Flexible Receiver system (H-2-79216) designed and fabricated for Project W-151 will be used for VDTT removal. The Flexible Receiver system consists of the Flexible Receiver, receiver bag, gamma assay system, control trailer, secondary receiver bag equipment, modified Grove 110 ton crane, and associated equipment. The flexible receiver system is existing equipment with necessary procedures and qualifications for its use. The receiver equipment, procedures, and configuration may be modified as permitted and required for the VDTT removal task. Changes to the Flexible Receiver will be in accordance with EP-2.2 *Engineering Document Change Control Requirements* (WHC-CM-6-1). The flexible receiver system was designed per criteria contained in *Functional Design Criteria Tank 101-AZ Waste Retrieval System (Kohlman 1993a)* and

Supplemental Design Requirements Document Tank 101-AZ Waste Retrieval System (Kohlman 1993b).

3.2 EXTERNAL DECONTAMINATION SYSTEM

A hot water wash decontamination will be performed on external VDTT surfaces in contact with the tank environment. An existing spray wash system developed in conjunction with the Flexible Receiver will be used for VDTT external decontamination. The spray wash system consist of a high pressure pump supplying water to a spray ring (H-2-79337) containing a circular array of fixed nozzles located below the flexible receiver. The high pressure pump, fabricated per criteria contained in *Specification for High Pressure Hot Water System* (Kohlman 1994), is capable of providing 3.2 l/s (50 gpm) at 20.7 Mpa (3000 psi). Supply water temperature is typically 66 °C (150°F). The spray wash system was designed per criteria contained in *Supplemental Design Requirements Document Tank 101-AZ Waste Retrieval System (Kohlman 1993b).*

3.3 LIFTING BAIL

A lifting bail will be designed to interface between the VDTT equipment and the receiver bag hook assembly. The lifting bail shall attach to the VDTT with a minimum of effort and modifications. Attachment shall be accomplished without welding or grinding on the VDTT. Attachment is anticipated to be accomplished through bolting directly to the existing VDTT mounting flange.

The lifting bail shall be rated for a minimum 22.2 KN (5,000 lb) capacity. Weight of a VDTT is estimated to be less then 4.4 KN (1,000 lbs). The lifting bail shall be designed, fabricated, and load tested per the requirements of DOE-RL-92-36, *Hanford Site Hoisting and Rigging Manual.*

3.4 LIQUID REMOVAL TOOL

A Liquid Removal Tool will be designed to penetrate the VDTT exterior allowing trapped liquids and flush water to exit. The Liquid Removal Tool will create a single opening in the VDTT body at a location shown in Figure 2. Items below the penetration are either sealed and isolated from the main VDTT body, or filled with potting compound to prevent any liquid accumulation. The opening shall be at least 13 mm (1/2 in) in diameter, or of equivalent area with a near circular opening.

The liquid removal tool will incorporate a camera and lighting to locate and observe the penetration. A VDTT restraint device may be included in the design if required. A restraint device to maintain position of the VDTT during the penetration phase will be evaluated during conceptual design.

The Liquid Removal Tool will be a contained system returning drained liquids and flush water to the waste tank. Internal surfaces will be designed for decontamination to the extent possible. A water wash decontamination system for the internal surfaces will be evaluated during conceptual design.

LOCATION OF VDTT PENETRATION

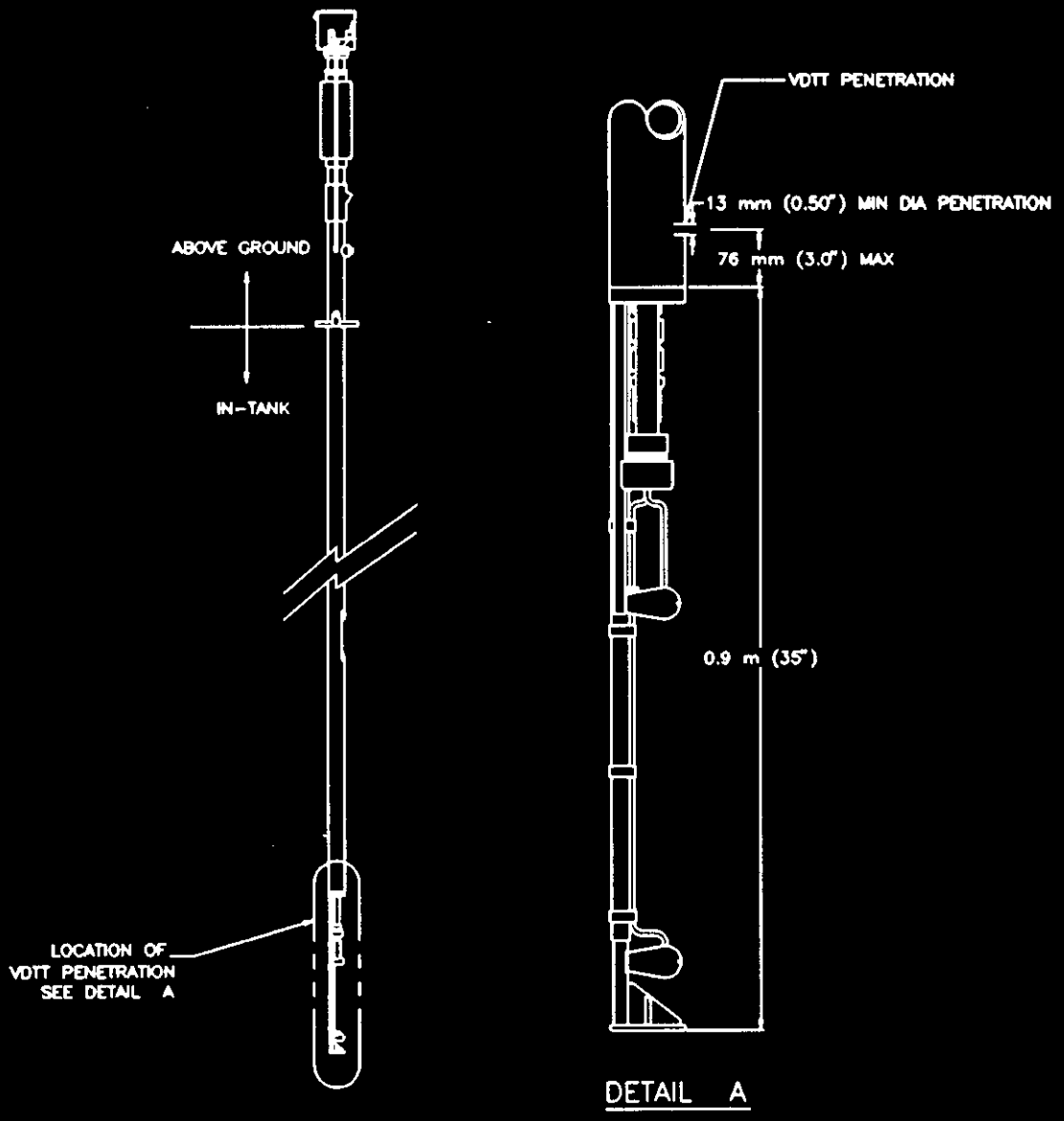

FIGURE 2

3.5 INTERNAL DECONTAMINATION SYSTEM

A water flush decontamination system will be designed for VDTT internals located below the mounting flange. Water flush of the VDTT internals will be performed after operation of the Liquid Removal Tool and prior to complete VDTT removal. Flush water will exit the VDTT through the liquid removal penetration and be returned to the waste tank through the riser. The system will consist of a flush attachment to the VDTT, a water supply, a bulkhead connection in the receiver bag, associated hose, fittings, valves, and gauges. The internal decontamination system shall not interfere with the VDTT lifting bail, or operation of the flexible receiver.

The flush attachment will connect at a location above the VDTT mounting flange. The attachment shall be drip tight with the water flush medium. Connecting the flush attachment shall require a minimum of effort without welding or grinding. A screwed, or clamped, connection is anticipated. The water supply shall be at a pressure not exceeding 690 Kpa (100 psig) and a recommended temperature of 66 °C (150 °F). Water supply hose, pipe, fittings, and valves shall have a minimum nominal 25 mm (1 in) inside diameter and be rated for the maximum supply pressure and temperature.

Backflow prevention shall be provided in the water supply at a location between the VDTT and the receiver bag bulkhead to prevent contamination from migrating through the supply lines to beyond the receiver bag. An air purge capability shall be provided to displace free liquids from the supply hoses, fittings, and the VDTT after completion of the water flushing. Air purge pressures shall not exceed ratings for the flush system.

Instrumentation shall be provided to indicate water flush pressure, flow rate, and a resetable total flow quantity. Instrumentation shall be provided to indicate pressure and flow for the air purge. A flow control valve shall be provided for the water flush and the air purge. Pressure bleed capabilities shall be provided during the water flush and the air purge processes.

3.6 BURIAL CONTAINER

The burial container for removed VDTT equipment is being designed by the Long Length Contaminated Equipment (LLCE) removal program. Burial container design is scheduled to be complete by 5/96. Burial containers will be fabricated per the LLCE design. The design is based on criteria contained in *Specification for the Contaminated Equipment Burial Container* (McCormick 1995a).

3.7 EQUIPMENT SKID

The equipment skid is being designed by the LLCE program in conjunction with the tilt and transport trailers. Equipment skid design is scheduled to be complete by 5/96. Removed VDTT equipment will be laid horizontally onto

the skid. The skid and removed equipment will be loaded into the container for disposal. Equipment skids will be fabricated per the LLCE design. The skid design is based on criteria contained in *Specification for Transportation System for Long-Length Contaminated Equipment* (McCormick 1995b).

3.8 TILT AND TRANSPORT TRAILERS

Trailers for tilting removed VDTT's from vertical to horizontal, and for transportation of the removed equipment, will be designed and fabricated by the LLCE program. Trailer designs are scheduled to be complete by 5/96. Design criteria for the tilt and transport trailers are contained in *Specification for Transportation System for Long-Length Contaminated Equipment* (McCormick 1995b).

4.0 SAFETY

The removal equipment is considered Safety Class 3. Existing equipment that is to be used have been designed, fabricated, and qualified to the criteria of Safety Class 3.

A Safety Assessment will be performed for the VDTT removal, packaging, and storage or disposal processes. Safety Assessments will be completed prior to VDTT removal activities. Safety Assessment for VDTT removal will be contained in Revision 15 of *A Safety Assessment for Proposed Pump Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-SY-101: Hanford Site, Richland, Washington* (H. Sullivan, et al. 1995). Safety Assessment for packaging and storage or disposal will be contained in a Safety Analysis for Packaging document.

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