SRR-CWDA-2015-00159
Revision 1

Tank 16 Final Configuration Report for H-Tank Farm at the Savannah River Site

May 2016

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Prepared for U.S. Department of Energy Under Contract No. DE-AC09-09SR22505

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

CM	Closure Module
DOE	United States Department of Energy
FCR	Final Configuration Report
FFA	Federal Facility Agreement
HLLCP	High Liquid Level Conductivity Probe
HTF	H-Tank Farm
IW	Inhibited Water
GCP	General Closure Plan
PA	Performance Assessment
SDDR	Supplier Deviation Disposition Request
SCDHEC	South Carolina Department of Health and Environmental Control
SRS	Savannah River Site
WTS	Waste Transfer System

1.0 EXECUTIVE SUMMARY

The United States Department of Energy (DOE) documented completion of operational closure of Tank 16 located in the H-Tank Farm (HTF) on September 23, 2015. [WDPD-15-53] The final as-built configuration of the closed waste tank is in accordance with the isolation process and stabilization strategy described in the *Industrial Wastewater Closure Module for the Liquid Waste Tank 16H H-Area Tank Farm, Savannah River Site*, SRR-CWDA-2013-00091, (hereinafter referred to as: Tank 16 Closure Module [CM]) with exceptions/clarifications described within this document. The waste tank has been isolated from the waste transfer system (WTS) and HTF support systems. Based on visual inspections performed and recorded during grouting and estimated grout volume delivered to the waste tank and annulus, no appreciable void space is present inside the waste tank. In-tank equipment and cooling coil void space was sufficiently filled with grout based on actual grout volume delivered as compared to calculated void space.

This final configuration report (FCR) is submitted to meet the requirements of the *Industrial Wastewater General Closure Plan for H-Area Waste Tank Systems,* SRR-CWDA-2011-00022, (hereinafter referred to as: HTF General Closure Plan [GCP]), the Tank 16 CM, and to satisfy requirements of Section IX of the Savannah River Site (SRS) Federal Facility Agreement (FFA). [SRR-CWDA-2013-00091, WSRC-OS-94-42] The purpose of this report is to document the final configuration of the closed Tank 16 in HTF at SRS. Field conditions that differ from those described in the Tank 16 CM, as approved by South Carolina Department of Health and Environmental Control (SCDHEC) May 14, 2015, are herein described. [SRR-CWDA-2013-00091, DHEC-OS-2015-05-14-01]

2.0 INTRODUCTION/BACKGROUND

The submittal of this FCR satisfies the requirement in Section 3.3.8 of the HTF GCP, which states: "Following completion of stabilization of the individual waste tank system, DOE will provide a Final Configuration Report to SCDHEC describing the final configuration of that system." [SRR-CWDA-2011-00022] This FCR includes certification by South Carolina Professional Engineers that all work has been completed in accordance with the approved HTF GCP and Tank 16 CM. [SRR-CWDA-2011-00022, SRR-CWDA-2013-00091] This FCR primarily addresses tank isolation, stabilization, and future monitoring information discussed in the Tank 16 CM.

The Tank 16 CM describes the processes by which DOE has removed waste from Tank 16, sampled residual contaminants, characterized the remaining residual inventory, and isolated the waste tank from the HTF facilities that remain operable. Submittal of this FCR for Tank 16 to SCDHEC (as described in the HTF GCP) describes with certification that the removal from service activities for Tank 16 have been performed in accordance with the HTF GCP (SRR-CWDA-2011-00022) and the Tank 16 CM. Sections of the Tank 16 CM applicable to this FCR are described below:

Waste Tank System Isolation Process and Stabilization Strategy - Describes the end state of the waste tank, including the following:

- Waste tank system isolation process and final configuration of the waste tank system

- Description of structures and equipment that are part of this removal from service activity including any equipment that will remain in the waste tank
- Stabilization strategy including type and characteristics of fill material, as appropriate

Maintenance and Monitoring Plans - Describes maintenance and monitoring requirements for the stabilized waste tank following operational closure. [SRR-CWDA-2013-00091]

Tank 16 is part of the group of four Type II waste tanks (Tanks 13 through 16) in HTF. These waste tanks have a nominal capacity of 1,070,000 gallons. Type II waste tanks are 85 feet in diameter and are 27 feet tall. The primary liner of Type II waste tanks is made of 0.5-inch thick carbon steel. The carbon steel shell sits inside a reinforced concrete vault that has 2-foot-9-inch thick walls, a 3-foot-9-inch thick roof, and a 3-foot-6-inch thick basemat. There is a 2-foot-6.625-inch wide annular space surrounding the primary tank. Lining the inside bottom of the vault for secondary containment is a 5-foot high, 0.5-inch thick carbon steel annulus pan to collect leakage, if any, from the primary tank. Each Type II waste tank has a concrete filled steel center column to support the roof. The center columns have a 6-foot-8-inch diameter consisting of a 0.5-inch carbon steel pipe filled with concrete and welded to the floor of the primary tank. The center columns are cone-shaped at the top and welded to the roof. Cooling coils in Type II waste tanks are configured in both a horizontal and a vertical array. Each Type II waste tank contains 40 vertical cooling coils that are supported from the primary tank roof by hanger and guide rods. The lower horizontal cooling coils are approximately one inch above the primary tank floor and the upper horizontal cooling coils are approximately four inches above the primary tank floor. In addition, there are supply pipes that connect the tank top cooling water system to the cooling coils. There are approximately 29,400 linear feet of 2-inch diameter carbon steel cooling coil pipes in a Type II waste tank. [SRR-CWDA-2013-00091]

Figures 2.0-1 and 2.0-2 depict the cross section and plan view outlining the general arrangement of waste tank equipment, respectively. Figure 2.0-1 depicts equipment typical of a Type II tank and is not intended to represent a specific waste tank configuration. Figure 2.0-2 depicts the Tank 16 primary and annulus riser configuration and equipment.

Figure 2.0-1: Typical HTF Type II Tank Cross Section

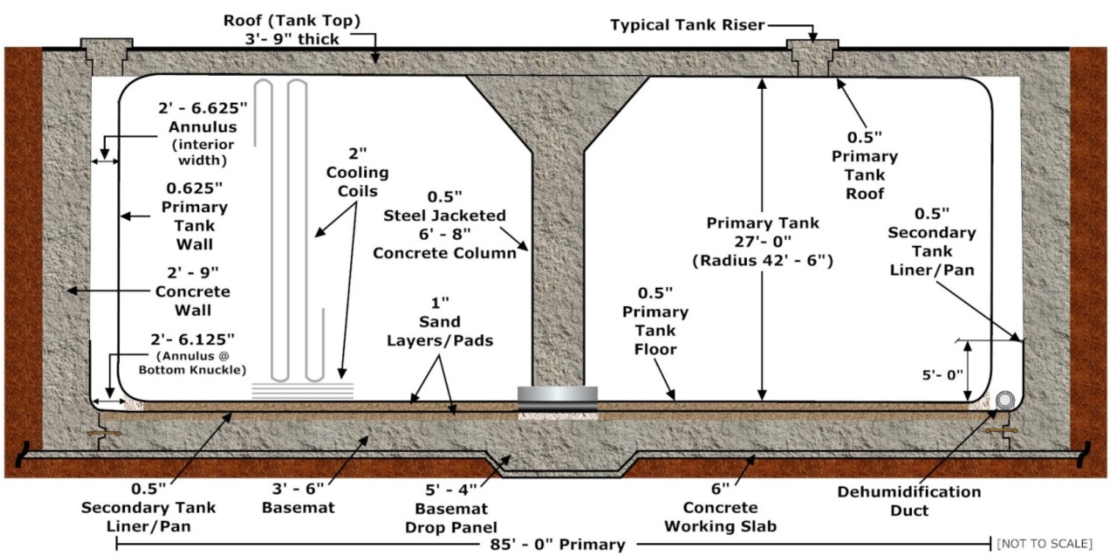
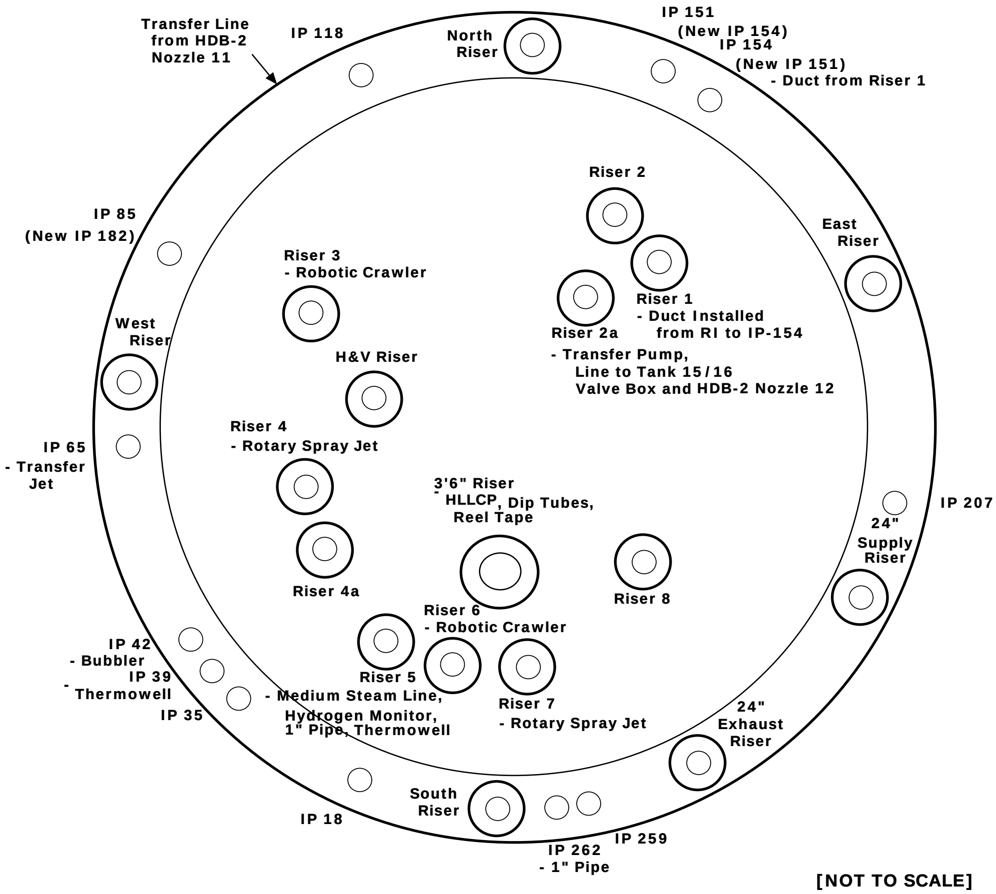


Figure 2.0-2: Tank 16 Plan View with Primary and Annulus Riser Configuration and Equipment



3.0 SUMMARY OF ISOLATION AND GROUTING ACTIVITIES

3.1 Isolation

Tank 16 was isolated in accordance with the Tank 16 CM Section 7.1 and the waste tank isolation strategy. [M-CTP-H-00001] There are no exceptions to the Tank 16 field isolation configuration versus the Tank 16 CM and isolation strategy. [SRR-LWE-2015-00085] Mechanical and electrical isolation consisted of demolishing and removing of piping and components, plugging lines, removing of equipment, identifying components as “Out Of Commission,” and removing obstructions from and around the risers. Tank 16 was isolated from the HTF WTS and the HTF support systems. The isolation strategy consisted of identification and isolation of transfer lines, drain lines, water, air, and steam supply lines, ventilation lines, power and instrumentation lines, and all other penetrations into or out of the waste tank. Isolation of these systems was performed at the electrical control rooms or field locations for electrical and instrumentation and at the system supply headers located off the tank top for mechanical systems. For example, Figure 3.1-1 shows a bearing water line that has been cut and plugged to isolate the bearing water system to Tank 16. Figure 3.1-2 shows an example of electrical isolation of a ventilation fan on Tank 16.

Figure 3.1-1: Tank 16 Bearing Water Pipe Isolated

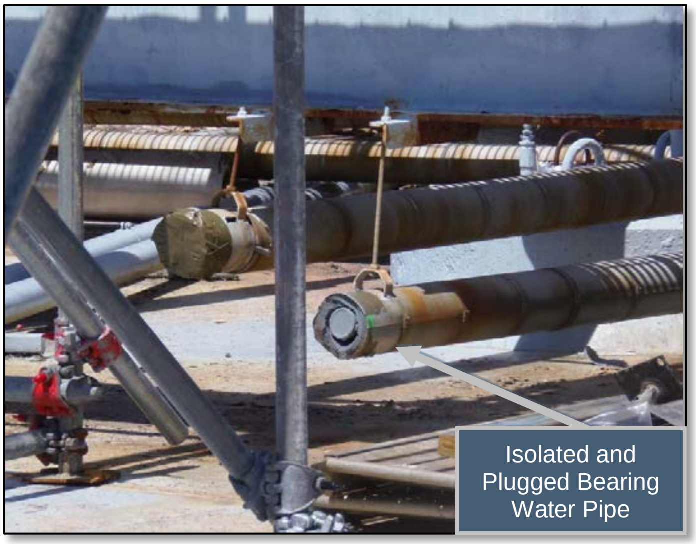
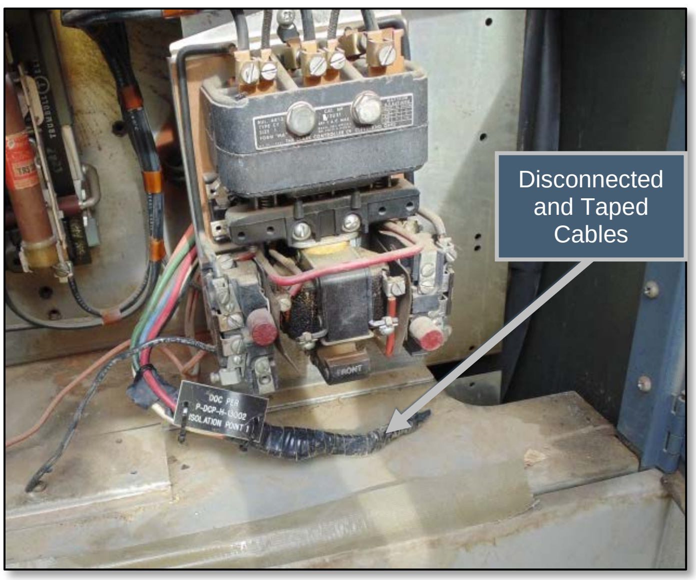


Figure 3.1-2: Tank 16 Ventilation Fan Power Cable Isolation



Descriptions of mechanical isolation in Tank 16 and associated design documents are found in *Tank 16 Mechanical Isolation Matrix*. [M-TRT-H-00081] The descriptions of electrical isolation and associated design documents are found in *Tank 16 Electrical Equipment Isolation Matrix*. [E-TRT-H-00011] These design documents (e.g., design changes, work instructions, and radiological control checklists) may be retrieved from SRS Records Management to provide details of the isolation modifications, if needed. The waste tank was closed to waste processing activities by isolating transfer lines or plugging/capping the piping, thereby creating a physical break from the rest of the waste tank system.

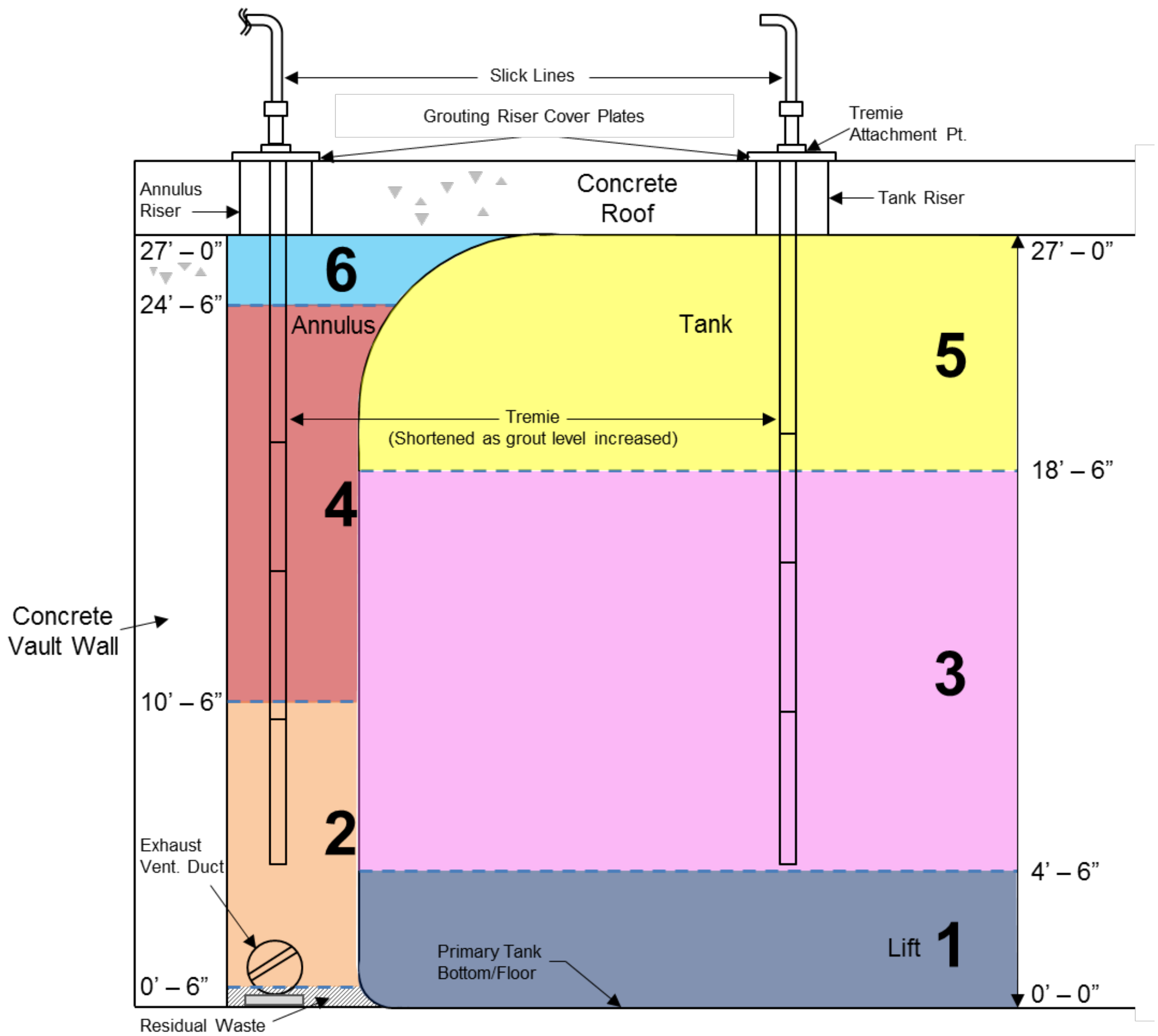
There were no FFA Assessment Reports required for Tank 16 during isolation because there were no modifications to FFA systems or components. Upon isolation from the transfer system, the waste tank was prepared for operational closure.

3.2 Grouting

Grouting activities were completed on Tank 16 on September 22, 2015. Tank 16 was grouted in accordance with the Tank 16 CM, consistent with the *Tank 16H Grout Strategy*. [SRR-LWE-2014-00013] It was estimated that 5,552 cubic yards of grout would be required to fill the tank primary, 687 cubic yards would be required to fill the annulus, and 21 cubic yards would be required to fill the primary and annulus risers. [SRR-LWE-2015-00085]

A structural analysis of the anticipated stresses on the tank primary liner anticipated during placement of grout in the waste tank was performed. [T-CLC-F-00496] As a result, a grout sequence comprised of six lifts was developed which cycled grouting at specific heights between the tank primary vessel and tank annulus. See Figure 3.2-1 for the six-lift grouting sequence that was used for Tank 16.

Figure 3.2-1: Grout Sequence for Tank 16



3.2.1 Tank Interior Bulk Fill Summary

Reducing grout was used to fill the entire volume of the Tank 16 interior. Tank interior bulk fill was comprised of lifts 1, 3, and 5 (Figure 3.2-1). Grout was added to the waste tank using a portable grout pump filled from cement mixer trucks. The pump pushed the grout through slick lines to the waste tank risers. Camera inspections of the interior of the waste tank were typically performed and recorded at the beginning, middle, and end of each day during the grouting process. These inspections indicated that the reducing grout flowed over the residual material to stabilize and immobilize it at the bottom of the waste tank. During lifts 1 and 3 the grout adequately flowed from the risers around internal obstructions (support column and cooling coils) to other areas of the waste tank (Figure 3.2-2). During lift 5 with approximately 80% of the tank grouted, an uneven buildup (i.e., mounding) of grout was observed beneath the risers. These mounds could potentially build up into the risers and block access for grouting, leaving void areas under the tank roof. On occasion, minimal mounding was observed during previous bulk fill lifts, but the mounding was more prominent and determined to be potentially problematic as the grout level approached the tank roof. Grouting with the bulk fill formula was stopped with approximately two feet of tank space remaining (Figure 3.2-3). An evaluation was conducted in accordance with applicable operational and performance documents to determine that it was acceptable based on programmatic, technical, and safety considerations to use an alternate grout. [SRR-CWDA-2015-00096] Therefore, an alternate, more flowable, grout mixture was used to fill the upper two feet of the final lift to reduce the possibility of creating voids under the tank roof. The evaluation and use of the more flowable grout mixture is discussed in Section 3.2.1.1.

Figure 3.2-2: Bulk Fill Grout during the Filling Process (Lift 3)

Figure 3.2-3: Uneven Buildup (i.e., mounding) of Grout under Riser 6 near the End of Lift 5

It was conservatively estimated that 5,552 cubic yards of grout would be required to fill the Tank 16 primary. The estimated volume of 5,552 cubic yards of grout equates to 1,121,357 gallons. This volume is greater than the nominal operating capacity of a Type II tank (1,070,000 gallons). The operating capacity is based on a fill level approximately 15 inches below the tank roof. Approximately 5,425 cubic yards of grout were actually poured. The actual volume of grout poured into Tank 16 aligned well with the estimated volume required to fill the waste tank and provides further evidence of the absence of significant voids. The actual volume of grout poured in the waste tank is estimated based on the number of grout trucks with a nominal volume of eight cubic yards per truck of bulk fill grout and seven cubic yards per truck of the alternate, more flowable, grout. The exact volume of each grout truck was not verified. Some trucks may have contained more than eight cubic yards, which may have resulted in the recorded volumes (5,425 cubic yards) being underestimated.

Quality control of the original grout production and delivery was implemented in accordance with the grout procurement specification. [C-SPP-F-00055] Quality control of the alternate, more flowable grout production and delivery was implemented in accordance with procurement specification *Vault 4 Clean Cap Grout*. [C-SPP-Z-00012] The quality control program included documentation of grout component compliance with specified standards, testing of grout test cylinders, and surveillance and audits of grout production and delivery activities. During the grouting process, multiple grout test cylinders were collected from approximately every 100 cubic yards. A total of 272 grout test cylinders were tested for compressive strength. The average 28-day compressive strength was 2,788 pounds per square inch, well above the value of 2,000 pounds per square inch described in the Tank 16 CM. There were no compressive strength tests performed on grout cylinders with cure times greater than 28 days because the result of the 28-day test results were acceptable, and the compressive strength increases as the grout continues to cure. Grout test cylinders were not required by the alternate grout specification, and were not collected while grouting Tank 16. [SRR-LWE-2015-00085]

3.2.1.1 Exceptions/Clarifications to Waste Tank Interior Bulk Fill Grouting Plans

The exceptions/clarifications to bulk fill grouting plans specified in the Tank 16 CM are described as follows:

During lift 5 with approximately 80% of the tank grouted, an uneven buildup (i.e., mounding) of grout was observed under the risers where grout was being poured. These mounds could potentially build up into the risers and block access for grouting, leaving void areas under the tank roof. Grouting with the bulk fill formula was suspended with approximately two feet of tank space remaining, as noted in Section 3.2.1 (Figure 3.2-3). Various options were thoroughly evaluated in accordance with prescribed processes, and the decision was made to use an alternate, more flowable grout to fill the upper two feet of the tank primary to minimize the potential for creating void spaces near the tank roof. There was also evidence of mounding later during annulus grouting, so the decision was made to also use the alternate, more flowable grout to fill the upper two feet of the annulus. Alternate fill grout (detailed in specification *Vault 4 Clean Cap Grout*, C-SPP-Z-00012) was evaluated for use to complete the final Tank 16 primary and annulus lifts (Lifts 5 and 6) and was determined to comply with the HTF Performance Objectives detailed in the HTF Performance Assessment. [SRR-CWDA-2010-00128] An evaluation was conducted in accordance with applicable operational and performance documents to determine that it was acceptable to use an alternate grout based on programmatic, technical, and safety considerations. [SRR-CWDA-2015-00096] This evaluation considered the alternate grout's performance with respect to 1) grout chemical properties, 2) waste tank stability, 3) inadvertent intruder prevention, and 4) waste tank release flow modeling. The evaluation concluded that the alternate grout would not impact the waste tank grout's overall effective reducing capacity, since it has a greater weight percent slag than the regular bulk fill grout. Overall waste tank stability is maintained because the alternate grout minimized void formation. The ability of the waste tank design elements (e.g., the concrete roof) to serve as inadvertent intruder barriers is not impacted by the alternate grout. Finally, the HTF fate and transport model was run with an increased infiltration rate and faster grout monolith degradation to conservatively assess the potential impact of the alternate grout on waste tank flow modeling. The potential impact on peak contaminant release was determined to be acceptable. [SRR-CWDA-2015-00096, SRR-CWDA-2015-00100]

In December 2015, grout cylinders taken from Z-Area Vault 4 clean cap grout in June 2014 were tested for compressive strength. (No Vault 4 grout cylinders were tested for compressive strength prior to the December 2015 tests.) The Vault 4 grout is essentially the same as the alternate, more flowable grout placed in the final two feet of Tank 16. The compressive strength for the four Vault 4 cylinder tests ranged from 5,560 psi to 6,880 psi with an average compressive strength of 6,202 psi, much greater than the nominal 2,000 psi cited in the HTF Performance Assessment (PA). Saturated hydraulic conductivity tests were also performed on Z-Area Vault 4 clean cap cylinders. The three hydraulic conductivity tests showed the cylinders had an average saturated hydraulic conductivity comparable to what was assumed for the HTF grout (2.2E-09 cm/s for the cylinders vs. 2.1E-09 cm/s assumed in the HTF PA). Therefore, the alternate, more flowable grout placed in the final two feet of Tank 16 supports assumed properties associated with the tank flow modeling. [SRR-CWDA-2015-00160]

The bulk fill specification required the trial batching to demonstrate the ability to meet the maximum bleed of 0.0 after 24 hours. This means that there should be no free standing bleedwater after 24 hours of curing. Bleedwater test results of bulk fill grout that was poured into Tank 16 showed that most batches met the 0.0 requirement. Some bleedwater tests showed that some batches exceeded the maximum bleed requirement. A supplier deviation disposition request (SDDR) was issued citing the two highest bleedwater test results of 3.3% and 8.9%. The SDDR was evaluated and dispositioned as "use as is." The batches met all other performance requirements in the specification and the deviation did not invalidate performance assessment grout properties. [SDDR 13307]

The grout specification required that test cylinders be cured in a controlled environment (temperature and humidity) and be tested for compressive strength at 28 days. [C-SPP-F-00055] Due to equipment failure, there were approximately seven hours when the temperature in the curing room exceeded the specified temperature by approximately two degrees. Affected test cylinders met the 2,000 psi 28-day compressive strength specification. [SRR-LWE-2015-00085]

On September 16, 2015, approximately 40 gallons of bulk fill grout spilled onto the tank top while filling Tank 16, Riser 4a (Figure 3.2-4). The spill resulted from a breach in the seal between the spray chamber and the riser/tank top. The breach was effectively sealed by the cured grout in the riser and spray chamber. A determination was made to leave the thin layer of grout on the tank top because it has no effect on the closed waste tank condition from a worker safety or performance assessment perspective. [SRR-LWE-2015-00104]

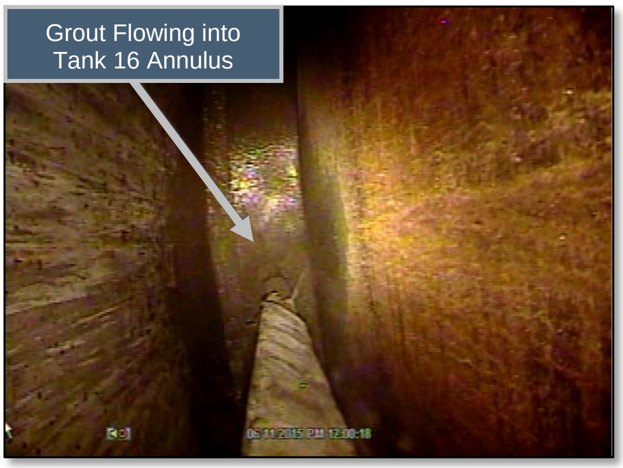
Figure 3.2-4: Grout Spill from Tank 16, Riser 4A

3.2.2 Annulus Bulk Fill Summary

Annulus bulk fill was performed in Tank 16 from June 11, 2015 to September 17, 2015, and was comprised of lifts 2, 4, and 6 (Figure 3.2-1).

Grout flowed into the dehumidification ductwork through the registers (6-inch by 14-inch openings in the top of the duct) during annulus bulk fill to fill the interior of the duct. Grout flowing into the registers during annulus bulk fill was observed in locations that could be viewed with cameras. (Figure 3.2-5).

Figure 3.2-5: Grouting the Tank 16 Annulus (Lift 2)



It was estimated that 687 cubic yards of grout would be required to fill the Tank 16 annulus. (Note: Residual material in the annulus of 1,910 gallons was accounted for in the estimated volume of grout to fill the annulus.) Approximately 697 cubic yards of grout were poured in the annulus. The grout formulation used for the primary fill was also used for most of the annulus and the entire annulus duct (Figure 3.2-6). [SRR-LWE-2015-00085] The actual volume of grout used to fill the annulus aligned well with the estimated volume and provides evidence of the absence of significant voids. As with tank interior bulk fill, the actual volume of grout poured in the annulus is estimated based on the number of grout trucks and a nominal volume of eight cubic yards per truck of bulk fill grout and seven cubic yards per truck of alternate grout.

Figure 3.2-6: Annulus Bulk Fill Grout during the Filling Process (Lift 4)

3.2.2.1 Exceptions/Clarifications to Annulus Grouting Plans

Due to the observed uneven buildup (i.e., mounding) of annulus bulk fill grout, an alternate, more flowable grout was used to fill the upper two feet of the annulus to minimize the potential for void space creation near the annulus roof. The evaluation and use of this alternate grout is discussed in Section 3.2.1.1.

3.2.3 Equipment Fill Summary

The in-tank equipment internals were grouted utilizing a pre-blended mix designed and tested to flow into and fill small void spaces. The equipment fill grout formulation consists of cable grout, slag, fly ash, and water. [SRNL-STI-2011-00592] Due diligence was exerted to slowly pour the highly flowable grout into the equipment to ensure that voids were filled as much as reasonably possible. Preparations at the risers were implemented to facilitate effective grouting of equipment. Grout flow into equipment was improved by venting equipment by drilling holes in the equipment or by removing components from equipment. When required, multiple attempts to fill equipment were made as the grout was allowed to flow and settle over time. [SRR-LWE-2015-00085] Calculated fill volumes of the internal void space of in-tank equipment was compared to actual grout volumes injected into the equipment. See Table 3.2-1. Calculated fill volumes are theoretical values based on assumptions about internal void space and potential grout flow paths. The equipment grout was delivered from buckets of a known volume. The actual grout volume values listed in Table 3.2-1 are based on the volume of buckets poured.

As noted in the *Tank 16H Grout Strategy*, the goal for grouting in-tank equipment was to minimize the potential for vertical fast flow path formation down through the grout to reach the residual material on the waste tank floor. [SRR-LWE-2014-00013] The grout placed in the transfer pump in Riser 2a, the rotary spray jet assemblies in Risers 4 and 7, the dip tubes in the 3'-6" Riser, and other equipment grouted in the closed waste tank minimized the potential for vertical fast flow path through this equipment to the waste tank floor.

The objective of the equipment fill efforts was to practice due diligence to ensure that as much grout as practical was placed into the equipment. Equipment grouting efforts did not cease until the equipment was unable to receive any more grout. Examples of due diligence included the formulation and testing of very flowable grout and the testing of equipment filling techniques by conducting equipment fill trials using mock-ups of some of the equipment anticipated to be more challenging to fill with grout. Equipment mock-ups were constructed of transparent material so that grout flow through the equipment could be assessed. Grout delivery flow rate, settling time, and venting methods are examples of equipment filling techniques that were identified during mock-up testing and implemented during the grouting of in-tank equipment.

As shown in Table 3.2-1, the filling of internal void space of in-tank equipment was acceptable.

Table 3.2-1: In-Tank Equipment Calculated vs. Actual Grout Fill Comparison

Equipment	Location	Calculated Fill Volume (Gallons)	Actual Grout Volume (Gallons)
Transfer Pump	Riser 2a	13.0	16.0
Transfer Pump Flush Pipe	Riser 2a	2.2	1.0
Transfer Pump Level Detection	Riser 2a	0.1	0.5
Thermowell	Riser 2a	1.3	0.5
Spray Wash Chambers	Risers 2, 2a, 3, 4a, 6, and 8	(Note 1)	(Note 1)
Dip Tube #1	3'-6" Riser	0.9 (Note 2)	1.0
Dip Tube #2	3'-6" Riser	0.9 (Note 2)	1.0
Dip Tube #3	3'-6" Riser	0.9 (Note 2)	1.0
Reel Tape	3'-6" Riser	3.3	4.5
High Liquid Level Conductivity Probe (HLLCP)	3'-6" Riser	0.3	1.0
Rotary Spray Jet Assembly	Riser 4	18.0	20.0
Inhibited Water (IW) Pipe #1	Riser 4	0.2	0.5
Inhibited Water (IW) Pipe #2	Riser 4	0.2	0.5
Thermowell #1	Riser 5	1.5 (Note 2)	1.5
Thermowell #2	Riser 5	0.2 (Note 2)	1.0
150# Steam Line	Riser 5	4.0	3.5
Rotary Spray Jet Assembly	Riser 7	21.5	17.0
Inhibited Water (IW) Pipe #1	Riser 7	0.2	0.5
Inhibited Water (IW) Pipe #2	Riser 7	0.2	0.5
Thermowell	IP-39	0.9	1.5
Level Detection Bubbler (4 tubes)	IP-42	5.6	4
1-inch Pipe	IP-259	0.3	0.5

Note 1: The spray chambers were fully grouted; however, the fill volumes could not be accurately measured because grout entered the spray chambers during riser grouting.

Note 2: The dip tubes and thermowells were not detailed on riser drawings; therefore, the lengths were based on observation. [SRR-LWE-2015-00085]

3.2.3.1 Exceptions/Clarifications to Equipment Grout Fill Plans

The following exceptions/clarifications to the in-tank equipment grout plans specified in the Tank 16 CM are described below. [SRR-LWE-2015-00085]

- The *Industrial Wastewater Closure Module for Liquid Waste Tank 16H H-Area Tank Farm Savannah River Site* Table 7.2-1 did not explicitly list the flush pipe and level detection equipment in Riser 2a. [SRR-CWDA-2013-00091] These components are associated with the transfer pump in Riser 2a and were entombed in the riser along with the transfer pump.
- Table 7.2-1 of the Tank 16 CM listed three one-inch pipes in Riser 5. In fact, Riser 5 did not contain three one-inch pipes.

- The grout plan in Table 7.2-1 of the Tank 16 CM stated that the reel tape in the 3'-6" Riser would be directly entombed. However, the reel tape was located inside a pipe sleeve that was filled with 4.5 gallons of grout.

3.2.4 Cooling Coil Grouting

Specially formulated and previously tested cooling coil grout was mixed in a hopper near the tank tops. The cooling coil fill grout formulation consists of cable grout, slag, and water. [C-SPP-F-00057, WSRC-STI-2008-00298] A small pump (versus the larger capacity auger pump used for bulk fill) delivered the grout into the cooling coils.

Failed Cooling Coil Grouting

Failed cooling coils were grouted successfully from each end (inlet and outlet) as per the requirements of the grout strategy. [SRR-LWE-2014-00013] Cooling coils were identified as "failed" when they were unable to maintain pressure or could not be flushed due to blockage. Grouting of failed cooling coils unable to maintain pressure was deemed to be successful when grout was observed exiting at the failure point into the waste tank. Tank 16 had five failed coils that were unable to maintain pressure and one failed coil that could not be flushed and fully grouted due to blockage.

Intact Cooling Coil Grouting

Intact cooling coils were grouted from the inlet end of the coil. Grout addition continued until a solid stream of grout plus a minimum of ten additional gallons of grout exited the outlet end of the coil. The liquid and grout discharged into a collection tote. [SRR-LWE-2015-00085]

3.2.4.1 Exceptions/Clarifications to Cooling Coil Grouting

The following exceptions/clarifications to the cooling coil grouting are described below. [SRR-LWE-2015-00085]

The one failed coil that could not be flushed due to blockage was not fully grouted. The failed coil with blockage (Cooling Coil 12) was grouted with as much grout as it would receive, approximately 5 gallons from one end and approximately 6 gallons from the other end.

Two of the 39 intact cooling coils in Tank 16 were not fully grouted due to time delays during the coil grouting process that allowed the grout to harden before the coils could be filled. [SRR-LWE-2015-00085]

- Cooling Coil 17 (81 gallons of an estimated 116 gallons, approximately 70% filled)
- Cooling Coil 22 (35 to 40 gallons of an estimated 113 gallons, approximately 31-35% filled)

The HTF Performance Assessment and supporting documentation recognized that cooling coils would be filled to the extent practical with the potential for a limited number of cooling coils to be partially filled. The three partially filled cooling coils in Tank 16 do not represent a change to the waste tank final configuration assumptions in closure documentation. [SRR-CWDA-2012-00051]

3.2.5 Riser Filling

Tank top modifications were made to accommodate waste tank riser grouting. Examples of pre-grout modifications included removing equipment components from risers and disconnecting and lowering miscellaneous hoses and cables into the waste tank. All waste tank risers were filled with the same type of reducing grout that was used for bulk fill. The estimated volume to fill the risers was 21 cubic yards. Approximately 23 cubic yards were actually used to fill the risers. There were no exceptions/clarifications associated with riser filling.

The primary work packages that implemented grouting of Tank 16 may be retrieved from SRS Records Management, if needed. The work package that addressed grout preparations for bulk fill and riser fill is 01324150-64. The work package that addressed equipment fill preparation and equipment fill is 01324150-78. The work packages that addressed cooling coil grouting are 01324150-79 and 01324150-85. Since Tank 16 had been isolated from the operating facility, configuration control of waste tank grouting activities was maintained by work packages, consistent with the isolation strategy. [M-CTP-H-00001]

4.0 MONITORING

As required by the Tank 16 CM, DOE will perform annual inspection and maintenance activities during the interim period between operational closure of Tank 16 and the final closure of the HTF operable unit. There are no ancillary structures associated with Tank 16 that will be removed from service in the future and require tracking in future waste tank closure modules.

As described in Section 8.0 of the Tank 16 CM, the annual visual inspections of the area surrounding Tank 16 will be conducted and documented by procedure/work control processes. Maintenance actions will be performed, as appropriate, to ensure long-term structural integrity of the grouted tank is maintained and adequately documented. The stormwater system will be maintained to ensure any possible water infiltration through grout is minimized.

After all waste tanks and ancillary structures in the HTF have been removed from service, decisions on removal of external structures such as remaining structural steel trusses, mechanical and electrical piping/conduit, instrumentation and power cables/wiring, raceways, motors, and any other remaining equipment from the tank top footprint will be addressed in conjunction with the final Resource Conservation and Recovery Act/Comprehensive Environmental Response, Compensation, and Liability Act closure of the HTF Operable Unit. [WSRC-OS-94-42]

5.0 CONCLUSION

This FCR is submitted to meet the requirements of the HTF GCP, the Tank 16 CM and to satisfy requirements of Section IX of the SRS FFA. [SRR-CWDA-2011-00022, SRR-CWDA-2013-00091, WSRC-OS-94-42] This report documents the final configuration of operationally closed Tank 16 in the HTF at the SRS and describes field conditions that differ from those described in the Tank 16 CM. [SRR-CWDA-2013-00091]

Upon approval of this report and final inspection/walkdown of closure activities by SCDHEC, DOE will request approval to remove this waste tank from Construction Permit #17,424-IW. An approval letter of the closure activities for Tank 16 from SCDHEC will represent partial closure of Construction Permit #17,424-IW. [DHEC_01-25-1993]

6.0 PROFESSIONAL ENGINEER CERTIFICATION

The design information in this report was developed from reviews under my direction or supervision, which included drawings, plans, specifications, and associated design documents. I certify that to the best of my knowledge, information and belief, the information represents the current conditions of Tank 16 and that this waste tank has sufficient structural integrity to meet the applicable engineering standards.

Stamp

Name: MICHAEL B. WOOD

License Number: 22845

The construction information in this report was implemented from reviews and inspections under my supervision based upon drawings, plans, specifications and associated design documents. I certify that to the best of my knowledge, information and belief, the field construction/modification information represents the current conditions of Tank 16.

Stamp

Name: Andrew R. Redwood

License Number: 20525

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