SRR-CWDA-2016-00068
Revision 0

Tank 12 Final Configuration Report for H-Tank Farm at the Savannah River Site

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LIST OF ACRONYMS

CM	Closure Module
CMA	Closure Module Addendum
DOE	United States Department of Energy
FCR	Final Configuration Report
FFA	Federal Facility Agreement
GCP	General Closure Plan
HLLCP	High Liquid Level Conductivity Probe
HTF	H-Tank Farm
PA	Performance Assessment
SCDHEC	South Carolina Department of Health and Environmental Control
SRS	Savannah River Site
STP	Submersible Transfer Pump
WTS	Waste Transfer System

1.0 INTRODUCTION

The United States Department of Energy (DOE) documented completion of operational closure of Tank 12 located in the H-Tank Farm (HTF) on April 28, 2016. [WDPD-16-39] 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 12H H-Area Tank Farm, Savannah River Site*, SRR-CWDA-2014-00086, (hereinafter referred to as: Tank 12 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 12 CM, and to satisfy requirements of Section IX of the Savannah River Site (SRS) Federal Facility Agreement (FFA). [SRR-CWDA-2014-00086, WSRC-OS-94-42] Section 3.3.8 of the HTF GCP 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] The purpose of this FCR is to document the final configuration of the closed Tank 12 in HTF at SRS. Field conditions that differ from those described in the Tank 12 CM and the *Addendum to the Industrial Wastewater Closure Module for Liquid Waste Tank 12H H-Area Tank Farm, Savannah River Site*, *SRR-CWDA-2014*-00086, SRR-CWDA-2015-00074, (hereinafter referred to as Tank 12 Closure Module Addendum [CMA]) as approved by South Carolina Department of Health and Environmental Control (SCDHEC) December 16, 2015, are herein described. [SRR-CWDA-2014-00086, SRR-CWDA-2015-00074, DHEC-OS-2015-08-10-01, DHEC-OS-2015-12-16-01] The Tank 12 CM describes the processes by which DOE has removed waste from Tank 12 and isolated the waste tank from the HTF facilities that remain operable. The Tank 12 CMA describes the processes by which DOE sampled residual contaminants, characterized the remaining residual inventory, and confirmed that regulatory performance objectives will be met.

Submittal of this FCR for Tank 12 to SCDHEC (as described in the HTF GCP) describes with South Carolina Professional Engineer certification that all work has been completed and the removal from service activities for Tank 12 have been performed in accordance with the HTF GCP, the Tank 12 CM, and the Tank 12 CMA.

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 12 from SCDHEC will represent partial closure of Construction Permit #17,424-IW. [DHEC_01-25-1993]

This FCR primarily addresses tank isolation, stabilization, and future monitoring information discussed in the Tank 12 CM as 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-2014-00086]

2.0 TANK DESCRIPTION

Tank 12 is part of the group of four Type I tanks (Tanks 9 through 12) in HTF. These waste tanks have a nominal operating capacity of 750,000 gallons, a nominal design capacity of 793,000 gallons, and are approximately nine feet below grade. The primary liner of Type I tanks is made of 0.5-inch thick carbon steel. The carbon steel shell sits inside a 22-inch thick reinforced concrete vault with a 2.5-foot annular space surrounding the primary tank. Lining the 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. Type I tanks are 75 feet in diameter and are 24.5 feet tall. Each Type I tank has 12 columns to support the roof. These columns were made from steel pipes welded to a steel bottom plate. The pipes are 0.5-inch thick carbon steel with a 2-foot outside diameter and are filled with reinforced concrete. The columns are welded to the roof and floor of the primary tank. Cooling coils in Type I tanks are configured in both a horizontal and a vertical array. Cooling coils are nominal 2-inch diameter schedule 40 carbon steel seamless pipes. Each Type I tank contains 34 vertical cooling coils that are supported from the primary tank roof by hanger and guide rods. The lower horizontal cooling coil is approximately one inch above the primary tank floor and the upper horizontal cooling coil is 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 22,800 linear feet of cooling coil pipes in a Type I tank. [SRR-CWDA-2014-00086]

Figures 2.0-1 and 2.0-2 depict the cross section and plan view outlining the general arrangement of the waste tank, respectively.

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

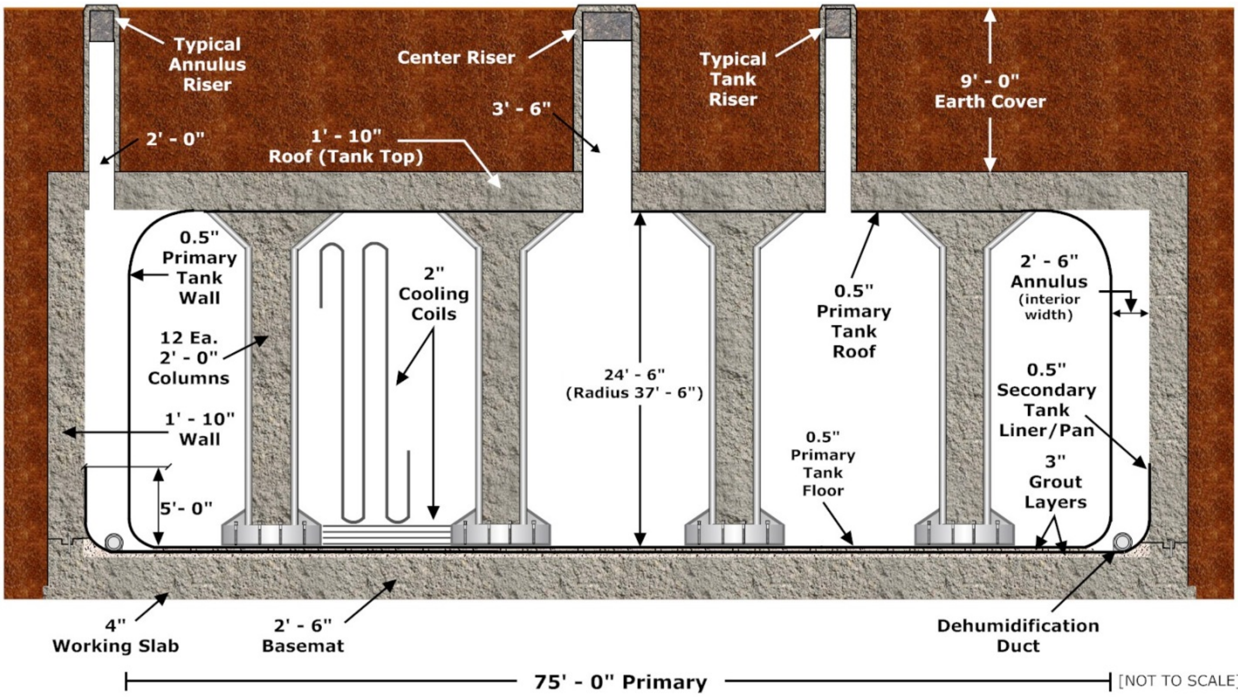
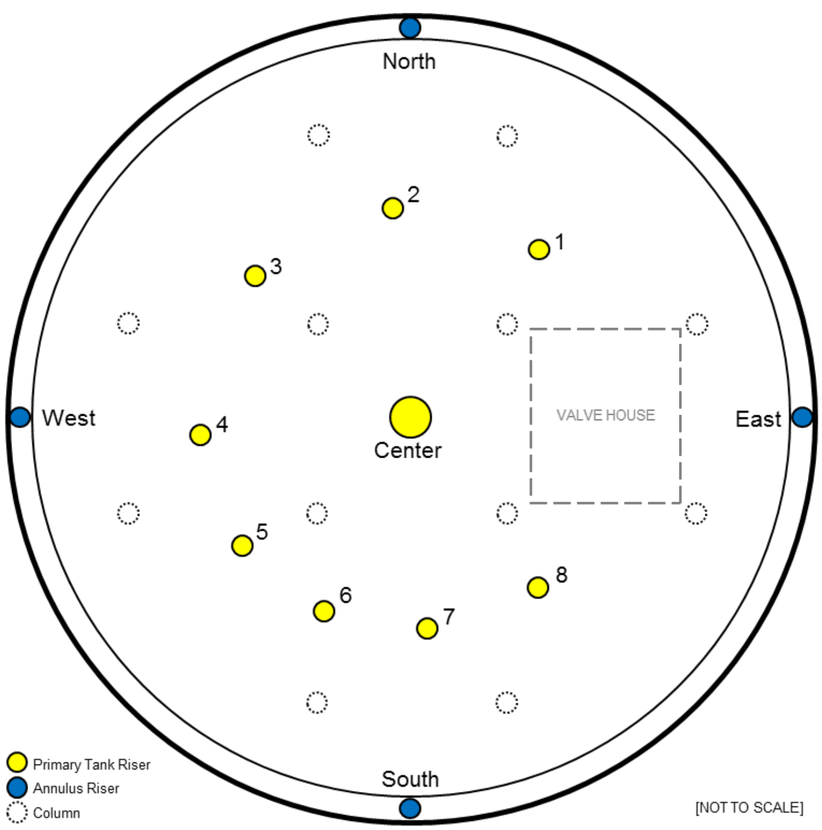


Figure 2.0-2: Typical HTF Type I Plan View with Primary and Annulus Riser Configuration



3.0 SUMMARY OF ISOLATION AND GROUTING ACTIVITIES

3.1 Isolation

Tank 12 was isolated in accordance with the Tank 12 CM Section 7.1 and the waste tank isolation plan. [M-CTP-H-00003] There are no exceptions to the Tank 12 field isolation configuration versus the Tank 12 CM and isolation plan. [SRR-LWE-2016-00036] Mechanical and electrical isolation consisted of demolishing and removing piping and components, plugging lines, removing equipment, identifying components as "Out Of Commission," and removing obstructions from and around the risers. Tank 12 was isolated from the HTF WTS and the HTF support systems. The isolation plan 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 an inhibited water pipe and a bearing water pipe that has been cut and plugged to isolate the systems to Tank 12. Figure 3.1-2 shows an example of electrical isolation of slurry pump instrumentation on Tank 12.

Figure 3.1-1: Tank 12 Bearing Water and Inhibited Water Pipes Isolated

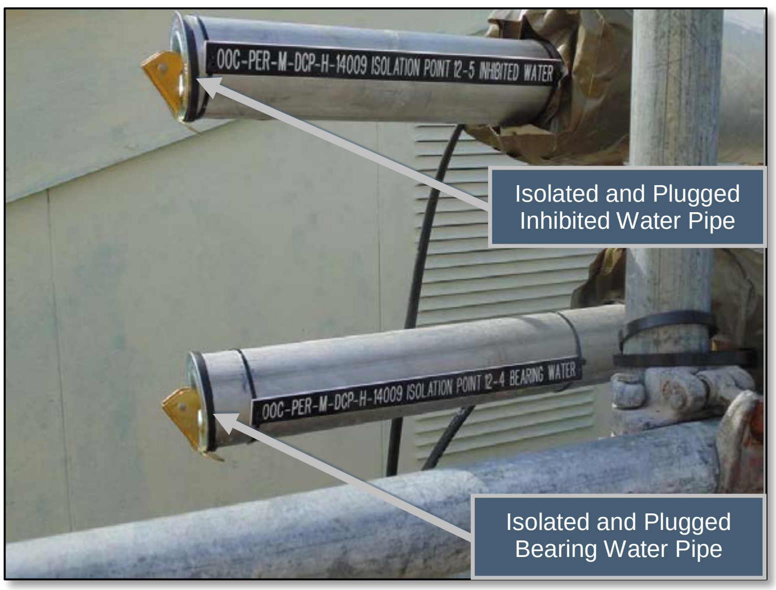
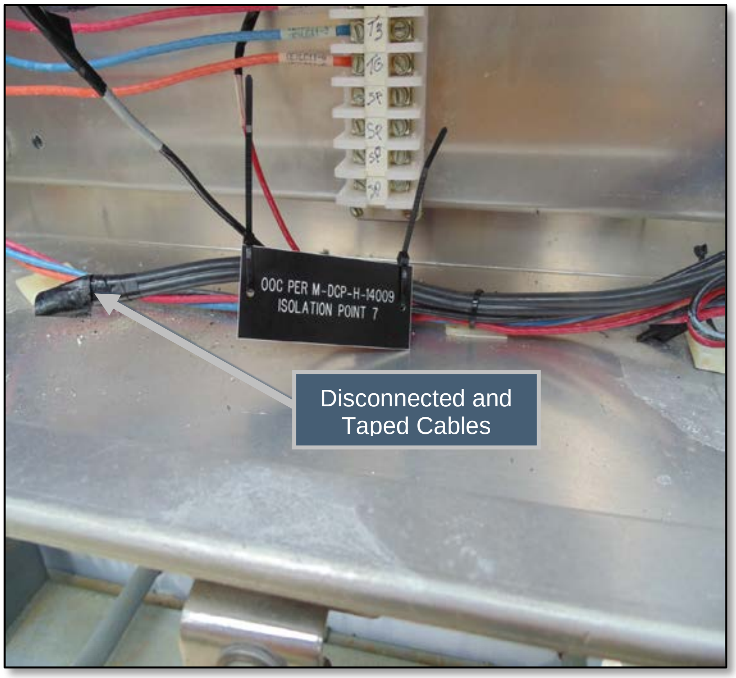


Figure 3.1-2: Tank 12 Slurry Pump Instrumentation Power Cable Isolation



Descriptions of mechanical isolation in Tank 12 and associated design documents are found in *Tank 12 Mechanical Isolation Matrix*. [M-TRT-H-00090] The descriptions of electrical isolation and associated design documents are found in *Tank 12 Electrical Equipment Isolation Matrix*. [E-TRT-H-00012] These design documents (e.g., design changes, work instructions, and radiological control checklists) can be retrieved from SRS Records Management to provide details of the isolation modifications, upon request. 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.

FFA Assessment Reports are required for modifications to specified waste tank systems and components. FFA Assessment Reports associated with isolation of Tank 12 are the *Federal Facility Agreement Assessment Report for Capping Waste Tank 12H Waste Transfer Piping* (M-ESR-H-00444) (cut and cap Tank 12 transfer line coming from Riser 7 on south side of tank) and *Federal Facility Agreement Assessment Report for Waste Tank 12H Annulus Conductivity Probes* (M-ESR-H-00460) (dismantle and remove annulus leak detection conductivity probes located in the North and South Risers). Upon isolation from the transfer system the waste tank was prepared for operational closure.

3.2 Grouting

Grouting activities on Tank 12 began on January 19, 2016. As noted in Section 1.0, DOE documented completion of operational closure on April 28, 2016. Tank 12 was grouted in accordance with the Tank 12 CM, consistent with the *Tank 12H Grout Strategy*. [SRR-LWE-2014-00147] It was estimated that 3,927 cubic yards of grout would be required to fill the tank primary, 583 cubic yards would be required to fill the annulus, and 45 cubic yards would be

required to fill the primary and annulus risers (including four spray chambers). [SRR-LWE-2016-00036]

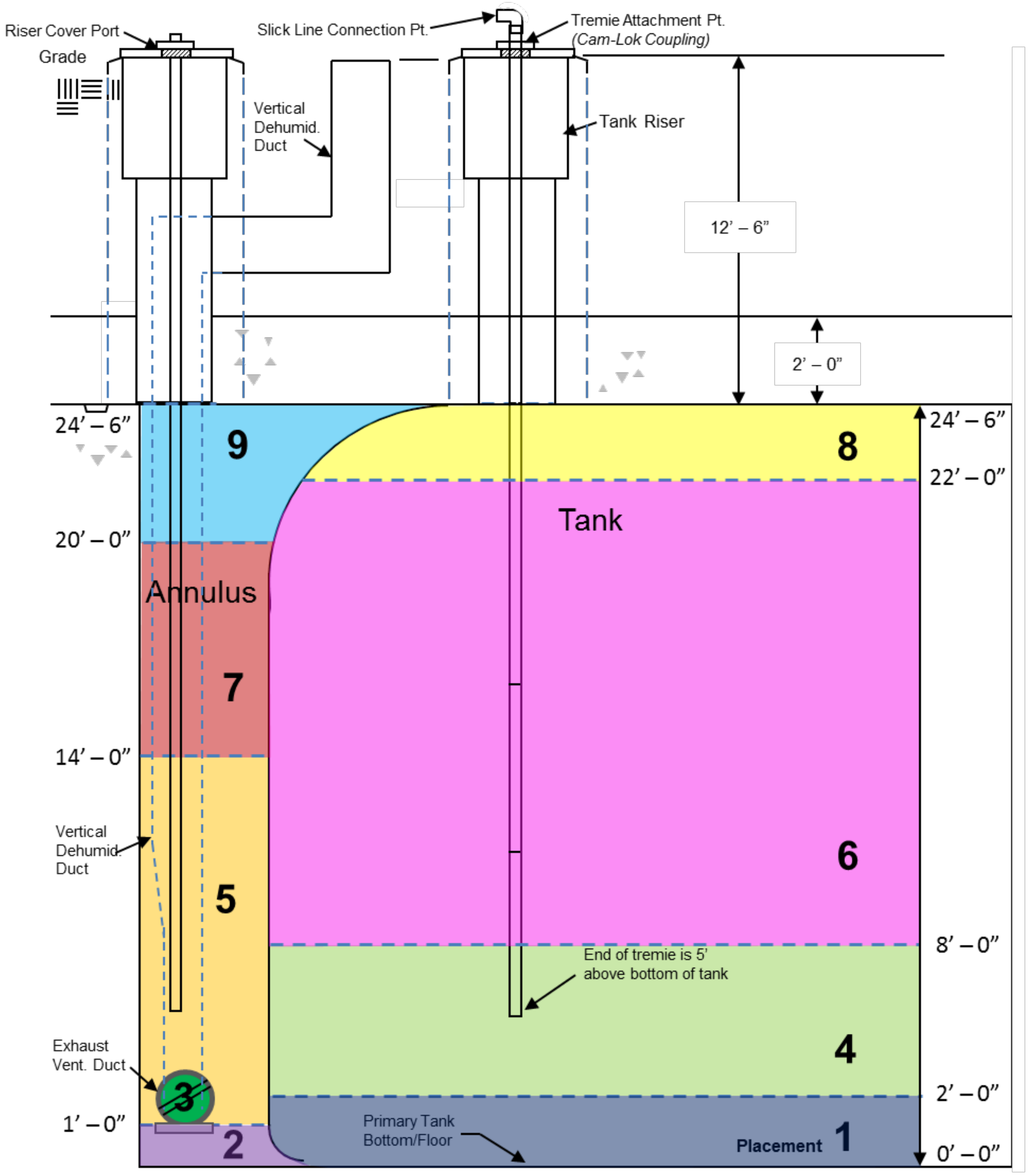
A structural analysis of the anticipated stresses on the tank primary liner anticipated during placement of grout in the waste tank was performed. Based on the results of the structural analysis, the following lift height limits to prevent tank wall failure, are applicable to Type I and Type II Tanks:

1. Height of annulus grout above primary grout is limited to less than or equal to 6 feet.
2. Height of primary grout above annulus grout is limited to less than or equal to 8 feet.

Otherwise, lift heights are at the discretion of the field grouting team and are often influenced by resources and schedule. [T-CLC-F-00496]

A grout sequence comprised of nine lifts was performed which cycled grouting at specific heights between the tank primary vessel and tank annulus. See Figure 3.2-1 for the nine-lift grouting sequence that was used for Tank 12. The purpose of the 2-feet thick Lift 1 was to support the cooling coils and eliminate the concern of tank floating.

Figure 3.2-1: Grout Sequence for Tank 12



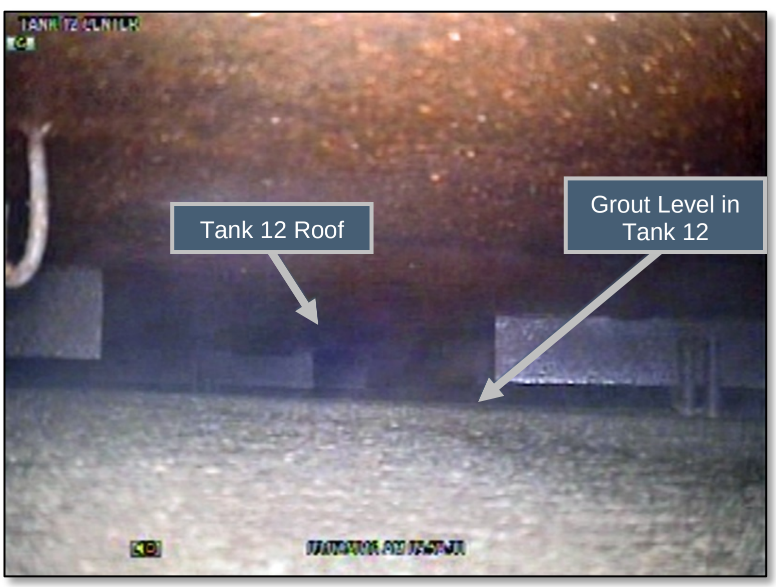
3.2.1 Tank Interior Bulk Fill Summary

Reducing grout was used to fill the entire volume of the Tank 12 interior. Tank interior bulk fill was comprised of lifts 1, 4, 6, and 8 (Figure 3.2-1). Grout was added to the waste tank using portable grout pumps filled from cement mixer trucks. The pumps pushed the grout through slick lines to risers of the waste tank. 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. The grout adequately flowed from the risers around internal obstructions (support columns and cooling coils) to other areas of the waste tank without significant mounding (Figures 3.2-2 and 3.2-3).

Figure 3.2-2: Bulk Fill Grout under Riser 5 during the Filling Process (Lift 6)

Figure 3.2-3: Grout Level Approaches Tank Roof near the End of Lift 8



It was conservatively estimated that 3,927 cubic yards of grout would be required to fill the Tank 12 primary. The estimated volume of 3,927 cubic yards of grout equates to 793,152 gallons. This volume is greater than the nominal operating capacity of a Type I tank

(750,000 gallons). The operating capacity is based on a fill level approximately 18 inches below the tank roof. Approximately 3,887 cubic yards of grout were actually poured. The actual volume of grout poured into Tank 12 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. 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 (3,887 cubic yards) being underestimated.

The first 213 cubic yards of Lift 1 was comprised of grout with Grade 100 slag. The remainder of the grout for Tank 12 used Grade 120 slag because Grade 100 slag was not available. The use of Grade 120 slag in tank closure grout was evaluated and determined to be consistent with the inputs and assumptions contained within the Tank Farm Performance Assessments (PA). [SRR-CWDA-2015-00088, SRR-CWDA-2015-00057] Prior to the start of grouting Tank 12, the grout specification was revised to allow either Grade 100 or Lehigh Grade 120 slag. [C-SPP-F-00055] Lehigh Grade 120 slag was recommended based on testing. [VSL-15R3740-1]

During bulk fill, relatively small quantities of water/liquid in the tank tended to accumulate at low areas at the tank perimeter, typically not under risers where grout was delivered. Therefore, grout was not typically poured directly into standing water/liquid. Grout flowed into the low areas and pushed around the water/liquid. This phenomenon did not present an issue with segregation. Additionally, water/liquid on the surface of grout is not expected to degrade cured grout properties.

Quality control of the original grout production and delivery was implemented in accordance with the grout procurement specification. [C-SPP-F-00055] 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 205 grout test cylinders were tested for compressive strength. The average 28-day compressive strength was 2,383 pounds per square inch, well above the value of 2,000 pounds per square inch described in the Tank 12 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. [SRR-LWE-2016-00036]

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 12 CM are described as follows:

> During lift 6, several small cracks were observed under Tank 12, Riser 1 during the morning inspection on February 22, 2016 (Figure 3.2-4). The longest crack was estimated to be less than three feet long. Grout had been poured in this riser during the previous pour which occurred five days earlier. The cracks were only observed in this location. These cracks appear to be shallow and would not be deeper than the previous daily pour which was less than 2 feet thick. These localized surface cracks were

determined to have minimal impact on the HTF PA because these cracks would not significantly increase the amount of groundwater traveling through the grout monolith to the residual waste at the bottom of the tank. They would not appreciably impact grout performance with respect to waste tank stability, flow through the tank, or the reducing capacity of the grout. . [SRR-LWE-2016-00036, SRR-CWDA-2010-00128, SRR-CWDA-2015-00074, SRR-CWDA-2012-00051]

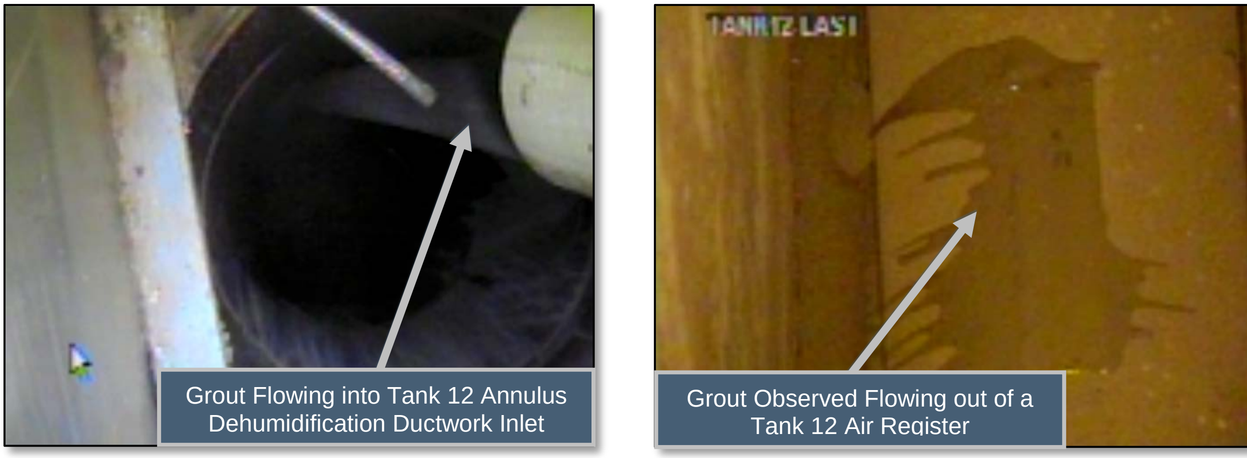
Figure 3.2-4: Surface Cracks in Grout under Tank 12, Riser 1

3.2.2 Annulus Bulk Fill Summary

Annulus bulk fill was performed in Tank 12 from February 8, 2016 to March 1, 2016, and was comprised of lifts 2, 3, 5, 7, and 9 (Figure 3.2-1).

Grout was poured into the dehumidification ductwork inlet and was observed flowing out of two air registers (6-inch by 14-inch openings in the top of the duct) into the annulus in locations that could be viewed with the camera in the East annulus riser. Grout flowing out of the registers indicated that this section of the ductwork interior was filled (Figure 3.2-5). It can reasonably be concluded that the entire duct is adequately filled with grout because the duct was found to have no collapsed areas that could potentially block grout flow during a 100% camera inspection in 2012. [C-ESR-G-00003] Additionally, the sixteen air registers provide other avenues for grout to flow into the duct during annulus bulk fill.

Figure 3.2-5: Grouting the Tank 12 Annulus Dehumidification Ductwork (Lift 3)



It was estimated that 583 cubic yards of grout would be required to fill the Tank 12 annulus. Approximately 613 cubic yards of grout were poured in the annulus. The grout formulation used for the primary fill was also used for the annulus and the entire annulus duct (Figure 3.2-6). [SRR-LWE-2016-00036] 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 waste 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.

Figure 3.2-6: Annulus Bulk Fill Grout during the Filling Process (Lift 5)

3.2.2.1 Exceptions/Clarifications to Annulus Grouting Plans

Water was observed flowing into the duct through a crack in the duct wall prior to final grouting of the dehumidification ductwork. It was speculated that the source of the water

was groundwater in-leakage because this ductwork location is under the water table. Approximately 500 gallons of water was pumped out down to an estimated 2-inch remaining liquid level prior to adding the final amount of grout to fill the ductwork inlet (Figure 3.2-7). The rate of water in-leakage was estimated to be approximately 6 gallons per hour, and grout was poured into the ductwork approximately 1.5 hours after the liquid was pumped out.

Performance Assessment assumptions revolve around the final cured grout properties. The cured grout meets the HTF PA assumptions. The HTF PA contains assumptions regarding both mechanical and chemical properties of the tank fill grout. These assumptions pertain to the waste tank grout's performance with respect to 1) grout chemical properties, 2) waste tank stability, and 3) tank flow modeling. This small amount of water in the duct would not create grout property conditions different from those assumed in the HTF PA.

Figure 3.2-7: Water in Annulus Ductwork Inlet Being Removed Prior to Filling with Grout

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 achievable. 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-2016-00036] Calculated fill volumes of the internal void space of in-tank equipment was compared to actual grout volumes injected into the equipment (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 12H 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-2014-00147] The grout placed in the Submersible Transfer Pump in Riser 7, the thermowells in Risers 4 and 7, and other equipment grouted in the closed waste tank minimized the potential for vertical fast flow paths 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. [SRR-LWE-2016-00036, SRR-CWDA-2012-00051]

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

Equipment	Location	Calculated Fill Volume (Gallons)	Actual Grout Volume (Gallons)
Reel Tape Riser Plug Penetration	Riser 4 (Note 1)	1.6	1.5
High Liquid Level Conductivity Probe (HLLCP) and Housing	Riser 4	1.7	1.5
Thermowell and Housing on Tank Floor	Riser 4	1.8	1.5
Spray Lance	Riser 4	1.2	1.0
H&V Riser Drain	Riser 4	1.0	1.5
Submersible Transfer Pump (STP)	Riser 7	22	39 (Note 2)
Thermowell	Riser 7	2.0	1
STP Caisson Lance	Riser 7	4.75	4
Conductivity Probe #1	North Annulus Riser	0.3	0.25
Conductivity Probe #2	North Annulus Riser	0.25	0.25
Steam Jet (Core and Discharge Line)	North Annulus Riser	22.0	26.0
Steam Jet (Jacket)	North Annulus Riser	8.5	1.0 (Note 3)
Conductivity Probe #1	South Annulus Riser	0.2	0.25
Conductivity Probe #2	South Annulus Riser	0.2	0.25

Note 1: The reel tape plug penetration in Riser 4 was a pipe that extended through the riser plug. The small line terminated just under the plug and was not deemed as "equipment" with regards to the Tank 12CM. Therefore, the pipe was not listed in the Tank 12 CM, Table 7.2.1. [SRR-LWE-2016-00036]

Note 2: The larger than calculated actual grout volume for the STP is attributed to grout initially flowing out of the open end of the bottom of the pump. STP grout fill was temporarily halted, and grout was placed in the bottom of the STP caisson to seal the pump. When STP grout fill was resumed, the STP filled with grout as expected.

Note 3: The steam jet jacket is a nominal 3-inch diameter schedule 40 pipe that surrounds the steam jet core which is a nominal 2-inch diameter schedule 40 pipe. Therefore, the annulus opening inside the jacket around the core pipe is less than ½ inch wide. This small opening proved difficult to fill and received only 1 gallon of grout.

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 12 CM are described below. [SRR-LWE-2016-00036]

- In November 2015, a wall crawler with an ultrasonic wall thickness testing device was installed in the annulus East Riser to obtain Tank 12 primary vessel wall thickness data. After the inspection, the crawler equipment was abandoned in the annulus and was entombed with grout. Table 7.2-2 of the Tank 12 CM did not list the crawler equipment. The grout plan in Table 7.2.1 of the Tank 12 CM stated that the transfer jet in Riser 6 would be grout-filled. The abandoned transfer jet was found to be suspended in the riser below the top riser plate. Based on the transfer jet location and misalignment with the riser plate opening, the jet could not be directly grouted. An indeterminate amount of grout was gravity fed into the transfer jet when grout was introduced into the riser and the transfer jet was entombed. The transfer jet in Riser 6 is expected to be partially grouted, and not expected to have the requisite configuration and void space to appreciably impact grout performance.
- Table 7.2-2 of the Tank 12 CM listed one HLLCP in the North Annulus Riser and One HLLCP in the South Annulus Riser. During grouting, it was discovered that both risers contained two HLLCPs. All HLLCPs were grouted as shown in Table 3.2-1.
- During grouting, a spray lance was found in Riser 4. The spray lance was not listed in Table 7.2-1 of the Tank 12 CM. The spray lance was grouted as shown in Table 3.2-1.
- A caisson lance was installed in Riser 7. The caisson lance was not listed in Table 7.2-1 of the Tank 12 CM. The caisson lance was grouted as shown in Table 3.2-1.
- Two small dewatering pumps and associated hose sections were left in the annulus under the West Riser and entombed with grout. These small pumps were not listed in Table 7.2-1 of the Tank 12 CM.

3.2.4 Cooling Coil Grouting

Cooling coils are nominal 2-inch diameter schedule 40 carbon steel seamless pipes. Specially formulated and previously tested cooling coil grout was mixed in a hopper near the tank tops. The cooling coil 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.

There were no exceptions/clarifications to the cooling coil grouting as described in the Tank 12 CM and grout strategy. [SRR-CWDA-2014-00086, SRR-LWE-2014-00147, SRR-LWE-2016-00036]

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-2014-00147] Cooling coils were identified as "failed" when they were unable to maintain pressure. 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 12 had 28 failed coils that were unable to maintain pressure.

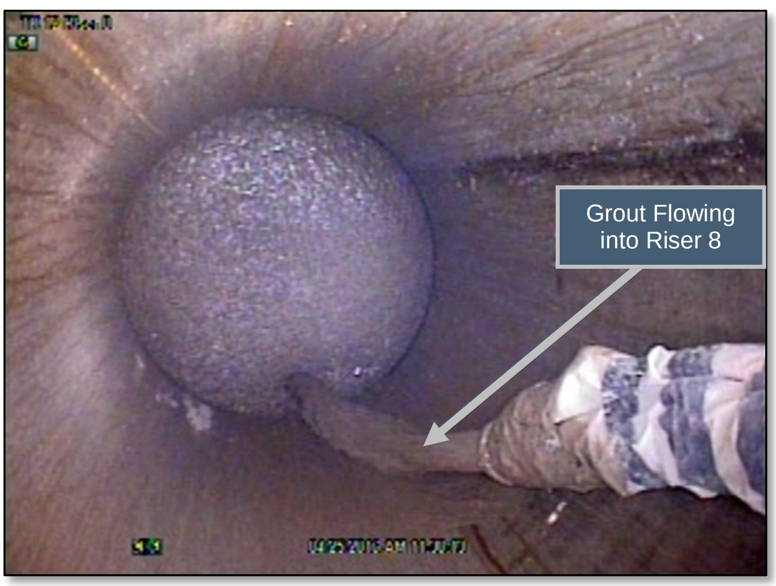
Intact Cooling Coil Grouting

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-2016-00036]

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. Final riser grout fill activities were completed on May 2, 2016. The estimated volume to fill the risers was 45 cubic yards (including four spray chambers). This estimated volume accounts for approximately five cubic yards of volume associated with riser plugs that remained in some risers. Approximately 26 cubic yards were actually used to fill the risers and spray chambers. The lower actual volume can be partially attributed to bulk fill grout from the primary present in the risers prior to riser fill. Visual inspection indicated the risers and spray chambers were filled with grout. Figure 3.2-8 shows Riser 8 being filled with grout.

Figure 3.2-8: Riser 8 Grout Fill



3.2.5.1 Exceptions/Clarifications to Riser Fill Plans

Liquid was observed in several Tank 12 primary risers as the grout level approached the tank roof (Figure 3.2-9). The sources of the liquid were speculated to be liquid that was present on the tank floor when grouting was initiated, rain water intrusion from riser openings, liquid used to lubricate the slick lines and tremmies prior to initiating grouting each day, and groundwater in-leakage observed coming from a crack near the bottom of Riser 8 (Figure 3.2-10). Tank 12 is beneath the water table. The liquid was pumped out of the risers prior to completing riser fill (Figure 3.2-11). A total of approximately 1,200 gallons of water/liquid were pumped out of seven tank risers (Risers 1, 2, 5, 6, 7, 8, and Center). The pump was typically capable of pumping the liquid level down to approximately two inches in the riser. This small amount of water/liquid was considered inconsequential to grout integrity.

The ground water in-leakage from the leaksite near the bottom of Riser 8 was informally estimated to be 5 gallons per hour. Grout was poured into Riser 8 in less than 1.5 hours after the liquid was pumped out. Performance Assessment assumptions revolve around the final cured grout properties. The cured grout meets the HTF PA assumptions. The HTF PA contains assumptions regarding both mechanical and chemical properties of the tank fill grout. These assumptions pertain to the waste tank grout's performance with respect to 1) grout chemical properties, 2) waste tank stability, and 3) tank flow modeling. This small amount of water in the riser would not create grout property conditions different from those assumed in the PA. Note that there is no free liquid present as Riser 8 is filled with grout (Figure 3.2-8).

Figure 3.2-9: Liquid in Riser 8 Prior to Pump Out

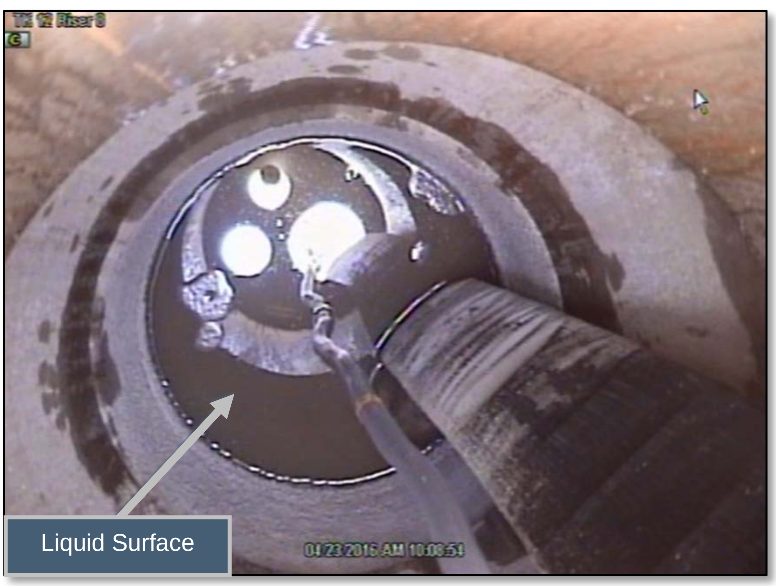


Figure 3.2-10: Groundwater Leaksite near the Bottom of Tank 12, Riser 8

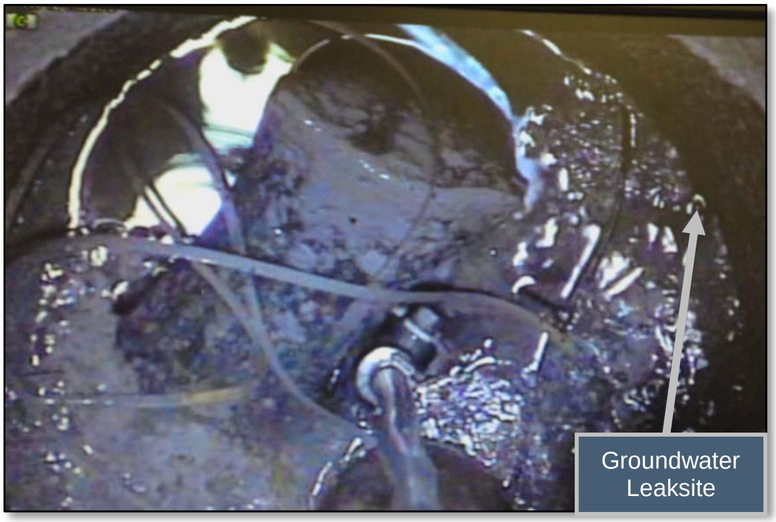


Figure 3.2-11: Liquid Being Removed From Riser 8 Prior to Grouting

The primary work packages that implemented grouting of Tank 12 can be retrieved from SRS Records Management, upon request. The work package that addressed grout preparations for bulk fill and riser fill is 01337683-33. The work package that addressed equipment fill preparation and equipment fill is 01337683-51. The work packages that addressed cooling coil grouting are 01337683-50 and 01337683-31. Since Tank 12 had been isolated from the operating facility, configuration control of waste tank grouting activities was maintained by work packages, consistent with the isolation plan. [M-CTP-H-00003]

4.0 MONITORING

As required by the Tank 12 CM, DOE will perform annual inspection and maintenance activities during the interim period between operational closure of Tank 12 and the final closure of the HTF operable unit. There are no ancillary structures associated with Tank 12 that will be removed from service in the future which require tracking in future waste tank closure modules.

As described in Section 8.0 of the Tank 12 CM, the annual visual inspections of the area surrounding Tank 12 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. Examples of potential maintenance actions include repairing large cracks in the tank roof or riser grout, removal of large vegetation with roots that could damage the tank top, removal of a structure with the potential to fall and damage the tank top, and filling in large washed out/eroded soil areas near the tank. 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 12 CM, and to satisfy requirements of Section IX of the SRS FFA. [SRR-CWDA-2011-00022, SRR-CWDA-2014-00086, WSRC-OS-94-42] This report documents the final configuration of operationally closed Tank 12 in the HTF at the SRS and describes field conditions that differ from those described in the Tank 12 CM and Tank 12 CMA. [SRR-CWDA-2014-00086, SRR-CWDA-2015-00074]

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 12 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 12 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 12.

Stamp

Name: Andrew R. Redwood

License Number: 20525

7.0 REFERENCES

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