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Revision 0

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Tank 17-F Closure
Strong Grout

Retention Time: Permanent

GROUT PLACEMENT REQUIREMENTS FOR SRS CLASS C TANK RESIDUAL WASTE FORMS (U)

Christine A. Langton

April 5, 2005

APPROVED for Release for
Unlimited (Release to Public)

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808

Prepared for the U.S. Department of Energy Under Contract Number DE-AC09-96SR18500

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SUMMARY/DISCUSSION

Grout placement requirements for stabilizing Class C Tank Residual Wastes at SRS are summarized in Table 1. The requirements are based on 10CFR61.55(a)(8) which allows calculating the radionuclide concentrations in the Class C waste form using the weight or volume of the waste form rather than only that of the waste itself.

The concentration averaging calculation described in the *NRC Branch Technical Position (BTP) on Concentration Averaging and Encapsulation*, January 17, 1995 was followed for stabilizing the tank residuals in SRS Tanks 17 and 20. The same averaging logic and calculation will be applied to stabilization of the residual material in Tanks 18 and 19. The objectives of the grout placement in Tanks 18 and 19 are identical to those approved by the NRC for Tanks 17 and 20. However, the mechanics and logistics of the grout placement have been simplified as the result of improvements in the grout slurry properties and experience gained during the Tank 17 and 20 closures.

Table 1 also contains a comparison of the methodology identified to meet the waste form stabilization requirements for Tanks 17 to 20. As additional experience is gained continual improvement in the mechanics of the process is expected.

Table 1. Grout Placement and Delivery Requirements for SRS Tank Closure

Requirement	Actions taken to achieve requirement			
	Tank 20 Completed	**Tank 17 Completed**	**Tank 19 Planned**	**Tank 18 Planned**
Section 3.2 of the BTP 10CFR 61.56 Stability requirements				
i. Resistance to subsidence	Completely fill tanks with load bearing grout(s) that have a minimum compressive strength of 50 psi.		Same as Tank 17 and 20	
ii. Resistance to dispersion	The grouts used to fill the tanks are very insoluble in water. Insoluble quartz sand grains makeup a significant portion of the fill. The sand is cemented together by inorganic very low solubility cemetitious phases. Completely fill tanks with grout(s) formulated with insoluble quartz sand and Portland cement, fly ash, slag binder. The fill material is an inorganic layered mass that can be described as a man-made sedimentary rock in which quartz sand is cemented together by matrix phases formed as the result of ambient temperature hydration of the binder materials.		Same as Tank 17 and 20	
iii. Reduction in the likelihood of inadvertent intrusion	A 2000 psi grout was cast in place inside of the tanks as the final layer to provide a deterrent to future drilling and excavation activities. 2000 psi grout was determined to be sufficiently more difficult to drill or excavate than the surrounding natural/surficial soil cover material.		Same as Tank 17 and 20	

Table 1 (continued). Grout Placement and Delivery Requirements for SRS Tank Closure

Requirement	Actions taken to achieve requirement			
	Tank 20 Completed	**Tank 17 Completed**	**Tank 19 Planned**	**Tank 18 Planned**
Section 3.2 of the BTP on Concentration Averaging based on 10 CFR Part 61.55(a)(8)				
Radionuclide concentration averaging calculation	Averaging calculations were performed using the weight of the solidified mass per protocol in Section 3.2 of the BTP.			
a. Waste form	Reducing Grout + Reducing Dry Grout		Reducing Grout 2 + Reducing Dry Grout 2 Reducing Grout 2 was designed to improve: • Production and placement properties • Maintain and improve radionuclide stabilization	
b. Waste form Homogeneity Testing at the SRS and the Construction Technology Laboratory (CTL) with simulated tank residue waste demonstrated that some of the settled solid residue was mixed or incorporated in the grout as it flowed over the bottom of the various forms. The liquid portion of the waste residue was displaced by the grout and some of it mixed into the grout as it flowed to fill the test forms. The remainder of the liquid waste residue was displaced by the reducing grout (about two times the spg of the liquid residue) and treated/immobilized with dry grout.	The solid and liquid fractions of the residual tank waste were incorporated in the Reducing Grout used to close the tank. The inspection of the top surface of the Reducing Grout was performed prior to continuing with the closure activities. Isolation of the settled waste residue by the Reducing Grout was observed and monitored during Tank placement of the grout. Displacement of the liquid portion of the residual waste by the heavier grout was also observed. Dry grout was applied to solidify and stabilize the liquid portion of the waste.	Same as Tank 20	Same as Tank 20	Same as Tank 20

Table 1 (continued). Grout Placement and Delivery Requirements for SRS Tank Closure

Requirement	Actions taken to achieve requirement			
	Tank 20 Completed	**Tank 17 Completed**	**Tank 19 Planned**	**Tank 18 Planned**
Section 3.2 of the BTP on Concentration Averaging based on 10 CFR Part 61.55(a)(8)				
Radionuclide concentration averaging calculation	Averaging calculations were performed using the weight of the solidified mass per protocol in Section 3.2 of the BTP.			
c. Drop Height	2 to 10 feet (No segregation was observed in testing for drop heights up to 10 feet. Greater drop distances were not tested but segregation is not expected based on the cohesiveness of the grouts.)	2 to 10 feet (No segregation was observed in testing for drop heights up to 10 feet. Greater drop distances were not tested but segregation is not expected based on the cohesiveness of the grouts.)	Same as Tank 20	Same as Tank 20
d. Pour Points	7 A conservative approach was adopted for placement of the first reducing grout formulation in a HLW tank at SRS. Multiple pour points were used rather than a single pour point demonstrated at the CTL, March 1998 (45 foot long "bow tie" form), because of uncertainty in the grout flow properties under field conditions (hot weather, field-scale production and pumped over 1500 feet)	5 A slightly less conservative approach was used for the second tank.	1 The current plan is to place grout through the center riser as was done for the Bulk Fill Grout in Tanks 17 and 20. Successful placement of the Reducing Grout 2 formulation using a single pour point is anticipated because the fresh properties are similar to the Bulk Fill and Capping Grouts which were placed using single pour points in Tanks 17 and 20. Grout flow and incorporation of liquid heel will be closely monitored in Tanks 18 and 19 as was done in Tanks 17 and 20. If additional pour locations are required to cover and incorporate tank residues in the waste form, additional access points will be installed to address the exact area requiring special effort.	
e. Inspection	Inspection was performed throughout the closure operation. No discernable liquid or solid waste was observed on top of the waste form. Significant mixing of the solid residuals and grout was not observed.		Inspection prior to completing the waste form and addition of dry grout if necessary. (Same as Tank 17 and 20.)	

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