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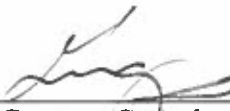
SRR-LWE-2014-00150
Revision 0, March 2015

Tank 16-H Closure Assurance Plan


Prepared By:


Matt Ostler
Closure EngineeringDate: 3/19/15


Concurrence By:


Gregory C. Arthur
Engineering ManagerDate: 3/19/15

Concurrence By:


FOR JIM RUSH
PER TELECOM.
James W. Rush
Tank 16 Project ManagerDate: 3/19/15

Concurrence By:


FOR RICH SALIZZONI
PER TELECOM.
Richard L. Salizzoni
Quality Assurance ManagerDate: 3/19/15

Concurrence By:


John Occhipinti
Engineering ManagerDate: 3-19-15

1.0 INTRODUCTION

Waste removal activities, sample analysis and characterization of residual material, and isolation of services and transfer lines have been completed for Tank 16-H to support operational closure. The next phase of the closure process will be grouting of the tank.

Numerous documents were generated to support the closure process. These documents provide protocols, processes, requirements, and analyses necessary to meet the regulatory requirements for closure. Tier 1 Closure Documentation is required to demonstrate compliance with DOE requirements, as defined in DOE Order 435.1, "Radioactive Waste Management". The key documents supporting the Tier 1 Closure Documentation are as follows:

- National Environmental Policy Act Environmental Impact Statement (EIS)
- H Tank Farm Performance Assessment (PA)
- H Tank Farm Waste Determination Basis Document (WD)
- Savannah River Site Composite Analysis (CA)
- Industrial Wastewater General Closure Plan (GCP)

After approval of the Tier 1 Closure Documentation, an Authorization to Proceed was issued by DOE-HQ.

The Tier 2 Closure Authorization provides the waste tank system-specific information to demonstrate that the process described in the Tier 1 Closure Documentation has been implemented and that the requirements specified in the Tier 1 Closure Documentation have been met. The key documents considered to be part of the Tier 2 Closure Documentation include the following;

- Closure Module (CM)
- Final Waste Removal documentation (includes Maximum Extent Practical (MEP) demonstration)
- Special Analysis (SA)
- Class C Calculation

These documents provide detailed closure information supporting the Tier 2 Closure Authorization from DOE-SR. Tier 2 is DOE's final authorization to proceed with permanent stabilization of the waste tank system.

The purpose of the Tank 16-H Closure Assurance Plan is to identify process and documentation requirements from the Tier 1 and Tier 2 closure documentation and to provide a strategy to ensure that the process requirements are met and that required documentation is generated and retained during the stabilization (i.e., waste tank grouting) of the residual materials in the tank. This plan is considered to be a tool for Savannah River Remediation to ensure that Tank 16-H is closed successfully meeting all regulatory process and documentation requirements.

2.0 APPROACH

The first step to develop the Closure Assurance Plan was to identify the Tier 1 and Tier 2 closure documentation that would be expected to contain process or documentation requirements associated with stabilization of residual material in Tank 16-H. The Tier 1 and Tier 2 documents identified during this step were the PA, the WD Basis Document, the GCP, and the CM. The CM includes the information from the waste removal documentation including the MEP demonstration. In addition, the grout specification was identified in the PA as being an important source for grout quality control requirements necessary to ensure that the grout meets physical and chemical property requirements.

The next step for development of the Closure Assurance Plan was to review the documents listed above and to extract requirements associated with stabilization of the residual material. The results of this effort are provided in the Closure Assurance Requirements Matrix (Attachment 1). This matrix includes a discussion of the requirements, strategies for meeting requirements, and documentation to be generated and/or document numbers if the documentation has already been issued. It should be noted that the WD Basis Document and the GCP did not include any process or documentation requirements associated with residual material stabilization that were not covered in the CM.

The scope of the Closure Assurance Plan is limited to stabilization of residual material. Requirements associated with waste removal, residual material sample analysis and characterization, tank isolation, and waste tank post-grouting maintenance and monitoring activities are not included in this plan. The final grouted tank configuration will be reported in the Final Configuration Report for Tank 16-H. This will include any required adjustments to the grouting strategy and configuration changes based upon field conditions and walkdowns. These types of activities will not be addressed in this Closure Assurance Plan.

Many of the requirements associated with the physical and chemical properties of the grout were verified during development and testing. The closure grout being used in Tank 16-H is the same grout recipe that was developed, tested, and accepted for use in closing Tanks 5-F and 6-F. Requirements associated with the grout development qualification of the closure grout are discussed in detail in SRR-LWE-2012-00036, "Tank 18F and Tank 19F Closure Assurance Plan" and will not be repeated in this Closure Assurance Plan (Initial Trial Batch Qualification will be part of this CAP). In process testing of the grout (as specified in the Grout specification) to ensure quality control of the grout production process is included in this Closure Assurance Plan.

Every requirement specified here in, will require signatures to be obtained upon completion. Some signatures will be acquired during grouting, and some will be obtained after. This document will remain a living document until grout completion.

3.0 PLAN FOR EXECUTION OF TANK GROUTING

The Closure Assurance Requirements Matrix (Attachment 1) lists requirements, associated with stabilization of residual material, identified from the Tier 1 and Tier 2 Closure Documentation. Existing documentation is identified in the matrix which satisfies many of the identified requirements and no additional validation during tank grouting activities is required. This section of the plan (i.e., section 3.0) identifies requirements which have not yet been satisfied and provides a detailed summary of the strategy for meeting the requirements and the documentation required to be generated. The information contained in each table identifies actions to meet requirements, documentation deliverables for the actions, and key assessment/surveillance activities to ensure that the actions are being prepared / performed in accordance with procurement specification and closure plan requirements.

The grouting evolution and documentation requirements can be broken down into several discrete areas. These include 1) initial trial batch qualification; 2) surveillances required prior to production grouting; 3) Savannah River Remediation (SRR) point of delivery sampling and acceptance of delivery; 4) production grout sample testing; 5) supplier certification, testing, and documentation requirements for grout components during production grouting; 6) surveillances of grout supplier and testing laboratories during production grouting; 7) in-tank surveillance of production grouting; and 8) in-tank surveillance of grouting of cooling coils and abandoned equipment.

3.1 Initial Trial Batch Qualification

Listed below are the requirements and documentation for the initial trial batch qualification.

Table 1 – Initial Trial Batch Qualification Requirements and Documentation

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
1. Verify NRMCA certification of the Grout Supplier. Review Supplier's Quality Assurance Program Manual for compliance with the requirements of section 3.4.2 of the specification. Verify proper flow down of requirements to lower tier suppliers [Requirement SPC-PR3.1.1.2 and SPC-QR3.4.2]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
2. Test grout mix components per sections 3.2.3.2 through 3.2.3.9, 4.1.2.1, and 4.1.2.2 of the grout specification (C-SPP-F-00055). [Requirements SPC-DR3.2.1.2A, SPC-DR3.2.3.2 through SPC-DR3.2.3.9, SPC-IT4.1.2.1, and SPC-IT4.1.2.2]	Test Reports for Trial Batching Grout Mix Component Tests	Supplier Testing Laboratory Note: If supplier accepts test results from component supplier(s), then the testing laboratories used by the component supplier(s) must meet action 3 below (see specification section 3.4.2.5 & 3.4.4.1 and requirements SPC-QR3.4.2 & SPC-QR3.4.4 in Attachment 1).

**Table 1 – Initial Trial Batch Qualification Requirements and Documentation
(continued)**

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
3. Procure the services of a testing laboratory, which conforms to ASTM E329 and ASTM C1077, for initial qualification of the grout and mix components. Submit documentation showing testing laboratory qualification. Exceptions to qualification must be submitted to SRR via Supplier Deviation Disposition Requests (SDDR) and must be accepted by SRR prior to initial trial batching. [Requirement SPC-QR3.4.4 and SPC-D3.10]	1. Qualification documentation for Supplier Testing Laboratory 2. SDDRs as needed (with SRR acceptance) for exceptions to qualification requirements.	Grout Supplier SRR Design Services
4. Test trial batch grout for slump flow, bleed, and compressive strength per section 3.2.1.2 of the grout specification [Requirement SPC-DR3.2.1.2A]	Test Reports	SRR Testing Laboratory
5. Procure the services of a testing laboratory, which conforms to ASTM E329 and ASTM C1077, for initial qualification of the grout. [Requirement SPC-QR3.4.4, SPC-D3.10, and SPC-IT4.2.1]	Qualification documentation for SRR Testing Laboratory or SRR Quality Assurance (QA) review of qualification of laboratory as documented in surveillance report.	SRR Testing Laboratory or SRR Quality Assurance
6. Complete sufficient trial batching to demonstrate capability to provide Tank Closure Grout production to meet specification requirements. [Requirement SPC-DR3.2.1.2A]	SRR Technical Summary Report [Note 1: Documentation provided from actions 1 through 4 above provide the basis for this document and should be referenced. Note 2: Completion of the summary report is not required prior to the start of production grouting.]	SRR Design Services

Changes to the initially qualified grout mix recipe must be evaluated for impact to qualification and to previous SRNL testing. If re-qualification is not required, then an evaluation and justification should be provided by SRR Closure Engineering in a Technical Report and/or an Unreviewed Waste Management Question Evaluation (see procedure ENG.46, S4 Manual). [See requirements SPC-DR3.2.1.1 and SPC-DR3.2.1.2B in Attachment 1]

3.2 Surveillances Required Prior to Production Grouting

Listed below are surveillances and assessments for the Grout Supplier and Testing Laboratories to ensure that they meet the requirements of the grout specification (C-SPP-F-00055). These surveillances and assessments should be completed prior to production grouting and any corrective actions identified should be implemented prior to the production grouting.

Note that where QA surveillances are identified, the surveillances/assessments will typically be performed by a QA led team including Subject Matter Experts as appropriate (especially where detailed code compliance reviews are indicated). Surveillances/assessments are generic words for the purpose of this plan and final documentation may include surveillances, assessments, or other forms of documentation such as reports, receiving inspections, etc.

Table 2 – Surveillances Required Prior to Production Grouting

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
<p>1. Review batch ticket form to ensure that it will capture all vendor supplied information required by the grout specification (C-SPP-F-00055).</p> <p>Required information includes;</p> <ul style="list-style-type: none"> a. Grout mix identification (by name or mix ID number) b. Component identification and quantities (including any admixtures used) c. Mixing start time d. Initial truck drum counter reading (unless counter is reset for each batch) e. Quantity of water available for addition by SRR at point of delivery (hold water) f. Initials of Supplier <p>[Requirements SPC-PR3.1.2.1, SPC-PR3.1.2.3, SPC-PR3.1.2.4, SPC-PR3.1.2.6, SPC-DR3.2.1.2C and SPC-DR-3.2.2]</p>	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
<p>2. Review completed batch ticket(s) from trial batch grouting (or interview Construction) to ensure that the SRR documentation on the batch ticket meets (or will meet) specification requirements. Required information includes;</p> <ul style="list-style-type: none"> a. Discharge completion time 	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance

Table 2 – Surveillances Required Prior to Production Grouting (continued)

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
Action 2 continued b. Number on truck drum revolution counter at completion of discharge (indicates total drum revolutions) c. Total time (start of mixing time to the discharge completion time) d. Quantities of admixtures added at point of delivery e. Water added at point of delivery (not to exceed hold water amount recorded on batch ticket by supplier) f. SRR acceptance of load by signature or initials [Requirements SPC-PR3.1.2.1, SPC-IT4.1.4.1A through F, SPC-PR3.1.2.5, and SPC-PR3.1.2.6]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
3. Verify that the Supplier's Measuring & Testing Equipment (M&TE) instrument calibration program meets the requirements of NQA-1 Subpart 2.5 paragraph 703, ASTM C94, and NRMCA QC3. [Requirement SPC-IT4.1.1]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
4. Verify that the Supplier's procedure for determining the amount of water that can be added at the point of delivery (i.e., hold water) is calculated properly and includes; a. Water added to grout mix at Supplier's facility b. moisture content of the fine and coarse aggregates added to grout mix at Supplier's facility c. maximum water content of grout (based upon the water-to-cementitious material ratio and total quantity of grout in batch) [Requirement SPC-PR3.1.1.4A, SPC-PR3.1.2.4, and SPC-DR3.2.1.2C]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
5. Verify that the Supplier uses water (and ice if required) that conforms to ASTM C94/C94M. [Requirement SPC-DR3.2.3.1]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance

Table 2 – Surveillances Required Prior to Production Grouting (continued)

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
6. Verify proper flow down of technical and quality requirements of the grout specification from the Grout Supplier to their subcontractors. [Requirement SPC-QR3.4.2]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
7. Verify that no unapproved material substitutions were made in the grout mix recipe during initial grout trial batch qualification. [Requirement SPC-D3.10]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
8. Verify that the SRR Testing Laboratory performs grout testing per ASTM Standards as listed in Attachment 5.3 of the grout specification. The focus of the surveillance should be on proper controlled storage of sample specimens, sample curing, sample capping, sampling methods, and test methods. [Requirements SPC-IT4.1.5.1]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance

3.3 SRR Point of Delivery Sampling and Acceptance of Delivery

This section of the plan provides details for SRR acceptance of each truck of grout using the batch ticket process. The section also provides details of the sampling requirements for the production grout.

Table 3 – SRR Point of Delivery Sampling and Acceptance of Delivery

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
1. Review batch ticket at point of delivery for acceptance. Verify the following: <ul style="list-style-type: none"> • Verify the correct grout mix is identified (by name or mix identification number) • Mixing start time is indicated • Hold water is indicated • Batch ticket has been initialed by the Supplier 	1. Completed and accepted batch ticket (via initials or signature of Construction) 2. Completed Receipt Inspection Criteria Package (RICP) Reports	SRR Construction SRR Quality Assurance

Table 3 – SRR Point of Delivery Sampling and Acceptance of Delivery (continued)

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
<p>Action 1 continued</p> <p>Enter the following information on the batch ticket or in the Daily Truck Log;</p> <ul style="list-style-type: none"> • Number on truck drum revolution counter at completion of discharge (total number of revolutions) • Discharge completion time • Total time (start of mixing time to the discharge completion time) • Quantities of admixtures added at point of delivery • Water added at point of delivery (not to exceed hold water indicated) • SRR acceptance of load by signature or initials <p>Admixtures and hold water may be added to the batch as needed (subject to limits specified in Attachment 5.5 of the specification) to adjust slump flow to within acceptable range (at the direction of SRR).</p> <p>Complete discharge within 90 minutes or before 300 drum revolutions, whichever comes first (within exceptions allowed by the specification)</p> <p>[Requirements SPC-PR3.1.2.1, SPC-PR3.1.2.3 through SPC-PR3.1.2.6, SPC-DR3.2.1.2C, SPC-DR3.2.2, and SPC-IT4.1.4.1A through SPC-IT4.1.4.1F]</p>		
<p>2. Obtain required Samples</p> <p>One sample set is required for the first batch each day and one sample set is required, at random, for the second 100 cubic yards delivered each day.</p> <p>Seven (7) sample cylinders are required for each set of compressive strength tests.</p> <p>Samples are also required for slump flow, temperature, air content, bleeding of the grout, and yield.</p> <p>[Requirements SPC-IT4.1.4.1C, SPC-IT4.1.5.1, SPC-IT4.1.5.6, and SPC-IT4.1.5.7]</p>	Completed Receipt Inspection Criteria Package (RICP) Reports	SRR Quality Assurance (QA)

3.4 Grout Sample Testing

Grout testing will be performed by the SRR Testing Laboratory. Sample results will be reported, when available, to the project team.

Table 4 – Grout Sample Testing

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
1. Perform testing of the grout per Attachment 5.3 of the grout specification. Required test parameters are listed below; <ul style="list-style-type: none"> • Slump flow • Temperature* • Air Content* • Unit weight/yield* • Bleeding of the grout • Compressive strength * For information only [Requirements SPC-IT4.1.4.1C, SPC-IT4.1.5.1, SPC-IT4.1.5.6, and SPC-IT4.1.5.7]	Test Report(s)	SRR Testing Laboratory

3.5 Supplier Testing, Certification, and Documentation Requirements for Grout Components During Production Grouting

The supplier must obtain certification and/or test documentation for grout components during production grouting. This documentation is required to be submitted to SRR monthly and is summarized below.

Table 5 – Supplier Testing, Certification, and Documentation Requirements for Grout Components During Production Grouting

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
1. Supplier is to obtain certification, documentation, and/or test reports for each new shipment of grout components used during production as described in section 3.2.3 of the grout specification. This information is to be provided to SRR monthly during the production grouting. [Requirement SPC-DR3.2.3.2 through SPC-DR-3.2.3.9]	Component Certifications, Documentation, and Test Reports	Supplier and Supplier Testing Laboratory

Table 5 – Supplier Testing, Certification, and Documentation Requirements for Grout Components During Production Grouting (continued)

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
<p>2. Supplier is to perform testing of fine aggregate and coarse aggregate as specified in sections 4.1.3.1 and 4.1.3.2 of the grout specification. Test results are to be submitted to SRR monthly during the production grouting. A summary of the test requirements and frequency are provided below;</p> <ul style="list-style-type: none"> • Determine moisture content daily • Determine gradation weekly • Determine fineness modulus (for fine aggregate only) weekly • Determine percentage of clay lumps and friable particles every six (6) months • Determine amount of material finer than 75-μm weekly • Determine presence of organic impurities (for fine aggregate only) every six (6) months <p>[Requirement SPC-IT4.1.3.1 and SPC-IT4.1.3.2]</p>	Test Reports (to be reviewed and accepted by Design Services)	Supplier and Supplier Testing Laboratory (acceptance by Design Services)

3.6 Supplier and Testing Laboratory Surveillances During Production Grouting

Periodic surveillances of the grout supplier and the testing laboratories during the production runs are warranted to ensure that the grout specification requirements summarized in Table 5 above are being met. Monthly surveillances shall be performed for this purpose, however, the first monthly surveillance should be performed early during the first month of production grouting in order to identify and correct issues as early as possible. The frequency of surveillance may be reduced (or increased) at the discretion of SRR Quality Assurance based upon ongoing surveillance results.

The periodic surveillances may investigate compliance with any requirement from the grout specification. However, specific attention shall be provided in the areas listed below.

Table 6 – Supplier and Testing Laboratory Surveillances During Production Grouting

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
1. Perform surveillance of Supplier documentation for grout components (see Action 1 and 2 from Table 5 – emphasis should be placed on Action 2 requirements from Table 5) [Requirement SPC-DR3.2.3.2 through SPC-DR-3.2.3.9, SPC-IT4.1.3.1, and SPC-IT4.1.3.2]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
2. Perform surveillance of SRR Testing Laboratory to ensure that production grout testing is being performed per ASTM Standards as listed in Attachment 5.3 of the grout specification. The focus of the surveillance should be on proper controlled storage of sample specimens, sample curing, and testing of compressed strength samples at specified frequencies. [Requirement SPC-IT4.1.5.1]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
3. Perform surveillance of batch tickets to ensure that no unauthorized changes to the grout mix recipe have been made. Also, ensure that amount of admixtures added does not exceed the limits specified in Attachment 5.5 of the specification (or as specified in the latest approved grout mix). [Requirements SPC-DR3.2.1.1, SPC-DR3.2.1.2B, SPC-DR3.2.1.2D, SPC-DR3.2.1.2E, and SPC-D3.10]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
4. Perform surveillance to ensure that vendor practices include truck washing (of the chute) at point of delivery and washing of vendor equipment (truck and mixers if applicable) at production facility as necessary (to ensure grout quality is not affected by contamination from remnants of previous batches). [Requirement SPC-PR3.1.3.1 and SPC-IT4.1.4.3]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance
5. If the time period of the grout contract approaches the expiration date of the Supplier's NRMCA certification, then verify that the grout supplier has renewed their NRMCA certification prior to its expiration. [Requirement SPC-PR3.1.1.2]	Quality Assurance (QA) Surveillance Report	SRR Quality Assurance

3.7 In-Tank Surveillance of Production Grouting of the Primary Tank and Annulus

Note: No surveillances are required by the Documented Safety Analysis (DSA).

In-Tank surveillance of production grouting will be performed to ensure that the grouting process is proceeding as expected and to help ensure that the entire tank is being filled with grout [see requirements PA-2, CM-2, and CM-4]. Video surveillance during production grouting provides an opportunity to identify and resolve grouting anomalies that may occur. The video surveillance strategy to be employed for Tank 16-H is detailed below.

1. Video inspection capability will be provided in each tank for use during production grouting of the primary tank and the annulus.
2. An inspection must be performed during the first thirty (30) minutes of grouting each day to ensure that the grouting process has initiated properly, that the grout is flowing as expected, and that the visual properties of the grout appear as expected.
3. Video monitoring (and recording) may continue for the duration of each days grouting activities, however, after the initial inspection (action 2) has been completed, then grouting activities are not required to be stopped due to a loss of camera inspection capability.
4. If grouting anomalies (e.g., grout line pluggage, void spaces) are identified during the video inspections or monitoring, then the Person In Charge (PIC) will evaluate the condition and will make a decision, with appropriate consultations, with respect to continuation of grouting (for the day) and will record the basis for the decision. The PICs will be briefed regarding what to look for and what to expect to see.
5. The in-tank video surveillance of the production grouting may not be possible once the grout level in the tank approaches the roof of the tank. Once the grout has reached a level in the tank where video surveillance is no longer practical, the inspection performed during the first thirty (30) minutes of grouting each day is no longer required.

The actions to implement the strategy described above are detailed in Table 7 below.

Table 7 – Actions for In-Tank Surveillance of Production Grouting

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
<p>1. Perform in-tank video inspection during the first 30 (30) minutes of grouting each day. This inspection should focus on examining the grouting from the previous day to look for anomalies and on establishment of grout flow as expected during the initiation of grouting for the day.</p> <p>Monitor grouting sequence to ensure that differences in the grout level between the primary tank and the annulus are less than restrictive limits established for structural integrity. Also, ensure that the annulus ventilation duct is grouted in the proper sequence to avoid collapse. See requirements CM-2 and CM-4.</p> <p>Anomalies should be evaluated and documented by the trained Person In Charge (PIC). Documentation can be made by any appropriate form (e.g., Path Forward, Nonconformance Report, or Person In Charge logbook).</p> <p>[Requirements PA-2, CM-2, and CM-4]</p>	<p>1. Video Footage</p> <p>2. Documentation of Anomalies (as applicable)</p>	<p>SRR Inspection Group Person In Charge (PIC)</p>
<p>2. Continue in-tank video surveillance of production grouting during the entire day of grouting, with attention to the grout/tank wall interface, grout/annulus wall interface, and when possible, the leading edge of the flowing grout. (Ref. SRR-LWE-2014-00021) Loss of video capability does not require stopping grouting after action 1 is completed.</p> <p>[Requirements PA-2, CM-2, and CM-4]</p>	<p>1. Video Footage</p>	<p>SRR Inspection Group</p>

All video inspections performed as described above will be kept as records.

3.8 In-Tank Surveillance of Abandoned Equipment and Cooling Coil Grouting

The internal space of major abandoned equipment and cooling coils will be filled with grout to the extent practical [see requirements PA-2, CM-1, and CM-5]. There are no acceptance criteria or quantitative requirements associated with this activity. In-Tank surveillance may be performed during this activity to help determine when the equipment or cooling coils have been filled, but surveillance is not required.

The decision to stop grouting for a piece of abandoned equipment will be made based upon the observation that no more grout is able to be pumped into the equipment/coils or the observation that grout is venting from the piece of equipment/coils.

No regulatory requirements exist for the properties of the equipment fill or cooling coil grouts, therefore, no quality control or test requirements are associated with making these grouts. However, potential equipment/coil fill grouts were evaluated and tested by SRNL and a grout mix recommended by SRNL is being used for equipment fill (grout mix T1A-62.5FA) and for filling the cooling coils (90 wt% Masterflow 816 and 10 wt% Blast Furnace Slag, grade 100). The equipment fill grout will be mixed by SRR Construction forces and work will be controlled via work package. The cooling coil grout will be mixed by SRR Construction or an off-site vendor. Installation will be performed by Construction and will be controlled via work package.

Actions associated with In-Tank Surveillance of Abandoned Equipment Grouting and Cooling Coil Grouting are summarized below.

Table 8 – Actions for In-Tank Surveillance of Abandoned Equipment Grouting and Cooling Coil Grouting

Action [requirement reference from Attachment 1]	Documentation	Responsible Organization
1. If warranted, perform in-tank video surveillance of abandoned equipment grouting. The purpose of this inspection will be to help determine when the equipment has been filled as indicated by grout venting from the equipment. [Requirement CM-1]	Video Footage	SRR Inspection Group
2. As warranted, perform in-tank video surveillance of cooling coil grouting. The purpose of this inspection will be to help determine when failed coils have been filled as indicated by grout venting from the coils. [Requirement PA-2 & CM-5]	Video Footage	SRR Inspection Group

All video inspections performed as described above will be kept as records.

4.0 REFERENCES

1. SRS-CWDA-2010-00128, "Performance Assessment for the H-Tank Farm at the Savannah River Site", revision 1, dated November 2012
2. SRR-CWDA-2013-00091, "Industrial Wastewater Closure Module for the Liquid Waste Tanks 16H H-Area Tank Farm, Savannah River Site", revision 0, dated February 28, 2015.
3. C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, dated December 20, 2012.
4. SRR-LWE-2013-00002, "Tank 16H Grout Strategy", revision 0, dated June 6, 2013
5. WSRC-STI-2008-00172, "Closure of HLW Tanks – Formulation for a Cooling Coil Grout", revision 0, dated April 2008.
6. WSRC-STI-2008-00298, "Closure of HLW Tanks – Phase 2 – Full Scale Cooling Coils Grout Fill Demonstrations", revision 0, dated June 2008.
7. SRNL-L3100-2012-00205, "Batch Plant Proportions for SRNL 2008 Cooling Coil Mix", revision 0, dated December 5, 2012.

ATTACHMENT 1

Closure Assurance Requirements Matrix

Requirement	Source	Discussion	Strategy for meeting Requirement and for Documentation	Requirement Complete
Performance Assessment – Requirements				
Requirement No. PA-1 Reducing grout will be used to fill the entire volume of the Type I, II, III, and IIIA tanks.	SRS-CWDA-2010-00128(PA), revision 1, page 189.	None	Strategy: The reducing grout that was developed and qualified for use in Tanks 18-F and 19-F will be used for grouting Tanks 16-H. No added documentation or verification is needed. C-SPP-F-00055 “Bulk Fill Spec,” C-SPP-F-00057 “Cooling Coil Spec,” SRNL-STI-2011-00564 “Equip Fill,” WSRC-STI-2008-00298 “Cooling Coil Grouting” Documentation: Included in work package 1324150-64.	Requirement Complete: James W. Rush
Requirement No. PA-2 For tank types with cooling coils and annulus, the cooling coils and annulus are grouted to minimize void spaces and for stability.	SRS-CWDA-2010-00128(PA), revision 1, page 189.	Tanks 16H is a Type II tank with an annulus and cooling coils. Grouting of the annulus and the cooling coils is planned.	Strategy: Strategy for grouting Tank 16 (including grouting of the cooling coils and annulus) provided in SRR-LWE-2014-00013 “Tank 16H Grout Strategy” Documentation: Included in work package 1324150-79. (See sections 3.7 & 3.8, Tables 7 and 8)	Requirement Complete: James W. Rush
Requirement No. PA-3 The quality control of the grout production will be included as part of the grout procurement specification.	SRS-CWDA-2010-00128(PA), revision 1, page 189.	None	Strategy: The grout specification includes testing and quality control requirements. Documentation: C-SPP-F-00055 “Furnishing and Delivery of Tank Closure Grout (Bulk Fill Spec.)”	Requirement Complete: QA Representative

Requirement	Source	Discussion	Strategy & Documentation	Complete
Closure Module – Requirements				
Requirement No. CM-1 Several pieces of equipment . . . from the tank will be entombed in place with grout . . . Internal space in this equipment will be filled with grout to the extent practical to minimize void space, as the waste tank is filled.	SRR-CWDA-2013-00091, “Industrial Wastewater Closure Module for the Liquid Waste Tanks 16H H-Area Tank Farm Savannah River Site” (CM), <u>revision 0, section 7.2, page 110.</u>	None	Strategy: Perform equipment grouting per SRR-LWE-2013-00002 “Tank 16H Grout Strategy” Documentation: Included in work package 1324150-78.	Requirement Complete: <hr/> James W. Rush
Requirement No. CM-2 The primary liner and the annulus will be filled with grout in a sequence that will be protective of the wall structure.	SRR-CWDA-2013-00091, “Industrial Wastewater Closure Module for the Liquid Waste Tanks 16H H-Area Tank Farm Savannah River Site” (CM), <u>revision 0, section 7.3.2, page 113.</u>	SRR-LWE-2013-00002, “Tank 16H Grout Strategy”, provides the proper sequencing of grout activities to ensure that the structural integrity of the tank wall is protected.	Strategy: Monitor and maintain control of grouting to meet sequencing requirements via work packages and video inspection. Calculation T-CLC-F-00496 Documentation: 1. Work Package 1324150-64 Refer to Table 7 actions 1 and 2.	Requirement Complete: <hr/> Closure Engineering
Requirement No. CM-3 Quality control requirements of the grout production is included as part of the grout procurement specification (C-SPP-F-00055).	SRR-CWDA-2013-00091, “Industrial Wastewater Closure Module for the Liquid Waste Tanks 16H H-Area Tank Farm Savannah River Site” (CM), <u>revision 0, section 7.3.2, page 113.</u>	None	Strategy: The grout specification includes testing and quality control requirements. Documentation: C-SPP-F-00055 “Furnishing and Delivery of Tank Closure Grout (Bulk Fill Spec.)”	Requirement Complete: <hr/> QA Representative
Requirement No. CM-4 Video cameras will be used during the grout pouring process to monitor for potential void space formations.	SRR-CWDA-2013-00091, “Industrial Wastewater Closure Module for the Liquid Waste Tanks 16H H-Area Tank Farm Savannah River Site” (CM), <u>revision 0, section 7.3.2, page 113.</u>	None	Strategy: The strategy for ensuring that the entire tank is filled with grout will be to monitor the grouting evolution via video cameras. Camera Inspection Plan SRR-LWE-2014-00021 Refer to Table 7 actions 1 and 2.	Requirement Complete: <hr/> Closure Engineering

Requirement	Source	Discussion	Strategy & Documentation	Complete
<p>Requirement No. CM-5 All intact cooling coils will be flushed prior to the introduction of grout into the cooling coils.</p> <p>Grout will be placed into the primary tank prior to the grouting of any cooling coils. Coils that have been severed will be grouted from each end to the extent practicable.</p> <p>The two horizontal cooling coils and all remaining vertical coils will be grouted after the primary tank bulk grout level has reached 20 inches or greater.</p>	<p>SRR-CWDA-2013-00091, “Industrial Wastewater Closure Module for the Liquid Waste Tanks 16H H-Area Tank Farm Savannah River Site” (CM), <u>revision 0, section 7.3.4, pages 116.</u></p>	<p>SRR-LWE-2013-00002, “Tank 16H Grout Strategy”, revision 0 dated June 6, 2013 provides the proper sequencing of grout activities to ensure that the structural integrity of the tank is protected.</p>	<p>Strategy: SRR-LWE-2013-00002, “Tank 16H Grout Strategy”,</p> <p>Documentation: Included in work packages 1324150-36 “Flush,” C-SPP-F-00055 “Bulk Fill Spec,” C-SPP-F-00057 “Cooling Coil Spec”</p> <p>See Table 8 actions 2 and 3.</p>	<p>Requirement Complete:</p> <hr/> <p>Closure Engineering</p>
Grout Specification – Performance Requirements				
<p>Requirement No. SPC-PR3.1.1.1 Production facility mixers and agitators must conform to ASTM C94/C94M (Standard Specification for Ready-Mixed Concrete)</p>	<p>C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.1.1.1</p>	<p>None</p>	<p>Strategy: Accept NRMCA certification of Supplier as evidence of production facility equipment meeting applicable standards.</p> <p>Documentation: Supplier certification documentation</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>
<p>Requirement No. SPC-PR3.1.1.2 Meet the National Ready-Mixed Concrete Association (NRMCA) QC3 Plant Certification Checklist (NRMCA Certification).</p> <p>Submit certification and maintain certification through completion of the contract</p>	<p>C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.1.1.2</p>	<p>None</p>	<p>Strategy: Supplier certification is required to be submitted with the bid proposal and will be verified prior to award of the grout contract. This is required by the procurement process and does not require any action or tracking in the Closure Assurance Plan.</p> <p>Establish a tickler to obtain a new current certification document if the grout contract extends past the expiration date of the certification document. This action is included in section 3.6 and Table 6 (action 5) of this plan.</p> <p>Documentation: Supplier certification documentation</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
Requirement No. SPC-PR3.1.1.3 Measure material components and batch in accordance with ASTM C94/C94M unless noted otherwise in the specification.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.1.1.3	None	Strategy: Accept NRMCA certification as evidence of Supplier’s ability to properly measure material components and to produce grout batches in conformance with specification requirements. Documentation: Supplier certification documentation and Batch Plant Surveillance	Requirement Complete: <hr/> QA Representative
Requirement No. SPC-PR3.1.1.4 Monitor and record the moisture content of the fine and coarse aggregates used.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.1.1.4	Specific requirements for measuring the moisture contents of the fine and coarse aggregates (including frequency) are provided in section 4.1.3 of the specification.	Covered by section 4.1.3 of the specification. See requirements SPC-IT4.1.3.1 and SPC-IT4.1.3.2 (below). Documentation: QA Surveillance Report	Requirement Complete: <hr/> QA Representative
Requirement No. SPC-PR3.1.1.4A Adjust the quantity of the mix water based upon the fine and coarse aggregate moisture contents such that the total quantity of water in any batch does not exceed the quantity specified for the grout mixes.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.1.1.4A	The batch ticket provides an amount of water that can be added at the point of delivery. This value should be based upon the water-to-cementitious material ratio (maximum water content of grout), the water added at the vendor facility, and the moisture content of the fine and coarse aggregates.	Strategy: Perform surveillance of vendor batching procedures (see Table 2 action 4) Documentation: QA Surveillance Report	Requirement Complete: <hr/> QA Representative

Requirement	Source	Discussion	Strategy & Documentation	Complete
Requirement No. SPC-PR3.1.1.5 Provide grout with a temperature range between fifty (50) and ninety (90) degrees Fahrenheit at the point of delivery. Use standards ACI 306R during cold weather concreting and ACI 305R during hot weather concreting.	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.1.1.5	Section 3.1.1.5C of the specification states that this attribute is for information only. Temperature information at point of delivery will be used to make recommendations to the supplier for batching succeeding loads in order to bring delivery temperatures into the desired range. (refer to requirement SPC-IT4.1.5.3)	For information only Temperature will be recorded per requirement SPC-IT4.1.5.1 below) Documentation: See requirement SPC-IT4.1.5.1 below	Requirement Complete: <hr/> QA Representative
Requirement No. SPC-PR3.1.2.1 Provide batch tickets in accordance with section 14.1 and 14.2 of ASTM C94/C94M (except that material components previously accepted by SRR may be identified by the suppliers material identification numbers)	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.1.2.1	Section 14.1 and 14.2 of ASTM C94/C94M requires that the concrete components be identified and the amount used documented on the batch ticket.	Strategy: Perform assessment review of batch ticket. Confirm that it meets the requirements of section 14.1 and 14.2 of ASTM C94/C94M. (See Table 2 actions 1 and 2) Documentation: QA Surveillance Report	Requirement Complete: <hr/> QA Representative
Requirement No. SPC-PR3.1.2.3 If truck mixing is utilized, designate the start time for mixing as the time of the first addition of water to the dry material components (or when all solid materials are in the drum for a stationary mixer). Designate the revolutions on the truck drum revolution counter at the first addition of water to the dry material components (or at the discharge of the stationary mixer into the truck if a stationary mixer is used)	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.1.2.3	Note: If the Supplier standard operating practice is to reset the truck drum revolution counter for each load, then recording the current count on the counter is not required.	Strategy: Perform assessment review of batch ticket. Verify that it records the start time for mixing and the initial reading on the truck drum counter at time of first water addition (if counter is not reset for each batch). (See Table 2 action 1). Documentation: QA Surveillance Report	Requirement Complete: <hr/> QA Representative
Requirement No. SPC-PR3.1.2.4 Designate the amount of water in gallons, not exceeding the water-to-cementitious material ratio, available for addition by the direction of SRR at the point of delivery.	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.1.2.4	None	Strategy: Perform assessment review of batch ticket. Verify that it records the amount of water in gallons available for addition at the direction of SRR at the point of delivery. (See Table 2 action 1) Documentation: QA Surveillance Report	Requirement Complete: <hr/> QA Representative

Requirement	Source	Discussion	Strategy & Documentation	Complete
Requirement No. SPC-PR3.1.2.5 Indicate the amount of high range water reducer added at the point of delivery.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.1.2.5	None	Strategy: No high range water reducer will be added at the point of delivery.	Requirement Complete: QA Representative
Requirement No. SPC-PR3.1.2.6 Initial the batch ticket (supplier).	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.1.2.6	This general requirement is discussed in detail in section 4.1.4.1.A of the specification.	Covered by Requirement SPC-IT4.1.4.1A (below)	Requirement Complete: QA Representative
Requirement No. SPC-PR3.1.3.1 Establish a washing and cleaning area at the batch plant in order to wash out Supplier operated truck chutes and mixer drums. Supplier shall wash truck chutes in a SRR designated area at the point of delivery.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.1.3.1	Failure to wash out truck chutes could affect the quality of later batches of grout due to contamination from the remnants of the previous batches.	Strategy: Perform surveillance during production grouting to ensure that vendor practices include truck washing at point of delivery and washing of vendor equipment at production facility as necessary. (See Table 6 action 4) Documentation: QA Surveillance Report	Requirement Complete: QA Representative James W. Rush
Requirement No. SPC-PR3.1.3.2 Provide a communications system between the Batch Plant and the point of delivery.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.1.3.2	Does not directly affect grout quality.	No verification or documentation of this requirement is necessary.	Requirement Complete: James W. Rush
Grout Specification – Design Requirements				
Requirement No. SPC-DR3.2.1.1 General requirements for production mixes include: <ul style="list-style-type: none"> Initial mix designs are described in Attachment 5.5 of specification Provide grout utilizing the local material components at the Batch Plant Do not make adjustments to grout mixes, material components, or source of material components without SRR approval via Supplier Disposition Deviation Request (SDDR) and re-qualification of grout as required. 	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.2.1.1	The specification identifies the fully tested and qualified grout mix (LP#8-16). Additional testing and qualification work is needed before any other grout recipe can be used.	Strategy: SRR periodic review of batch tickets and material component documentation during the subcontract will identify any unauthorized changes. (See Table 6 action 3) Documentation: Authorized changes will be documented via SDDR (if Supplier initiates the change) or by a Purchase Requisition Change Notice (if initiated by SRR). (also see requirement SPC-DR3.2.1.2B below)	Requirement Complete: James W. Rush Closure Engineering

Requirement	Source	Discussion	Strategy & Documentation	Complete
<p>Requirement No. SPC-DR3.2.1.2A Trial Batching and Initial Qualification Requirements:</p> <ul style="list-style-type: none"> Complete sufficient trial batching to demonstrate capability to provide Tank Closure Grout production to meet specification requirements. Mix uniformity to comply with ASTM C94/C94M. Grout mix testing by SRR. Materials used in trial batching shall be representative of the materials to be used to meet Tank Closure Grout production requirements. Grout mix components shall be tested by the Supplier as described in Sections 3.2.3.2 through 3.2.3.9. Submit trial batching grout mix component test results concurrent with performing trial batching and initial qualifications. Minimum trial batch size shall be 3 cubic yards The number of trial batches, and resulting trial batch data, shall be sufficient to establish the ability to meet the minimum specified compressive strength requirement shown in Attachment 5.5, through providing the minimum required average strength requirement following the criteria shown in Appendix of ASTM C94/C94M and Chapter 4 of ACI 214R. The trial batching shall demonstrate the ability to meet the minimum slump flow requirement specified in Attachment 5.5. The trial batching shall demonstrate the ability to meet the maximum bleed of 0.0 after 24 hours. Trial batching shall demonstrate that the minimum compressive strength of the mix at 28 days is 2000 psi. 	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.1.2A	None	<p>Strategy: Perform trial batching and testing as required. Generate a technical summary report to document the adequacy of the trial batching and that all acceptance criteria were met. Obtain test documents, laboratory qualification documentation, and/or perform assessments of laboratory qualification. (See Table 1 of this plan) (also see requirement SPC- PR3.1.1.1 above).</p> <p>Documentation:</p> <ol style="list-style-type: none"> Grout and component test reports, laboratory qualification documentation, and QA surveillance reports as described in section 3.1 (Table 1) of this plan. 	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
Requirement No. SPC-DR3.2.1.2B Re-qualification (if required due to changes by the Supplier) must be designed, proportioned, and tested in accordance with ACI 211.1, ACI 301 and ACI 304.2R (Grout mix testing by Supplier). Test results must be submitted to SRR for acceptance.	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.1.2B	Note that if the grout mix needs to be changed by the Supplier, then Requirement No. SPC-DR3.2.1.1 will be applicable. An SDDR is required and testing and pre-qualification may be required depending on the nature of the changes.	Strategy: Evaluate for impact to SRNL testing and pre-qualification of grout recipes. (See Table 6 action 3) (also see requirement SPC-DR3.2.1.1 Documentation: Authorized changes will be documented via SDDR. Testing and reports may be required.	Requirement Complete: <hr/> QA Representative <hr/> Closure Engineering
Requirement No. SPC-DR3.2.1.2C The Supplier shall not produce any grout batch at the Supplier's Batch Plant with an amount of water which exceeds the maximum amount of water allowed per the grout batch. The maximum amount of water in any grout batch shall not exceed . . .	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.1.2C	This requirement is redundant with requirements specified in sections 3.1.1.4A and 3.1.2.4 of the specification.	Covered by requirements SPC-PR3.1.1.4A and SPC-PR3.1.2.4	Requirement Complete: <hr/> QA Representative
Requirement No. SPC-DR3.2.1.2D For Retarding Admixture (Hydration Stabilizer): <ul style="list-style-type: none"> The maximum amount of admixture shall not exceed that specified on Attachment 5.5, or as specified in the latest approved grout mix. 	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.1.2D	None	Strategy: Perform assessment review of batch ticket. Ensure that the amount of admixtures added does not exceed the limits specified in Attachment 5.5 of the specification (or as specified in the latest approved grout mix) Documentation: QA Surveillance Report See Table 6, action 3.	Requirement Complete: <hr/> QA Representative
Requirement No. SPC-DR3.2.1.2E For High Range Water Reducing Admixture (HRWR) and Viscosity Modifying Admixture (VMA): <ul style="list-style-type: none"> The maximum amount of admixture shall not exceed that specified on Attachment 5.5, or as specified in the latest approved grout mix. 	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.1.2E	None	Strategy: Perform assessment review of batch ticket. Ensure that the amount of admixtures added does not exceed the limits specified in Attachment 5.5 of the specification (or as specified in the latest approved grout mix) Documentation: QA Surveillance Report See Table 6, action 3.	Requirement Complete: <hr/> QA Representative

Requirement	Source	Discussion	Strategy & Documentation	Complete
Requirement No. SPC-DR3.2.2 Production mix identifiers are specified on Attachment 5.5. Ensure all documentation identified the production mix identifiers assigned to the Batch Plant.	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.2	None	Strategy: Perform assessment review of batch ticket. Ensure that it includes identification of the approved production mix. (See Table 2 action 1) Documentation: QA Surveillance Report	Requirement Complete: <hr/> QA Representative
Requirement No. SPC-DR3.2.3.1 Provide water and ice that conforms to ASTM C94/C94M. Do not use wash water for batching unless directed by SRR.	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.3.1	None	Strategy: Perform surveillance prior to production grout runs. (See Table 2 action 6) Documentation: QA Surveillance Report	Requirement Complete: <hr/> Closure Engineering
Requirement No. SPC-DR3.2.3.2 A. Provide Portland cement that meets the requirements of ASTM C150, Type I or Type II and contains no more than 0.60%, by weight, of equivalent alkalis calculated as: $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$. B. For each shipment of Portland cement used, obtain and retain a Manufacturer's Certification Report on chemical composition requirements and physical requirements that confirms compliance with ASTM C150. C. Submit Portland Cement Certification	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.3.2	None	Strategy: The specification requires that test documentation be submitted for qualification of grout components. Documentation: 1. Component Certification and/or Test Reports (with SRR acceptance) (see Table 1 action 2 and Table 5 action 1) 2. QA Surveillance Report during production grouting for new shipments of Portland cement (see Table 6 action 1)	Requirement Complete: <hr/> QA Representative
Requirement No. SPC-DR3.2.3.3 A. Provide a Slag Cement that meets the requirements of ASTM C989, Grade 100. B. For each shipment of Slag Cement used, obtain and retain a Manufacturer's Certification Report on chemical composition requirements and physical requirements that confirms compliance with ASTM C989, Grade 100. Submit Slag Cement Certification. C. For the first shipment of Slag Cement from a manufacturer, obtain and retain documentation, such as laboratory test results, showing conformance for the reactivity with cement to ASTM C989 for Grade 100 Slag Cement. Submit Slag Cement Certification.	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.3.3	None	Strategy: The specification requires that test documentation be submitted for qualification of grout components. Documentation: 1. Component Certification and/or Test Reports (with SRR acceptance) (see Table 1 action 2 and Table 5 action 1) QA Surveillance Report during production grouting for new shipments of slag cement (see Table 6 action 1)	Requirement Complete: <hr/> QA Representative

Requirement	Source	Discussion	Strategy & Documentation	Complete
<p>Requirement No. SPC-DR3.2.3.4</p> <p>A. Provide a fly ash that meets the requirements of ASTM C 618, Class F except that the loss on ignition shall not exceed six (6) percent and the ammonia content shall be 0.</p> <p>B. For each shipment of fly ash used, obtain and retain documentation, such as laboratory test results, showing conformance to the chemical requirements and physical requirements of ASTM C 618 for the Class F fly ash. Documentation shall also show the loss on ignition and the ammonia content for the fly ash. Submit fly ash Documentation.</p> <p>For the first shipment of fly ash from a manufacturer, obtain and retain documentation, such as laboratory test results, showing conformance for the reactivity with cement alkalis of the supplementary optional physical requirements of ASTM C 618 for the fly ash. Previous laboratory testing, field performance records or equivalent documentation are acceptable. Submit Initial Fly Ash Documentation.</p>	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.3.4	None	<p>Strategy: The specification requires that test documentation be submitted for qualification of grout components.</p> <p>Documentation:</p> <ol style="list-style-type: none"> 1. Component Certification and/or Test Reports (with SRR acceptance) (see Table 1 action 2 and Table 5 action 1) <p>QA Surveillance Report during production grouting for new shipments of fly ash (see Table 6 action 1)</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>
<p>Requirement No. SPC-DR3.2.3.5</p> <p>A. Provide a fine aggregate that meets the requirements of ASTM C33/C33M for fine aggregates and as specified in this Section (below).</p> <p>B. For each source of fine aggregate used, obtain and retain documentation, such as laboratory test results, showing conformance to the requirements of ASTM C33/C33M for fine aggregates and as specified in this Section (below).</p> <p>C. Gradation limits shall be in accordance with Section 6 of ASTM C33/C33M.</p> <p>D. Base fineness modulus shall be in accordance with Section 6.2 of ASTM C33/C33M [≥ 2.3 and ≤ 3.1].</p>	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.3.5	None	<p>Strategy: Perform testing for the specified attributes C through K (test method standards are provided in requirements SPC-IT4.1.2.1 and SPC-IT4.1.3.1). Also, perform petrographic examination and testing for moisture content and bulk density & voids as required by requirements SPC-IT4.1.2.1 and SPC-IT4.1.3.1.</p> <p>Evaluate results from trial batch testing and adjust mix or accept qualification as appropriate. Consider re-qualification of mix recipe depending on the nature of any mix changes.</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
<p>E. Fineness modulus shall not vary from the base fineness modulus more than provided in Section 6.4 of ASTM C33/C33M [0.20 variation is allowed in Section 6.4].</p> <p>F. The limit for clay lumps and friable particles is provided in Table 2 of ASTM C33/C33M [maximum of 3.0 mass percent of total sample]</p> <p>G. The limit for material finer than 75-µm (No. 200) sieve is provided in Table 1 of ASTM C33/C33M and shall be for concrete subject to abrasion [3.0% maximum, except for manufactured fine aggregate where the material finer than 75-µm (No. 200) sieve is essentially free of clay and or shale where the limit is 5.0% maximum]</p> <p>H. Use the limit for coal and lignite provided in Table 2 of ASTM C33/C33M for all other concrete [maximum of 1.0 mass percent of total sample]</p> <p>I. Limit organic impurities in accordance with Section 7.2 of ASTM C33/C33M.</p> <p>J. Limit for soundness is provided in Section 8 of ASTM C33/C33M</p> <p>K. The expansion limit for the alkali-silica reaction is 0.10% at sixteen (16) days. [If the expansion limit is not met, follow the procedure in Appendix X1, Section X1.3.4 of ASTM C33/C33M for acceptance].</p> <p>L. If re-qualification is required, perform testing of fine aggregate as specified in section 4.1.2 (see requirement no. SPC-IT4.1.2.1). Submit re-qualification test results if re-qualification is performed.</p> <p>M. Perform testing of fine aggregate for production Tank Closure Grout in accordance with section 4.1.3.1. Submit Fine Aggregate Test Results (see requirement SPC-IT4.1.3.1).</p>			<p>Generate a technical report to document the adequacy of the trial batching and that all acceptance criteria were met (see requirement No. SPC-DR3.2.1.2A). For production grout testing, ensure that the Supplier is submitting test documentation as required. Review submitted documentation for adequacy and to ensure that acceptance criteria are met. Resolve any discrepancies through the Nonconformance Reporting program (Procedure 15-1, Manual 1Q) and the Unreviewed Waste Management Question process (Procedure ENG.46, Manual S4).</p> <p>Documentation:</p> <ol style="list-style-type: none"> 1. SRR Technical Report for initial grout trial batch qualification. 2. Component Certification and/or Test Reports from Supplier (with SRR acceptance) (see Table 1 action 2 and Table 5 action 1) <p>Surveillance or audit reports from review of fine aggregate Test Result documentation. This includes documentation from any new sources of aggregate and ongoing testing per section 3.2.3.5M. Include any Nonconformance Reports (NCRs) or Unreviewed Waste Management Question (UWMQ) evaluations performed as a result of any discrepancies. (see Table 5 action 2 and Table 6 action 1)</p>	

Requirement	Source	Discussion	Strategy & Documentation	Complete
<p>Requirement No. SPC-DR3.2.3.6</p> <p>A. Provide a coarse aggregate that meets the requirements of ASTM C33/C33M for fine aggregates and as specified in this Section (below).</p> <p>B. For each source of coarse aggregate used, obtain and retain documentation, such as laboratory test results, showing conformance</p> <p>C. to the requirements of ASTM C33/C33M for coarse aggregates and as specified in this Section (below).</p> <p>D. Gradation limits shall be in accordance with Section 10 of ASTM C33/C33M.</p> <p>E. The limit for clay lumps and friable particles is provided in Table 4 of ASTM C33/C33M and shall be for Class Designation 3M. [The limit for Class Designation 3M is 5.0%.]</p> <p>F. The limit for material finer than 75-µm (No. 200) sieve is provided in Table 4 of ASTM C33/C33M and shall be for Class Designation 3M. [The limit for Class Designation 3M is 1.0% except that there are circumstances as specified in the standard where the limit can be increased to 1.5%.]</p> <p>G. The limit for coal and lignite is provided in Table 4 of ASTM C33/C33M and shall be for Class Designation 3M. [The limit for Class Designation 3M is 0.5%]</p> <p>H. The limit for chert is provided in Table 4 of ASTM C33/C33M and shall be for Class Designation 3M. [The limit for Class Designation 3M is 8.0%]</p> <p>I. The limit for the sum of clay lumps, friable particles, and chert is provided in Table 4 of ASTM C33/C33M and shall be for Class Designation 3M. [The limit for Class Designation 3M is 10.0%]</p>	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.2.3.6	None	<p>Strategy: Perform testing for the specified attributes C through L (test method standards are provided in requirements SPC-IT4.1.2.2 and SPC-IT4.1.3.2). Also, perform petrographic examination and testing for moisture content and bulk density & voids as required by requirements SPC-IT4.1.2.2 and SPC-IT4.1.3.2.</p> <p>Evaluate results from trial batch testing and adjust mix or accept qualification as appropriate. Consider re-qualification of mix recipe depending on the nature of any mix changes. Generate a technical report to document the adequacy of the trial batching and that all acceptance criteria were met (see requirement No. SPC-DR3.2.1.2A).</p> <p>For production grout testing, ensure that the Supplier is submitting test documentation as required. Review submitted documentation for adequacy and to ensure that acceptance criteria are met. Resolve any discrepancies through the Nonconformance Reporting program (Procedure 15-1, Manual 1Q) and the Unreviewed Waste Management Question process (Procedure ENG.46, Manual S4).</p> <p>Documentation:</p> <ol style="list-style-type: none"> 1. SRR Technical Report for initial grout trial batch qualification. 2. Component Certification and/or Test Reports from Supplier (with SRR acceptance) (see Table 1 action 2 and Table 5 action 1) <p>Surveillance or audit reports from review of coarse aggregate Test Result documentation.</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
<p>J. The limit for soundness is provided in Table 4 of ASTM C33/C33M and shall be for Class Designation 3M. [The limit for Class Designation 3M is 18.0% based upon magnesium sulfate and 12% based upon sodium sulfate]</p> <p>K. The expansion limit for the alkali-silica reaction is 0.10% at sixteen (16) days. [If the expansion limit is not met, follow the procedure in Appendix X1, Section X1.3.4 of ASTM C33/C33M for acceptance.</p> <p>L. The average expansion limits for the alkali-carbonate reaction is 0.015% at three (3) months and 0.025% at six (6) months.</p> <p>M. The limit for abrasion is provided in Table 4 of ASTM C33/C33M and shall be for Class Designation 3M. [The limit for Class Designation 3M is 50%</p> <p>N. If re-qualification is required, perform testing of coarse aggregate as specified in section 4.1.2 (see requirement no. SPC-IT4.1.2.2). Submit re-qualification test results if re-qualification is performed.</p> <p>O. Perform testing of coarse aggregate for production Tank Closure Grout in accordance with section 4.1.3.2. Submit Coarse Aggregate Test Results (see requirement no. SPC-IT4.1.2.2).</p>			<p>This includes documentation from any new sources of aggregate and ongoing testing per section 3.2.3.6N. Include any Nonconformance Reports (NCRs) or Unreviewed Waste Management Question (UWMQ) evaluations performed as a result of any discrepancies. (see Table 5 action 2 and Table 6 action 1)</p>	
<p>Requirement No. SPC-DR3.2.3.7</p> <p>A. As allowed in approved mix designs, provide a retarding admixture (RA) hydration stabilizer that meets the requirements of ASTM C494/C494M, Type D.</p>	<p>C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.2.3.7</p>	<p>None</p>	<p>Strategy: The specification requires that test documentation be submitted for qualification of grout components.</p> <p>Documentation:</p> <ol style="list-style-type: none"> 1. Component Certification and/or Test Reports (with SRR acceptance) (see Table 1 action 2 and Table 5 action 1) <p>QA Surveillance Report during production grouting for new shipments of hydration stabilizer admixture (see Table 6 action 1)</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
B. For each shipment of retarding admixture used, obtain and retain documentation, such as laboratory test results, showing conformance to the physical requirements of ASTM C494/C494M Type D. Documentation shall also show that the retarding admixture does not contain chlorides except those that may be contained in the water used in the manufacture of the retarding admixture. Submit Retarding Admixture (Hydration Stabilizer) Documentation.				
<p>Requirement No. SPC-DR3.2.3.8</p> <p>A. If required, provide a high range water reducing admixture that meets the requirements of ASTM C494/C494M, Type F or G.</p> <p>B. For each shipment of high range water reducing admixture used, obtain and retain documentation, such as laboratory test results, showing conformance to the physical requirements of ASTM C494/C494M Type F or G. When laboratory test results of such admixtures are proprietary information, “Certificates of Conformance” (C-of-C) may be provided in lieu of laboratory test results provided that the C-of-C shows conformance to the specified ASTM standards C-of-C documentation must also demonstrate successful use of the same product in the past for production of grout mixes with similar properties. Documentation shall also show that the high range water reducing admixture does not contain chlorides except those that may be contained in the water used in the manufacture of the high range water reducing admixture. Submit High Range Water Reducing Admixture Documentation.</p>	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.2.3.8	None	<p>Strategy: The specification requires that test documentation be submitted for qualification of grout components.</p> <p>Documentation:</p> <ol style="list-style-type: none"> 1. Component Certification and/or Test Reports (with SRR acceptance) (see Table 1 action 2 and Table 5 action 1) <p>QA Surveillance Report during production grouting for new shipments of high range water reducing admixture (see Table 6 action 1)</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
<p>Requirement No. SPC-DR3.2.3.9</p> <p>A. A Viscosity Modifying Admixture (VMA) shall be provided for the Tank Closure Grout “near zero bleed” mix. Provide a viscosity modifying admixture that meets the requirements of ASTM C494/C494M, Type S.</p> <p>B. For each shipment of viscosity modifying admixture used, obtain and retain documentation, such as laboratory test results, showing conformance to the physical requirements of ASTM C494/C494M Type S. When laboratory test results of such admixtures are proprietary information, “Certificates of Conformance” (C-of-C) may be provided in lieu of laboratory test results provided that the C-of-C shows conformance to the specified ASTM standards C-of-C documentation must also demonstrate successful use of the same product in the past for production of grout mixes with similar properties.</p> <p>Documentation shall also show that the viscosity modifying admixture does not contain chlorides except those that may be contained in the water used in the manufacture of the viscosity modifying admixture. Submit Viscosity Modifying Admixture Documentation.</p>	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.2.3.9	None	<p>Strategy: The specification requires that test documentation be submitted for qualification of grout components.</p> <p>Documentation:</p> <ol style="list-style-type: none"> 1. Component Certification and/or Test Reports (with SRR acceptance) (see Table 1 action 2 and Table 5 action 1) <p>QA Surveillance Report during production grouting for new shipments of viscosity modifying admixture (see Table 6 action 1)</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
Grout Specification – Quality Requirements				
<p>Requirement No. SPC-QR3.4.2</p> <ul style="list-style-type: none"> Work performed in the execution of this specification shall be in accordance with an SRS approved Supplier's Quality Assurance Program that complies with the requirements defined in Appendix 5.4. SRS review and acceptance of the Supplier's Quality Assurance Program is required. Subsequent revisions to the Supplier's Quality Assurance Program shall be reviewed and accepted prior to use in the performance of this specification. Submit documentation of NRMCA certification of the production facility. The Supplier is responsible to flow down those Technical and Quality requirements deemed applicable for the activities within its defined scope of work, in accordance with referenced Codes, Standards, Material Specifications, or other requirements identified in this specification and the procurement documents. Flow down of requirements includes verification that the sub tier supplier is appropriately qualified for performance of activities complying with the procurement. Supplier shall maintain objective evidence of the successful flow down for SRS review upon request. <p>This flow down is required at all levels if the sub tier supplier to the prime supplier deems it necessary to further subcontract its part of the work.</p>	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.4.2	None	<p>Strategy: See Requirement No. SPC-PR3.1.1.2 regarding NRMCA Certification of the production facility. SRR approval of the Supplier's Quality Assurance Program is required prior to award of the contract. Flow down of technical and quality requirements will be verified via QA surveillance.</p> <p>Documentation:</p> <ol style="list-style-type: none"> Grout Supplier's Quality Assurance Manual which is required to be submitted prior to award of subcontract. Grout Supplier's NRMCA certification of the production facility which is required to be submitted prior to award of subcontract. QA Surveillance Report (see Table 1 action 1) 	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>
<p>Requirement No. SPC-QR3.4.3</p> <p>Retain documents and records as specified in section 3.4.3 of the specification.</p>	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 3.4.3	None	Covered by other specific requirements listed in this matrix	<p>Requirement Complete:</p> <hr/> <p>James W. Rush</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
Requirement No. SPC-QR3.4.4 Procure the services of a testing laboratory, which conforms to ASTM E329 and ASTM C1077 (or is otherwise approved by SRR prior to bid award), for initial qualification of the grout and mix components. Submit documentation showing testing laboratory qualification. If re-qualification of the grout is performed, then use a testing laboratory meeting the requirements specified above and submit documentation showing testing laboratory qualification.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.4.4	Refer to requirement SPC-IT4.2.1	Refer to requirement SPC-IT4.2.1	Requirement Complete: <hr/> QA Representative
Grout Specification – Schedule & Delivery Requirements				
Requirement SPC-S&D3.6.4.3 The Supplier shall make available fresh grout for inspection and testing, at the production facility. Inspection and testing requirements to be as shown in Attachment 5.3.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.6.4.3	Refer to requirement SPC-IT4.1.5.1 below	Refer to requirement SPC-IT4.1.5.1 below	Requirement Complete: <hr/> QA Representative
Requirement SPC-S&D3.6.4.4 The trial batching shall be representative of the production batching to be performed to fill the applicable tanks with grout, i.e., the production facilities, delivery equipment, material components, personnel, etc., shall be representative.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.6.4.4	Covered by Requirement SPC-DR3.2.1.2A	Covered by Requirement SPC-DR3.2.1.2A	Requirement Complete: <hr/> QA Representative
Requirement SPC-S&D3.6.4.5 The trial batching shall conform to the requirements described herein in Section 3.0, i.e., conformance of the production facility, testing and certification of material components, measurement of material components, control of aggregate moisture content, batch tickets, etc.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.6.4.5	Covered by Requirement SPC-DR3.2.1.2A	Covered by Requirement SPC-DR3.2.1.2A	Requirement Complete: <hr/> QA Representative
Requirement SPC-S&D3.6.4.6 Quality verification documentation requirements for material components shall be as specified in Section 3.2.1.2.A.2 and shown in Attachment 5.2.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.6.4.6	Covered by Requirement SPC-DR3.2.1.2A (also see requirements SPC-DR3.2.3.2 through SPC-DR3.2.3.9	Covered by Requirement SPC-DR3.2.1.2A (also see requirements SPC-DR3.2.3.2 through SPC-DR3.2.3.9	Requirement Complete: <hr/> QA Representative

Requirement	Source	Discussion	Strategy & Documentation	Complete
Grout Specification – Deviation Requirements				
Requirement SPC-D3.10 After award of the subcontract, A Supplier Deviation Disposition Request (SDDR) form shall be prepared and submitted to SRS for review and disposition for each Supplier proposed deviation from this procurement specification, including material substitution requests.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 3.10	None	Strategy: Perform assessment review of batch ticket to ensure that no unapproved material substitutions were made in the grout mix recipe. Perform surveillance during production grouting to verify that SDDRs are generated for deviations as required. Documentation: 1. QA Surveillance Report (from batch ticket review) (see Table 2 action 8) 2. QA Surveillance Report (during grout production run) (see Table 6 action 3)	Requirement Complete: <hr/> Closure Engineering
Grout Specification – Inspection/Testing Requirements				
Requirement SPC-IT4.1.1 Calibrate all Measuring & Testing Equipment (M&TE) instruments in accordance with the requirements in NQA-1 Subpart 2.5 paragraph 703, ASTM C94, and NRMCA QC3.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.1	Perform surveillance of M&TE calibration program during trial batching. Resolve any deficiencies identified prior to the grout production run.	Strategy: Perform surveillance of Supplier prior to grout production run to verify that M&TE calibrations are performed per specified requirements. Resolve any deficiencies identified prior to the grout production run. Surveillance during the production run is only required for correction of deficiencies identified during trial batching. (see table 2 action 4) Documentation: QA Surveillance Report	Requirement Complete: <hr/> QA Representative
Requirement SPC-IT4.1.2.1 Perform testing to establish initial qualification (and for re-qualification as needed) of fine aggregate. <ul style="list-style-type: none"> Determine gradation in accordance with ASTM C136. Determine base fineness modulus in accordance with ASTM C136. Determine bulk density and voids in accordance with ASTM C29/C29M. 	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.2.1	These test methods are performed in conjunction with requirement number SPC-DR3.2.3.5 which specifies acceptance criteria where applicable. Note that SPC-DR3.2.3.5 provides no acceptance criteria for	Strategy: See requirement SPC-DR3.2.3.5	Requirement Complete: <hr/> QA Representative

Requirement	Source	Discussion	Strategy & Documentation	Complete
<ul style="list-style-type: none"> Determine percentage of clay lumps and friable particles in accordance with ASTM C142. Determine amount of material finer than 75 µm in accordance with ASTM C117. Determine percentage of coal and lignite in accordance with ASTM C123. Determine presence of organic impurities in accordance with ASTM C40. Determine soundness in accordance with ASTM C88 using magnesium sulfate. Perform petrographic examination in accordance with ASTM C295. Determine Alkali-Silica reaction in accordance with ASTM C1260. 		bulk density and voids and for petrographic examination.		
<p>Requirement SPC-IT4.1.2.2 Perform testing to establish initial qualification (and for re-qualification as needed) of coarse aggregate.</p> <ul style="list-style-type: none"> Determine gradation in accordance with ASTM C136. Determine bulk density and voids in accordance with ASTM C29/C29M. Determine percentage of clay lumps and friable particles in accordance with ASTM C142. Determine amount of material finer than 75 µm in accordance with ASTM C117. Determine percentage of coal and lignite in accordance with ASTM C123. Determine percentage of chert in accordance with ASTM C123. Determine soundness in accordance with ASTM C88 using magnesium sulfate. Perform petrographic examination in accordance with ASTM C295. Determine Alkali-Silica reaction in accordance with ASTM C1260. Determine Alkali-Carbonate rock reaction in accordance with ASTM C1105. Determine resistance to degradation (abrasion) in accordance with ASTM C131 or ASTM C535. 	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 4.1.2.2	These test methods are performed in conjunction with requirement number SPC-DR3.2.3.6 which specifies acceptance criteria where applicable. Note that SPC-DR3.2.3.6 provides no acceptance criteria for bulk density and voids and for petrographic examination.	Strategy: See requirement SPC-DR3.2.3.6	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
<p>Requirement SPC-IT4.1.3.1 Perform examination/testing of fine aggregate for the production grout per the frequency and methods specified below;</p> <ul style="list-style-type: none"> Determine moisture content in accordance with ASTM C566 each day. Determine gradation in accordance with ASTM C136 every week. Determine fineness modulus in accordance with ASTM C136 every week. Determine percentage of clay lumps and friable particles in accordance with ASTM C142 every six (6) months. Determine amount of material finer than 75-μm in accordance with ASTM C117 every week. Determine presence of organic impurities in accordance with ASTM C40 every six (6) months. 	<p>C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.3.1</p>	<p>These test methods are performed in conjunction with requirements SPC-PR3.1.1.4 and SPC-DR3.2.3.5 which specify acceptance criteria where applicable. Note that SPC-PR3.1.1.4 provides no acceptance criteria for moisture content. However, this information is used to determine the amount of additional water that can be added at the point of delivery (see requirements SPC-PR3.1.1.4A and SPC-PR3.1.2.4) and to ensure that the water-to-cementitious material ratio is not exceeded.</p>	<p>Strategy: See requirement SPC-DR3.2.3.5</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>
<p>Requirement SPC-IT4.1.3.2 Perform examination/testing of coarse aggregate for the production grout per the frequency and methods specified below;</p> <ul style="list-style-type: none"> Determine moisture content in accordance with ASTM C566 each day. Determine gradation in accordance with ASTM C136 every week. Determine percentage of clay lumps and friable particles in accordance with ASTM C142 every six (6) months. Determine amount of material finer than 75-μm in accordance with ASTM C117 every week. 	<p>C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.3.2</p>	<p>These test methods are performed in conjunction with requirements SPC-PR3.1.1.4 and SPC-DR3.2.3.6 which specify acceptance criteria where applicable. Note that SPC-PR3.1.1.4 provides no acceptance criteria for moisture content.</p>	<p>Strategy: See requirement SPC-DR3.2.3.6</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
		However, this information is used to determine the amount of additional water that can be added at the point of delivery (see requirements SPC-PR3.1.1.4A and SPC-PR3.1.2.4) and to ensure that the water-to-cementitious material ratio is not exceeded.		
Specification Section 4.1.4.1 The initial inspection and acceptance of the production grout by SRR are indicated by requirements SPC-IT4.1.4.1A through SPC-IT4.1.4.1F below.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.4.1	See requirements SPC-IT4.1.4.1A through SPC-IT4.1.4.1F below	See requirements SPC-IT4.1.4.1A through SPC-IT4.1.4.1F below	Requirement Complete: <hr/> QA Representative
Requirement SPC-IT4.1.4.1A SRR will verify and record on the batch ticket that the Supplier’s representative has reviewed the batch ticket for the amount of water added (at the Supplier’s facility) and the Supplier’s representative has initialed the batch ticket.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.4.1A	None	Strategy: SRR review and acceptance of the batch ticket (See Table 3 action 1) Documentation: SRR acceptance of batch ticket via initials or signature by Construction.	Requirement Complete: <hr/> QA Representative
Requirement SPC-IT4.1.4.1B The retarding admixture and high range water reducing admixture may be adjusted by the direction of SRR as necessary to the requirements at the point of delivery as provided in the Performance Requirements Section.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.4.1B	See requirements SPC-DR3.2.3.7 and SPC-DR3.2.3.8.	Refer to requirements SPC-DR3.2.3.7 and SPC-DR3.2.3.8.	Requirement Complete: <hr/> QA Representative
Requirement SPC-IT4.1.4.1C Perform acceptance slump flow test(s) in accordance with the testing frequencies and requirements per Attachment 5.3. Attachment 5.3 states that a test must be performed on the first batch delivered each day, and that a random test must be performed on the second 100 cubic yards delivered (each day). Additional tests samples are to be taken at the discretion of SRR.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.4.1C	None	Strategy: Perform tests as specified. (see Table 4 action 1) (also see requirement SPC-IT4.1.5.1) Documentation: Test Reports	Requirement Complete: <hr/> QA Representative

Requirement	Source	Discussion	Strategy & Documentation	Complete
<p>Informational slump flow test(s) may be taken from the top of any batch at the direction of SRR in order to determine the delivered slump flow at the discharge of the chute. If the delivered slump flow at the discharge of the chute indicates it is below the minimum working range requirement, high range water reducing (HRWR) admixture can be added at the direction of SRR. After addition of the HRWR at the point of delivery, and prior to discharge of the batch, perform an additional informational slump flow test to ensure that the range is within the working range.</p> <p>In lieu of the informational test, an acceptance test may be performed at the direction of SRR.</p> <p>SRR may accept mixes that do not meet the specified slump flow, based upon technical expertise and professional judgment. [This would be based on the small impact to the overall characteristics of the grout in the tank from a single truck load of grout]</p>				
<p>Requirement SPC-IT4.1.4.1D Complete discharge of the grout within ninety (90) minutes or before the drum has revolved three hundred (300) revolutions, whichever comes first. (These limits may be exceeded in accordance with ASTM C94/C94M, Section 12.7 provided the grout is of such slump flow that it can be placed without the additional introduction of high range water reducing admixture to the batch)</p>	<p>C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.4.1D</p>	<p>None</p>	<p>Strategy: SRR is to verify that this requirement is met at the point of delivery in conjunction with the information recorded on the batch ticket per requirement SPC-IT4.1.4.1E below. (see Table 3 action 1)</p> <p>Documentation: Batch Ticket</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>
<p>Requirement SPC-IT4.1.4.1E SRR will record discharge completion time and number of drum revolutions from the drum revolution counter at the completion time of discharge on the batch ticket. SRR will also record the total time (start of mixing time to the discharge completion time) plus the total number of drum revolutions and record this information on the batch ticket(s).</p>	<p>C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.4.1E</p>	<p>None</p>	<p>Strategy: This information will be determined and entered onto the batch ticket or in the Daily Truck Log by Construction at the point of delivery. (see Table 3 action 1)</p> <p>Documentation: Batch Ticket or Daily Truck Log</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
Requirement SPC-IT4.1.4.1F The batch ticket(s) will be reviewed and accepted by SRR at the point of delivery.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.4.1F	None	Strategy: SRR is to review the batch ticket for acceptance prior to unloading batch. Provide acceptance signature on batch ticket at completion of unloading (into the hopper). (see Table 3 action 1) Documentation: Batch Ticket (with SRR approval)	Requirement Complete: <hr/> QA Representative
Requirement SPC-IT4.1.4.3 Wash chutes in a SRR designated area at the point of delivery. Wash and clean all mixer drums at the production facility.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.4.3	None	Strategy: Perform surveillance during production grouting. Documentation: QA Surveillance Report See Table 6 action 4.	Requirement Complete: <hr/> James W. Rush
Requirement SPC-IT4.1.5.1 SRR will perform inspection and testing in accordance with Attachment 5.3 at the point of delivery. Perform sampling of fresh grout and field acceptance testing at the point of delivery, in accordance with Attachment 5.3.	C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.5.1	None	Strategy: Perform sampling, curing, capping, and testing as specified. Obtain test reports as required. Perform surveillance of grouting to verify that sampling, curing, and capping of test specimens are being performed per the methods specified in the standards referenced in Attachment 5.3. Develop a checklist or some other tool (e.g., receipt inspection) to be used at the point of delivery to ensure that all required samples are obtained in order to complete all required testing (see sections 3.3 and 3.4 and Tables 3 and 4 of this plan). Documentation: 1. Test Reports as described below; a) For compressive strength per ASTM C39/C39M b) For slump flow per ASTM C1611/C1611M (redundant with requirement SPC-IT4.1.4.1C) c) For temperature per ASTM C1064/C1094M (also see requirement SPC-PR3.1.1.5) d) For Unit weight/yield per ASTM C138/C138M	Requirement Complete: <hr/> QA Representative

Requirement	Source	Discussion	Strategy & Documentation	Complete
			<p>e) For bleeding of grout per ASTM C232/C232M Test Method A modified as described in Note 3 (of Attachment 5.3)</p> <p>f) For air content per ASTM C231/C231M (for information only)</p> <p>2. Surveillance Report for test specimen sampling, curing, and capping.</p>	
<p>Requirement SPC-IT4.1.5.4</p> <p>If the slump flow of the grout falls outside the specified limits of this document, SRR may perform a check test immediately on another portion of the same sample at the discretion of SRR. In the event the slump flow is outside the specified range, SRR will direct the supplier to take measures to adjust succeeding loads in attempt to bring them into range. SRR may reject mixes that do not meet the specified slump flow. However, rejection is not required as described in SPC-IT4.1.4.1C.</p>	<p>C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.5.4</p>	<p>None</p>	<p>Strategy: Any additional testing performed must be documented by applicable Test Reports or in the log book of the construction Discipline Engineer. Any changes made by the vendor (at SRR direction) must be within the allowances of the specification, otherwise re-qualification of the modified grout recipe is required per requirements SPC-DR3.2.1.1 and SPC-DR3.2.1.2B</p> <p>Documentation: Test Reports if applicable (with SRR acceptance)</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p> <hr/> <p>Closure Engineering</p>
<p>Requirement SPC-IT4.1.5.6</p> <p>SRR will cast seven (7) compressive strength cylinders, four (4) inches in diameter x eight (8) inches long.</p> <p>Test two (2) cylinders at seven (7) days, three (3) at twenty-eight (28) days, and two (2) are to be placed on hold (archived cylinders for future additional testing if needed). The archived samples are expected to be tested at ninety-one (91) days if the 28 day samples do not meet the 2,000 psi strength requirement. Perform compressive strength test breaks within permissible test age tolerance provided in the industry standard test method specified on Attachment 5.3 (ASTM C39, see requirement SPC-IT4.1.5.1 above).</p>	<p>C-SPP-F-00055, “Furnishing and Delivery of Tank Closure Grout”, revision 4, section 4.1.5.6</p>	<p>SRR will evaluate compressive strength in accordance with ASTM C94/C94M.</p>	<p>Strategy: Perform testing as described in section 3.3 and 3.4 of this plan.</p> <p>Documentation: Test Reports as described in Tables 3 and 4.</p>	<p>Requirement Complete:</p> <hr/> <p>QA Representative</p>

Requirement	Source	Discussion	Strategy & Documentation	Complete
Requirement SPC-IT4.1.5.7 SRR will perform grout yield checks as specified on Attachment 5.3 to check the quantity of grout shown on the Supplier's batch ticket(s) is the actual quantity of grout received.	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 4.1.5.7	Check yield per standard identified in requirement SPC-IT4.1.5.1	Strategy: Strategy: Perform testing as described in section 3.3 and 3.4 of this plan. Documentation: Test Reports as described in Table 3 and 4.	Requirement Complete: <hr/> QA Representative
Grout Specification – Testing Laboratory Requirements				
Requirement SPC-IT4.2.1 SRR and the Supplier will procure, as required, the services of a testing laboratory for production and trial batch testing. The testing laboratories shall conform to ASTM E239 and ASTM C1077, or be otherwise approved by SRR.	C-SPP-F-00055, "Furnishing and Delivery of Tank Closure Grout", revision 4, section 4.2.1	None	Strategy: Utilize testing laboratory qualification documentation for Supplier laboratory and for SRR testing laboratory or perform SRR QA review of qualifications with SRR acceptance. (see Table 1 actions 3 and 5) Documentation: Testing laboratory qualification documentation or SRR QA surveillance/assessment of laboratory qualification.	Requirement Complete: <hr/> QA Representative

Concurrence By: _____ Date: _____
Gregory C. Arthur
Engineering Manager

Concurrence By: _____ Date: _____
James W. Rush
Tank 16 Project Manager

Concurrence By: _____ Date: _____
Bruce Dragon
Quality Assurance Manager