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Plan

Compliance and Monitoring Plan for Performing Grouting at the INTEC Tank Farm Facility Closure Project

Idaho Cleanup Project

CH2M ◆ WG Idaho, LLC is the Idaho Cleanup Project contractor for the U.S. Department of Energy

SUMMARY

This plan was prepared for the Idaho Nuclear Technology and Engineering Center (INTEC) Tank Farm Facility (TFF) Closure Project under the INTEC Cleanup Project, which is part of the Idaho Cleanup Project (ICP) operated by CH2M-WG Idaho (CWI). This plan identifies the activities that will be performed to document and ensure the correct placement of grout in the TFF tanks and ancillary equipment according to closure requirements and design specifications. This includes verification of grout formulas and the performance of quality assurance testing. The grouting requirements from the Department of Energy Tier I Closure Plan, Tier II Closure Plan, Waste Determination, Record of Decision, and the approved Resource, Conservation and Recovery Act Closure Plans have been incorporated into the project design specification. The applicable quality requirements are summarized in this plan. Proper completion of the activities outlined herein will provide the independent Professional Engineer (PE) with the information needed to certify the completion of closure activities. In addition, the documentation will provide Department of Energy (DOE) personnel, regulators, and stake holders a complete record of grout placement activities to ensure proper compliance with design requirements. This compliance and monitoring plan provides the implementation requirements, methods, and controls to ensure that the design drawings and specifications are implemented as designed. This includes sampling, testing, and monitoring, as well as the preparation of appropriate records to ensure compliance with the design.

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ACRONYMS

ALARA	as low as reasonably achievable
CWI	CH2M-WG Idaho, LLC
DEQ	(State of Idaho) Department of Environmental Quality
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
ES&H	Environmental, Safety, and Health
GDE	guide
HLW	high-level waste
ICP	Idaho Cleanup Project
IH	industrial hygienist
INEEL	Idaho National Engineering and Environmental Laboratory
INL	Idaho National Laboratory (formerly INEEL)
INTEC	Idaho Nuclear Technology and Engineering Center
MCP	Management Control Procedure
NWCF	New Waste Calcining Facility
OSHA	Occupational Safety and Health Administration
PLN	plan
PM	Project Manager
PRD	Program Requirements Document
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
SOW	Statement of Work
TFF	Tank Farm Facility
TPR	Technical Procedure

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1. INTRODUCTION

This plan was prepared for the Idaho Nuclear Technology and Engineering Center (INTEC) Tank Farm Facility (TFF) Closure Project under the INTEC Cleanup Project, which is part of the Idaho Cleanup Project (ICP) operated by CH2M-WG Idaho (CWI). The TFF Closure Project consists of the flushing and grouting of eleven 300,000-gal tanks (WM-180, WM-181, WM-182, WM-183, WM-184, WM-185, WM-186, WM-187, WM-188, WM-189, and WM-190), and four 30,000-gal tanks (WM-103, WM-104, WM-105, and WM-106). In addition, the TFF Closure Project consists of the flushing and grouting of numerous ancillary equipment and transfer lines associated with the operation of the TFF. This plan identifies the activities that will be performed to ensure and document the placement of grout in the TFF tanks and ancillary equipment according to closure requirements. Proper completion of the activities outlined herein will provide the independent Professional Engineer (PE) with the information needed to certify the completion of closure activities. In addition, the documentation will provide Department of Energy (DOE) personnel, regulators, and stake holders a complete record of grout placement activities to ensure proper compliance with design requirements.

The grouting requirements from the DOE Tier I Closure Plan, Tier II Closure Plan, 3116 Waste Determination, Record of Decision, and the Resource Conservation and Recovery Act (RCRA) Closure Plans have been incorporated into the project design specifications (SPC-777, SPC-763, and SPC-1017). Appendix C contains a matrix listing grouting requirements identified in these plans and how and where the requirements have been implemented into the grouting design. The applicable quality compliance and verification requirements are summarized in this plan.

As required in DOE Order 435.1, an annual review will be conducted to ensure conclusions reached in the 3116 Waste Determination remain technically sound and based upon analysis that is representative of current information. This annual review will be conducted to evaluate any new information or data that may impact assumptions used to support the DOE Tier 1 Closure Plan, the INTEC TFF Performance Assessment, Composite Analysis, Institutional Controls/Land Use Planning, Environmental Monitoring Plan, and support to NRC Monitoring. The process for performing this review is described further in Section 6 of this Compliance and Monitoring Plan.

1.1 Project Overview

Grouting of the TFF 300,000-gal tanks will be conducted by installing a grout mast, camera, and grout arms in or on top of interface risers located above each 300,000-gal tank riser. An engineered pour will be utilized to displace the remaining tank residuals towards the lowest level steam jet. This jet will be used to transfer the remaining tank heels out of the tank. Upon completion of the engineered pour, grout arms will be removed from the tank, and several grout layers will be poured to fill the tank. Concurrently, grout will also be placed in the respective tank vaults.

Grouting of the 30,000-gal tanks is much simpler in that only a grout mast will be used, and there are only two layers of grout placements for each tank. There is no heel displacement pour required in these tanks, and no vault grouting.

Grouting of ancillary equipment and piping including cooling coils will be conducted by inserting grout at various grout points. Grout will be inserted at each grout point until full as determined either by engineering calculations, visible verification, or the point at which the grout pump pressure does not exceed 150 psig at the pump or 100 psig at the connection. Valve boxes will be grouted by simply filling the boxes, allowing grout to flow down secondary containment trenches.

This grout compliance and monitoring plan provides the implementation requirements, methods, and controls to ensure that the design drawings and specifications for grouting are implemented as designed. Implementation requirements include sampling, testing, and monitoring, as well as the preparation of appropriate records to ensure compliance with the design.

1.2 Site Description

The Idaho National Laboratory (INL) Site encompasses 2,305 km^2 (890 mi^2) and is located approximately 55 km (34 mi) west of Idaho Falls, Idaho. The United States Atomic Energy Commission, now the U.S. Department of Energy, established the Nuclear Reactor Testing Station, now the INL, in 1949 as a site for building and testing nuclear facilities. At present, the INL supports the engineering and operations efforts of DOE, through the DOE-Idaho Operations Office and other federal agencies in areas of nuclear safety research, reactor development, reactor operations and training, nuclear defense materials production, waste management and technology development, and energy technology and conservation programs.

The INTEC is located in the south central portion of the INL Site approximately 13 km (8 mi) north of the southern INL Site boundary and covers an area of 0.4 km^2 (0.15 mi^2). Operations commenced at INTEC in 1953. The INTEC facility has historically been a uranium reprocessing facility for both defense projects and research while also acting as a storage facility for spent nuclear fuel. While reprocessing activities at INTEC were phased out in the 1990s, the facility continues to receive and store spent nuclear fuel and radioactive wastes for future disposition. In addition, operations continue to reduce the volume of liquid radioactive waste stored at the site.

The TFF is part of the INTEC facility. The TFF includes eleven belowground 300,000-gal and four below-grade 30,000-gal stainless-steel tanks. Aboveground structures in the TFF include the Control House (building CPP-628), the Computer Interface Building (CPP-618), condenser pits, valve boxes, tank and vault sump riser covers, and other structures. A perimeter fence encloses the TFF on each side. Some buildings also border the TFF on the south side. Gates are located on all sides of the TFF for truck and equipment access.

The TFF was used to store liquid wastes generated by spent nuclear fuel reprocessing operations and decontamination wastes from reprocessing facilities at INTEC. Construction of the TFF began in 1951, and the last tanks were constructed in 1964.

Eight of the eleven 300,000-gal tanks and the 30,000-gal tanks contain stainless steel cooling coils to minimize tank corrosion. Risers provide access to each tank. Each tank has four or five 12-in. diameter risers. Tanks WM-184 through WM-190 also have at least one or two 18-in. diameter risers. Most risers have contained installed equipment such as radio frequency probes for level measurement, or waste transfer equipment (steam jets and airlifts). Much of this equipment has been removed as part of tank farm closure washing activities in preparation for grouting.

Each 300,000-gal tank is contained in a concrete vault. The vault floors are approximately 45 feet belowground and are configured in one of three basic designs: monolithic octagonal, pillar and panel octagonal or monolithic square. The 6-in. thick concrete vault roofs are covered with approximately 8-10 feet of soil to provide radiation shielding.

Liquid waste transfers, to, from, and among the tanks are managed through a system of piping, valves, and diversion boxes. The liquid waste is routed through waste transfer valves located in underground, stainless steel-lined concrete boxes, referred to as valve boxes.

1.3 Tank Farm Closure Activities

Under the terms of the 1992 Consent Order (and subsequent modifications) between the Idaho Department of Health and Welfare, (IDHW) and the DOE-ID, DOE-ID must permanently cease use of belowground tanks at the TFF or bring the tanks into compliance with secondary containment requirements for tanks that store hazardous waste. The DOE is closing the TFF tanks because high radiation fields and possible high radiation dose to workers would make compliance with secondary containment requirements impractical. In addition, the need for such tanks is not evident after 2012.

In 2002, the use of a tank washing system, which included a washball to wash residuals from the tank walls and a new jet to remove residual waste from the tank, was successfully demonstrated for Tank WM-183 in Technical Procedure (TPR) P7.5-X2, "Spray Wash Demonstration WM-183." The existing steam jets in Tanks WM-182 and WM-183 were replaced with a new steam jet in each tank located 3/8 in. from the tank floor. This washing system was used to remove residual waste during final closure of the tanks. Observations during the 2002 wash demonstration using video equipment in Tanks WM-182 and WM-183 showed that by using a small stream of water (low pressure), the residual waste on the walls could be easily removed.

Following the demonstration in Tanks WM-182 and WM-183, the tank washing system, including a new jet, was installed in Tanks WM-184, WM-185, and WM-186. These tanks were washed and sampled in 2003. Tanks WM-180 and WM-181 were washed and sampled in 2004 and 2005. The 30,000 gallon tanks were flushed and sampled in 2004. During this same time period, ancillary equipment (cooling coils, vault sumps, valve boxes, and other transfer piping) was also washed. Activities associated with washing, cleaning, and sampling were performed to reduce levels of contamination or hazardous waste to within acceptable risk limits contained in the approved Hazardous Waste Management Act/Resource Conservation and Recovery Act Closure Plan for the respective tanks.

Because tanks WM-187 through WM-190 will be required for storage of liquid waste until operation of the Integrated Waste Treatment Unit (IWTU) to treat the remaining liquid waste, the washing and sampling of these tanks will not be completed until a later date. However, the washing and cleaning will follow the same procedures as the other tanks. Grouting of these tanks will be performed upon completion of cleaning.

1.4 Grouting Scope

Grouting activities commenced late in 2006 with grouting of tanks WM-104, WM-105, and WM-106. Grouting continued in 2007 filling tank WM-103 and tanks WM-180 through WM-186. In addition, grout was placed in the associated tank vaults. In 2008, grouting was completed with the placement of grout in the associated ancillary lines, sumps, risers, and cooling coil lines. Additional grouting will be completed on tanks WM-187 though WM-190 once these tanks have been cleaned.

Grout delivery equipment will be installed through tank risers on the 300,000-gal tanks and through sump risers for their respective vaults. Video surveillance equipment may also be installed through risers on the tanks. Grout will be placed, in layers, in each tank following a specified sequence per engineered drawings.

In the heel displacement sequence, the grout will be placed so that it displaces as much of the tank residuals as possible and moves the remaining residuals toward the steam jet for removal from the tank. As the grout is placed, the remaining tank residuals (liquid and solid) will be pumped (using the steam jets remaining in each tank) out of the tank and transferred through process waste piping for further treatment. After the initial grout placements to remove tank residuals, additional grout will be placed in the tank to level out mounds of grout from the heel displacement pours. The completion of this activity constitutes grout placement layer 1 according to the project grouting specifications. Dry grout or another absorbent may be placed in the tanks if free liquids remain.

The remaining liquids in the vault sumps will be transferred out of the vault through process waste piping for further treatment. Vaults will be accessed through sump risers by removing the covers to the vault riser access boxes. Grout will be added to each vault in specified layers.

Subsequent pours will be made in layers in each tank and vault. Grout pours in the tank and vault will be poured one layer at time with the addition of a layer in the tank followed by an addition of a layer in the vault. During the grout placement of these layers, the tanks will continue to be ventilated through the Tank Farm Ventilation System.

Upon completion of the grouting of each of the 300,000-gal tanks and vaults as described above, modifications will be made to the ventilation system for each tank. This modification will allow grout to be injected back into each tank using either a tank riser or vessel off-gas (VOG) line. The modifications will also allow the Tank Ventilation System to remain in service after this final tank grout placement and allow the tank to be isolated from the remaining Tank Ventilation System. Any remaining voids in the tank risers will be filled with grout to approximately ground level.

The final grouting will include grouting specific pipes and their encasements per the respective closure plan. Grout will be pumped through the encasement covers and valve boxes. After the vaults have been filled, the sump risers will be filled to approximately ground level.

The cooling coils for each tank will be grouted by connecting the grouting pump to each cooling coil inlet line. Grout will be pumped into each line until full or the line no longer accepts grout.

A subcontract has been established to furnish plant, labor, material, equipment, and supplies, and perform work operations necessary to supply grout to the project (reference Construction Specification [SPC]-763). The subcontractor has installed a batching facility at INTEC for producing the grouting mix. Based on project requirements, the subcontractor will deliver grout mixes to the TFF in mixer trucks. A pumper truck will be stationed at the tank farm for grout transfer to each individual insertion point. The majority of grout placed in the TFF will arrive via this method. In addition, a small portable pump will be used to place grout in locations not accessible by the pumper truck and where only small volumes of grout will be needed (e.g., cooling coils). When using the small portable pump, grout may be hand-mixed in the mix tank instead of receiving deliveries from the batching facility in mixer trucks due to the small volumes required. The hand mixing of grout and delivery using the portable pump is supplied according to SPC-1017.

2. ORGANIZATIONAL RESPONSIBILITIES

The following sections contain a description of each of the principle roles associated with this project. This organization will ensure that project objectives, data gathering and reporting, and operational safety meet ICP requirements. Appendix A contains a list of the key project personnel that will fulfill

these project duties along with their designated back-up replacements. In addition, specific roles and responsibilities have been identified for grout day operations. These grout day positions and responsibilities are identified in Section 2.9.

2.1 Operations Manager

The operations manager is responsible for all work that is accomplished in the TFF. This includes ensuring that work activities are scheduled, adequate safety and health personnel are available, and that the work performed is completed by personnel that are adequately trained to accomplish the work. The operations manager is responsible for ensuring that qualified Waste Operations personnel are available, that procedures are up-to-date and accurate, and that notifications are properly made if upset conditions occur. The operations manager will make certain that activities conducted during the project comply with management control procedures (MCPs) and program requirements documents (PRDs), and applicable requirements of the Occupational Safety and Health Administration (OSHA), EPA, DOE, U.S. Department of Transportation (DOT), and State of Idaho. The operations manager will ensure that all work performed will be controlled and performed under proper work control procedures.

2.2 Project Manager

The project manager will coordinate document preparation, field activities, and subcontractor activities. The PM is responsible for all aspects of the project including the overall work scope and budget.

The PM will serve as the interface between the operations manager, Operations personnel, subcontractor personnel, and project personnel, and will work closely with each organization to make certain that the objectives of the project are accomplished. The PM will work with other identified personnel to identify and obtain additional resources needed at the site and interact with Environmental, Safety, and Health (ES&H) and Quality Assurance (QA) oversight personnel, as required. The PM will ensure that all activities conducted during the project comply with MCPs, PRDs, and all applicable requirements.

The PM is responsible to order the grout from the batch plant by communicating the projects needs to the subcontractor technical representative. Each week the PM is responsible to provide notification to the subcontractor technical representative (STR) of which type of grout will be needed and the quantities. The STR is responsible to provide this information to the batch plant. Section 4 identifies the steps and responsible parties to perform various activities during the grouting process.

2.3 Construction Coordinator and Subcontractor Technical Representative

The construction coordinator supports the project team through all phases of the project starting from initial project planning continuing through design, construction, and acceptance and closeout. Grout placement activities will generally be performed by construction personnel according to the requirements of the construction work order. The construction coordinator is responsible to coordinate all work with the operations manager and project manager. The construction coordinator will ensure that construction activities are performed in compliance with applicable MCPs and procedures. The construction coordinator will ensure that all construction personnel have the applicable training and qualifications required to perform the assigned tasks.

The construction coordinator also acts as the construction STR. The STR is responsible for the grout supply subcontractor. The STR is responsible to direct and coordinate activities of the grouting subcontractor including operations of the batching facility. The STR will ensure that the subcontractor complies with the requirements outlined in the applicable construction specifications, and will coordinate project requests for grout with the subcontractor. The STR is the single point of contact responsible to provide direction to the batching facility and will be responsible to communicate the project's requests for grout. The STR will monitor the batching facility to ensure compliance with requirements and procedures. The STR or batch plant operator will monitor each batch to ensure the delivery matches the project request and will document this by initialing each batch ticket before it leaves the batching plant.

2.4 Construction Job Site Supervisor

The construction job site supervisor is responsible to direct construction activities at the project site per the requirements of the project work order. Grout placement activities will be performed according to SPC-777, "Tank Farm Closure Project – Tank and Vault Modifications for Grouting," or SPC-1017, "Tank Farm Closure Pipe Grouting," and the applicable drawings and work order. The job site supervisor is responsible to ensure all activities at the job site are performed in a safe and compliant manner according to project requirements.

2.5 Grouting Compliance Coordinator

The grouting compliance coordinator is the project representative responsible for ensuring project requirements are met and grouting is performed according to project specifications. The grouting compliance coordinator will ensure that grouting activities are properly documented and recorded. The grouting compliance coordinator works closely with the performing organizations to verify that applicable requirements are being met including all requirements outlined in this plan. The grouting compliance coordinator works closely with project personnel and the certified Professional Engineer to document tank farm closure and grouting activities for final closure certification.

When grouting is performed, the grouting compliance coordinator, or designee, will be responsible to review the batch ticket upon arrival at the delivery location to ensure the correct approved mix is delivered. The grouting compliance coordinator will sign the batch ticket to indicate the mix is correct and complies with the requirements of this plan. The grouting compliance coordinator or designee shall be responsible to complete the grout placement logbook form (or equivalent) to document the placement of the grout batches per the approved specifications and drawings. The grouting compliance coordinator's signature on the form will indicate that the location to which the grout is being pumped is correct per the project specifications, and the form will be signed prior to authorization to proceed with grout placement.

When using the small portable hand mixer, the grouting compliance coordinator will ensure that the pump hoses are connected to the correct hook-up points per the applicable procedures and drawings. The compliance coordinator will complete the applicable tracking sheets and log to document grout placement.

2.6 QA Support

QA personnel at INTEC have project responsibilities that may include reviewing procedures and documents, work orders, and procurement documents related to project work for inclusion of quality requirements, performing assessments/audits/surveillance of activities in the field, and reviewing and

validating calculations and data. Specifically, QA personnel will be assigned to (a) concur with and approve this document, (b) assure implementation of QA review and oversight functions as defined herein, and (c) advise and support the TFF Closure Project PM with the QA requirements and responsibilities.

QA personnel are responsible to verify and test the grout formulations to ensure the requirements of construction specifications are met. QA personnel shall observe production and perform sampling to control and monitor the production, transportation, and delivery temperatures of the grout. Required QA inspections will be conducted at the job site by a qualified inspector according to the requirements of an approved inspection plan developed per the approved specifications (SPC-763, SPC-777, or SPC-1017) and drawings.

2.7 Safety and Health

The Safety and Health representative(s) is responsible to ensure that the job is conducted in a safe manner in compliance with all applicable ICP procedures. The representative advises the PM and workers on all aspects of health and safety to ensure that operations are conducted to protect workers and public health and safety. Representatives are authorized to verify compliance with procedures, conduct inspections, and require and monitor corrective actions. The safety and health representatives may include safety engineers, industrial hygienists (IHs), radiological control technicians (RCTs), radiological engineers, environmental compliance personnel, and facility representatives, as needed.

2.7.1 Industrial Hygiene

The industrial hygienist (IH) is the primary source for information regarding hazardous and toxic agents at the project site. The IH assesses the potential for worker exposures to hazardous agents according to applicable procedures, MCPs, and accepted industry industrial hygiene practices and protocol. By participating in grouting, the IH assesses and recommends appropriate hazard controls for the protection of project personnel and operates and maintains personnel sampling and monitoring equipment. The IH also recommends and assesses the use of personal protective equipment in the health and safety documentation.

2.7.2 Radiological Engineer

The radiological engineer is the primary source of radiological information and provides guidance on radiological hazards and mitigations. The radiological engineer’s responsibilities include evaluating the intended work, conducting as low as reasonably achievable (ALARA) reviews, giving input to work packages and radiological work permits, and establishing radiological control points.

2.7.3 Radiological Control Technician

The RCT is the primary source of information and guidance on radiological hazards and will be present at the project site as necessary. Responsibilities of the RCT include radiologically surveying the project site, equipment, and samples, providing guidance for radioactive decontamination of equipment and personnel, and if radiological contamination occurs, assisting workers as necessary and as required by procedures.

2.8 Records Administrator

The records administrators are responsible for maintenance of records in accordance with established procedures and protocols including MCP-557, "Managing Records," and PRD-111, "Records Management."

2.9 Grout Day Positions

On the day grout is actually placed, grouting procedures generally require that several key positions be staffed to perform the grout placement. These grout day positions may be filled concurrently by the same individuals fulfilling the various project positions outlined in the previous subsections.

2.9.1 Grout Manager

The Grout Manager conducts grouting operations and may fulfill the duties of the operations manager when performing grouting. The grout manager is responsible to oversee all grouting operations and to be physically present in the field when grouting operations occur. The grout manager authorizes the placement of grout and ensures that all procedures and requirements are followed. The grout manager is responsible to ensure that grouting activities are conducted in a safe and compliant manner according to the project specifications and drawings. The grout manager is responsible to ensure that the grout connections are made to the correct location prior to authorizing grout pumping to proceed.

2.9.2 Grout Supervisor

The grout supervisor oversees the grout placement activities and may fulfill the duties of the project manager when performing grouting. In addition, the grout manager and grout supervisor may function concurrently by the same person. The grout supervisor is responsible to monitor grout placement to ensure compliance with the applicable specifications and drawings. The grout supervisor maintains the grouting logbook and grout supervisor forms. The grout supervisor is responsible to observe grout placement activities using the installed cameras to ensure compliance with placement requirements. The grout supervisor is responsible to direct the positioning of the grout arm and to start and stop the pump truck. The grout supervisor will also record activities in the control trailer operations logbook.

2.9.3 Truck Supervisor

The STR or designee acts as the truck supervisor during grout placement activities. The truck supervisor directs the activities of the batch plant and grout delivery to the tank farm. The truck supervisor is responsible to ensure that the correct truck arrives at the right place, at the right time, with the correct grout mix.

The truck supervisor will monitor the batching facility to ensure compliance with requirements and procedures. Once authorization is received from the grout manager, the truck supervisor is responsible to notify the batch plant to start mixing operations and delivery to the grout placement site. The truck supervisor or batch plant operator will monitor each batch to ensure the delivery matches the project request and will document this by initialing each batch ticket before it leaves the batching plant. The first batch to leave the batch plant for the day is initialed by both the truck supervisor and the batch plant operator.

When using the small portable pump, the truck supervisor will monitor batching activities in the pump hopper. The truck supervisor is responsible to ensure that the batching activities at the portable pump are in compliance with requirements and procedures. The truck supervisor must complete and sign the mixing log for each of the batches mixed at the portable pump.

2.9.4 Tank Farm Supervisor

The Tank Farm Supervisor directs grouting actions on the tank farm and may fulfill the duties of the job site supervisor role during grouting. The tank farm supervisor directs the tent operators in performing activities inside the tents such as hook up and disconnect of grouting equipment and pressure gauge monitoring. The tank farm supervisor reports directly to the grout supervisor.

2.9.5 Pump Truck Operator

The pump truck operator is responsible to start and stop operations of the pump truck (when being used) according to the direction of the grout supervisor. The pump truck operator reports to the grout supervisor and performs adjustment of the grout pumping rate per the grout supervisor’s instructions. The pump truck operator monitors the pump pressure to ensure pumping operations are performed according to applicable requirements and specifications.

2.9.6 Test Ring Operator

The test ring operator receives the trucks at the test ring and monitors the batch mix to ensure compliance with grouting requirements and may fulfill the duties of the grouting compliance coordinator during grouting. The test ring operator reports to the truck supervisor. The test ring operator ensures that required QA testing is performed, that the batch mix is correct, and that the grout meets all specifications to be delivered to the pump truck. The test ring operator assists in completing the truck supervisor form.

3. GROUT MIX QA/QC TESTING

Placing grout in the TFF tanks as part of this closure effort will provide long-term structural stability of the waste under the expected disposal conditions. Structural stability will prevent excessive subsidence, settlement or deformation, minimize water infiltration, postpone the possible radionuclide release, and minimize the likelihood of waste intrusion. It is critical that the grout mix have the appropriate density and consistency to ensure the correct flowability and strength.

SPC-763, “INTEC Grout, Concrete, and CLSM Supply Project,” contains the specific requirements for the grout supplier including sampling and testing of the grout mixture. The QA/QC requirements for the grout supplier are specified in SPC-763. The subcontractor shall comply with all requirements outlined in SPC-763, and the subcontractor technical representative is responsible to verify compliance by performing surveillance activities. The STR or batch plant operator will initial each batch ticket before dispatching a truck from the plant to the job site indicating that the batch matches the written project request.

For each batch generated, a batch ticket is prepared. The batch ticket documents the mix description and the volume of material in the mix. The percent moisture is documented, as well as the water to cement ratio. Other information recorded on the batch ticket includes the yardage and the time the batch was loaded. Each batch ticket is individually numbered and contains several copies.

SPC-1017, "Tank Farm Closure Pipe Grouting" contains the specific requirements for mixing and placement of hand-mixed grout using the small portable grout pump. The QA/QC requirements outlined in this specification will be followed when placing grout using the portable pump. Batch tickets will generally not be prepared for this process. However, a grout mixing verification log will be kept to ensure that the proper materials and amounts (as outlined in the specification) are used and documented. In some cases, grout may be mixed at the batch plant according to SPC-763 and placed using the small portable grout pump according to SPC-1017.

4. GROUT PLACEMENT VERIFICATION

Upon arrival at the grout placement location, the grouting compliance coordinator or designee will verify the batch ticket to ensure that the grout mixture meets the grout composition requirements (SPC-763) for placement in the TFF component as defined in the grouting placement specifications and drawings (SPC-777). The grouting compliance coordinator, or designee, will verify the water to cement ratio to ensure that it is less than 0.65.

A qualified QA inspector will perform sampling and testing of the grout per the requirements of the approved inspection plan. The inspection plan is prepared to include all required checks as outlined in the project specifications. Testing and verifications performed by the QA inspector are documented by the inspector on the required inspection plan.

SPC-763 contains three different grout formulas to be used on the tank farm. The heel displacement formula will be used to displace residuals in the large 300,000 gallon tanks as part of layer 1. This formula contains a mixture of cement, Class F Pozollan and ground blast furnace slag designed to displace and stabilize tank residuals.

Controlled low strength material grout will be used to fill the remaining tank layers, and contains a mixture of Class C fly ash, cement, and sand. The third mix design is the pipe fill grout that will be used to fill the tank farm piping. Pipe fill grout may also be used for the final leveling pour in the tanks and vault risers to ensure maximum fill. This mixture contains Class C Pozollan and cement.

Additionally, SPC-1017 contains the grout formula that will be used when performing hand mixing of pipe fill grout using the small portable grout pump. This formula contains a mixture of Class F Pozollan and cement. When the grout is mixed using the portable grout pump, the grouting compliance coordinator, or designee, will verify that the mixing was performed in compliance with the grouting requirements (SPC-1017). This verification will be documented in the grout mixing verification log.

The proportions may be slightly modified to provide the required yield as allowed by American Concrete Institute Standards. The amount of water and high range water reducer may need to be modified to provide the strength, slump, flow characteristics, and pumping characteristics required for each placement. SPC-763 or SPC-1017 contains the specific formula amounts and requirements.

If some materials are not available, formulas may need to be adjusted. Any changes to the grout formulas must receive formal approval through the established vendor data submittal process based on an approved engineering field design change. Only approved grout formulas will be used for grout to be placed on the tank farm. In some cases, standard concrete may be used in valve boxes per SPC-1017. This will be used to prevent the flow of grout to areas not undergoing closure. This concrete mixture shall also have a water to cement ration of less than 0.65.

After verifying that the correct mix is delivered or mixed, the grouting compliance coordinator or designee will sign the batch ticket (or mixing log as applicable), and will retain a copy for the project records. If the batch does not meet the required specifications and the mix is incorrect, the batch ticket will not be signed, and the truck will be sent for disposal at the INL landfill or other designated location.

Grout placement is governed by SPC-777 (or SPC-1017 for pipe grouting) and the applicable work order. These specifications contain details documenting grout requirements, the sequence that must be followed when placing the grout, and other details. Specific instructions and procedural steps are placed in the applicable work order. Grouting personnel will review the specification to ensure the grout will be placed correctly. Concurrence that the grout will be placed correctly according to the applicable specifications and work orders will be obtained by authorization of the grout manager and grout supervisor and documented in the grout placement form (See Appendix B) or other designated logbook form prior to authorization to proceed with grout placement.

The grouting compliance coordinator, or designee, will prepare and maintain a logbook documenting grout placement activities. The logbook will contain the grout placement forms (See Appendix B), grout supervisor forms, truck supervisor forms, and copies of the batch tickets, as applicable. These forms will identify the batch ticket number, the date and time that the batch was placed, the amount of grout placed (either the entire truckload or a portion thereof), the insertion point where the grout was inserted into the system (i.e., tank riser, vault riser, pipe, valve box, etc.), and any applicable comments including any unusual conditions.

When placing the grout into the applicable component, the component may eventually become full to the point of grout refusal. For tanks, vaults, and valve boxes, the component will be considered full when the documented (SPC-777) required volume has been placed in the component. Risers will be filled to approximately ground level. The portion of the structure that extends above ground will not be filled with grout to accommodate future D&D removal activities. Other fill material may be used to fill the remaining voids per the approved specifications. For piping, the pipe will be considered full either when the calculated amount has been added per engineering calculations, or visible verification shows that the pipe is full, or the grout pump pressure reaches 150 psig at the pump (or 100 psig at the grout connection). At the point where the component will no longer accept grout, the grout pump will be shut off. The grout placement form (or equivalent) will reflect how much of the grout was placed. The signature on the form will reflect that the system was grouted full.

As stated in Section 3, some sampling and grout testing will be required at the grout placement site upon arrival of the mixer truck. SPC-763 governs testing that will be performed at the grout placement site including slump testing, strength testing, and/or puddle testing. SPC-1017 governs testing that will be performed for batches mixed using the portable grout pump. Testing will be performed by a qualified QA inspector. Other QA/QC activities at the project site will include observing and recording activities to ensure compliance with applicable procedures, reviewing batch tickets, and randomly verifying that delivery meets project expectations and review of logbook documentation to verify all information is accurately recorded.

The process compliance and verification flow is documented in Table 1 for SPC-763 grout. Appendix A contains a list of key personnel that will fulfill the required activities. For grout placed according to SPC-1017, the flow of activities may differ from the table below.

Table 1. Grouting compliance process flow.

Previous Week Actions
Place weekly grout order (PM e-mails STR)
STR informs batch plant of next week's schedule
Batch plant orders supplies needed for next week
Day of Grouting Operations
Grout Supervisor notifies Truck Supervisor that they are ready to commence grouting
Truck Supervisor notifies batch plant to begin mixing operations
Batch plant prepares mix
Batch plant generates batch ticket
Batch Plant Operator or Truck Supervisor verifies ticket matches e-mail request and initials batch ticket
Mixer truck delivery to Tank Farm
Quality Inspector performs required inspections (may be performed at batch plant prior to delivery)
Test Ring Operator verifies correct batch and Tank Farm Supervisor verifies correct grout connection
Grout Manager and Grout Supervisor authorize grout placement and record in logbook
Grout Compliance Coordinator (or designee) signs batch ticket
Perform grout placement
Applicable form(s) completed to document grout placement activities

5. Document Control

Document control consists of the clear identification of all project-specific documents in an orderly form, secure storage of all project information, and controlled distribution of all project information. Document control ensures controlled documents of all types related to the project will receive appropriate levels of review, comment, and revision as necessary. The project manager is responsible for properly maintaining project documents according to document control requirements. Upon completion of the project, all project documentation and information will be transferred to compliant storage according to project, program, and company requirements. Project management will involve the active support of their organization's trained records coordinator. Record filing, storage, and retention shall conform to MCP-557, "Managing Records."

6. Maintenance and Monitoring

The INTEC Tank Farm Closure Project received approvals for a 3116 Determination, an amended NEPA Record of Decision, and a DOE Tier 1 closure plan in November 2006, in support of in-place closure of the TFF at INTEC. Grouting commenced in November 2006 after issuance of the key authorization documents. As required in DOE Order 435.1, an annual review will be conducted to ensure conclusions reached in the 3116 Determination remain technically sound and based upon analysis that represent current information. This annual review will be conducted to evaluate any new information or data that may impact the assumptions used to support DOE Tier 1 Closure Plan, the INTEC TFF

Performance Assessment, Composite Analysis, Institutional Controls/Land Use Planning, Environmental Monitoring Plan, and support to NRC Monitoring.

Appendix D of this plan (PLN-2309) contains a checklist that must be reviewed in order to implement the requirements for an annual review. This checklist will be completed by the TFF Closure Project Manager annually until final closure of the TFF is achieved. A completed copy of the checklist will be kept with the project records. Based on the results of the completed checklist, actions to update the applicable documents will be developed when necessary, and the review shall be considered complete. A record of any actions developed and completed as a result of the annual review will also be kept in the project records.

7. REFERENCES

1. MCP-557, "Managing Records."
2. SPC-763, "INTEC Grout, Concrete, and CLSM Supply Project."
3. SPC-777, "Tank Farm Closure Project – Tank and Vault Modifications for Grouting."
4. SPC-1017, "Tank Farm Closure Pipe Grouting."
5. TPR P7.5-X2, "Spray Wash Demonstration WM-183." (canceled)

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Appendix A

Key Individual Training

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Appendix A

Key Individual Training

Key personnel at the grouting job site will be responsible to perform job functions to ensure the correct grout is placed in the required locations according to the approved specifications (SPC-763, SPC-777, and SPC-1017) and the requirements of this plan. These key positions, names of the primary responsible person, and their designated back-ups are provided below.

Key personnel		**Back-up personnel**
Project Manager:	Steve Butterworth	Jeff Long
STR:	TBD	TBD
Job Site Supervisor:	TBD	TBD
Grouting Compliance Coordinator:	Jeff Long	Steve Butterworth, Jeff Bryant

Prior to commencement of grouting, these individuals will undergo training as to the requirements of this plan (PLN-2309). If any of the named individuals are not present so that one of the key positions is vacant, grouting operations will be suspended until the key individual returns to work or a replacement is trained. Training to this plan will be performed and documented according to procedures. If additional personnel are trained to fill one of these key positions, this appendix will not necessarily be revised. Training of the replacement individual will be properly documented and approved by the project management.

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Appendix B

Grout Placement Log

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Appendix B

Grout Placement Log

Batch Ticket Number:	
Date:	Time:
Grout Insertion Point:	
Estimated Volume Inserted (Entire truckload or portion thereof):	
Comments (Indicate Any Upset Conditions):	
Grout Compliance Coordinator Signature:	

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Appendix C

Approved Document Requirements Matrix

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Appendix C

Approved Document Requirements Matrix

The following matrix contains a listing of the grouting requirements identified in the DOE Tier I Closure Plan, Tier II Closure Plan, Waste Determination, and RCRA Closure Plans. The table identifies where and how the requirements have been implemented in the grouting design. The comments section indicates where several documents must still be developed. This Appendix C will not be revised to reflect completion of these documents.

Requirements Document	Requirement	Implementation	Comments
RCRA Closure Plans	Closure plans specify tanks, vaults, valve boxes, piping, and other components to be grouted	SPC-777 and AFC Drawings 635548 PLN-2309	Phase V Closure Plan has been approved. However, the engineering drawings for grouting of ancillary equipment are under development. Any grouting requirements included in the approved closure plans will be incorporated into the design drawings.
Tier 1	2.5.1.7. Grout Supply. A batch plant will supply grout to concrete trucks. The concrete trucks will mix and deliver the grout to a concrete pump truck supply lines, grout delivery system, and two grout nozzles. When cleaning of the tanks is complete and grouting is ready to commence, the nozzles will be inserted through risers closest to the tank walls.	SPC-763 SPC-777 and AFC Drawings 635548	Grout arms will be used in the 300,000 gallon tanks per the design specifications. Grout arms will not be used for the placement of grout in tanks WM-103 through WM-106.
	2.5.3.1 Grout Design. The grout must be able to provide long-term stability of the waste under the expected disposal conditions and meet the requirements of 10 CFR 61 (2006).	TFF Performance Assessment SPC-763 TFR-26 SPC-1017	

Requirements Document	Requirement	Implementation	Comments
	2.5.3.1 The grout mixture to be used for the closure was initially tested as part of the conceptual design (INEEL 2000b) in the tank mockup testing (INEEL 2001b), and most recently, in field testing (EDF-6715, 2006). Mixtures will differ depending on their use (closure of the pipes, tank, or vault). In general, the grout will consist of the following ingredients in differing proportions: Cement (Type I/II) Fly ash and water Sand Slag Water reducer.	SPC-763 SPC-1017	Per SPC-763, the slag will only be included in the mix for the engineered grout placements and encapsulation grout pours and the initial pours in the WM-185 and WM-187 vaults.
	2.5.3.2 Initial Grouting. The initial grouting process is comprised of: (1) an engineered grout placement sequence to move remaining solids and liquids toward the steam jets, aid in the mixing of residuals with the grout, and provide a reducing environment; and (2) an encapsulation pour to stabilize residuals on the surface of the grout placements and level the engineered grout placements. The initial placement of the grout and concurrent operation of the steam jet is designed to remove as much residuals as possible. Grouting will be performed using the grout nozzles in a predetermined sequence. As the grout is placed, the residuals (liquids and solids) will be displaced toward the steam jet and transferred through process waste piping to an operational TFF tank.	SPC-763 SPC-777 and AFC Drawings 635548 Work Order 606642	The initial grouting sequence applies to grouting of the large 300,000 gallon tanks. These initial and final pours will not be performed on tanks WM-103 through WM-106.

Requirements Document	Requirement	Implementation	Comments
	2.5.3.3 Final Grouting. After the initial placement, the remaining grout will be placed in layers into the tank and vault. The final grouting will include VOG lines and the tank dome. The cooling coils and transfer piping will be grouted to the extent possible. When the valve boxes are grouted, grout will flow into the trenches. Video surveillance equipment and lighting will be used to observe grout placement. This action will also grout the overflow lines between the tanks. The VOG lines and condenser pits will be grouted. Grout will be pumped through the VOG lines until it enters the tank risers. Any remaining voids in the tank risers will be filled with grout. These lines and the tank risers will then be permanently capped. The cooling coil lines for each tank will be grouted by connecting the grouting equipment to the supply (60 lines for each tank). Grout will be pumped into each line until it exits the return end or until the line no longer accepts grout.	SPC-777 and AFC Drawings 635548 SPC-1017 Work Order 606642	Video surveillance equipment will not be used in WM-103, WM-104, WM-105, and WM-106. Volume measurements will be used to ensure that the tanks are full of grout.
3116 Basis Document	Section 6.1 The grout will be introduced through two available risers with specially designed grout masts. The first two placements go in directly below the available risers to a height of 0.9–1.2 m (3–4 ft). The purpose of the first two placements is to begin moving residuals toward the steam jet for removal and to provide troughs to direct placements 3 through 5 to the other areas of the tank. In the grout mockup (INEEL 1999b), these placements were successful in moving solid and liquid surrogate materials. Placements 3 and 4 use the same riser access as placements 1 and 2, and displace the residuals between the tank wall and the steam jet. The purpose of placement 5 is to displace the residuals on the opposite side of the tank from the steam jet. These placements flow through the trough to sweep residuals toward the steam jet. Placement 5 may be replaced with two separate placements to allow better residual removal, but the purpose of the placement is the same.	SPC-777 and AFC Drawings 635548	A sixth placement may be used to aid in removal of additional residuals from the tanks.

Requirements Document	Requirement	Implementation	Comments
	Section 6.2 The vault will be filled completely with grout. Incremental steps in the grout fill will accomplish covering the sandpad by making grout pours through the two available risers, filling to level the initial grout pour, and finally filling the entire vault. A minimum grout height of 1 m (3 ft) is necessary to allow the grout to flow around the vault and rise to a level of at least 46 cm (18 in.) above the grout floor. The 46-cm (18-in.) height is desirable because the sandpad and associated dike are 15 cm (6 in.) above the floor and approximately 46 cm (18 in.) level, which will ensure encapsulation of the sandpad. Grout poured into the vault will fill the area surrounding the sandpads, leaving no voids and providing structural integrity to the sandpads. Liquid entering the vault system will be drained from the vault sump prior to closure. Grouting of the vault area surrounding the sandpad will incorporate any remaining liquids.	SPC-777 and AFC Drawings 635548 TPR-7097	Normal operating procedures require vaults to be jetted when liquid enters the vaults. The applicable AFC drawings will be updated to require the liquid in the vault to be jetted prior to vault grouting.
	Section 6.3 During grouting operations, the tanks will be filled to the midway point initially because the thin film observed in the tanks does not extend beyond the bottom half of the tank. This grout pour will be performed to contain the residual on the tank wall. These tanks will be filled completely with grout prior to closure. Since the bottom area of a horizontal, cylindrical tank is relatively small compared to a flat-bottomed tank, and minimal residuals remain in the tank bottom, the multi-point grout placement technique planned for the 300,000-gal tanks will not be necessary for these tanks.	SPC-777 and AFC Drawings 635548	Section 6.3 of the 3116 Basis Document emphasizes the volume of grout in the small tanks which is used for waste form concentration calculations. This discussion specifies that half the tank volume will be applied to the calculation. This volume is referred to in this section as an engineering grout pour to differentiate it from the remaining volume to be added to the tank. However, the terms “engineering grout pour” and “encapsulation grout” described in this section is not equivalent to the “engineered grout placements” or “encapsulation grout pours” to be used in the large tanks. Due to the very small inventory remaining in the small tanks, the addition of slag is not necessary in the small tanks to meet performance objectives. This has been confirmed by NRC Review.

Requirements Document	Requirement	Implementation	Comments
	Section 6.4 Like the other TFF system components, the TFF ancillary components and equipment (e.g., piping, encasements, valves, and valve boxes) will be grouted at final closure (i.e., disposal). The grout will provide a solid physical form to incorporate any residuals and to prevent their dispersal into the surrounding environment. The piping and ancillary equipment grout must necessarily be able to flow more easily during grouting operations, and consequently, this grout will have a higher water content than the grout mixture used for other TFF system components. However, the grout will still be able to harden into a solid physical form to provide waste stability. The pour process will be adjusted so that effective grout distribution through the piping, encasements, and other equipment is achieved.	SPC-763 SPC-1017	The piping grout does not contain sand to ensure maximum flowability.
	Appendix C-1 Using grout in the tank closures provides long-term structural stability of the waste under the expected disposal conditions. If the final waste form is structurally stable, it will meet the following criteria (per 10 Code of Federal Regulations [CFR] 61): Prevent excessive subsidence, settlement, or deformation Minimize water infiltration Prevent radionuclide release from waste form disintegration Minimize the likelihood of waste intrusion. Using grout in the tank closure process also provides a mechanical means for repositioning tank heels such that the waste residuals can more easily be removed from the tanks. The grout then serves to integrate and encapsulate the waste residuals. To accomplish this action, the grout must have the appropriate consistency and density to displace the waste. The grout must remain sufficiently flowable during placement. The above uses are, in various instances, mutually exclusive. Specifically, increasing flowability is generally accompanied by a strength reduction and increased susceptibility to cracking. Based on the 1999 Idaho Nuclear Technology and Engineering Center grouting mockups, it is understood that flowability versus strength issues will be balanced by engineering the grout mix designs and placement sequencing (INEEL 2000, Book 1, Volume I, Chapter 16).	TFF Performance Assessment SPC-763 SPC-777 and AFC Drawings 635548 TFR-26 SPC-1017	

Requirements Document	Requirement	Implementation	Comments
	Appendix C-2 Two basic grout mixtures have been developed for Tank Farm Facility (TFF) closure. The first (pipe grout) is a mixture of Portland cement, fly ash, water, and water-reducing admixtures. This mixture will be used to fill piping, small vessels, or other equipment that may require a very fluid grout. The other type of grout is tank and vault grout. They have the same basic mixture but differing volumes of constituents to account for differences in the required strength and the slump or flowability of the grout. The grout is expected to exhibit strongly reducing conditions, as do most concrete systems (DOE-ID 2003). Original grout designs did not include the addition of blast furnace slag, since TFF analysis concluded that reducing conditions in the grout are not necessary to demonstrate compliance with performance objectives (Portage 2005). Based on consultation with the NRC (RAI Clarifying Request 3 [NRC 2006]), the addition of reducing agents such as blast furnace slag was evaluated. DOE updated the basic mix design for engineered grout placements, encapsulation grout pours, and the first pours in the WM-185 and WM-187 vaults to add blast furnace slag to further ensure the establishment of a reducing environment. The vault grout is required to flow around at least half the circumference of the existing 15.2-m (50-ft) diameter tanks.	SPC-763 AFC Drawings 635548 SPC-1017	Engineered drawings for the grouting of ancillary equipment are under development.
	Appendix C-2 The flowability or fluidity of the mixtures is the main requirement for the grouts. This requirement has been measured in the past using standard concrete slump tests (ASTM International [ASTM] C 143/ C 143M). Approximately 23 cm (9 in.) of slump is required for all of the mixtures, and the pipe grout requires slumps of approximately 28 cm (11 in.). The tank grout must be able to move the tank waste residuals (both liquid and some solids) to locations where the wastes can more easily be removed from the tanks. For this reason, the tank grout needs to be less fluid than the other grout mixtures. Adjusting the quantity of water and admixtures is the easiest way to obtain the desired fluidity.	SPC-763 AFC Drawings 635548 SPC-1017	A slump test is required for the engineered grout placements per the drawings. A puddle test is required for the controlled low-strength material pours to ensure proper flowability.
	The base mix design for the tank and vault engineering grout pours is as described in Appendix C-2.	SPC-763	

Requirements Document	Requirement	Implementation	Comments
	The base mix design for the controlled low-strength material, which will be used to fill the tanks and vaults above the engineering grout pour volumes is as described in Appendix C-2.	SPC-763	Finalization of the mix design resulted in less sand than shown in the base mix design in Appendix C. The basic mix design for CLSM shown in Appendix C includes 2,750 - 3,100 lbs of fine aggregate (sand), while SPC-763 includes a lesser amount of fine aggregate (sand) and additional air-entraining agents. The reduction in sand mass and addition of the air entrainment agent maximizes the flowability of the grout while maintaining performance consistent with that modeled in the Performance Assessment. The final mix design, which contains a water/cement ratio of 0.65 or less, will be tested by the subcontractor and approved by CWI. Since tanks WM-103 through WM-106 were an insignificant contributor to the Performance Assessment release model, adherence to the listed implementation documents provides assurance that short-term performance of the grout in these tanks is bounded by the analysis of the TFF PA. For the 300,000 gallon tanks additional review will be performed prior to grouting.

Requirements Document	Requirement	Implementation	Comments
	Appendix C-2 Testing results indicate that all the mixtures are flowable and will achieve 28-day compressive strengths of at least 2,000 psi. Because of the high ash content of the mixtures, they continue to gain significant strength for a longer time period than is normal for typical construction grouts. The 56-day compressive strengths are approximately 1,000 psi stronger than the 28-day compressive strengths.	SPC-763	The statement in the Appendix regarding 2,000 psi compressive strength refers to mixtures associated with engineered grout placements and encapsulation grout pours. For these mixtures, SPC-763 will ensure compressive strengths are consistent with this value. Compressive strengths for controlled low-strength material are designed for increased flowability and lower strengths. SPC-763 requires compressive strengths of 100 psi. No assumptions regarding compressive strength of the grout were made in the Performance Assessment. Additional review has been conducted to determine that the grout formulations in the referenced specifications are consistent with the degradation analysis in the TFF Performance Assessment.
	Appendix C-2 The base mix design for the pipe grout is as described in Appendix C-2. The 28- and 56-day compressive strengths for the pipe grout mixture (using later tests based on 91 gal of water per yd^3) are 3,360 and 4,680 psi, respectively. The lowest 28-day test compressive strength for the pipe grout mixture tests is 2,400 psi (EDF-1464, 2000).	SPC-763 SPC-1017	
	Appendix C-2 The slump of the pipe grout as tested by ASTM C 143/C 143M was in excess of 29 cm (11.4 in.). For larger pipes, it may be possible to reduce the water content of the mixture, and thus, reduce the shrinkage and bleed water associated with the high water content. Bleed water amounts from past tests of the mixture were low.	SPC-763 SPC-1017	

Requirements Document	Requirement	Implementation	Comments
	Appendix C-3 The grout supplier will provide and manufacture grout according to the following requirements (INEEL 2000, Section 16): Cement, Sand, Blast Furnace Slag, and Fly Ash ASTM C 150 Standard Specification for Portland Cement ASTM C 618 Standard Specification for Coal Fly Ash or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete ASTM C 989 Standard Specification for Ground Granulated Blast Furnace Slag for Use in Concrete and Mortars Chemical Admixtures ASTM C 494/C 494M Standard Specification for Chemical Admixtures for Concrete ASTM C 1017/C 1017M Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete	SPC-763	SPC-763 does not require the use of ASTM C 1017/C 1017M "Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete." ASTM C 494/C 494M "Standard Specification for Chemical Admixtures for Concrete" provides the necessary standards for admixtures used in these mixtures. The chemical material test report for the slag material will be reviewed to ensure that the sulfur content meets the performance assessment requirements and approved prior to its use in the grout mix.
	Appendix C-4 Manufacturing QA will be conducted by an engineer and generally includes the following: Review documentation stating the supplier's qualifications, capabilities, licenses, certifications, etc. Periodic inspections of the manufacturing plant Verification that substantive requirements of manufacturing quality control are being met Construction quality control. The construction quality control procedures include activities such as delivery cycles, truck waiting time limitations, mixing revolutions, water and admixture measurements, and any other procedures that are used to meet the project specifications consistently (INEEL 2000, Section 16).	SPC-763	

Requirements Document	Requirement	Implementation	Comments
	Appendix C-5 Construction QA activities conducted by the engineer at the project site consist of the following: Observe and record the contractor's activities and construction quality control procedures Receive batch tickets, and randomly verify that delivery meets project specifications Provide adequate grout samples for field and laboratory testing per applicable ASTM standards Field test grout per applicable ASTM standards. The ASTM standards or equivalents for controlled low-strength material for construction QA include: Sampling Procedures ASTM C 31/C 31M Standard Practice for Making and Curing Concrete Test Specimens in the Field ASTM C 172 Standard Practice for Sampling Freshly Mixed Concrete Grout Testing ASTM C 143/C 143M Standard Test Method for Slump of Hydraulic-Cement Concrete ASTM C 939 Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method) ASTM C 1064/C 1064M Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete. Periodic tests will be conducted at the engineer's discretion to verify that the delivered grout used throughout the TFF closure project has compressive strength properties similar to preliminary design values and remains consistent over time. Tests on representative samples will be conducted per ASTM C 39, *Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens* (INEEL 2000, Section 16).	SPC-763 SPC-777 AFC Drawings 635548 Inspection Plans PLN-2309 SPC-1017	Inspection plans will be developed for each tank prior to grouting.

Requirements Document	Requirement	Implementation	Comments
	Table C-1 as reflected in Appendix C	SPC-763 SPC-777 and AFC Drawings 635548 PLN-2309 Inspection Plans SPC-1017	SPC-763 does not require the use of ASTM C 1017/C 1017M "Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete." ASTM C 494/C 494M "Standard Specification for Chemical Admixtures for Concrete" provides the necessary standards for admixtures used in these mixtures.
NRC Technical Evaluation Report	The NRC emphasized that the reducing capacity of the grout is important. DOE should ensure that short-term performance of the grout is similar to or better than that assumed in the PA release modeling.	SPC-763 SPC-777 and AFC Drawings 635548 PLN-2309 Inspection Plans	Per SPC-763, the slag will be included in the mix for the engineered grout placements and encapsulation grout pours and the initial pours in the WM-185 and WM-187 vaults. This will ensure adequate reducing conditions consistent with that modeled in the Performance Assessment. The chemical material test report for the slag material will be reviewed to ensure that the sulfur content meets the performance assessment requirements and approved prior to its use in the grout mix. Since tanks WM-103 through WM-106 were an insignificant contributor to the Performance Assessment release model, adherence to the listed implementation documents provides assurance that short-term performance of the grout in these tanks is bounded by the analysis of the TFF PA.
Response to NRC Request for Additional Information # 6	The grout is scheduled to be poured in a series of nine separate layers, each with a thickness of approximately 1 m. Since the volume of grout contacting the vault during each pour will be relatively small, there will not be any significant thermal or mechanical stresses to the vault walls. Time between pours will allow for cooling. Procedures will be in place during grout pouring to protect the integrity of the tank and vault during grout pours by limiting temperature rise and volume change.	SPC-777 and AFC Drawings 635548	Field Design Change 3878 has determined that the cooling time between pours is not required.

Requirements Document	Requirement	Implementation	Comments
Response to NRC Request for Additional Information Clarifying Comment # 3	Slag will be added to the engineered grout placements and encapsulation grout pours and the first pour in the WM-185 and WM-187 vaults to ensure the establishment of a reduced environment and mitigate the release of electroactive radionuclides, such as ^{99}Tc. The following is the revised basic mix design: Cement — 230 lb Pozzolan Class F (fly ash) — 118 lb Fine aggregate (sand) — 2,500 lb Ground blast furnace slag — 352 lb Water — Up to 400 lb (48 gal) High-range water reducer — Up to 32 oz or as required to obtain slump and flow	SPC-763	

Appendix D

Review Checklist for Annual Review of Idaho Nuclear Technology and Engineering Center Tank Farm Facility Closure

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Appendix D

Review Checklist for Annual Review of Idaho Nuclear Technology and Engineering Center Tank Farm Facility Closure

The annual review should evaluate each of the key authorization documents as well as monitoring by both the project and the Nuclear Regulatory Commission to support the 3116 Determination and/or identify areas needing further evaluation. As a part of this process any modifications or updates to the core documents will be identified. The Idaho Cleanup Project, in conjunction with the U.S. Department of Energy (DOE) Idaho Operations Office, will determine the path forward should modifications be needed. This review will be conducted annually upon completion and acceptance of the Independent Professional Engineer certification for the first phase of grouting (October 2009) and continuing up until final closure is achieved.

Prepared by: ______________________ Date: ______________

Reviewed by: ______________________ Date: ______________

Approved by: ______________________ Date: ______________

DOE Tier 1 Closure Plan

The Tier 1 Closure Plan (DOE/ID-10975) was approved in November 2006 prior to grouting activities. If significant issues are identified related to the closure plan objectives and the plan is no longer representative of plans for closure, the Tier 1 closure plan will be updated to reflect current planning. The closure approach is based on the following key assumptions made in the Tier 1 closure plan.

- The 3116 Determination (DOE/NE-ID-11226) will be approved to leave residuals in place.
  - The Ronald Reagan Defense Act required that the Idaho National Laboratory (INL) use the 3116 Determination process. The 3116 Determination concluded that the residuals could be left in place.

  Still applicable? ☐ yes ☐ no

  If no, explain:______________________________

- The actions outlined in the Tier 1 closure plan will be bound by any alternatives selected in the *Idaho High-Level Waste and Facilities Disposition Final Environmental Impact Statement* (DOE/EIS-0287).
  - The Tier 1 closure plan is bounded by the *Idaho High-Level Waste and Facilities Disposition Final Environmental Impact Statement.*

  Still applicable? ☐ yes ☐ no

  If no, explain:______________________________

- Sufficient treatment, storage, and disposal facilities will be available for all liquid and solid waste removed from the tanks or generated during closure activities. The Process Equipment Waste Evaporator (PEWE) will be used for evaporation of liquids. These facilities are not included in the scope of the closure.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- A key element of the performance assessment (PA) (DOE/ID-10978) and composite analysis (CA) (DOE/ID-10974) is the radiological source inventory, which is an estimate of the radionuclides and their calculated activities remaining after TFF closure. The source inventory is based on the measured activity of Cs^{137} in Tank WM-188 and is a bounding value. As such, the source inventory is the bounding inventory that will not be exceeded during the closure phases.

  – Estimates of the radioactivity remaining in the tanks have been performed and indicate the residual activity is significantly below the bounding inventory modeled in the PA. The cleaning of the remaining tanks will be monitored and characterization of residuals performed to ensure that all closure activities are bounded by the radionuclide inventory established for the PA.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

Performance Assessment/Composite Analysis

The PA and CA were considered "approved for use" in November 2006, prior to grouting. If during this review, it is determined that the plans for closure or site conditions are adequately represented by the PA and CA such that the conclusions of the 3116 Determination or the Tier 1 closure plan may no longer be technically justified, the PA and/or CA will be updated to reflect current conditions.

Identify latest composite analysis performed for INL activities:______________________________

Are the analyses performed in the above identified composite analysis still consistent with the TFF composite analysis? ☐ yes ☐ no

If no, explain: ____

Have groundwater samples been collected since October of 2009 or since the last review? ☐ yes ☐ no

If groundwater samples have been collected since October 2009 or the last review, is the resulting data still consistent with the performance assessment's groundwater modeling? ☐ yes ☐ no

If the resulting data is not consistent with the performance assessment's ground water modeling, explain:____

Have grouting activities occurred since October 2009 or since the last review? ☐ yes ☐ no

If grouting activities have occurred since October 2009 or since the last review, was the grout mixture consistent with parameters identified in "Evaluation of Grout Formulations for Tank Farm Facility Closure" (PEI-EDF-1033)? ☐ yes ☐ no

If the grout mixture was not consistent with the parameters identified in PEI-EDF-1003, explain:____

Has tank cleaning and sampling of residuals occurred since October 2009 or since the last review? ☐ yes ☐ no

If yes, does the evaluation of the data support the bounding nature of the performance assessment inventory? ☐ yes ☐ no

If the evaluation of the data does not support the bounding nature of the performance assessment inventory, explain:____

Institutional Controls/Land Use Planning

Section 8.1 of the Tier 1 closure plan includes a discussion of the land use planning, which was deemed to be appropriate at the time the plan was submitted for review and approval. The closure plan also includes a discussion of the institutional controls in place at the time of approval along with a discussion of associated assumptions in place at that time. These assumptions will be reviewed to ensure that any changes would not significantly impact decisions about in-place closure of the TFF.

Identify most current documents related to institutional controls and land use at the INL (provide references):

____

____

Institutional Controls

- The INL will remain under government management and control for at least the next 100 years. The implementation of this management and control becomes increasingly uncertain over this time period. Regardless of the future use of the land now occupied by the INL, the federal government has an obligation to provide adequate institutional controls (i.e., limit access) to areas that pose a significant health or safety risk to the public and workers until that risk diminishes to an acceptable level for the intended purpose of the land. Achievement of this obligation hinges on the U.S. Congress to appropriate sufficient funds to the responsible government entity charged to maintain the institutional controls for as long as necessary.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- Advances in DOE and private-sector research will result in the obsolescence of existing facilities. Further, it is assumed that new facilities will need to be constructed in response to the need to provide state-of-the-art research facilities. Other programs, however, will be discontinued entirely after the facilities become obsolete.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- As contaminated facilities become obsolete, decontamination and decommissioning (D&D) will be required. Similarly, contaminated areas will require remediation. The D&D process will commence following closure of a facility once it has been determined that the facility is no longer needed and sufficient funds are appropriated to safely accomplish the work.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- New construction may include new structures in existing facility areas and development of new facility areas. Development should be restricted to core areas already established.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- To the extent practical, new development will be encouraged in established facility areas to take advantage of existing infrastructures. Such development will reduce environmental degradation associated with construction activities in previously undeveloped areas.

  Still applicable? ☐ yes ☐ no

  If no explain:____

- The Central Facilities Area will remain the focal area for support and infrastructure activities, assuming continuity of existing or similar INL missions.

  Still applicable? ☐ yes ☐ no

  If no explain:____

- Environmental restoration and waste management activities will continue. Cleanup of hazardous, mixed, and low-level waste sites is expected in accordance with the record of decision for the cleanup mandated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601 et seq., 1980).

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- Research and development facilities will be expanded to accommodate "new frontier research." To support such efforts, cooperative partnerships between the public and private sectors may be developed to achieve mutual goals. This could result in the re-use of INL facilities by private-sector interests, supplemented with technology support by INL personnel.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- The INL may be called upon to support defense-related operations.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- Regional development trends will be closely related to activities at the INL. The weight of the INL's influence on the region may increase or decrease over time depending on the diversity and strength of the regional economy.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- No residential development (i.e., housing) will occur within the INL boundary. However, grazing will be allowed to continue in the buffer area.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- No new major, private developments (residential or nonresidential) on public lands are expected in areas adjacent to the INL. There is uncertainty about the applicability of this assumption to privately-held land. Beyond 25 to 50 years, there is less certainty about this assumption.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- An 890-mi^2 site dedicated to nuclear research, development, testing, evaluation, and environmental management is irreplaceable. Therefore, it is unlikely that the siting of a similar DOE facility and land withdrawal would occur in the future at any other location in the contiguous 48 states.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- New locations for low-level waste disposal may need to be identified. If new locations are needed, they will be subject to regulatory approval processes.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- In accordance with DOE Order 1230.2, DOE recognizes that a trust relationship exists between federally recognized Tribes and DOE. DOE will consult with Tribal governments to ensure that Tribal rights and concerns are considered before DOE actions, decision-making, or program implementation that may affect the Tribes.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

Land Use

Future land use is addressed in the Long-Term Land Use Future Scenarios document (DOE/ID-10440) and the Infrastructure Long-Range Plan (INEEL/EXT-2000-01052). The following assumptions were applied to develop forecasts for land use within the INL Site:

- The INL Site will remain under DOE ownership and control until at least 2095. The boundary is currently static. Portions of the INL Site will be managed beyond 2095 due to DOE’s responsibility for long-term stewardship.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- The life expectancy of current and new facilities is expected to range between 30 and 50 years. The decontamination and dismantlement process will commence following closure of each facility if new missions for the facility are not determined.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- No residential development (e.g., housing) will be allowed to occur within the current INL Site boundaries before 2095, and there are no specific reasons to expect such development after that date.

  Still applicable? ☐ yes ☐ no

  If no explain:____

- No new major, private developments (residential or nonresidential) are expected in areas adjacent to the INL Site.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

Commitments in Operable Unit 3-14 Record of Decision

The Operable Unit 3-14 record of decision (DOE/ID-11296) executive summary states that following Tank Farm Facility closure, these major components will be implemented:

- Install a low-permeability pavement (or equivalent barrier to reduce infiltration) over the north, central, and south tank farm to reduce infiltration of precipitation. Direct captured surface water run-off toward lined ditches, culverts, and lift station(s) for transport to the lined evaporation pond.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- Maintain the drainage system and low-permeability pavement over the recharge control zone to reduce infiltration of precipitation without interfering with ongoing Idaho Nuclear Technology and Engineering Center (INTEC) cleanup operations.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- Maintain the recharge controls in northern INTEC to reduce anthropogenic and storm water recharge sources to the northern perched water zones.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

In addition, it states that as part of and coordinated with INTEC facility closure, these major components will be implemented:

- Install a protective cover over the north tank farm. Use characterization results to design the protective cover (i.e., maintain the low-permeability pavement, excavate soil and replace with clean backfill and new low-permeability pavement or equivalent barrier to reduce infiltration, or extend the evapotranspiration cap with capillary biobarrier [ET/CB] that is to be placed over the central area).

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- Install an ET/CB over the central and south tank farm to protect workers from exposure.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

- Monitor and maintain the ET/CB, low-permeability pavement, and drainage system to reduce infiltration of precipitation.

  Still applicable? ☐ yes ☐ no

  If no, explain:____

Environmental Monitoring Plan

Section 8.2 of the Tier 1 closure plan commits that a post-closure monitoring program will begin with final closure of the TFF and meet the elements in DOE 435.1, and that a program will monitor for key radionuclides and those identified by the PA and CA.

Have the Long-Term Monitoring Plan for Operable Unit 3-14, Tank Farm Soil and INTEC Groundwater (DOE/ID-11334) or Operable Unit 3-14,Tank Farm Soil and INTEC Groundwater Remedial Design/Remedial Action Work Plan (DOE/ID-11333) been revised since October 2009 or since the last review? ☐ yes ☐ no

If yes, do the revisions impact the assumptions made in the authorization documents supporting the 3116 Determination for the TFF? ☐ yes ☐ no

If the revisions do impact the assumptions made in the authorization documents, explain:____

Is further action required? ☐ yes ☐ no

Explain:____

Support to Nuclear Regulatory Commission Monitoring

The NRC issued in April 2007 a monitoring plan that described NRC plans to monitor tank closure actions as a part of their authority under the National Defense Authorization Act. That plan detailed five key monitoring areas stemming from the technical review of the Idaho TFF Closure Determination basis that will be reviewed annually.

Key Monitoring Area 1—Residual Waste Sampling

> *DOE should sample tanks WM-187 through WM-190 after cleaning as stated in Section 2.3 of the Draft Section 3116 Determination Idaho Nuclear Technology and Engineering Center Tank Farm Facility (DOE Idaho, 2005). Sampling data and analysis of tanks WM-187 through WM-190 after cleaning should be reviewed to ensure that the inventory for these tanks was not significantly underestimated (i.e., similar or better waste retrieval will be achieved).*

Baseline planning for the tank closure program includes plans to wash each of the remaining four large tanks, following by confirmatory sampling to understand remaining risk. The samples are planned to be taken in a manner similar to previous tank cleaning samples on Tanks WM-180 through WM-186. These samples are taken in accordance with sampling and analysis plans, which are developed in part to satisfy data quality objectives described in individual RCRA closure plans. Cleaning, sampling, and closure of the remaining tanks will be addressed in a Phase V RCRA closure plan. It is planned that a comparison of tank sample results will be made in the upcoming Tier 2 closure plan, much the same as in the first Tier 2 closure plan, which supported DOE authorization to proceed with grouting.

Has tank cleaning and sampling of residuals occurred since October 2009 or since the last review? ☐ yes ☐ no

If tank cleaning and sampling of residuals has occurred since October 2009 or the last review, does the evaluation of the data support the bounding nature of the performance assessment inventory? ☐ yes ☐ no

If evaluation of the data does not support the bounding nature of the performance assessment inventory, explain:____

Key Monitoring Area 2—Grout Formulation and Performance

The final grout formulation used to stabilize the TFF waste should be consistent with design specifications or significant deviations should be evaluated to ensure that they will not negatively impact the expected performance of the grout. The reducing capacity of the tank grout is important to mitigating the release of Tc^{99}. Short-term performance of as-emplaced grout should be similar to or better than that assumed in the performance assessment release modeling or significant deviations should be evaluated to determine their significance with respect to the conclusions in the performance assessment and [technical evaluation report] TER. The short-term performance of the grouted vault is especially important to mitigate the release of short-lived radionuclides such as Sr^{90} from the contaminated sand pads that could potentially.

Have grouting activities occurred since October 2009 or since the last review? ☐ yes ☐ no

If grouting activities have occurred since October 2009 or the last review, was the grout mixture consistent with parameters identified in "Evaluation of Grout Formulations for Tank Farm Facility Closure" (PEI-EDF-1033)?
☐ yes ☐ no

If the grout mixture was not consistent with parameters identified in PEI-EDF-1033, explain:____

Key Monitoring Area 3—Hydrological Uncertainties

Relevant recent and future monitoring data and modeling activities should continue to be evaluated to ensure that hydrological uncertainties that may significantly alter the conclusions in the performance assessment and [technical evaluation report] TER are addressed. If significant new information is found, this information should be evaluated against the performance assessment and TER conclusions.

Have groundwater samples been collected since October 2009 or since the last review? ☐ yes ☐ no

If yes, is the resulting data consistent with the performance assessments groundwater modeling?
☐ yes ☐ no

If the resulting data is not consistent with the performance assessment's groundwater modeling, explain:____

Key Monitoring Area 4—Monitoring During Operations

Closure and post-closure operations (until the end of active institutional controls, 100 years) will be monitored to ensure that the 10 CFR 61.43 performance objective (protection of individuals during operations) can be met. As part of this assessment radiation records, environmental monitoring, and exposure assessment calculations may be reviewed.

For closure or post-closure operations, an annual review will performed of dose records, monitoring data, and exposure assessments. Documentation of this review will be attached to this review document.

Key Monitoring Area 5—Engineered Surface Barrier/Infiltration Reduction

INTEC infiltration controls and construction and maintenance of an engineered cap over the TFF under the CERCLA program should be monitored to ensure that performance assessment assumptions related to infiltration and contaminant release are bounding.

What steps have been taken since October 2009 or since the last review to limit infiltration in the TFF?

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____

____

____

Are the performance assessment assumptions on contaminant release still bounding? ☐ yes ☐ no

If no, explain: ____