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7. Abstract

The purpose of the Hanford Grout Disposal Program Quality Verification Plan is to establish a set of technical guidelines for conducting actions required to ensure compliance with regulations promulgated pursuant to The Resource Conservation Recovery Act Part B Permit and requirements of DOE 5820.2A.

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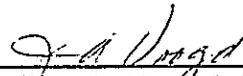
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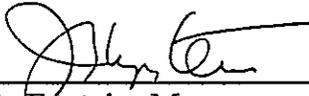
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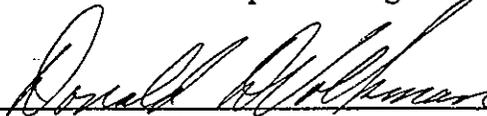
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GROUT QUALITY VERIFICATION PLAN

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1.0 PURPOSE

This supporting document was prepared for the development and application of the Quality Verification activity for the Hanford Grout Disposal Program (HGDP). The materials covered by these activities are those contained in the Grout Disposal Facility (GDF). That is the grout slurry and solidified grout contained within the vaults. The underlying purpose of this document is to define the tests and administrative conditions whereby the Westinghouse Hanford Company (WHC) can define and report physical properties for the low-level waste form—grout.

In honoring the final environmental impact statement; *Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes* (HDW-EIS, DOE 1987) and the accompanying record of decision, the immobilization of the low-level portion of Hanford tank wastes are to be accomplished by the controlled mixing of said waste with cementitious materials. The process and materials employed in the method will ensure the formation of a stable and solidified material that will be contained in near-surface underground vaults.

Among others requirements, the Hanford Grout Disposal Program falls under the purview of the Resource Conservation and Recovery Act (RCRA) as implemented in Title 40 of the *Code of Federal Regulations*, Parts 264, 265 and 268, the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement), Chapter 173-303 ("Dangerous Waste Regulations") of the Washington Administrative Code (WAC), and Department of Energy Order 5820.2A (*Radioactive Waste Management*, DOE, 1988). As such, certain minimum performance levels (*i.e.*, physical properties) are stipulated for the disposed waste. Those performance levels of interest to this activity include, but are not limited to, the unconfined compressive strength and resistance to leaching.

The purpose of this Hanford Grout Disposal Program Quality Verification

Plan ("Plan") is to establish a set of technical guidelines for conducting actions required to ensure compliance with regulations promulgated pursuant to RCRA and the requirements of the Grout Treatment Facility Dangerous Waste Permit (Part B Permit) ("... postcuring verification shows that the final product meets performance requirements and is the last step in the overall verification process."). The primary objective of the Plan is to outline the activities to be conducted to provide evidence of performance compliance with the regulatory requirements. Compliance with regulatory requirements dealing with the environment is required by WHC in WHC-CM-1-3, *Management Requirements and Procedures*, MRP 5.5.

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2.0 RESPONSIBILITIES

Implementation of the Hanford Grout Disposal Quality Verification Plan shall be the responsibility of the Manager, Grout Technology Group, or his designee.

Specific activities will fall under the responsibilities of several managers as detailed below. The Technical Leader shall ensure that technical and engineering staff are aware of the technical requirements of the Plan. Additionally, this position will provide technical leadership for all quality verification for Double-Shell Tank (DST) grout disposal.

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3.0 BASIS AND STRUCTURE FOR APPROACH

The principal means of grout quality verification is the formulation development, and testing process used to ensure that quality grout will be made at all times. For the scope of this document, the particulars of the grout formulation and processing for the filling of the vaults have no impact, unless a non-cementitious formulation is ultimately used. In overview, this plan outlines the general activities planned to demonstrate compliance with performance standards specifically imposed or negotiated by the various regulatory authorities (*e.g.*, Washington Department of Ecology (Ecology), United States Environmental Protection Agency (EPA) and the Department of Energy (DOE)) on the solidified waste form. Postcuring verification confirms that the final product meets performance requirements and is the last step in the overall verification process.

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4.0 PLAN COMPONENTS

4.1 Core Drilling

4.1.1. Basis

As stated in the RCRA Part B Permit, physical sampling and testing provides a perceived higher level of confidence in the performance data, but also results in increased radiation exposure to workers and results in the generation of secondary waste streams. At a minimum, the first mixed waste vault (218-E-16-102) will be core drilled to ensure that the grout has solidified.

4.1.2. Actions

Samples from all regions of the waste form (top, bottom, middle, and edge) will be tested. Laboratory testing will include compressive strength, leachability, density and ultrasonic pulse velocity. An extensive microstructural investigation will be conducted. The experimental data and interpretations will be presented to Ecology. The findings of the nondestructive testing will be presented along with any correlation that may exist between the various testing techniques.

In order for this work to be completed a mobile core drilling rig shall be designed and purchased.

4.1.3. Responsibilities

The Manager, Grout Technology shall appoint a Cognizant Scientist/Engineer and secure commitments for the CENTRC and expense funding to complete this activity. The Cognizant Scientist/Engineer shall direct and track all necessary activities to provide for the timely fabrication of an operational core drilling rig and associated equipment.

4.2 Bottle-on-String Sampling

4.2.1. Basis

As stated in the RCRA Part B Permit, fluid grout samples have been taken

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from the Phosphate/Sulphate Waste (PSW) vault (218-E-16-101) by bottle-on-string sampling through risers. Samples can be taken from the subsequent vaults by this method; however, the applicability of this method to DST wastes does not support dose minimization levels as low as reasonably achievable (ALARA) concerns.

4.2.2. Actions

- a. Investigation of remotely operated sampling shall be conducted. Such systems must allow for the "grabbing" of actual grout samples from the system between the Grout Processing Facility and the Grout Disposal Facility. Laboratory testing of sampled material will include compressive strength, leachability, density, ultrasonic pulse velocity, free liquid at cure, etc...
- b. An extensive microstructural investigation will be conducted. Ultimately it is required that a defensible and obvious correlation be established between laboratory, pilot and full-scale samples.

4.2.3. Responsibilities

The Manager, Grout Technology shall appoint a Technical Leader and secure commitments necessary to fund this activity. The Technical Leader shall identify, justify, direct and track all necessary activities to provide for the timely delivery of all data and interpretations to the various regulatory authorities.

4.3 Nondestructive Testing

4.3.1. Basis

As stated in the RCRA Part B Permit, the amount of physical sampling will be reduced, or eliminated entirely, once nondestructive testing (NDT) techniques have been demonstrated to indicate grout quality. Based upon the preliminary work completed in support of the PSW campaign it was determined that acoustic methods (e.g., ultrasonic pulse velocity, crosshole seismic logging, etc...) is very promising for monitoring the cure of grouted wastes. Minimization of physical sampling is consistent with the ALARA concepts.

4.3.2. Actions

Conduct such work and documentation as necessary to establish the correlation between physical properties measured in-situ and those obtained by destructive techniques. Such a correlation would require testing of samples at the laboratory, pilot and full-scale levels.

4.3.3. Responsibilities

The Manager, Grout Technology shall appoint a Technical Leader and secure commitments for the necessary funding to complete this activity. The Technical Leader shall identify, justify, direct and track all necessary activities to provide for the timely delivery of all data and interpretations. The Technical Leader shall provide such a correlation to the various regulatory authorities for approval of the entire elimination or reduction of physical sampling.

4.4 In-situ Testing

4.4.1. Basis

As stated in the RCRA Part B Permit, the amount of physical sampling will be reduced, or **eliminated entirely**, once nondestructive testing (NDT) techniques have been demonstrated to indicate grout quality. An electro-chemical device to measure the necessary physical properties to provide for the establishment of a correlation between physically removing samples for leach testing and making such measurements within the grout monolith is technically feasible. Minimization of physical sampling is consistent with the ALARA concepts.

4.4.2. Actions

In addition to the work on NDT for unconfined compressive strength, activities should be undertaken to provide for an in-situ electro-chemical device. Such work and documentation as necessary to establish the correlation between physical properties measured in-situ and those obtained by destructive techniques shall be conducted. Such a correlation would require testing of samples at the

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laboratory, pilot and full-scale levels.

4.4.3. Responsibilities

The Manager, Grout Technology shall appoint a Technical Leader and secure commitments for the necessary funding to complete this activity. The Technical Leader shall identify, justify, direct and track all necessary activities to provide for the timely delivery of all data and interpretations. The Technical Leader shall provide such a correlation to the various regulatory authorities for approval of the entire elimination or reduction of physical sampling.

4.5 Quality Assurance

4.5.1. Basis

Specific requirements for each activity described in paragraphs 4.1–4.4 shall meet appropriate levels of quality assurance. Such quality assurance is required to ensure that each action leading to the verification of the quality of disposed wastes does not lead to inadvertent disposal of wastes. These actions will assure compliance to NQA-1, EPA, Ecology and provide the documentation to support compliance.

4.5.2. Actions

Prior to engaging actions described above, the appropriate level and procedures of quality assurance shall be determined (*e.g.*, WHC, DOE, EPA, Ecology) and shall be integrated into the proposed action.

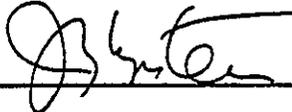
4.5.3. Responsibilities

Each Cognizant Scientist/Engineer conducting actions under paragraphs 4.1–4.4 shall ensure that the appropriate quality assurance is determined and applied to each action.

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5.0 APPROVAL

The implementations of action under this Hanford Grout Disposal Program Quality Verification Plan are approved and shall be implemented by the Manager, Grout Technology.

CONCURRENCE: 
Joseph L. Epstein, Manager
Grout Facilities

9/25/91
Date

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