West Valley Demonstration Project

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TEST REQUEST

LONG TERM COMPRESSIVE STRENGTH TESTING OF THE THOREX WASH CEMENT-WASTE FORM

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WVNS RECORD OF REVISION

DOCUMENT

If there are changes to the controlled document, the revision number increases by one. Indicate changes by one of the following:

- Placing a vertical black line in the margin adjacent to sentence or paragraph that was revised.
- Placing the words GENERAL REVISION at the beginning of the text.
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Example:

The vertical line in the margin indicates a change.

FC1> The FC#> in the margin along with the vertical line line (redline) indicates a change.

Rev. No.	Description of Changes	Revision On Page(s)	Dated
0	Original Issue	All	09/28/95
1	Per ECN #10557	1 - 5	02/17/97

WVNS RECORD OF REVISION CONTINUATION FORM

Rev. No.	Description of Changes	Revision On Page(s)	Dated

Long Term Compressive Strength Testing of the
THOREX Wash Cement-Waste Form

WVNS-TRQ-075
Rev. 1

1.0 This work is to be performed to satisfy the NRC Branch Technical Position on Waste Form, Rev. 1, and a letter from the NRC (TAC No. L21412). The request specifies a long-term testing plan which will include visual inspection and compressive strength test of cement cores retrieved from product drums. These tests will be performed once every twelve months for a five-year period. The test period could be extended if requested by the NRC at a future date. Also requested is a 14-day immersion test followed by a compressive strength test to be performed at the first two test intervals. All testing will be performed on both nominal 22 wt.% and 28 wt% TDS recipe full scale drums. After completion of all testing, a report will be issued to the NRC with this information and corresponding conclusions.

2.0 OBJECTIVES

2.1 Set aside ten (10) THOREX Wash - Portland Type V drums for long term testing. The ten drum lot drum numbers are specified in WVNS-TP-075, Section 4.2 from both the nominal 22 wt% and 28 wt% TDS recipe. Included in these ten drums will be drums made from the decontaminated concentrate batches that yielded the lowest process control plan (PCP) 2-inch cube compressive cube strengths for the 22 wt% and 28 wt% TDS recipes.

2.2 Perform compressive strength testing of three (3) cores approximately once every twelve months. This will include one (1) core each from the lower, middle (interface), and upper sections of the drum.

2.3 For the first two test intervals, perform a 14-day immersion per NRC Branch Technical Position on Waste Form, Rev. 1, Section VII of Appendix A to include:

2.3.1 Removal of one (1) core specimen at approximately the twelve month interval from either the lower or upper section of the drum.

2.3.2 Fourteen day immersion in demineralized water. This immersion fluid water is chosen because it was found to be the most aggressive in WVNS-TR-70-025, section 7.5.

2.3.3 Upon removal of the core from immersion liquid and allowing the core to dry in ambient air for a minimum of 48 hours, the specimen should be visually examined for cracking, spalling, or bulk disintegration. The specimen should be photographed.

2.3.4 If there is no evidence of significant degradation following the immersion, the specimen should be subjected to an ASTM C39 compressive strength test.

2.4 At the first two test intervals, both tests described in sections 2.2 and 2.3 will display a minimum mean compressive strength test of not more than two standard deviations below the mean of the as-cured strength values obtained with the qualification test specimens (NRC Branch Technical Position on Waste Form, Rev. 1, Section VII of Appendix A). The acceptance criteria for the THOREX cement waste form is provided below for cement cores cured for at least the listed time periods:

	22 Wt.% TDS	28 Wt.% TDS
Average days cured:	251	243
Mean (X-bar) compressive strength:	2190 psi	2600 psi
Standard Deviation (δ_{n-1}):	771 psi	550 psi
(X-bar) - 2x(δ_{n-1}):	648 psi	1500 psi

2.5 Archive three (3) cores specimens, one (1) each from the lower, middle, and lower sections of the drum. Bag and store archive core in the Drum Cell environment for visual examination at twelve-month intervals for signs of cracking or spalling.

2.6 The work performed under this Test Request will be Quality Level C.

3.0 SAFETY

3.1 Industrial hygiene practices shall be as described in the WVNS Hygiene and Safety Manual, WVDP-011.

3.2 Radiological work will be performed in accordance with the WVDP Radiological Controls Manual, WVDP-010.

4.0 PREREQUISITES

4.1 Ten (10) drums were produced at the Cement Solidification System in a full scale production mode.

4.2 The ten (10) drums are cured in the Drum Cell environment.

5.0 STANDARD PRACTICES AND GENERAL TEST APPROACHES

5.1 Each core is visually examined for indications of cracking or spalling and then photographed. The core identification number, drum serial number, and date labeled should be included in the photograph.

5.2 As test specimens are generated, they are bagged and uniquely identified to include the date, drum number, and core identifier, in accordance with SOP 70-44, Attachment C.

5.3 No "standard method of test" for immersion testing has been adopted for low-level radioactive waste. The applicable steps of ACM-6400 (see section 10.4) are in compliance with the Branch Technical Position, Appendix A.II.G.

5.4 Cores produced have an approximate length-over-diameter ratio of 2:1.

6.0 PERSONNEL QUALIFICATIONS

6.1 Operations shall have their work (coring) performed by qualified personnel.

6.2 Surveillance activity and compressive strength testing shall be performed by qualified Quality Assurance personnel.

7.0 DATA

7.1 Within ten (10) working days after compression of immersion cores Quality Assurance will issue a Surveillance Report (or similar type of Quality Record) stating the results of the compressive strength testing and visual inspection of tests described in sections 2.2, 2.3, and 2.5.

7.2 After receipt of data in section 7.1, the Cognizant Engineer shall issue a formal letter report with the following requirements:

7.2.1 QA Surveillance Report or similar type of Quality Record) as an attachment (e.g.-IIDS).

7.2.2 SOP 70-44, Appendix D, drum core position data sheets as an attachment.

7.2.3 List all drum numbers with pre- and post-immersion compressive strength data to date in a table format.

7.2.4 Line graph the data in section 7.2.3 above with time on the X-axis and compressive strength in PSI on the Y-axis.

7.2.5 References to Waste Management Operations and Analytical and Process Chemistry log books. References should include log book designator, page numbers, and dates.

7.2.6 Cognizant Engineer and Cognizant Quality Engineer signatures.

7.2.7 If this is the first two test intervals, additional data to be reported from section 2.3 and 2.4 will be included in letter.

7.3 The Test Summary Report WVNS-TSR-075 shall contain the following information:

7.3.1 All pertinent Surveillance Reports and/or other Quality Assurance documentation.

7.3.1 All pertinent SOP 70-44, Attachment D, Drum Core Position data sheets.

7.3.2 Final list of all drums cored with pre- and post-immersion results in a table format.

7.3.3 Final line graph of pre- and post-immersion results.

7.3.4 Conclusions resulting from the tests.

8.0 ORGANIZATION RESPONSIBILITIES

8.1 IRTS & Vitrification Support Engineering will provide engineering support in identifying drums, issuing Test Procedures, and Test Summary Reports; producing letters mentioned in section 7.2; and issuing Test Exceptions per EP-11-003. The cognizant engineer will serve as the test exception authority per EP-11-003.

8.2 Quality Services will provide destructive testing services involved with compressive strength testing waste form cores. Quality Assurance will also provide surveillance activities to assure that the work performed agrees with work documents.

8.3 Radiological Waste Support will provide support for drum movements from the Drum Cell to the core boring set up, operation of core boring equipment, and restorage of the core bored drum.

8.4 Radiation Protection will provide support for work in the core boring and compressive strength testing tents, and will release samples and drums.

8.5 DELETED

8.6 Analytical and Process Chemistry Laboratories will provide immersion fluid.

9.0 POST RUN REPORTING REQUIREMENTS

9.1 Every test interval, a letter will be issued with data described in section 7.0

9.2 After the completion of coring ten (10) drums (five years), the cognizant engineer will produce the Test Summary Report.

10.0 REFERENCES

10.1 USNRC Branch Technical Position on Low-level Waste Form, Rev. 1, dated January, 1991.

10.2 Letter AA:013:95-0879:95:08, DW:95:6554, "Request for Additional Information on THOREX Wash Using Type V Portland Cement for Nuclear Regulatory Commission (NRC)," Dated May 2, 1995.

10.3 SOP 70-44, Core Sampling of CSS Product Drums

10.4 ACM-6400, Immersion Testing, applicable sections: 5.0, 6.2, 7.1, 7.2, 10.1-10.8, 10.10, 10.12, 10.14, Attachment A.

10.5 ASTM C39, Compressive Strength of Cylindrical Concrete Specimens

10.6 ASTM C617, Standard Practice for Capping Cylindrical Concrete Specimens

10.7 Letter (TAC No. L21412) G. C. Comfort, Jr. to T. J. Rowland, "Long-Term Testing for Cement Stabilization of Supernatant and Sludge Wash Recipes", dated October 17, 1996.

EXPERIMENTAL AND DEVELOPMENT TEST ACCEPTANCE SHEET

PREPARED BY:

COG TRQ ENGR: _____ / _____ QUALITY ENGINEER: _____ / _____

CRITERIA FOR ACCEPTANCE OF DATA	RESULTS/COMMENTS
1) All Test Exceptions issued have been completed and ECN issued.	
2) Table of drum numbers, pre and post immersion compressive strength data present.	
3) Line graph of pre and post immersion compressive strength data present.	
4) All surveillance reports issued by Quality Assurance are referenced in the report.	
5) Six month and twelve month compressive strength requirements for section 2.4 have been included in report.	

ACCEPTED BY:

COG TRQ ENGR: _____ / _____ QUALITY ENGINEER: _____ / _____