West Valley Demonstration Project

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TEST PROCEDURE

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:

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Rev. No.	Description of Changes	Revision On Page(s)	Dated
0	Original Issue	All	12/03/96
1	Per ECN #10557	1, 3, 4, 5, 9, 10	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-TP-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). This procedure will include visual inspection and compressive strength testing of cement cores retrieved from product drums. These test will be performed once every twelve months for a five-year period. After this time period, a report will be issued to the NRC with this information. Also included is a 14-day immersion test followed by a compressive strength test to be performed at the first two test intervals.

2.0 DEFINITIONS AND ABBREVIATIONS

2.1 Definitions

CSS Product Drum - 71-gallon square drum of cement solidified waste from the decontaminated 8D-2 supernatant or sludge wash liquid.

Drum Cell - storage area for CSS 71-gallon square drums of cemented, low-level waste

Long-term Tests of Cemented Waste Form - applies to periodic confirmatory testing of WVNS cemented, low-level waste generated under actual production conditions to demonstrate long-term waste form stability.

2.2 Abbreviations

ANA - Analytical Aisle

CSRF - Contact Size Reduction Facility

CSS - Cement Solidification System

DC - Drum Cell

IIDS - Inspection Instructions Data Sheet

IRTS - Integrated Radwaste Treatment System

IWP - Industrial Work Permit

LWA - Lower Warm Aisle

QA - Quality Assurance

RP - Radiation Protection

RWP - Radiation Work Permit

SOP - Standard Operating Procedure

TCLP - Toxicity Characteristic Leaching Procedure

TRQ - Test Request (EP-11-003)

TP - Test Procedure (EP-11-003)

UWA - Upper Warm Aisle

WMO - Waste Management Operations

WRPA - Waste Reduction and Packaging Area

WVDP - West Valley Demonstration Project

3.0 RESPONSIBILITIES

3.1 Vitrification & IRTS Operations Engineering will provide engineering support in identifying drums, issuing the Test Summary Report, letters, and Test Exceptions per EP-11-003. The cognizant engineer will serve as the test exception authority per EP-11-003.

3.2 Quality Services will provide compressive strength testing and visual examinations of waste form cores. Quality Assurance will also provide surveillance activities to assure the work performed agrees with work documents.

3.3 Radiological Waste Support will provide support for drum movements, operation of core boring equipment, and storage of the core bored drum

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

3.5 Analytical and Process Chemistry Laboratories will provide immersion fluid.

4.0 TOOLS, EQUIPMENT, AND REFERENCES

4.1 Tools and Equipment

4.1.1 See SOP 70-44, section 4.1, for all tools and equipment required for core boring operations.

4.1.2 Other tools and equipment

- 5-gallon immersion buckets
- 6-gallon immersion bucket for double containment

4.2 Components

4.2.1 List of drums recommended for use by this test

Wt.% TDS	Recipe Number	Date Processed	Minimum Number of Drums
28.02	9501576 *	04/24/95	4
20.79	9500574	02/10/95	5
21.68	9500927	03/15/95	
21.37	9500561 *	02/14/95	
28.14	9501404 +	04/17/95	1

* Low PCP cube lot for 20% or 28% TDS batches: at least 1 drum required
+ Low Mid-Tank PCP cube

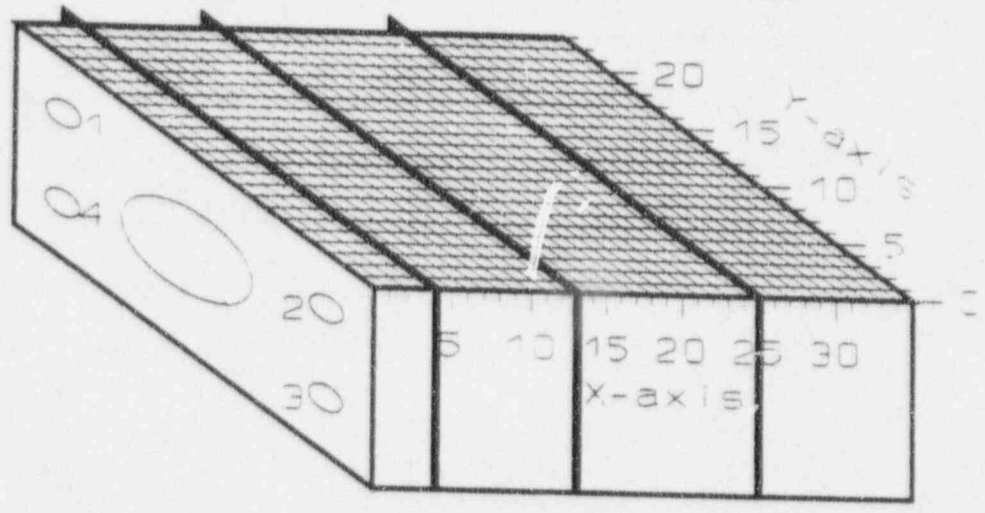
4.3 Test Apparatus

4.3.1 Approximately every twelve months, the following cores shall be taken from a drum selected from both the nominal 20% and the nominal 28% TDS lots listed in section 4.2.1:

Core Location	Purpose
Top	Compressive Strength Testing
Top	Archive Sample
Middle	Compressive Strength Testing
Middle	Archive Sample
Bottom	Compressive Strength Testing
Bottom	Archive Sample
Top or Bottom	14-day Immersion (for first two test periods)

The locations described above are at the x-axis below:

Location	x-axis
Top	4" - 13"
Middle	13" - 25"
Bottom	25" - 35"



4.3.2 QA will perform visual inspection of archive cores taken in section 4.3.1 approximately every twelve months from the time of coring.

4.4 References

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

OSR-GP-3 - Building and Vessel Ventilation System Requirements

SOP 70-44 - Core Sampling of CSS Product Drums

SOP 73-02 - On-site Transport of CSS Cemented Waste Drums for Core Sampling

ASTM C39 - Compressive Strength of Cylindrical Concrete Specimens

ASTM C617 - Standard Practice for Capping Cylindrical Concrete Specimens

WVNS-TR-70-025 - Waste Form Qualification Report: WVDP Stabilized THOREX Wash Cement-Waste

WVDP-130 - Quality Assurance Department Work Process Manual, section 2.4.1, General Inspection Reporting

4.5 Safety

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

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

4.5.3 ACP 7.2, "Laboratory Safety" must be complied with for all laboratory activity.

5.0 GENERAL INFORMATION

5.1 Approximately ten drums will be identified for this five-year test program. Ten (10) drums from the 28% and 20% recipes will be used by this Test Procedure.

5.2 Three cores shall be obtained and compressive strength tested approximately once each twelve-months for a period of five-years. These cores will be compressive strength tested as soon as reasonably possible after extraction from the drum.

5.3 One core shall be obtained and subjected to a fourteen-day immersion followed by a compressive strength test for the first two test intervals.

5.4 Three cores shall be obtained approximately once each twelve-month period and archived for visual examination for five-years. These cores shall be visually examined approximately every twelve-months thereafter until the completion of the test program.

5.5 For the first two test intervals, tests described in sections 5.2 and 5.3 should meet the following requirements:

5.5.1 Cores should 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 qualification specimen information (reference WVNS-TR-70-025) is as follows:

	20-22 Wt.% TDS	28-29 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

5.5.2 If the cores do not pass the X-bar minus two-sigma, the NRC shall be notified in writing within 30-days of the condition per NRC Branch Technical Position on Waste Form section VII of Appendix A. Also, the disposal facility operator is to be notified if this test invalidates certification per 10 CFR 20.311.

5.6 WMO supervisor and A&PC manager will agree on location of immersion testing prior to each set of immersion tests.

5.7 Work under this Test Procedure will be Quality Level C.

5.8 For the first two test periods only, one drum from a nominal 21 wt % recipe and one drum from a nominal 28 wt% recipe will be cored for three compressive strength cores, three archive cores, and one core for a 14-day immersion test followed by a compressive strength test.

5.9 For the remaining test periods, one drum from the 21 wt% recipe and one drum from the 28 wt% recipe will be cored for three compressive strength cores and three archive cores. The previous archive cores will be visually examined for signs of cracking or degradation.

6.0 PREREQUISITES AND START-UP

6.1 Prerequisites

6.1.1 Cognizant engineer fills out SOP 70-44, appendices B and D.

6.1.2 WMO supervisor conducts a pre-job brief with cognizant engineer, WMO personnel, representative from A&PC labs, and representative from QA.

6.2 Preparation of Immersion Solution

6.2.1 A&PC technician place 9.27 ± 0.5 liters ASTM Type II water in a 5-gallon bucket for 2 (two) cores. Use 14.0 ± 0.5 liters for 3 cores.

6.2.2 A&PC technician place cover on 5-gallon bucket.

6.3 Calibration of Compressive Strength Test Equipment - is required once per year. QA to verify calibration is current prior to compressive strength testing. Record equipment serial number and calibration date on QA IIDS.

7.0 TEST INSTRUCTIONS

7.1 Coring and compressive strength testing

7.1.1 Cognizant engineer fills out SOP 70-44, appendix D, indicating all drums to be core drilled, locations of cores, and purpose of each core.

7.1.2 Perform core boring operations and destructively evaluate cores per SOP 70-44. Record all data on SOP 70-44 appendices.

7.2 Visual Inspection of Cores

7.2.1 Cognizant engineer fills out SOP 70-44, appendix B, sheet 2 of 5, indicating all archive cores to be retrieved from storage and visually inspected by Quality Services.

7.2.2 Perform visual examination operations per SOP 70-44 and WVDP-130, Quality Services Department Work Process Manual, section 2.4.1, General Inspection Reporting. Record visual examination per SOP 70-44.

7.3 Immersion of Cores

7.3.1 Cognizant engineer fills out SOP 70-44, appendix D, indicating drum to be core drilled and the location of core to be immersed. The core location will be either the top or bottom section of the drum.

7.3.2 A&PC prepares immersion fluids per section 6.2.

7.3.3 WMO perform core boring operation per SOP 70-44, including QA visual examination of core and bagging core for transportation. Record all data per SOP 70-44.

7.3.4 Obtain RWP prior to performing work contained in steps 7.3.5 - 7.3.9.

7.3.5 WMO place cores in 5-gallon bucket containing demineralized water. Immersion testing will be performed in a location that is normally between 60°F and 80°F. Record core identifier, start date and start time, and initial appendix A. Also record core identifier, start date and start time on 5-gallon bucket.

7.3.6 To minimize the amount of immersion fluid generated, place up to three cores in each immersion bucket used.

7.3.7 WMO remove cores from 5-gallon bucket after a minimum of fourteen days. Record end date, end time, and initial appendix A.

7.3.8 WMO allow core to dry at ambient temperature for a minimum of 48 hours. Record starting and ending dates and times on appendix A.

7.3.9 WMO arrange for 35mm high-resolution, black and white photographs of core. Give film to cognizant engineer to be processed and filed.

7.3.10 QA visually inspect core for cracking, spalling, or bulk disintegration. Record information on SOP 70-44, appendix B, sheet 2 of 5.

7.3.11 QA Destructively evaluate immersion core per SOP 70-44, section 6.5.

8.0 TEST COMPLETION

8.1 Disposal of Immersion Fluid

8.1.1 WMO place 5-gallon bucket inside a 6-gallon bucket or equivalent for double containment per RP.

8.1.2 RP survey out cask for transportation, if required.

8.1.3 Obtain a sample of the immersion water.

8.1.4 Complete Analytical Request Form WV-3111, requesting gross alpha and beta, and total chromium, mg/L.

8.1.5 If chromium is <u>less than</u> 5.0 PPM ± 1%, and gross activity (alpha plus beta) is less than 5.0E-3 μCi/mL, then the immersion water may be directed to the interceptor. If chromium is <u>greater than</u> 5.0 PPM ± 1%, then contact Cognizant Engineer for disposition.

8.1.6 Either wipe inside of 5-gallon bucket dry or allow to air dry.

8.1.7 If 5-gallon bucket has no precipitates in it, recycle it by using it for another job and/or hold it for future immersion tests. If bucket has precipitates in it then discard it to a yellow drum. There must be no free liquids for disposal in a yellow drum.

8.1.8 RP survey out secondary containment for future use.

8.2 Disposition of Cored Drum and Crushed Cores

8.2.1 Store cored drum per SOP 70-44, section 6.7.

8.2.2 Dispose of crushed cores per SOP 70-44, section 6.9.5.

9.0 DATA ACQUISITION

9.1 Compressive Strength Data - will be obtained per WVDP-130, section 2.4.1, General Inspection Reporting and SOP 70-44, section 6.5.

9.2 Visual Examination of Archived Cores

9.2.1 Cognizant Engineer will plan visual examinations using SOP 70-44, Appendix B, sheet 2 of 5, section 6.8.3. The cognizant engineer will provide drum number and core identification information. Compressive Strength will be N/A. Archive will be checked Yes.

9.2.2 All QA visual examination results will be reported on SOP 70-44, Appendix B under Visual Examination Results.

9.3 Within ten (10) working days after compression testing of immersion cores, QA will issue a Surveillance Report (or similar Quality Record) stating the results of the compressive strength testing and visual examinations for incorporation into SOP 70-44 data sheets and fifteen-day summary report.

9.4 Fifteen-day Summary Report - to be provided by the cognizant engineer approximately once every twelve months. The report will be issued within fifteen working days after completion of step 9.3 with the following information:

9.4.1 QA Surveillance Report or equivalent type of Quality Record as an attachment (typically an IIDS).

9.4.2 SOP 70-44, Appendix C and D, completed and signed.

9.4.3 A summary table of all available pre and post immersion compressive strength data to date.

9.4.4 A line graph of the data in section 9.4.3 with time on the X-axis and compressive strength in PSI on the Y-axis.

9.4.5 References to log books should include log book designator, page numbers, and dates.

9.4.6 Cognizant engineer and cognizant quality engineer signatures.

9.4.7 If this is the first two test intervals, additional data to be reported from section 5.5 will be included in the letter.

APPENDIX A

IMMERSION WORKSHEET
(Sheet 1 of 1)

Core ID Number	Immersion Duration	Start Date	Start Time	Initials	End Date	End Time	Initials

Core ID Number	Drying Duration	Start Date	Start Time	Initials	End Date	End Time	Initials

Supervisor_____ Date_____