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**STATUS OF DOCUMENTS AVAILABLE FOR THE  
SEISMIC ANALYSES REVIEW**

*Prepared for*

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# 1 INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) contracted with the Center for Nuclear Waste Regulatory Analyses (CNWRA) to provide technical support under the Waste Solidification Systems (WSS) Program Element for the NRC activities in connection with the West Valley Demonstration Project (WVDP). Currently, five tasks are identified as part of the WSS Program Element work scope. The subject of this letter report is the Task 3 Intermediate Milestone, 20-3706-003-050, and it presents the status of the information available from the U.S. Department of Energy (DOE) to date on the seismic analyses for the Vitrification Facility (VF).

The seismic and structural evaluation of the VF had been an ongoing process between the DOE and NRC until April 1990. In April 1990, the NRC transmitted a letter requesting several details of component analyses that were not completed by the DOE. The DOE responded in August 1992, outlining the ongoing nature of the work in evaluating the seismic and tornado effects on the VF. This report catalogues and assesses the nature of the information provided to the CNWRA in this area. A detailed review report on the seismic analyses of the VF will be prepared in FY 93, once all the necessary documents are obtained from the DOE.

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## 2 STATUS OF RECEIPT OF VITRIFICATION FACILITY-RELATED DOCUMENTS

To facilitate the review of the seismic analyses for the VF at the WVDP, a number of documents and materials will be needed. Some of these are currently available, while others have been identified by the DOE for delivery to the NRC at a later date. As the seismic analyses continue, it is anticipated that additional reference materials which will be required will be identified during future interactions with the DOE.

### 2.1 DOCUMENTS CURRENTLY AVAILABLE

Following is a list of the documents received at the CNWRA, in chronological order of transmittal, along with brief comments on each.

- Johnson, N. E., and J. C. Walls. 1981. *Seismic Resistance Capacity Evaluation of Spent Fuel Storage Racks and Fuel at West Valley, New York*. NUREG/CR-2236. Washington, D.C.: NRC.

This report has been reviewed as an example of a seismic analysis evaluation of facilities at the WVDP.

- Gates, W. E. 1989. *Progress Report—Confinement Barrier Integrity Review of Shield Doors, Vitrification Facility, West Valley Nuclear Services, Inc.* Los Angeles, California: Dames & Moore.

This letter report dated August 11, 1989, pertains to the shield doors and is part of the DOE's September 8, 1989, transmittal to the NRC. The letter of transmittal cites two problems identified by Dames & Moore: support for gravity loads for Door 1 and tornado missile rebound for Doors 3, 4, 5, and 7. The second problem was purportedly mitigated by a design change for the latch pins for Doors 3, 4, and 5, but a need for further review or mitigative action was proposed for Door 7. Table A of the letter report has incomplete data on Doors for certain combinations of door component and/or failure mode. The credibility of the various failure mode combinations remains to be investigated. Also, Table A indicates areas that require further review to evaluate the consequence of potential failures for Doors 4, 5, and 7. The resolution of a gravity problem with Door 1 is pending; this will be an item for future follow up with the DOE. Design drawings and calculations used by Dames & Moore for their independent analyses of shield door integrity may be needed in the future for the CNWRA seismic analyses review.

- Gates, W. E., A. R. Porush, and R. W. Kupp. 1989. *Progress Report—Tornado Driven Missile Penetration Resistance of Shield Windows on Vitrification Cell for West Valley Nuclear Services*. Los Angeles, California: Dames & Moore.

This letter report dated August 11, 1989, pertains to the shield windows, and it is part of the DOE's September 8, 1989, transmittal to the NRC. It includes an analysis

consisting of a 12-page appendix entitled "Safety Analysis—Post Tornado Vitrification Cell," by R. W. Kupp, dated July 6, 1989. In this report, it was stated that "it is the opinion of experts in glass manufacture and missile testing of glass that the design basis tornado for the WV site will not penetrate the multiple layers of heavy glass that form the shield windows on the Vitrification Cell." A worst case scenario was developed to determine possible effects of a window being completely blown through its frame by a tornado-borne missile. This scenario led to the conclusion that "the post-tornado winds would produce sufficient negative pressure that hazardous quantities of gaseous materials could be released from the cell in an unacceptable radiological accident." The size of the penetration used in the analysis was next reduced, and the resultant loss of a few cubic feet of radioactive materials was considered acceptable. Reducing the size of the penetration used in the analysis was justified by concluding that much of the glass rubble during missile penetration would remain in place afterwards and thus act to restrict air flow. This conclusion was based on "simple momentum considerations between the design basis missile and the physical geometry of the multiple layered windows." The negative pressure created by the Heating, Ventilation, and Air Conditioning (HVAC) system, designed to withstand tornado loads and remain functional, is reported to maintain radiological consequences within acceptable limits. The CNWRA analysis will examine details from this report to determine the following: (i) review momentum considerations for appropriateness and accuracy; (ii) review gas flow through the cell during the tornado event to determine appropriateness and accuracy of estimated volume of radioactive materials released; (iii) review post-tornado scenario to verify that HVAC will adequately ventilate and filter radioactive materials; (iv) review the HVAC system design to withstand tornado loading and remain functional; and (v) review any documented expert opinion supporting the conclusions in the report.

- Gates, W. E. 1989. *Progress Report—Primary Confinement Barrier Integrity Review—Vitrification Facility, West Valley Nuclear Services, Inc.* Los Angeles, California: Dames & Moore.

This letter report dated August 11, 1989, pertains to the primary confinement barrier, and it is part of the DOE's September 8, 1989, transmittal to the NRC. The primary confinement barrier includes the civil structural elements (excluding the shield windows and shield doors). The references for this report include the following incomplete items which need to be delivered before the seismic review can be performed: Design Criteria, Design Calculations (some of these are included in Figures and Attachments), and Design Specifications (these are noted "to be added later"). Appropriateness and accuracy of the VF Stick Model, presented in Figure 2 of the report, will be reviewed in the seismic analyses. The report also states that "further study should be conducted on the influence of radiation, chemical attack, freezing and thawing, etc. on the physical properties of the Rodofam" which comprises the coupling between the VF and the Equipment Decontamination Room (EDR). Although coupling through the Rodofam is described as "insignificant," this could change if the Rodofam material properties stiffen with age or environmental exposure to the extent that coupled earthquake response of the VF and EDR is significantly affected. A description should be given of the program planned to pursue the "further study," or bounding calculations should be provided to show that such a study is not necessary. In Section 2.2 entitled "Method of Design Review," it is evident that design criteria and design drawings and calculations are available, since they

were used during Dames & Moore's review. Table 9 of the report indicates that cracking of the roof slab and the top portion of the walls of the VF could occur during an earthquake of magnitude less than the Design Basis Earthquake (DBE), when out-of-plane bending is combined with thermal stresses. However, the report states that for ultimate collapse, the structure "probably has a margin of safety on the order of 5 or 6 times the Design Basis Earthquake, based on engineering judgment and experience." This potential mode of failure will be examined in the seismic analyses report.

- Maestas, E. 1989. Letter of Transmittal. West Valley, New York: DOE Idaho Operations Office, West Valley Project Office.

This letter, dated September 8, 1989, transmits three progress reports to West Valley Nuclear Services (WVNS), each dated August 11, 1989. These reports deal with different aspects of the confinement barrier (see descriptions of the three documents whose descriptions immediately precede this one).

- Rowland, T. J. Letter to G. Comfort, NRC, dated August 7, 1992. DOE Responses to NRC Comments. West Valley, New York: U.S. DOE.

This letter, with its enclosure and exhibits, represents the latest review correspondence between the DOE and NRC concerning outstanding items of discussion concerning seismic analyses for the VF at the WVDP. These documents will be discussed in detail in the seismic analyses report.

Other documents available for review are:

- Price, J. D. 1989. Memorandum of November 30, 1989: Price to Hurt. Subject: Status of the West Valley Vitrification Facility Seismic/Tornado Review. Oak Ridge, TN: Science Applications, Inc.
- DesCamp, V., W. E. Gates and R. W. Kupp. 1989. Synopsis and Presentation Materials for Meeting on NRC Progress Review—Vitrification Facility Confinement Barrier and Margin Assessment at NRC Headquarters, Rockville, Maryland.
- Hurt, R. D. 1990. *NRC Comments on the WVDP Seismic and Tornado Analysis for the Vitrification Facility*. Letter of April 2, 1990, to W. Bixby, U.S. DOE. Washington, D.C.: NRC.

## 2.2 DOCUMENTS YET TO BE RECEIVED

In addition to the materials identified above, it is expected that further information will be required to complete the CNWRA review. Some of this information may be obtained through coordination meetings on an as-needed basis from appropriate participants in the WVDP project. In the August 7, 1992, letter from the DOE to the NRC, the following documents were identified as being in various stages of completion and not yet in final form for transmittal to the NRC.

- High-Level Waste Transfer System (HLWTS) & VF Soil Structure Interaction Analysis

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- Piping and Trench Seismic Design
  - Interpolated Solids Data
  - Simplified Structural Interaction Analysis (EBASCO) (Soil-Structure)
  - Dames and Moore Review of Structural Interaction Analysis
  - Canister Transport System Seismic Analysis
  - Canister Transport System Design Drawings (if necessary)
  - Canister Transport System Design Calculations (if necessary)
  - In-Cell Equipment Seismic Analysis
  - Construction Contractor's Analyses, Testing Techniques, & Calculations (if necessary)
  - WVNS Review of Construction Contractor's Analyses
  - Dames and Moore Review of Selected Analyses
  - Shield Door Report by Dames & Moore to be ready by September 30, 1992

### **3 FUTURE ACTIVITIES FOR THE SEISMIC ANALYSES REVIEW REPORT**

#### **3.1 IMPACT OF SCHEDULE FOR RECEIPT OF DOE DOCUMENTS ON REPORT DELIVERY**

In the August 7, 1992, letter from the DOE to the NRC, the DOE assured allowance of adequate time for the NRC's review of final reports in advance of the final due date of NRC review. However, our most recent experience [development of the Safety Evaluation Report (SER) on the WVDP Supernatant Treatment System (STS)] indicates that this may not be the case. Although draft versions were available early, the DOE's final Safety Analysis Report (SAR) on the STS provided very little time for preparing a SER. It is expected that these documents should be available to the CNWRA no less than 6-8 weeks prior to any scheduled meetings with the DOE so that adequate time for review will be available.

#### **3.2 FORMAT FOR PRESENTATION**

Attached to this letter report (Attachment 1) is a preliminary draft outline of our Seismic Review Report. This outline represents the contents of the report as currently identified. The scope of the final CNWRA Seismic Review Report will involve the review of existing documents and new materials and documents from the DOE. As a result, areas for further consideration, which have not been identified in previous analyses, may become apparent, and they will be included in the final report as appropriate.

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## ATTACHMENT 1

# PRELIMINARY DRAFT OUTLINE OF SEISMIC ANALYSES REVIEW REPORT

1. INTRODUCTION
2. FACILITY DESCRIPTION
3. TECHNICAL APPROACH
4. BACKGROUND DOCUMENTS
  - DOE Submittals
  - NRC-DOE Correspondence
  - Science Application International Corporation (SAIC) Review Summary
5. SEISMIC ANALYSES REVIEW
  - 5.1 Document Evaluations
  - 5.2 Component Evaluation
    - Primary Confinement Barrier
    - Shield Doors
    - Shield Windows
    - Other Components
6. ASSESSMENT OF TECHNICAL ISSUES
  - List of Technical Concerns/Issues
  - Impact on Radiological Safety
7. SUMMARY AND RECOMMENDATIONS