

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

October 20, 1995

**MEMORANDUM** G. W. Cunningham, Technical Director  
**FOR:**  
**COPIES:** Board Members  
**FROM:** A. H. Hadjian  
**SUBJECT:** Structural Review of the Defense Waste Processing Facility (DWPF) at the Savannah River Site (SRS)

1. **Purpose:** This report documents Defense Nuclear Facilities Safety Board's (Board) staff and outside experts review of the status of DWPF at SRS. The review was conducted at the site on September 27-29, 1995, by staff members Asa Hadjian and Donald Wille, and outside experts Paul Rizzo, William Hall and John Stevenson.
2. **Summary:** The structural and system review of DWPF determined that the structures have been designed and constructed well; however, additional attention to seismic qualification of equipment is needed. In particular, the seismic support of cable trays over the Emergency Control Center (ECC) equipment may be inadequate and its failure could result in the inability to safely shutdown the process following a seismic event. Additional review of the seismic adequacy of buried waste transfer lines, Organic Waste Storage Tanks (OWST), benzene transfer line, and safety class components, which are not designated as seismically qualified, will be necessary. Additional evaluation will be required by the Board staff to assess the adequacy of critical elements of the DWPF structures and systems designed to the Blume spectra anchored to 0.2g, which has not been accepted as adequate for some design and assessment applications. In addition, the safety basis for phased approach of radioactive operations while safety system upgrade modifications are in progress will also need to be evaluated. As an example, the updated System Design Descriptions (SDD) for safety systems will not be completed until months after the planned start of radioactive operations for sludge processing.
3. **Background:** DWPF has been under design and construction since the early 80's. It encompasses many structures, of which the following were toured and reviewed by the review team, based primarily on presentations at the site, as well as discussions with site personnel and representatives of the facility designers: Vitrification Building, Sand Filter, Fan House, Low Point Pump Pit (LPPP) and waste transfer lines (buried), Glass Waste Storage Building, OWST, and benzene transfer lines.
4. **Discussion/Observations:** In general, the above structures have been designed and constructed well. However, similar attention was not given to the seismic evaluation of equipment and trays supporting cables, conduits and lighting fixtures. Conservative floor spectra are available to adequately complete this activity. Seismic II/I walkdowns and assessments remain to be completed. Despite the overall robustness of the above listed structures, the following areas require further review:

- a. Seismic II/I walkdowns and assessments remain to be completed. For example, during the tour of the Vitrification Building it was observed that the cable tray supports immediately above the ECC may be inadequate to preclude collapse onto the equipment. Failure of the ECC could result in the inability to safely shutdown the process following a seismic event.
- b. Revision of the SDDs for safety class and safety significant systems to incorporate the upgraded safety basis modifications, which are in progress, will not be completed for about 10 months. The scheduled completion of the SDDs is phased to support radioactive operations in the Salt Process Cell with sludge processing only. The lack of timely and up-to-date SDDs to support training, operations and integrated system reviews requires further evaluation by the staff to determine the safety basis prior to initiation of radioactive operations.
- c. The upgraded safety basis program resulted in many systems and components being classified as safety class, but not requiring seismic qualification. This was justified as the safety function provided by the equipment was not needed during or following a seismic event. A critical evaluation of the system equipment lists for seismic qualification designation needs to be carried out by the Board staff.
- d. The seismic capability of the buried transfer lines from the tank farm to the LPPP and the LPPP retaining cells need further review by the staff based on the potential for large unmitigated off-site doses to the public for this postulated accident. There is a plan to add a seismically qualified manual valve at the tank farm to prevent large quantities of radioactive waste from surface discharge following a seismic event.
- e. The effect of two 6" expansion joints on the dynamic response of the Vitrification Building was not considered in the safety analyses. Specifically, the deformability of the base slab at the expansion joints was not included in the simplified model. This may lead to the inadequate sizing of the expansion joint. Air flow problems through Zone 1 ventilation to the sand filter could result if the integrity of the expansion joints is compromised. In addition, some of the distribution systems which traverse the expansion joints may have insufficient flexibility to accommodate the seismic differential motion of the expansion joint.
- f. In the past, the Housner spectra, and the Blume spectra (used for retrofit of the SRS reactors) anchored to 0.2g were employed. In recent times it has been felt that the Blume spectra anchored to 0.2g and the associated ground motions may not be adequate for many design and assessment applications. A determination needs to be made to assess whether critical elements of this facility should be evaluated to a more conservative spectra, as well as ground motions, taking into consideration the probability that high level waste is present in the buried waste transfer lines and the inventory of high level waste expected in process systems.
- g. Seismic adequacy of the unanchored tanks in the Vitrification Building needs to be revisited by the staff, not so much from the perspective of overturning, but mainly to check the buckling of the tanks, their support legs, and the

punching/shearing at the region of the trunnion connections.

- h. The staff has not completed the review of the seismic evaluation of the OWST and benzene transfer lines (on trestles). Follow-up on this potentially explosive configuration is required.