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# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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October 9, 1997

The Honorable Alvin L. Alm  
Assistant Secretary for Environmental Management  
Department of Energy  
Washington, D.C. 20585

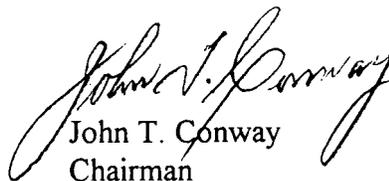
Dear Mr. Alm:

Defense Nuclear Facilities Safety Board (Board) staff review teams have visited the Savannah River Site several times this year to review implementation of Recommendation 96-1 at the In-Tank Precipitation (ITP) Facility, and to assess the authorization basis and safety programs for the high-level waste tank farms. The Board requested Mr. R. Tontodonato of the Board's staff to review the reports of these visits and to summarize these findings for us. The enclosed report is his **summary** of the issues identified during each site visit and the progress made in resolving each open item.

There are several key issues the Board would like to draw to your attention. The numerous observations made by our staff regarding the ITP nitrogen inerting systems make it clear that great care must be taken to ensure these systems are rigorously effective and reliable. Furthermore, the staff's observations regarding controls on ITP pump operations highlight the fact that ITP appears to be developing an undue reliance on administrative controls. Engineered controls would be preferable, to the extent that they are practical, for a facility facing such a long and technically demanding mission. Finally, the prolonged discussions that have taken place regarding the accident analyses and controls for hydrogen deflagrations in waste tanks and waste tank overheating indicate that closure of these issues is proving difficult and may warrant increased scrutiny from the Department of Energy. The Board is closely following the progress of the research on the chemistry of the ITP process, and the results that continue to come in with bearing on the safety of the process.

The enclosed reports provide a synopsis of the observations made during the reviews conducted by the Board's staff and are forwarded for your consideration. If you have any questions, please feel free to call me.

Sincerely,

  
John T. Conway  
Chairman

c: Mr. Mark Whitaker

Enclosures

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

June 16, 1997

**MEMORANDUM FOR:** G. W. Cunningham, Technical Director

**COPIES:** Board Members

**FROM:** R. Tontodonato

**SUBJECT:** Review of Savannah River Site Waste Management Facilities,  
June 9–11, 1997

This memorandum documents a visit by members of the staff of the Defense Nuclear Facilities Safety Board (Board) L. Jellett and R. Tontodonato to the Savannah River Site (SRS) on June 9–11, 1997. The purpose of this visit was to review implementation of Board Recommendation 96-1 at the In-Tank Precipitation (ITP) Facility, hydrogen retention in SRS high-level waste tanks, and operational problems at the Consolidated Incineration Facility (CIF).

**Recommendation 96-1.** Technical Safety Requirements being developed for ITP will impose safety-class and safety-significant reliability criteria on certain existing systems, structures, and components. Westinghouse Savannah River Company (WSRC) is performing backfit analyses to determine whether upgrades are needed to ensure that such equipment will function as assumed by the safety analysis. Six backfit analyses have been completed to date. Design deficiencies identified by the analyses include vulnerability to single failures, inadequate electrical design (particularly lack of redundant sources of power), inadequate protection against environmental conditions, and failure to meet modern quality assurance standards for procurement. WSRC responses include a mix of equipment upgrades and compensatory actions such as improved surveillance and new administrative controls. The Board's staff will evaluate these analyses to assess whether the WSRC methodology results in appropriate backfit decisions. The initial conclusions of the Board's staff are that there is little basis for the surveillance frequencies specified in the compensatory actions, and that the feasibility and merit of potential compensatory actions were not thoroughly evaluated in

some cases (e.g., performing functional testing of check valves instead of relying on periodic inspections and operator response to valve failure).

WSRC is evaluating the potential for hydrogen retention in ITP tanks. Tank data show that small hydrogen releases occur when the slurry pumps in Tank 48 are started. Future operations involving more waste and higher curie loadings could significantly increase the size of these releases. Laboratory studies have shown that simulated tetraphenylborate slurries can retain over 3.5 volume percent hydrogen. Release of such a quantity of hydrogen from a large volume of slurry would create a flammable atmosphere in the tank. WSRC is working to define additional authorization basis controls to prevent hazardous quantities of hydrogen from accumulating during full-scale ITP operations, without relying on continuous (or near-continuous) slurry pump operations. Continuous pump operations are not feasible using the existing pumps and power supplies.

The potential exists for ITP operations to become very complex if too many variables are factored into the determination of pump operating frequencies, especially when both hydrogen and benzene accumulation are considered. Using conservative values for some parameters (such as nitrate and nitrite concentrations) instead of recalculating the maximum allowable quiescent time for the precise tank conditions that exist at any given time could greatly simplify operations. It could also make operator compliance with the controls easier. Ideally, the authorization basis will identify a simple set of Limiting Conditions of Operation providing mixing frequencies for each major phase of the ITP process (e.g., precipitation, concentration, washing).

**Hydrogen Retention in Other Waste Tanks.** Hydrogen retention in non-ITP tanks is much less severe than at the Hanford Site because high-level waste at SRS contains only small quantities of organic compounds. Spontaneous gas release events have not been observed. However, a significant hydrogen release was observed in 1993 during slurry pump operations in Tank 51. WSRC plans to address the potential for induced releases by estimating the size of such releases and developing controls on ventilation, mixing frequency, and/or the intensity of agitation. Interim controls on waste-disturbing activities have been implemented to ensure that operations will remain safe while these investigations are pursued.

**Consolidated Incineration Facility.** Several operational problems have occurred at CIF since it started operating in late 1996. Significant events include a pump leak that contaminated a facility worker and a small fire involving waste boxes jammed in the feed unit for the rotary kiln. Corrective actions being taken by CIF management appear to address both the immediate problems and the broader implications of each incident adequately. However, an incident that occurred the day after the review by the Board's staff (spill of radiologically contaminated liquids due to an improper valve line-up) shows that conduct of operations at CIF needs further improvement.