DEFENSE NUCLEAR FACILITIES SAFETY BOARD

April 17, 1998

MEMORANDUM FOR: G. W. Cunningham, Technical Director
FROM: J. Kent Fortenberry / Joe Sanders
SUBJECT: SRS Report for Week Ending April 17, 1998

Todd Davis and Ralph West were onsite this week to observe portions of the resumed DOE Readiness Assessment for restart of H-Canyon Phase II operations.

H-Canyon Phase II Restart - In addition to resumption of the DOE Readiness Assessment this week, DOE-SR issued a letter to WSRC outlining the actions to be taken to resolve the issues identified in the March 11, 1998 Board letter. The actions to be taken are consistent with DNFSB staff expectations.

Actions to verify Process Vessel Ventilation (PVV) purge flow for individual tanks started this week with a pressure-drop measurement between Tank 18.3 and the canyon cell. Tank 18.3 is a Pu-239 storage tank located at the end of the warm canyon PVV header, and is the H-Canyon tank with the greatest hydrogen generation. The pressure-drop measured for this tank was about 0.01 inches WC. Preliminary calculations indicate that this pressure-drop is more than large enough to provide the required purge flow. The validity of this calculation in relating the pressure-drop to the purge flow will need to be determined. Pressure-drop measurements will be made for three other canyon storage tanks prior to the H-Canyon Phase II start-up. Resolution of this issue for the H-Canyon process tanks and for F-Canyon is being evaluated.

Storage of Alpha (α)-Phase Plutonium Metal in APSF - Pure plutonium metal will undergo α-beta ( ) phase transition at 112°C and expand up to 10% by volume. Furthermore, continued cycling between these two phases generates microvoids in the metal that can decrease the plutonium density by four-fold. As a result, DOE Standard 3013-96 currently requires that the steady-state plutonium metal temperature be maintained below 100°C. However, DOE-SR intends to waive this design requirement for the APSF system as a result of testing performed at LANL which indicated that the plutonium metal would yield before the inner container plastically strained to the point of rupture. LANL performed tests in which plutonium metal was inserted into a container and cycled through the phase-change temperature for two metal geometries: a cylindrical ingot of diameter slightly smaller than the inner container diameter and a slender rod of length just smaller than the container diameter. For the ingot which was exposed to 25 phase-change cycles, the stainless steel container plastically yielded, reaching a stress of 123 ksi, but did not rupture. The rod buckled during the first cycle. While the experimental results appear promising, a much more extensive experimental/analysis program seems merited, given the hazard of rupturing the containers, before the thermal requirement in the APSF design is relaxed**.**