DEFENSE NUCLEAR FACILITIES SAFETY BOARD

December 14, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: R. Todd Davis

SUBJECT: Savannah River Site (SRS) - In-Tank Precipitation (ITP) Facility Review (November 16-18,1994)

1. Purpose: This report documents a review of the startup test program and conduct of operations (with an emphasis on procedures) at the In-Tank Precipitation (ITP) facility by Defense Nuclear Facilities Safety Board (DNFSB) technical staff, R. Todd Davis, and outside expert, Ralph West, on November 16-18,1994. The staff has separately reviewed and reported on the adequacy of the safety class ventilation equipment test program to satisfy the safety basis requirements and assumptions.

2. Summary: The review identified the following significant issues:

   a. A safety class equipment procedure, which had been used by operators several times, contained several errors which indicate that WSRC is not adequately identifying and resolving problems in procedures.

   b. The impact of elevated radiation levels, due to concentration of high activity liquid in tanks 48 and 49, on operations (including emergency ventilation equipment installation) has not been adequately reviewed or addressed.

   c. Resolution and documentation of test program deficiencies does not appear to be adequate.

   d. Three instances, two for safety significant equipment, of inadequate configuration management and control of temporary modifications were noted.

3. Background: The ITP facility is a high-level radioactive waste chemical processing facility in which radioactive salt solutions from the SRS tank farms will be separated into high and low activity solutions by precipitation and filtration. The high activity solution will be the feed material for vitrification operations at the Defense Waste Processing Facility (DWPF). The low activity solution will be processed at the saltstone facility. ITP is currently resolving issues identified in the WSRC Readiness Self Assessment (RSA) and Operational Readiness Review (ORR).

4. Discussion:

a. Procedures: The DNFSB staff and outside expert reviewed several operating procedures (emergency, abnormal, surveillance and normal). Operators stated that initial revisions of procedures typically contained a number of significant errors. Because of the significant number of errors in initial procedure revisions, WSRC stated that operators will help review and validate any additional new procedures.

The DNFSB staff evaluated procedures and conduct of operations during the simulated installation of the Emergency Purge Ventilation Equipment (EPVE). The EPVE is classified as safety class equipment and provides emergency ventilation if the normal methods of ventilation fail. Several procedure errors and operator deviations from the procedure were identified during the evolution. Because of the safety significance and the number of times this procedure has been performed, errors in this procedure indicate that operating personnel are not adequately identifying and resolving problems in procedures.

The impact of elevated radiation levels, due to the concentration of high activity liquid in tanks 48 and 49, on the installation of the EPVE was not simulated in the EPVE installation exercise.

b. Engineering Support: Five engineers were interviewed to determine their effectiveness as ITP systems engineers. Several engineers were unaware of expected radiation levels and had not considered how the levels would impact repairs and evolutions on their systems.

c. Startup Test Program: Several test reports were sampled and reviewed. One test of the benzene stripping system identified a deficiency with the amount of benzene carryover. Documentation of the resolution of this deficiency did not appear to indicate that the problem was corrected. The responsible engineer explained that a subsequent integrated test established compliance with the carryover requirement. He agreed that the resolution was not clearly documented.

Two EPVE units shut down because of rain during testing. As a result of these failures, Westinghouse Savannah River Company (WSRC) modified the equipment design to include a rain shield; however, no additional testing was documented to confirm that the design change fixed the problem. In addition, the qualification testing does not adequately ensure the EPVE will be operable in all possible weather conditions.

d. Configuration Management: Three instances of inadequate configuration management and control of temporary modifications were noted. Two safety significant relays were disconnected for a short time because of incorrect electrical drawings. A hydrogen regulator installed in the laboratory sampling system was not identified on any drawings.

In addition, a temporary jumper was not removed from a safety significant

interlock and resulted in slight pressurization of one of the ITP tanks.

5. Future Staff Actions: The DNFSB staff will follow up on WSRC's resolution of procedure problems.

Attachment:DNFSB Staff Review of the Startup Test Program and Conduct of Operations at ITP

I. Introduction: This attachment provides a detailed review of the startup test program and conduct of operations (with an emphasis on procedures) at the In-Tank Precipitation (ITP) facility.

II. Discussion/Observations:

a. Procedures: A review of several emergency, abnormal, surveillance and normal operating procedures was performed. Operators stated that initial revisions of procedures typically contained a number of significant errors. Because of the significant number of errors in initial procedure revisions, WSRC stated that operators will help review and validate any additional new procedures.

Procedures and conduct of operations were evaluated during the installation of the Emergency Purge Ventilation Equipment (EPVE). The EPVE is classified as safety class equipment and is maintained by ITP as a means to provide ventilation if the normal methods of ventilation fail. Ventilation is required to prevent flammable gas from accumulating in the tank head space.

The setup and startup of the emergency ventilation equipment during simulated post-severe accident conditions were observed for tank 49. Operators stated that this procedure has been used several times for installation of the EPVE. Errors and problems with this procedure indicate that procedures are not receiving adequate review by engineers and operators. The following problems were identified during this exercise:

1. Radiation levels expected during normal operations were not simulated during the exercise. After ITP operations commence, the dose rate above an open plug on tanks 48 and 49 will increase significantly. The exercise did not adequately simulate the expected radiation levels and the impact these levels will have on EPVE installation.

2. One step of the installation procedure requires assembly of the downcomer to the flexible duct prior to inserting the downcomer into the tank while the next step requires the duct be connected to the downcomer after the downcomer is in the tank. These two requirements contradict each other. Additionally, operators stated that the first step was not possible because of the assembly weight.

3. The procedure for tank 48 requires taping the downcomer to a tank joint with duct tape to ensure adequate sealing. For tank 49 the procedure states that duct tape should be used, if necessary. However, the use of duct tape was not simulated or discussed during the drill. In addition, a member of

the WSRC staff in charge of the evolution revealed that he was unsure of when and how the tape would be applied.

4. The initialing of an independent verification step was not accomplished. A supervisor questioned by DNFSB staff was not sure how the signature would be obtained in the radiologically controlled area.

5. The drain hose between the filter housing and the downcomer was connected out of sequence.

6. The complete procedure, which included tank throttle adjustment based on flammable vapor concentration, was not performed. Only sufficient gasoline was added to allow engine operation for approximately one minute.

7. The tank 49 procedure incorrectly refers to tank 48.

b. Crane Procedures: ITP uses a remotely operable crane for manipulation of the shielded filtration system piping and filter. Filter replacement is expected to be required approximately every two years. Crane operations will be controlled by special procedures which will be written as they are needed. ITP personnel have failed to learn from F-canyon and DWPF experience where the use of special procedures has been curtailed because of significant procedural problems.

c. Engineering Support: Five system engineers were interviewed. Most engineers were knowledgeable about their specific area of responsibility. However, three engineers were weak in the overall system operation of ITP. None of the engineers had a good understanding of the expected radiation levels during operations and the impact of increased radiation levels on their areas of responsibilities.

d. Startup Test Program: Several test reports were sampled and reviewed. One test of the benzene stripping system identified a deficiency with the amount of benzene carryover. Documentation of the resolution of this deficiency did not appear to indicate that the problem was corrected. The responsible engineer explained that a subsequent integrated test established compliance with the carryover requirement. He agreed that the resolution was not clearly documented.

The testing of the EPVE included short duration runs (4 hours) for all units and two extended duration runs. During this testing two units failed during operation in the rain. A design change was implemented to install rain deflectors on the engine; however, no additional testing was documented in the test report to ensure the design change will preclude failure during rain storms. In addition, EPVE operation under all possible severe weather conditions has not been demonstrated.

e. Configuration Management: Two engineers described problems which resulted

from lack of adequate configuration management. The first involved the disconnection of two safety significant alarm relays because of inaccurate drawings. Second, a hydrogen regulator which was installed in a laboratory sampling system was not identified on any drawing. In addition, recently a temporary jumper was not removed from a safety interlock which shuts off the inlet blowers on loss of outlet flow. During testing of the interlock, which did not operate because of the jumper, the tank was slightly pressurized. WSRC is reviewing this occurrence to determine the cause and appropriate corrective action.