DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004
(202) 208-6400

March 28, 1995

Mr. Mark Whitaker, EH-9
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Whitaker:

Enclosed for your information and distribution are six Defense Nuclear Facilities Safety Board staff reports. The reports have been placed in our Public Reading Room.

Sincerely,

George W. Cunningham
Technical Director

Enclosures (6)

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

December 12, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: C. H. Keilers, Jr.

SUBJECT: In-Tank Precipitation Facility - Review of Emergency Ventilation

1. **Purpose:** This report documents a review of Emergency Purge Ventilation Equipment (EPVE) for the In-Tank Precipitation (ITP) Facility at the Savannah River Site. The review was performed on-site on October 20-21, 1994 by C. Keilers and J. Sanders of the Defense Nuclear Facilities Safety Board (DNFSB) technical staff, with a follow-up document review. This review focuses on EPVE compliance with the ITP Safety Basis. The staff has separately reviewed and will report on EPVE procedures and operation in-the-field.

2. **Summary:** Currently, EPVE components (gasoline-powered blowers and ducting) are the only Safety Class components for ITP, other than the tanks themselves. To prevent a tank deflagration, the EPVE would be manually installed following an accident or if the normal exhaust fans are lost for an extended period. The staff considers that potential post-accident obstacles to installing the EPVE have not been fully addressed. For example, it is possible that waste transfer lines on the tank top could rupture during an earthquake and result in radiation levels high enough to preclude manual installation of the EPVE. The staff is also concerned whether the EPVE demonstration adequately verified assumptions and requirements in the Safety Analysis Report (SAR).

3. **Background:** The ITP Facility will concentrate high-level radioactive waste in a processing tank (tank 48) and then transfer the resulting slurry to a feed tank (tank 49) for the Defense Waste Processing Facility (DWPF). The installed tank ventilation systems were not designed to withstand a design basis accident and are not Safety Class systems.

4. **Discussion:** By DOE Order 6430.1A, *General Design Criteria,* the ITP tanks require a Safety Class system to prevent flammable gas build-up, since a tank deflagration could have significant off-site consequences. Westinghouse Savannah River Company (WSRC) has procured several redundant sets of the EPVE that can be installed if normal tank ventilation is lost. Since most EPVE components are "off-the-shelf" commercial items, WSRC is using a Commercial Grade Dedication process to upgrade them to Safety Class. As part of this process, WSRC performed a special test which showed that two people can quickly transport

EPVE components and manually connect them to a tank. WSRC also successfully operated an assembled EPVE unit on tank 49 for greater than 36 hours to demonstrate that the equipment can provide sustained flow comparable to the normal system.

A key SAR assumption is that 3 days are available after loss of ventilation to install the EPVE before flammable gases build up to the lower flammable limit. WSRC has revised the Operational Safety Requirements (OSRs) to require that the EPVE be in operation within 1 day after such an event. The cumulative time required to install the equipment during the demonstration was about 3 hours, without any obstacles or obstructions. The DNFSB staff is separately evaluating whether 3 days is really available for this installation.

The staff has performed an in-depth review of the EPVE to determine whether SAR assumptions and requirements are satisfied. The staff's review and comments are documented in the attachment to this report. The main comments are as follows:

a. The special test performed to upgrade the EPVE to Safety Class did not verify some key SAR assumptions and requirements. In particular, potential obstacles to EPVE movement during post-accident conditions were not considered.

b. Potential obstacles that should be considered include high radiation levels at the tank top that might result if a radioactive waste transfer line breaks. (In the ITP Safety Evaluation Report, DOE recognized these lines as potential seismic vulnerabilities and is currently evaluating them). Another example is a postulated high wind event that topples trees and electrical lines or causes icy road conditions, thereby obstructing a vehicle transporting the EPVE. A third example is an extreme event leaving debris on the tank top which blocks access needed for connecting the EPVE.

c. WSRC has not clearly presented the technical basis for concluding that the 36 hour operational test verifies either sustained 7 day EPVE operation, as discussed in the SAR, or the reliability actually assumed in SAR analyses. The logical connection between the SAR "7 day mission time," the 36 hour demonstration (a Commercial Grade Dedication process critical characteristic), and the reliability data actually used in SAR fault tree analysis is missing. Since this connection has not been established, WSRC has not demonstrated that the EPVE can function as Safety Class components.

5. **Future Planned Activities:** The DNFSB staff is continuing its review on whether the ITP safety requirements in the SAR are adequate. Also, the staff is following up on the concerns identified above and in the attachment, particularly those involving system Safety Classification and potential obstacles to EPVE post-accident installation and operation.

Attachment
DNFSB Staff Review of EPVE Compliance with Safety Requirements

I. Introduction: This attachment augments information in the trip report documenting the DNFSB staff review of the Emergency Purge Ventilation Equipment (EPVE) for the In-Tank Precipitation (ITP) Facility. The attachment first describes the EPVE, the WSRC Commercial Grade Dedication process, and the WSRC test done to demonstrate that the EPVE satisfies the requirements in Table 1, taken from the Safety Analysis Report (SAR) and the Operational Safety Requirements (OSRs) [1,2]. The attachment then describes and provides staff comments on how WSRC implemented each Table 1 requirement.

The ITP installed tank ventilation systems were not designed to withstand a design basis earthquake or high wind event and are not Safety Class systems, as defined in the DOE Order 6430.1A, "General Design Criteria" [3]. By the General Design Criteria (Section 1300-3), the tanks require a Safety Class system to prevent flammable gas build-up since a tank deflagration could have significant off-site consequences. Therefore, WSRC has procured the EPVE, consisting of gasoline-powered blowers and ducting that can be installed if both the normal tank exhaust fans become inoperable.

II. EPVE Description: Emergency Purge Ventilation Equipment consists of fan units, stainless steel flexible ducting, HEPA filters, and assorted installation equipment. A fan unit has a gasoline-powered engine coupled to an exhaust fan, all mounted in a single frame. WSRC procured nine fan units and associated ducting. Since these are "off-the-shelf" commercial items, WSRC is using a Commercial Grade Dedication process to upgrade them to Safety Class [4]. This process involves verifying the Table 2 critical characteristics [5,6].

Four gasoline-powered fan units, complete with fuel, ducting, downcomers, and other equipment, are to be stored down the hill from the tank top in a local shelter designed to withstand a 0.2g seismic event. Since this shelter is susceptible to wind-driven missiles, four other units and associated equipment (without fuel) are stored in the C-reactor building, where they are protected by greater than two feet of reinforced concrete. The ninth unit, randomly selected, was used in the EPVE Operability Demonstration Test, discussed below.

The fan units, ducts, downcomers, HEPA filters, and installation equipment each weigh less than 90 lbs to facilitate handling by two people. If normal tank ventilation is lost, WSRC has demonstrated that two people can hand-carry a fan unit from the local shelter and connect it to the tank via flexible steel ducts and a downcomer which is inserted down a tank riser. When conditions permit, a HEPA filter is also installed between the fan unit and the downcomer.

1	Four sets of emergency purge ventilation equipment (EPVEs) are provided as backup to each tank (eight total). The EPVEs include power supplies, which are independent of the remainder of the nitrogen purge system [1].
2	Emergency purge ventilation equipment must be sized so that the equipment can be hand-carried from its storage location to the tank top [1].
3	The emergency purge ventilation equipment must be stored and maintained in a building that will survive a 0.2g earthquake or high wind event, along with peripheral equipment (including installation procedures) necessary for their installation at Tanks 48 and 49. This equipment includes special tools, flexible duct, and consumables required for proper installation. Two sets (4 EPVEs) will be protected to survive a Design Basis Earthquake of 0.2g. Two other sets (4 EPVEs) will be stored in the C-reactor and will survive a design basis tornado of 137 mph [1].
4	The storage location must be selected based on Waste Management personnel's demonstrated ability to move the emergency purge ventilation equipment from its storage location to the tank top within 4 hours. Under the anticipated post-accident conditions, potential obstructions to movement must be considered [1].
5	Twelve hours are assumed for diagnosis [1].
6	Operations personnel have 3 days following the seismic event to establish air-based ventilation using emergency purge ventilation equipment before exceeding the composite lower flammability limit [1].
7	EPVEs will be able to be relocated to Tanks 48 and 49 and made operable within the time limits specified in the administrative controls with a 7 day mission time [1].
8	Two maintenance persons trained (via simulations) in the installation of the emergency purge ventilation equipment must be available on all shifts to move and install the purge equipment [1].
9	Portable radio communications with the Operations Support Center must be available [1].
10	Operating procedures should identify the storage location of the emergency purge ventilation equipment [1].
11	In order to allow for recovery action if the emergency purge ventilation equipment were hooked up incorrectly, a flow indicator must be installed as part of the emergency purge ventilation equipment unit [1].
12	Every 7 days, replace the battery-operated portable CLFL analyzers [2].
13	Every 3 months, verify the start and run capability of each EPVE, and replace the existing fuel supply at the seismically qualified EPVE storage location with a sufficient fresh fuel supply to run two EPVEs for at least seven days [2].
14	Every 3 months while in storage, verify that each EPVE fan can draw an exhaust flow rate of greater than or equal to 500 scfm [2].
15	Every 3 months, perform a visual inspection of the EPVE motors, couplings, hoses, HEPA filters, installation tools, and applicable installation procedures [2].

Table 1: EPVE Safety Requirements [1,2]

1	One randomly selected motor-fan unit shall start easily and run continuously for a period of 36 hours in accordance with the Operability Demonstration Test Procedure. Any shutdowns or failures except to refuel or add oil is reason for rejection. Conditions which could be cause for rejection include: inadvertent shutdown, insufficient air flow, unusual noise, fluid leakage, excessive vibration, difficulty in starting, and any other condition deemed abnormal [5,8].
2	For the one randomly selected unit, verify that unit weight is less than 90 lbs, exclusive of fuel and oil [5].
3	For the one randomly selected unit, verify that handles are located such that the unit can be easily lifted and carried by two operators [5].
4	For the one randomly selected unit, verify air flow is maintained at greater than or equal to 500 scfm at less than 5" water static vacuum throughout test in accordance with the Operability Demonstration Test Procedure [5,8].
5	A WSRC QA inspector shall verify that each of the eight remaining units is started and successfully run for a minimum one hour period and generates greater than or equal to 500 scfm at less than 5" water static vacuum [5,8].
6	Verify for all the units that the engine and blower nameplates include identification information [5].
7	Verify for all the units that the air inlet and outlet flanges mate with ducting disconnects [5].
8	Evaluate the seismic characteristics of the unit based on Manufacturer's drawings and an inspection of the provided units [5].
9	For all the flexible ducts, verify they are tagged with identification information [6].
10	For all the flexible ducts, SSR shall witness the vendor perform a pressure decay leak test in accordance with ASME N510-89. The maximum permissible leak rate shall be 11 percent per minute of the total duct volume at 11" WG vacuum [6].
11	For all the female Kam-lok fittings, verify that they contain a buna-N rubber seal ring. Each seal ring shall show no signs of cracking or deterioration which might preclude proper gas tight seal [6].
12	For 3 of the flexible ducts, verify that the Kam-lok fittings fit securely to the Kam-lok adapters on the fan unit, HEPA housing, and other duct sections of duct. Kam-lok fittings shall fully engage the male adapters. A maximum of two operators shall be able to engage the Kam-lok fittings for each duct section [6].
13	For 3 of the flexible ducts, verify that the inside diameter is 8" within 1/16" [6].
14	For 3 of the flexible ducts, verify they are at least 10 feet long and weigh 90 lbs or less [6].
15	Verify duct operability. This shall be performed in conjunction with the fan unit Operability Demonstration Test. Two operators shall be able to transport duct sections to the assembly area as specified by test procedure. Demonstration will include assembly and connection of duct to the tank riser [6].

TABLE 2: EPVE Critical Characteristics for Commercial Grade Dedication [5,6]

III. Commercial Grade Dedication Process: Since the EPVE engines, fans, and ducting were procured "off-the shelf," WSRC is using their on-site procedure to upgrade these commercial items to Safety Class [4]. The process involves identifying the critical characteristics, establishing verification methods and tolerances, selecting a sample size, and establishing an acceptance method. Documentation supporting the upgrade is then assembled in a Commercial Grade Dedication package to be acted upon by WSRC Quality Assurance.

For the EPVE, the critical characteristics selected are listed in Table 2. These ensure proper function, fit, and traceability as well as verify several Table 1 safety requirements. The acceptance method chosen was performing a special test in accordance with a controlled procedure [7,8]. The test involved selecting one fan unit at random and verifying that the unit could be transported, assembled, and operated within specified time periods while achieving acceptable flow. The remaining fan units were each started and run for at least one hour to verify operability. As of December 2, 1994, WSRC Quality Assurance had not yet taken action on the EPVE Commercial Grade Dedication packages [5,6].

DNFSB Staff Comment: Although WSRC has satisfied the Table 2 critical characteristics, these characteristics and the special test performed did not verify the corresponding SAR safety requirements listed in Table 1. This is discussed further below.

IV. Operability Demonstration Test: During the special test, WSRC operated all the EPVE fan units, assembled an EPVE on tank 48 without inserting the downcomer, and then assembled and operated an EPVE on tank 49 [8,20]. The test demonstrated that:

1. All the EPVE fan units could achieve greater than 500 scfm (actual full throttle flows were between 800 and 1000 scfm). Bypass leakage was not measured.

2. Two maintenance personnel could transport an EPVE and associated equipment from the C-reactor storage area to the ITP Area in under 4 hours (actual time: 40 minutes).

3. Two maintenance personnel could hand-carry an EPVE fan unit and associated equipment (except the HEPA filter) from local storage to the tank top in under 2 hours (actual time: 1 hour 20 minute).

4. Two maintenance personnel could fully assembly an EPVE, connect it to tank 49, and start the EPVE in under 4 hours (actual time: 45 minutes).

5. The EPVE on tank 49 could provide at least 500 scfm flow for at least 36 hours and was stopped every 12 hours to add oil as necessary (actual run time: 41 hours).

The test of the EPVE on tank 49 was run twice. In the first test, the engine was operated continuously for 43 hours until it ran out of fuel. Fuel and lubricant were not checked during this period. **This EPVE then failed to restart due to apparent loss of compression.** The engine was replaced within three days. In the second test, the engine was stopped every 12 hours to add oil, and it successfully ran for 41 hours. Therefore, the WSRC Joint Test Group concluded that the test was satisfactorily completed [20].

Based on the test experience, WSRC has revised the EPVE post-accident operating procedure to require that an operating engine be stopped every 12 hours to check the oil and every 24 hours to change the oil [9]. WSRC has indicated that the oil change periodicity is consistent with the manufacturer's technical manual, which suggests an oil change every 25 hours. WSRC also added rain shields to protect the engine air filters, after having engines stop due to air filters plugging in the rain.

DNFSB Staff Comment: The staff considers that the special test did not verify some corresponding SAR safety requirements listed in Table 1. For example, potential obstructions to EPVE movement during post-accident conditions were not considered (requirement 4). Also, the 41 hour run on the tank did not conclusively demonstrate a 7 day mission time (requirement 7). Furthermore, bypass leakage was not measured, and the new air filter rain shields were not tested for effectiveness.

V. **EPVE Safety Requirements Review:** The following lists each of the EPVE assumptions and requirements from Table 1, describes how WSRC implemented or demonstrated the requirement, and provides DNFSB staff comments. The requirements are in bold.

1. **Four sets of emergency purge ventilation equipment (EPVEs) are provided as backup to each tank (eight total). The EPVEs include power supplies, which are independent of the remainder of the nitrogen purge system.**

   a. WSRC Implementation: WSRC procured eight gasoline-powered fan units and associated ducts, HEPA filters, and installation equipment to satisfy this requirement [11,12,13]. A ninth fan unit was procured for testing purposes. WSRC fabricated the downcomers to on-site Quality Assurance standards. The fan units, ducts, and downcomers are Safety Class. The HEPA filters are not Safety Class since WSRC considers that the EPVEs can operate without them.

   b. DNFSB Staff Comment: The staff has not found evidence that the downcomers were built to Safety Class (level 1) requirements [10]. The staff is pursuing this.

2. **Emergency purge ventilation equipment must be sized so that the equipment can be hand-carried from its storage location to the tank top.**

a. WSRC Implementation and Demonstration: WSRC procurement specifications specified a 90 lb weight limit on components [11,12,13]. Furthermore, the Commercial Grade Dedication critical characteristics include checking the weight on a sampling of the components [5,6]. During the Operability Demonstration Test, operators demonstrated that two people could lift and transport the components within the allotted times [8].

b. DNFSB Staff Comments: None.

3. **The emergency purge ventilation equipment must be stored and maintained in a building that will survive a 0.2g earthquake or high wind event, along with peripheral equipment (including installation procedures) necessary for their installation at Tanks 48 and 49. This equipment includes special tools, flexible duct, and consumables required for proper installation. Two sets (4 EPVEs) will be protected to survive a Design Basis Earthquake of 0.2g. Two other sets (4 EPVEs) will be stored in the C-reactor and will survive a design basis tornado of 137 mph.**

a. WSRC Implementation: WSRC has constructed a steel frame structure near the tanks for storing four blowers units, ducting, HEPA filters, and a 7 day fuel supply. WSRC analyzed the structure for a 0.2g earthquake and 137 mph winds by using equivalent static loads [14]. At the time of the staff's on-site review, the local shelter was not yet complete, and no equipment was in the shelter.

Since the local shelter is susceptible to wind-driven missiles, WSRC will store four other fan units and associated equipment (but no gasoline) in the C-reactor building. This space is protected by reinforced concrete barriers greater than two feet thick and has been analyzed for 192 mph winds and associated missiles [15].

Besides the analysis, the EPVE surveillance requirements [16] require inspecting the storage areas quarterly to ensure that the fan units are properly restrained to prevent damage during a seismic event.

b. DNFSB Staff Comments:

(1) The WSRC surveillance procedure [16] does not require ensuring that the portable Composite Lower Flammability Limit (CLFL) meters are seismically restrained, even though the meters are required by procedure for monitoring post-earthquake conditions in the tank vapor space [9].

(2) The fan units themselves appear seismically robust; however, they were evaluated using an approach not yet formally recognized by DOE. Specifically, WSRC evaluated the units by using a commercial experience database prepared by the Seismic Qualification Utility Group (SQUG). Although DOE has been developing a similar approach for evaluating *existing* components, DOE has not authorized its use for *new* components.

4. **The storage location must be selected based on Waste Management personnel's demonstrated ability to move the emergency purge ventilation equipment from its storage location to the tank top within 4 hours. Under the anticipated post-accident conditions, potential obstructions to movement must be considered.**

a. WSRC Implementation: During the operability demonstration discussed above, WSRC showed that two maintenance personnel could hand-carry an EPVE and associated equipment (less HEPA filter) from the local storage shelter to the tank top in 1 hour and 20 minutes. WSRC also showed that two people could transport the equipment by vehicle from the C Area to the ITP Area in 40 minutes [8].

b. DNFSB Staff Comments: Potential obstructions to movement under anticipated post-accident conditions were not addressed, as required by the SAR. For example:

(1) A waste transfer line break may spill concentrated radioactive slurry on the top of tank 48 (The transfer lines are not Safety Class). The resulting high radiation levels may prohibit manually installing the EPVE. DOE recognizes this and has included it as an open seismic-review item in the ITP Safety Evaluation Report [17].

(2) A high wind event requiring the use of the EPVE from the C-reactor storage location may also topple trees and electrical lines, or cause icy roads. This may obstruct on-site vehicular movement.

(3) A high wind or seismic event may leave debris on the tank top, blocking access to a tank riser for downcomer installation. Although WSRC had outside consultants walkdown the tank top [18], the staff believes that WSRC should consider preparing an action plan for quickly removing debris, including sizing rigging equipment that could be required.

5. **Twelve hours are assumed for diagnosis.**

a. WSRC Implementation: During the operability demonstration discussed above, WSRC showed that two maintenance personnel could fully assembly an EPVE, connect it to tank 49, and start the EPVE in 45 minutes [8]. Also, WSRC has indicated that properly trained personnel could breakdown and rebuild a similar type gasoline engine in about 2 hours [19].

b. DNFSB Staff Comments: Even though an engine failed during on-tank testing, the staff agrees with WSRC that it should be possible in practice to quickly rebuild or replace a faulty engine.

6. **Operations personnel have 3 days following the seismic event to establish air-based ventilation using emergency purge ventilation equipment before exceeding the composite lower flammability limit.**

a. WSRC Implementation: The WSRC Operational Safety Requirements require an EPVE to be in operation within 1 day following a loss of tank ventilation [2]. Furthermore, using the cumulative times from the operability demonstration discussed above, it appears that the EPVE could be transported, installed, and started in about 3 hours, assuming no obstructions to movement [8,20].

b. DNFSB Staff Comment: Although WSRC has demonstrated that the EPVE can be quickly installed, the staff is concerned that post-accident conditions may obstruct movement, as previously discussed. Also, the staff is separately investigating whether 3 days is really available following loss of tank ventilation before flammable gas concentrations exceeds the lower flammability limit.

7. **EPVEs will be able to be relocated to Tanks 48 and 49 and made operable within the time limits specified in the administrative controls with a 7 day mission time.**

a. WSRC Implementation: During the operability demonstration discussed above, WSRC showed that the EPVE could be made operable within the time limits specified and demonstrated operability for 41 hours [8]. Only a 36 hour demonstration was required by the test plan [7] and by the Commercial Grade Dedication critical characteristics [5,6]. This is supported by reliability data for similar engines from other manufacturers, which indicate a mean time to failure of nearly 3 weeks (with 90 percent confidence of about 3 days) [19]. Furthermore, industry (IEEE) standards indicate a mean time to repair of about 70 minutes for similar gasoline engines driving electrical generators [21].

Furthermore, the EPVE surveillance procedure requires quarterly verification that the local shelter has adequate fuel (70 gallons) to supply two operating EPVEs for 7 days operation [16].

b. DNFSB Staff Comments: WSRC has not clearly presented the technical basis for concluding that a 36 hour demonstration verifies that the EPVEs will operate for 7 days. It is also unclear how the 7 day mission time assumption actually supported the SAR analysis.

8. **Two maintenance persons trained (via simulations) in the installation of the emergency purge ventilation equipment must be available on all shifts to move and install the purge equipment.**

   a. DNFSB Staff Comments: The staff is separately reviewing the ITP training and staffing requirements.

9. **Portable radio communications with the Operations Support Center must be available.**

   a. WSRC Implementation: The EPVE post-accident operating procedure requires establishing portable radio communications with the Operations Support Center [9].

   b. DNFSB Staff Comment: None.

10. **Operating procedures should identify the storage location of the emergency purge ventilation equipment.**

    a. WSRC Implementation: The EPVE post-accident operating procedure includes maps showing the EPVE storage locations [9].

    b. DNFSB Staff Comments: None.

11. **In order to allow for recovery action if the emergency purge ventilation equipment were hooked up incorrectly, a flow indicator must be installed as part of the emergency purge ventilation equipment unit.**

    a. WSRC Implementation: No flow indicator is provided with the equipment. However, the EPVE post-accident operating procedure includes a step to verify exhaust flow after every startup [9]. In discussions with the staff, WSRC indicated that a flow indicator does not need to be installed since the presence of flow will be obvious to the operators.

b. DNFSB Staff Comment: The staff agrees that presence of flow will be obvious but considers that the reasoning for not installing a flow indicator should be documented. Also, leakage and bypass flow magnitude may not be readily apparent even if a flow indicator was installed.

12. **Every 7 days, replace the battery-operated portable Composite Lower Flammability Limit (CLFL) analyzers.**

a. WSRC Implementation: The EPVE surveillance procedure, draft revision A, includes replacement of the analyzers every 7 days [16]. This ensures that calibrated analyzers are always available.

b. DNFSB Staff Comments: None.

13. **Every 3 months, verify the start and run capability of each EPVE, and replace the existing fuel supply at the seismically qualified EPVE storage location with a sufficient fresh fuel supply to run two EPVEs for at least seven days.**

a. WSRC Implementation: During required quarterly surveillance, EPVE's operability and adequate fuel supply at the local storage location is verified [16]. Draft revision A of the surveillance procedure requires replacing the fuel supply quarterly.

b. DNFSB Staff Comments: None.

14. **Every 3 months while in storage, verify that each EPVE fan can draw an exhaust flow rate of greater than or equal to 500 scfm.**

a. WSRC Implementation: During required quarterly surveillance, the EPVE is assembled without the downcomer and are operated for long enough to confirm adequate flow [16].

b. DNFSB Staff Comments: None.

15. **Every 3 months, perform a visual inspection of the EPVE motors, couplings, hoses, HEPA filters, installation tools, and applicable installation procedures.**

a. WSRC Implementation: During required quarterly surveillance, all equipment is visually inspected [16]. Draft revision A includes verifying that the current EPVE post-accident operating procedure [9] is also present.

b. DNFSB Staff Comments: The EPVE surveillance procedure [16] does not provide for testing HEPA filter efficiency after they have been moved.

V. References

1. "Summary of Frequency of Deflagration in the In-Tank Precipitation Process Tanks Due to Loss of Nitrogen Purge System," *Safety Analysis Report - Savannah River Site - Liquid Radioactive Waste Handling Facilities*, WSRC-SA-15, Addendum 1, Appendix C, rev 4, June 1994.

2. Freed, E. J., "DNFSB Information Request," (containing draft pages from ITP Operational Safety Requirements, WSRC-RP-94-303, sections 3.2.1 and 3.2.2), WSRC inter-office memorandum, October 21, 1994.

3. "Safety Class Criteria," Article 1300-3 to DOE Order 6430.1A, *General Design Criteria,"* April 6, 1989.

4. "Commercial Grade Item Dedication and Material Upgrade," *E7 - Conduct of Engineering and Technical Support Manual,* Procedure 3.46, rev 1, October 2, 1994.

5. Commercial Grade Item Dedication and Material Upgrade M-CGD-H-00005, rev 1, October 3, 1994. (not yet finalized)

6. Commercial Grade Item Dedication and Material Upgrade M-CGD-H-00006, rev 2, October 3, 1994. (not yet finalized)

7. "ITP Tank 48 & 49 Emergency Purge Ventilation Equipment (EPVE) Test Plan," HLW-ITP-940333, rev. 1, August 11, 1994.

8. ITP Startup Test Procedure No. ITP-HFT-015, through TCR No. 7, August 12, 1994.

9. "Post Severe-Accident Operation of EPVE," *The Savannah River Site SW16.1 ITP/ESP Facility Operating Manual System Operating Procedure*, SW16.1-SOP-WTE(EPVE)-2, rev 1, November 17, 1994.

10. Ortner, T. and Wood, C., "EPVE Component Level Functional Classification," WSRC Inter-office memorandum HLW-ITP-94-0541, July 15, 1994.

11. "Procurement Specification for Gasoline Powered Engine for Exhaust Blower," Specification No. M-SPP-H-00200, rev 0, November 19, 1993.

12. "Procurement Specification for Gasoline Powered Engine Driven Exhaust Blower," Specification No. M-SPP-H-00203, rev 0, November 19, 1993.

13. "Procurement Specification for Stainless Steel Bendable Duct," Specification No. M-SPP-H-00201, rev 0, November 19, 1993.

14. "Emergency Purge Ventilation Eq. Storage Facility - Steel Structure," WSRC Calculation No. C-CLC-H-00640, rev 0, May 19, 1994.

15. Joshi, J., "Wind/Tornado Evaluation of the EPVE Remote Storage Facility," WSRC inter-office memorandum EPD-CES-94-0217, September 12, 1994.

16. "Emergency Purge Ventilation Exhauster Surveillance Requirements," *The Savannah River Site SW16.6 ITP/ESP Facility Operating Manual Surveillance Procedure*, SW16.6-SR-3.2.2, rev 0, September 16, 1994.

17. Fiori, M., "In-Tank Processing Safety Evaluation Report (SER)" September 23, 1994.

18. EQE International, "Access to In-Tank Precipitation Waste Tanks 48 and 49 to Install Emergency Purge Ventilation Equipment Following a Natural Phenomena Event," (DRAFT), September 1993.

19. Cramer, D. S., "Factors Affecting the Reliability of Fans Powered by Gasoline Engines for the In Tank Precipitation Program," WSRC Inter-office memorandum SRT-DCA-930014, November 1, 1993.

20. "Tank 48 and 49 EPVE Test," ITP/ESP Test Summary Report # 108, revision 0, September 20, 1994.

21. ""IEEE Guide to the Collection and Presentation of Electrical, Electronic, Sensing Component, and Mechanical Equipment Reliability Data for Nuclear-Power Generating Stations," IEEE Std 500-1984.