DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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

December 8, 1995

Mr. Mark Whitaker
Department of Energy
1000 Independence Avenue
Washington, DC 20585-0119

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

August 10, 1995

MEMORANDUM TO: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Roger W. Zavadoski

SUBJECT: Review of Selected Ventilation Systems at Oak Ridge's K-25, Oak Ridge National Laboratory and Y-12 facilities

1. **Purpose:** This trip report documents the review conducted by the Defense Nuclear Facilities Safety Board's (Board) technical staff regarding ventilation systems at selected facilities on the Oak Ridge site. This review was performed on July 11-13, 1995, by Board staff member Roger W. Zavadoski.

2. **Summary:**

   a. The relationship between an upgraded ventilation project and the design criteria contained in the general and specific sections of Division 1300 of Department of Energy (DOE) Order 6430.1A has not been clearly established as required by DOE Order 5480.23.

   b. Filter testing procedures in use at the Oak Ridge site are generic, i.e., specific data for damper location, low operability, and sampling port locations for each filter system tested are not explicitly identified. Additionally, tests for damper and system bypass, required by ASME N510-1989, *Testing of Nuclear Air Treatment Systems*, are not routinely performed. Bypass leakage can lead to a nonconservative estimate of filter efficiency.

   c. Kathene (lithium chloride) leaks from the Kathabar temperature and humidity control system on Building 9204-2E have penetrated through the floor in several places into the process area. At this time, the degree of degradation is unknown, but is being assessed. Other facilities which use the Kathabar system are also under investigation.

3. **Background:**

   a. The Deposit Removal Project (DRP) is located inside the fifty-year old K-25 complex at the Oak Ridge site. The DRP is designed to remove process uranium deposits from sections of pipe. Removal and recovery of the uranium will be accomplished in a glove box located within the deposit removal room.

Nuclear criticality constitutes the design basis accident (DBA) for the project. The evaluation of the consequences of a criticality accident does not consider the ventilation/filtration system as being present and, therefore, it is not classified as a safety system. The ventilation/filtration system is principally for personal protection.

b. Building 3019 at the Oak Ridge National Laboratory (ORNL) was, in essence, the pilot plant facility ranging from the plutonium separations for the Manhattan Project to the PUREX, REDOX, and THOREX processes. Currently, the facility is one of the principle repositories for Uranium 233.

Over its fifty-year history, Building 3019 has received numerous additions of buildings and ventilation to the original hot cells. Today, the ventilation consists of the Cell Off Gas, Laboratory Off Gas, Glove Box Off Gas, Vessel Off Gas and the Sample Gallery Ventilation.

c. Building 9212 at Y-12 has been used for enriched uranium processing, scrap recovery, production of special compounds, and uranium casting. The facility has a once through ventilation system, consistent with the design practices for the time it was built, some forty plus years ago. Ventilation upgrades have been made to various wings of the building. Many of these upgrades fall under the auspices of the AEC Manual, Chapter 6301.

Building 9204-2E was designed and constructed in the 1960s to support nuclear weapons assembly activities. The design basis accidents do not take credit for the ventilation systems and, therefore, they are not classified as a safety class system.

3. Discussion:

a. The Deposit Removal Room of the DRP is physically located within the K-25 facility. Ventilation exhausted from the room and its glove box is discharged directly into the K-25 building. The ventilation system for the room is not classified as a safety system. The potential consequences to the general public from a DBA criticality is stated to be less than 9 millirem at greater than 500 meters. By Division 1300-3.2 of 6430.1A, there is clearly no requirement to have a safety-related ventilation system for this room.

b. Operations at the Oak Ridge Filter Test Station were discussed and observed. Preinstallation testing of HEPA filters was in progress and being conducted in accordance with established procedures. The operation of the facility appeared adequate and sufficient.

c. Building 3019 at ORNL has been upgraded and expanded numerous times over its fifty year history. As such, the upgrades and expansions met the design criteria applicable at the time. Today, an effort is underway to establish the actual design basis in accordance with DOE Order 5480.23. Contrary to 5480.23 8.b.(3).(b), the current configuration is not being compared to the general design criteria found in the general and specific sections of Division 1300, DOE Order 6430.1A.

d. During a tour of the roof of Building 3019, several instances of external radioactive contamination of ducts were noted. Contractor filter testing personnel stated that the ducts were not tested for integrity. They also stated that dampers and filter housings were not routinely tested for bypass leakage and that their filter test procedure was generic; i.e., explicit directions for fan configuration and damper alignment were not given. The Board representative stated that filter procedures found at Savannah River and Hanford followed the same standard being applied at ORNL, but were explicit for each filter system tested. Discussions between the contractor and the Board representative at the Glove Box Off Gas system centered on the possibility of damper leakage leading to the better than expected (i.e. nonconservative) filter efficiencies. The contractor planned to review these aspects of the standard, ASME N510-1989, *Testing of Nuclear Air Cleaning Systems*.

e. Tours were conducted of Buildings 9212 and 9204-2E in Area Y-12. In Building 9204-2E evidence of Kathene (a lithium chloride solution or brine solution) leaks from the Kathabar temperature and humidity control system were obvious both on the floor by the units and in the process room below. The contractor stated that an evaluation was ongoing. The contractor and DOE representatives stated that they would be contacting the Rocky Flats facility for a comparison of similar problems and solutions.