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## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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99-0002396



October 5, 1999

Dr. Martha A. Krebs  
Director  
Office of Science  
Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-0113

Dear Dr. Krebs:

The staff of the Defense Nuclear Facilities Safety Board (Board) visited the Oak Ridge National Laboratory (ORNL) on July 27, 1999, to review certain aspects of the Uranium-233 (U-233) Inspection and Repackaging Project. One of the technical areas reviewed was fire protection. In the area of program requirements, the staff observed that a recent change to the ORNL Work Smart Standards redressed a deficiency created several years ago when Department of Energy (DOE) Order 5480.7A, *Fire Protection*, was deleted from the contract. Installed fire protection features were found to be adequate, subject to inspection of certain sprinkler heads in the U-233 process area of Building 3019. The staff observed that the condition of the building demonstrated adequate attention to control of combustibles and equipment.

The staff found that a prompt review of ORNL fire department staffing is needed to ensure the availability of sufficient shift complements. Based on the latest DOE Baseline Needs Assessment, insufficient fire department personnel are available on the backshift.

Staff observations related to this matter are provided in the enclosed report. If you have comments or questions on this matter, please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "John T. Conway".

John T. Conway  
Chairman

c: The Honorable Carolyn L. Huntoon  
Ms. Gertrude Leah Dever  
Mr. Mark B. Whitaker, Jr.

Enclosure

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

## Staff Issue Report

August 11, 1999

**MEMORANDUM FOR:** G. W. Cunningham, Technical Director  
J. K. Fortenberry, Deputy Technical Director

**COPIES:** Board Members

**FROM:** W. M. Shields

**SUBJECT:** Fire Protection at Oak Ridge National Laboratory,  
U-233 Inspection and Repackaging Project

This memorandum documents a review by the staff of the Defense Nuclear Facilities Safety Board (Board) of fire protection for the Uranium-233 (U-233) Inspection and Repackaging Project on July 27, 1999, at the Oak Ridge National Laboratory (ORNL).

**Fire Protection Requirements.** Prior to 1996, ORNL's fire protection program was based on Department of Energy (DOE) Orders. In 1996, through the application of the Work Smart Standards process, DOE Order 5480.7A, *Fire Protection*, was deleted from the ORNL contract. The Order was replaced by National Fire Protection Association (NFPA) Codes and Tennessee State Codes. As is well understood, neither of these sets of consensus standards describes a comprehensive fire protection program for a DOE nuclear facility. Nonetheless, this situation prevailed until a few months ago, resulting in 3 years of operations with inadequate contract requirements for fire protection.

On June 30, 1999, the ORNL Work Smart Standards set was amended to include the fire protection requirements of DOE Orders 420.1, *Facility Safety*, and 440.1, *Worker Protection*, with one minor exception. Although the *Fire Protection Implementation Guide* for these Orders was not adopted, ORNL personnel informed the staff that the guide, as well as other DOE fire protection guidance applicable to nuclear facilities, would be followed in program implementation. These recent changes, if carried out in practice, should result in a fire protection program that meets DOE objectives as expressed in the referenced Orders and guides.

**Assessment of Building 3019.** A complete Fire Hazards Analysis (FHA) for Building 3019, performed by a qualified outside contractor, is expected to be completed by September 30, 1999. The FHA should contain a comprehensive assessment of the building's structural features, ignition hazards, combustible loads, detection and suppression systems, and deficiencies as measured against the NFPA Codes and other applicable standards.

Documentation available for review included an Engineering Assessment (a 14-page review of the building that is useful, but not as comprehensive as an FHA); the Fire Department Prefire Plan; the Basis for Interim Operations (BIO); and the Unreviewed Safety Question

Determination (USQD) Change Package for the U-233 Phase I Inspection Project. The Engineering Assessment, dated December 1998, concludes that fire protection in the building is adequate for worker safety and sufficient to prevent unacceptable property damage or program delays. Section 2.7 of the BIO reviews fire protection systems for various operational areas and buildings, and briefly describes fire scenarios. In the USQD, there is a brief qualitative evaluation of a full-facility fire. The conclusion reached is that the consequences of a full-facility fire are in the same range as those predicted for an earthquake (i.e., less than 5 rem for unlikely and extremely unlikely events). A sustained facility fire capable of worst case consequences (i.e., greater than 5 rem) is considered to be extremely unlikely. This conclusion is based on the fact that Building 3019 has automatic suppression systems (wet and dry pipe sprinklers) in most areas, along with a variety of detection and alarm systems. These systems give considerable assurance that incipient fires will be detected and controlled while the building is evacuated and until the fire department is able to respond. Building 3019 also contains 2.5-hour-rated fire barriers with sealed penetrations and fire doors rated at 1.5 hours. These barriers provide additional assurance that a fire cannot spread widely through the facility. However, until DOE prepares a proper FHA, these conclusions cannot be confirmed.

**Manual Firefighting.** The fire department has good access to Building 3019 from all sides, and three hydrants are located close to the building. The Prefire Plan is adequate and contains a special set of instructions for response in Building 3019, Cell 3 and Penthouse, where fissile materials are present, and criticality may be a concern. The BIO for U-233 operations does not take credit for a specific response time. However, in view of the small size of the ORNL site, the fire department should be able to reach the building within 5 to 6 minutes once an alarm has been received.

A Baseline Needs Assessment conducted in 1996 concluded that ORNL needed a minimum on-shift complement of 10 personnel to mount a rapid in-building fire attack. This staffing level can be met only during the day shift, when fire department personnel working as inspectors augment the on-duty force. On the backshift, only 5 firefighters are available until more can be supplied by means of callbacks and mutual aid from the Y-12 Plant and the City of Oak Ridge. This same Baseline Needs Assessment concluded that a 10-man shift was also needed at Y-12.

A more recent Baseline Needs Assessment for Y-12, conducted by DOE's Office of Environment, Safety and Health (DOE-EH), concluded that an 8-man shift is "minimally acceptable" for that facility. ORNL representatives stated during the staff's review that DOE-EH has been asked to conduct a new assessment at the laboratory. Even if the DOE-EH review leads to the same conclusion as that of Y-12 (i.e., that 8 rather than 10 is an acceptable shift complement), ORNL would still fall short of the number needed on the backshift.

While this issue need not hold up U-233 inspection activities, ORNL should proceed expeditiously to resolve it. In light of the adoption of DOE Order 420.1 as a contractual requirement, ORNL is required to have a current Baseline Needs Assessment and to staff the fire department accordingly on all shifts.

**Building Walkdown.** A building walkdown indicated that housekeeping is good, fire barriers and doors are in well-maintained condition, and installed suppression and detection systems are fully operational. A few painted sprinkler heads were observed, but it did not appear that the amount and location of the paint would interfere with sprinkler functioning. In response to a question about inspection of the ceiling-level sprinklers in the Building 3019 Penthouse, ORNL stated that the sprinklers had not been inspected since being installed in 1962, other than by viewing from the floor level. These sprinkler heads face upwards and are probably 30 feet or more from the floor, above the level of the lights. It is possible to inspect these heads visually using the traveling crane, which is also used to replace incandescent bulbs in the ceiling fixtures. This inspection should be conducted prior to the start of U-233 operations in the Building 3019 Penthouse.