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# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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October 16, 2003

The Honorable Linton Brooks  
Administrator  
National Nuclear Security Administration  
U.S. Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-0701

Dear Ambassador Brooks:

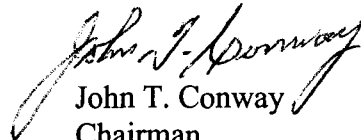
The staff of the Defense Nuclear Facilities Safety Board (Board) recently reviewed the Operational Safety Requirements for Enriched Uranium Operations (EUO) at the Y-12 National Security Complex. The Board is pleased to note that, for the most part, those systems, structures, and components in Building 9212 reviewed by the staff should be able to prevent or mitigate the hazard for which they are credited. However, the Board's staff has identified some issues that could potentially compromise the ability of EUO to operate safely.

During the staff's review, discussions of fire suppression within EUO revealed that the six credited sprinkler systems within Building 9212 had been designed to National Fire Protection Association (NFPA) 13, *Standard for the Installation of Sprinkler Systems*, a code that dates back to 1969. Since that time, the code has been revised to incorporate new knowledge of the piping sizes required to maintain adequate fluid flow to all parts of the sprinkler system. This failure to capture changes in the NFPA code means that parts of EUO may have inadequate fire suppression coverage.

Furthermore, one of the six credited sprinkler systems was recently upgraded in safety functional classification from safety-significant to safety-class without an evaluation to ensure a level of effectiveness and reliability commensurate with its new safety designation. BWXT Y-12 personnel acknowledged that no analysis had been performed to ensure that these sprinkler systems can operate effectively despite their substantially outdated code of record. The Board believes that the adequacy of the subject sprinkler systems to meet current standards should be evaluated.

Additional issues are identified in the enclosed report, which is provided for your use as appropriate. The Board will continue to follow closely the progress made by the Y-12 National Security Complex in addressing these issues.

Sincerely,



John T. Conway  
Chairman

c: The Honorable Everet H. Beckner  
Mr. William J. Brumley  
Mr. David E. Beck  
Mr. Mark B. Whitaker, Jr.

Enclosure

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

## Staff Issue Report

September 3, 2003

**MEMORANDUM FOR:** J. K. Fortenberry, Technical Director

**COPIES:** Board Members

**FROM:** R. Rauch

**SUBJECT:** Y-12 Building 9212 Operational Safety Requirements

This report documents a review by the staff of the Defense Nuclear Facilities Safety Board (Board) of the Operational Safety Requirements (OSRs) for Building 9212 Enriched Uranium Operations (EUO) at the Y-12 National Security Complex (Y-12). Staff members R. Rauch, W. Andrews, C. March, and M. Piccarreta and outside expert R. West conducted this review.

**Background.** Efforts to restart EUO began in 1996 using a phased sequence. Casting, rolling, forming, and machining operations were restarted in 1998, and reduction operations followed in April 2001. Preparations for wet chemistry restart were completed in March 2003. The last major restart effort for EUO is the oxide conversion process, scheduled for completion in calendar year 2004. The Building 9212 Basis for Interim Operation (BIO) and OSRs were developed and implemented as part of the restart effort following the shutdown of EUO in 1994. The BIO has not been approved as a Title 10 Code of Federal Regulations (CFR) Part 830 compliant documented safety analysis (DSA). An exception has been granted to defer submission of this DSA until September 2004.

**Findings.** The purpose of the staff's review was to assess the effectiveness and reliability of selected Building 9212 OSRs. Sixteen structures, systems, and components were analyzed in the areas of procurement, design, maintenance, operations, and testing requirements. The OSRs that have been credited for the oxide conversion process were specifically excluded from the scope of the review because the restart efforts for this system have not been completed. The controls chosen for evaluation included ventilation, fire suppression, water detection, phase separation, and alarm systems. These controls are credited to prevent or mitigate a variety of accident types, such as criticality, loss of confinement, fire, and explosion scenarios.

The Board's staff concluded that most controls could perform effectively and reliably. However, the staff identified issues in the following areas.

*Adequacy of Safety System Design*—Building 9212 contains five safety-significant sprinkler systems and one sprinkler system that was recently upgraded to a safety-class functional classification. The code of record for these systems, National Fire Protection Association (NFPA) 13, *Standard for the Installation of Sprinkler Systems*, dates back to 1969. Given the substantial changes in NFPA 13 requirements since that time—particularly with

respect to pipe sizing requirements, which affect fluid flow rates—the Board’s staff believes that portions of the credited sprinkler system piping scheme for Building 9212 may have insufficient fluid flow. Inadequate fire protection for parts of EUO could result in high-consequence events with significant radiological and toxicological off-site consequences exceeding evaluation guidelines.

BWXT Y-12 personnel acknowledged that no evaluation of the design adequacy of these systems had been conducted to ensure that the credited sprinkler systems in Building 9212 can perform to the expectations of effectiveness set forth in the current form of consensus industry standards such as NFPA 13. Without such an evaluation—particularly in the case of the upgraded sprinkler system, for which there are particularly high expectations of both effectiveness and reliability—site workers and the public stand at an increased risk of an event with potentially significant consequences. Other sites in the defense nuclear complex have recognized the benefit of developing a process for review of design adequacy for situations such as this in which a given safety system has undergone an upgrade in safety classification and/or has a substantially outdated code of record. The Board’s staff believes that the development of such a review process at Y-12 could improve safe operation at the site by ensuring that credited safety controls can perform at a level of effectiveness commensurate with their functional classification.

*Organic Phase Separators*—The Building 9212 BIO credits seven organic phase separators as a design feature for safety in preventing an explosive event due to a reaction between organic and acid process streams. Four separators are designed to automatically decant organic process streams for expected and off-normal operational flow rates. Three separators (the pour-up separator, high-capacity evaporator separator, and wiped-film evaporator separator), however, require operator action (e.g., administrative controls) to ensure safe operation. Despite the Department of Energy’s (DOE) preference for engineered controls, it appears that these administrative controls will remain in place even after planned modifications to two of these three separators have been completed. Furthermore, these administrative controls should be implemented consistent with DOE’s Implementation Plan for Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*.

BWXT Y-12 personnel stated to the Board’s staff that there are no physical limitations preventing these three separators from being modified to decant automatically; however, significant redesign and/or equipment relocation would be required. Based on applicable accident analyses and controls, BWXT Y-12 personnel believe that the current phase separator configurations address the postulated events at an acceptable level of risk.

Given DOE’s stated preference for engineered over administrative controls, a formal review of this issue with basis for conclusion may be warranted. If the decision is made to retain administrative controls for these separators, it would be advisable to conduct a formal analysis that documents this decision (including the required modifications, the reasons for not implementing them, and the associated risk).

**Conclusion.** The Board's staff found that most preventive and mitigative controls adequately protect against the hazard for which they are credited. The staff identified some issues, however, that demonstrate potential weaknesses in the Building 9212 OSRs. In particular, it appears that no formal process exists to ensure that a given control operates at the level of reliability and effectiveness associated with its classification.