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# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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June 5, 2000

Brigadier General Thomas F. Gioconda  
Acting Deputy Administrator for  
Defense Programs  
Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-0104

Dear General Gioconda:

Members of the staff of the Defense Nuclear Facilities Safety Board (Board) recently reviewed the Oak Ridge Operations Office's (ORO) Chemical Safety Program and various chemical safety issues at the Y-12 Plant. The enclosed report presents the findings of the Board's staff.

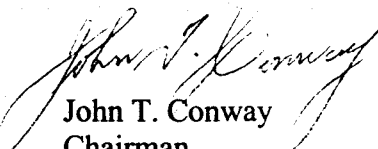
The Department of Energy (DOE) has made progress in implementing the chemical management program, however, efforts would be more effective if the contractors were provided additional guidance on the program, particularly the vulnerability assessment, and the prioritization of vulnerabilities, as described in the enclosed report.

The recent chemical safety incidents at the Y-12 Plant, including the accident in Building 9201-5, indicate inadequacies in the methodology for hazard identification and analysis. It appears that a substantial change in the way the contractor conducts such activities may be necessary. Strengthening the analysis of inherent hazards may be required. In this regard, the industrial guidance was developed for high hazard facilities subject to episodic chemical events by the Center for Chemical Process Safety. A letter to John Conway from T. J. Glauthier, dated February 2, 2000, cited the Center for Chemical Process Safety products available to the DOE Complex.

The Board also believes that Y-12 line management should examine the staffing of the various safety analysis groups at the site to ensure the appropriate mix of expertise and level of competence to reduce the likelihood of chemical incidents.

The Board would like to be informed about the progress of the ORO Chemical Safety Management Working Group and the hazard analysis upgrades at Y-12.

Sincerely,



John T. Conway  
Chairman

c: Ms. Gertrude Leah Dever  
Mr. Mark B. Whitaker, Jr.

Enclosure

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

## Staff Issue Report

April 27, 2000

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

**COPIES:** Board Members

**FROM:** W. Von Holle

**SUBJECT:** Status of Oak Ridge Operations Office's Chemical Safety Action Plan and Chemical Safety Issues, Y-12 Plant

This memorandum documents information obtained in a review of chemical safety at the Oak Ridge Reservation. This review was conducted during February 28–March 1, 2000, by members of the staff of the Defense Nuclear Facilities Safety Board (Board) W. Von Holle and I. Pyatt and Site Representatives P. Gubanc and D. Moyle.

**Background.** A letter from the Board dated July 9, 1999, called on the Department of Energy (DOE) to correct deficiencies in the management of chemicals at the Oak Ridge Operations Office (ORO) and the various contractors' operating facilities. On October 29, 1999, the Secretary of Energy responded to the Board's letter by committing to establish a chemical safety management corrective action plan for the Oak Ridge Reservation. The ORO Manager sent the *Oak Ridge Operations Chemical Safety Action Plan* to ORO Assistant Managers through a memorandum dated September 23, 1999. In November 1999, at the suggestion of one of the Board's Site Representatives, the ORO Manager convened a Chemical Safety Working Group to provide guidance and technical support for implementation of this Plan; the group prepared and issued a revised schedule for the plan on January 25, 2000. The purpose of this site visit was to determine the status of the plan and to review corrective action plans (CAPs) for several recent chemical incidents and occurrences at the Y-12 Plant.

**DOE-ORO Chemical Safety Working Group for the Chemical Safety Action Plan.** The DOE-ORO Chemical Safety Working Group for the Chemical Safety Action Plan has made progress since it was formed in November 1999. The team leader reports directly to the ORO Manager on a monthly basis, and the group has five other members representing each of the five Assistant Manager Offices. The group has issued two guidance documents to the contractors:

- The *Chemical Safety Program Description* was issued to depict an outline of the form of the program descriptions requested from each of the contractors. It contains little detail, but may prove useful once a more complete handbook has been issued by DOE.
- The *Chemical Vulnerability Determination Guidance Document* was written to assist the contractors in determining their vulnerabilities. It fails to supply any recommendations on how to identify vulnerabilities or how to prioritize those identified. It contains only "considerations for identification of chemical

vulnerabilities” and “factors” involved in prioritizing vulnerabilities. This information may be a step in the right direction, but more standardization and specificity are required to achieve a uniform list that will be useful for management in allocating resources for the timely mitigation of risks across the site. Indeed, as of the staff’s visit, ORO had not even availed itself of the definition of *chemical hazard* used by the emergency management program to conduct its hazard surveys, although the ORO Chemical Safety Working Group expected to use these hazard surveys as a major information source.

**Chemical Safety Issues of Recent Importance at Y-12 Plant.** The second part of the staff’s review addressed several issues at the Y-12 Plant concerning the safety of chemical processes and storage. The staff requested a discussion of the mitigation of Y-12’s highest-ranking site-specific chemical vulnerabilities. The response was a presentation of activities related to Building 9206, followed by requested briefings on recent incidents, Unreviewed Safety Questions, and CAPs. However, current vulnerabilities at the site include more chemical safety issues. It is not clear whether DOE-ORO or Y-12 has made an attempt to identify the highest-priority vulnerabilities and risks at the site. The problem appears to be that neither Y-12 nor ORO has any methodology for prioritizing vulnerabilities or risks, as discussed above with regard to the ORO Chemical Safety Working Group.

The Building 9206 manager pointed out that several positive steps have been taken to reduce the hazards at the building and enable deactivation to proceed, but many hazards remain. Some uranium residues in deteriorating containers have been repacked, but many have not. In addition, a contract has been let to survey the underground ducts for uranium holdup. Although the dibutylcarbitol/peroxide Unreviewed Safety Question Determination was negative, there is still enough uncertainty to warrant initiation of a sampling plan. Hazardous materials and combustibles have been removed, but excess equipment and additional combustibles remain. A plan has been formulated to remove and treat the pyrophoric material, and a hazard evaluation study has been completed; however, no schedule for the removal was provided to the staff.

The staff reviewed the CAPs resulting from the sodium potassium (NaK) alloy explosion investigation. These CAPs reasonably address the findings of the investigation, but the staff will need to confirm implementation of the details. For example, one corrective action is to provide guidance and training to the Operational Safety Boards (OSBs) for improving hazard identification and analysis for the facilities. However, given the history of events and the complexity of chemical storage and operations at the aging Y-12 Plant, the staff is concerned that the staffing of the OSBs may not be optimum for this task. The admitted deficiencies in Integrated Safety Management described in the NaK accident report derive from an inability to properly identify hazards. According to the Center for Chemical Process Safety in its *Plant Guidelines for Technical Management Chemical Process Safety* (Revised edition, American Institute of Chemical Engineers, New York, New York, 1995), identification of the hazards inherent in chemical processes should be done by process teams that include experts from various disciplines appropriate to the system. If experienced personnel are not available, they could be brought in from outside Y-12 to survey high hazard facilities.

The CAPs for the January 11, 2000, waste explosion in the Analytical Chemistry Laboratory in Building 9995 were also reviewed and appear to be adequate. The major

breakdown involved in this incident was in work organization and planning. Incompatible waste streams were combined in a single waste transfer container because they were thought to contain polychlorinated biphenyls, which had to be disposed of separately in a special area.

The staff reviewed an example of a process hazard evaluation for the Phase B Enriched Uranium Operation startup activity. The hazard evaluation serves as input for the hazard and accident analyses, the Basis for Interim Operation/Operational Safety Requirements, and Job Hazard Analyses. This process hazard evaluation for Building 9815 chemical makeup appeared to be thorough, based on a brief review of the draft document.

The latest incident in the Lithium Hydride Production Facility was a fire involving special lithium hydride material. Instead of an inert (argon) glove box, this material was being handled in a reduced-moisture atmosphere when it caught fire. This was the latest in a series of incidents occurring during the last 2 years. The root cause was a management deficiency in work organization/planning. A contributing cause was improper inventory and control of hazards. The CAPs for this incident included disposal of the remaining material from the incident and revision of the receipt and transfer procedures. The staff suggested that the Lithium Hydride Production Facility management attempt to locate and determine the storage conditions of all lithium hydride materials on site to prevent future surprises. Previous staff attempts to speed up the conduct of hazard analyses for the facility appear to have been effective. The latest schedule for formal, structured hazard analyses for operations involving special material indicates completion for all high-hazard operations by August 2000. Previous schedules indicated completion several years later.