



U.S. Department of Energy
Office of Inspector General
Office of Audit Services

Audit Report

Beryllium Controls at the Oak Ridge National Laboratory

DOE/IG-0737

September 2006



Department of Energy

Washington, DC 20585

September 6, 2006

MEMORANDUM FOR THE SECRETARY

FROM:

Gregory H. Friedman
Gregory H. Friedman
Inspector General

SUBJECT:

INFORMATION: Audit Report on "Beryllium Controls at the Oak Ridge National Laboratory"

BACKGROUND

The Department of Energy (Department) has a long history of beryllium use due to the element's broad application in nuclear weapon and reactor operations and processes. Exposure to beryllium can cause beryllium sensitization or even Chronic Beryllium Disease, which is an often debilitating, and sometimes fatal, lung condition. Thus, there is a recognized connection between beryllium exposure and the general health and welfare of Department of Energy employees. The importance of worker health and safety has been of primary concern to the Department for a number of years, with significant emphasis during your term as Secretary of Energy.

Since the 1950's, the Department's Oak Ridge National Laboratory (ORNL) has managed building 9201-2, located at the Y-12 National Security Complex (Y-12) in Oak Ridge, Tennessee. The work conducted in the building involved the use of machine shop equipment such as lathes, milling machines, forklifts, hand tools and metal cabinets. In December 2001, an inventory in building 9201-2 detected the presence of beryllium. Nearly three years later in September 2004, ORNL began relocating operations from building 9201-2 to the Laboratory itself. Some of the equipment associated with the work conducted in 9201-2 was moved to ORNL and other locations as part of this process.

The Office of Inspector General received an allegation regarding the mishandling of beryllium contaminated equipment located in building 9201-2. In response, we initiated an audit to determine the validity of the allegation, as well as to analyze internal controls related to beryllium.

RESULTS OF AUDIT

Our review disclosed that the Laboratory did not properly manage activities relating to beryllium contamination. More specifically, we observed:

- Beryllium contaminated equipment, some of which was contaminated above the release limit established in Federal regulations, was transferred from building 9201-2 to non-beryllium areas such as buildings 7625 and 7039 at the Laboratory; the Department's Spallation Neutron Source Project; and, Theragenics Corporation, which was a private entity located at the Department's East Tennessee Technology Park site;



- Employees associated with moving and working with the equipment were not always adequately protected from possible beryllium exposure and were not fully identified, formally notified and offered the option of a medical evaluation;
- Equipment released from 9201-2 was not labeled in accordance with the Laboratory's beryllium contamination management procedure; and,
- Building 9201-2 was not posted as a potential beryllium contamination area and access controls were not established; although not required, the Department considers this a good management practice.

We determined that the Laboratory had not fully implemented its own beryllium internal control procedures, nor had it adopted other sound business practices relating to beryllium exposure. As a result, the potential for employee exposure to beryllium was not minimized.

While worker safety was the focus of our audit, we also questioned the allowability of certain costs associated with moving the contaminated equipment. Accordingly, we made several recommendations to address these issues. During the course of our audit, the Department recognized the significance of the issues identified by the audit and initiated several corrective actions.

MANAGEMENT COMMENTS

Management concurred with our recommendations and began implementing corrective actions. Management's comments were responsive to the recommendations.

Attachment

cc: Deputy Secretary
Under Secretary for Science
Administrator, National Nuclear Security Administration
Chief of Staff
Manager, Oak Ridge Site Office
Director, Policy and Internal Controls Management, NA-66

REPORT ON BERYLLIUM CONTROLS AT THE OAK RIDGE NATIONAL LABORATORY

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BERYLLIUM CONTROLS AT THE OAK RIDGE NATIONAL LABORATORY

Beryllium Contamination Management

The Oak Ridge National Laboratory (Laboratory) did not properly manage activities related to beryllium contaminated equipment at building 9201-2. In particular, beryllium contaminated equipment was transferred to non-beryllium areas; employees working with the contaminated equipment were not fully identified and notified; and transferred equipment was not labeled appropriately. In addition, we observed that building 9201-2 was not posted as a potential beryllium contamination area and access controls were not established.

Equipment Transfers

In December 2001, an inventory in building 9201-2 detected the presence of beryllium. Subsequently, beryllium contaminated equipment, some which was contaminated above the Department of Energy (Department's) release limit, was transferred without being sampled for beryllium contamination. Specifically, equipment was:

- Transferred from building 9201-2 to buildings 7625 and 7039 at the Laboratory;
- Moved to the Department's Spallation Neutron Source Project; and,
- Loaned to Theragenics Corporation, which was a private entity located at the Department's East Tennessee Technology Park.

Employee Exposure

Employees involved in operating and moving the contaminated equipment were not always adequately protected from possible beryllium exposure and were not fully identified, formally notified or provided the option of a medical evaluation. Specifically, individuals were allowed to enter and work in building 9201-2 without protective equipment despite beryllium surface contamination being reported as high as 30 micrograms per 100 cm². This contamination level is well above the 3 micrograms at which personal protective equipment is required by the Code of Federal Regulations.

Additionally, employees associated with operating and moving the contaminated equipment were not fully identified, formally notified, and offered the option of a medical evaluation regarding potential beryllium exposure. In particular, we were told and management confirmed that not all of the employees potentially exposed to beryllium had been identified and offered a medical evaluation. This is significant since there is no correlation between the amount of beryllium an individual is exposed to and the likelihood of becoming beryllium sensitized or contracting Chronic Beryllium Disease.

During the course of the audit, the Department and its operating contractor recognized the urgency of addressing this situation and began developing a list of the employees who were potentially exposed to beryllium. Once this list is completed, the Department planned to perform validation activities; formally notify affected individuals; and, offer them the opportunity for a medical evaluation.

Equipment Labeling

Equipment released from building 9201-2 was not labeled in accordance with Laboratory procedures. The Laboratory developed a Chronic Beryllium Disease Prevention Program to protect employees from health effects related to beryllium exposure which included labeling contaminated equipment after cleaning and prior to movement to a non-beryllium area. During the audit, the Department reported that all but one piece of equipment transferred from building 9201-2 was labeled properly. However, during a tour of building 7625 on May 4, 2006, we observed and Laboratory personnel confirmed that labels were not affixed to any of the equipment transferred from building 9201-2 to building 7625.

Beryllium Postings

The Laboratory also had not posted building 9201-2 as a potential beryllium contamination area and access controls were not established to prevent possible beryllium exposures. Although not required by regulations, we noted that at least one other Oak Ridge Reservation site had adopted a posting requirement as a good business practice. Specifically, the Y-12 National Security Complex requires that areas be posted if surface contamination levels exceed

0.2 micrograms per 100 cm², a contamination level less than existed in building 9201-2. Further, employees, including those known to be diagnosed with sensitivity to beryllium or Chronic Beryllium Disease, must be notified that the area is posted because of beryllium contamination.

On April 24, 2006, we toured building 9201-2 to determine the locations of beryllium contaminated equipment and to assess whether or not warning signs were present. We observed that the only warning signs present were those that had been placed directly on the equipment. There were no indications of the presence of beryllium at any building or area entrances, although the Laboratory reported one piece of equipment with contamination levels at 150 times greater than the Department's release limit. During the audit, the Department agreed that such warnings and controls constituted good management practices and instituted additional controls.

**Beryllium
Contamination
Controls**

We determined that the Laboratory did not fully implement the internal control procedures called for in its Chronic Beryllium Disease Prevention Program, and had not adopted other sound business practices to prevent beryllium exposure.

Implementation of Controls

Although controls were in place to ensure the appropriate handling of beryllium, these policies were not fully implemented. For example, according to Laboratory policy, the transfer of equipment is not allowed if the contamination levels exceed the Department release limit as defined in the Code of Federal Regulations. However, as noted previously, equipment was transferred to non-beryllium areas in September 2004 that was above the limit.

Additionally, the Laboratory did not ensure that the use of personal protective equipment was consistently applied throughout the equipment cleaning process. For example, not all of the individuals present during cleaning activities were required to wear protective equipment. Further, although employees who cleaned the equipment were

initially required to wear a respirator, they were given the opportunity to work without the respirator after the first few cleaning sessions based on two personal air monitoring samples showing no exposure.

Similarly, the Laboratory did not follow its existing procedures for:

- Identifying, notifying and offering medical evaluation to employees who were potentially exposed to beryllium; or,
- Labeling contaminated equipment.

During the audit, the Department indicated that an independent validation of the actions taken in building 9201-2 and of the Laboratory's Chronic Beryllium Disease Prevention Program was initiated.

Enhancements of Controls

While the Laboratory had established internal controls for managing beryllium contamination, we noted areas where controls could be strengthened to further ensure the safety of Department employees. For example, the Laboratory had not adopted a posting requirement for beryllium contaminated areas similar to the requirement established by the Y-12 Nuclear Security Complex. Although not required by regulation, implementing procedures for controlling access to areas where beryllium is present would greatly reduce the risk of exposure to employees.

Beryllium Contamination Effects

As a result of the Laboratory not properly managing activities relating to beryllium contamination, employees' exposure to beryllium was not minimized. This is significant since research has shown that once an individual is exposed to beryllium, they carry a lifelong risk of developing beryllium sensitization or Chronic Beryllium Disease, even if the exposure amount was small or if the individual is no longer exposed.

In addition, we questioned the allowability of the costs associated with moving the contaminated equipment unnecessarily. Specifically, the Department incurred over \$27,000 due to moving beryllium contaminated equipment to a non-beryllium area and subsequently moving that

equipment back to its original location. Had the Laboratory properly managed activities related to beryllium contamination, the initial movement of the equipment from building 9201-2 would not have occurred; thus, the equipment would not have been moved twice.

RECOMMENDATIONS

In order to minimize Department employees' exposure to potential beryllium contamination, we recommend that the Oak Ridge Office Contracting Officer direct the Laboratory to:

1. Complete the beryllium procedure review and implement proper procedures for identifying, cleaning, and labeling equipment that is potentially contaminated with beryllium;
2. Adopt enhanced procedures for the future control of beryllium exposure including adoption of procedures to ensure that warnings are posted and access controls are established for buildings which contain beryllium contamination;
3. Complete actions to fully identify, formally notify, and offer the option of a medical evaluation to employees who were potentially exposed to beryllium; and,
4. Identify equipment transferred from building 9201-2 and ensure that the equipment is properly identified and labeled.

We also recommend that the Oak Ridge Office Contracting Officer determine the allowability of the costs associated with moving beryllium contaminated equipment from 9201-2 and back to 9201-2.

MANAGEMENT REACTION

Management concurred with our recommendations and began implementing corrective actions.

AUDITOR COMMENTS

Management's comments were responsive to the recommendations.

OTHER MATTERS

The Code of Federal Regulations, Title 10, Part 850, mandates that personal protective equipment be worn when beryllium surface contamination levels exceed 3 micrograms per 100 cm². However, it does not require that areas where these items are located be posted to warn individuals of the potential hazards or inform them that protective equipment is required. In order to ensure full implementation of this requirement, we suggest that the Department of Energy consider establishing a requirement to post areas where surface contamination levels exceed 3 micrograms per 100 cm². This practice would warn employees that the area is contaminated with beryllium as well as that personal protective equipment is required for access.

Appendix 2

OBJECTIVE The objective of this audit was to determine the validity of the allegation regarding the mishandling of beryllium contaminated equipment located in building 9201-2, as well as to analyze internal controls related to beryllium.

SCOPE The audit was performed between April 2006 and August 2006.

METHODOLOGY To accomplish our audit objective, we:

- Reviewed laws, regulations, contractual requirements, policies and procedures relevant to the management of beryllium contamination;
- Analyzed Laboratory documentation regarding its handling of beryllium contaminated equipment;
- Toured various Laboratory buildings to observe the condition of the facilities and equipment; and,
- Held discussions with officials from the Oak Ridge Office, Laboratory, and Y-12 concerning the management of beryllium contamination.

The audit was performed in accordance with generally accepted Government auditing standards for performance audits and included tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. Specifically, we tested controls with respect to the management of beryllium contamination at the Laboratory. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit. We did not rely on computer-processed data to accomplish our audit objective. Finally, we assessed the Department's compliance with the Government Performance and Results Act of 1993. While there were no specific performance measures established relating to beryllium, measures were in place regarding environment, safety and health issues that would apply to beryllium.

Management waived the exit conference.

RELATED AUDIT REPORTS

- The report on *Implementation of the Department of Energy's Beryllium-Associated Worker Registry* (DOE/IG-0726, April 2006), showed that the Department of Energy had not: maintained data completeness or accuracy in the worker registry; used the registry to evaluate health effects of beryllium exposure, nor used the registry as envisioned to examine the prevalence of beryllium disease. Thus, the audit results showed that program implementation did not meet expectations.
- The report on *Beryllium Oxide Operations at the Y-12 National Security Complex* (DOE/IG-0595, April 2003), disclosed a number of inefficiencies in Y-12's beryllium oxide operations. Specifically, operations were spread across the Y-12 site, and in some cases, were co-located with other Y-12 operations. In addition, manufacturing equipment and facilities were outdated, which increased manufacturing time and costs, and exacerbated health hazards associated with the use of beryllium.

United States Government

Department of Energy

Oak Ridge Office

memorandum

DATE: August 22, 2006

REPLY TO

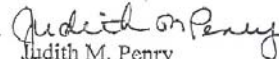
ATTN OF: FM-733:Miller

SUBJECT: **COMMENTS ON THE OFFICE OF INSPECTOR GENERAL DRAFT REPORT**

TO: George W. Collard, Assistant Inspector General for Performance Audits, Office of Inspector General, IG-32, FORS

Attached are the Oak Ridge Office (ORO) comments on the Office of Inspector General draft report entitled, "Audit of Beryllium Controls at the Oak Ridge National Laboratory."

Please contact Jeanette Miller at 865-576-2654 or Cathy Stachowiak at 865-576-7730 if you have any questions or wish to discuss these comments.


Judith M. Penry
Chief Financial Officer

Attachment
As stated

cc w/attachment:
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