

working directly with the materials were wearing personal air monitors. In February 1999, the sample results from the personal air monitors were received. Four sample results indicated concentrations of hexachlorobenzene that exceeded the threshold limit value (TLV)/time weighted average (TWA) for eight hours, as listed in the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for 1998. When respirator use was factored in, three of the four samples were within acceptable limits. One of the four samples yielded a result which exceeded the maximum use concentration of the respirator under the DOE, contractor's and OSHA/NIOSH guidelines.

ANALYSIS: The direct cause was designated personal protective equipment (PPE) and engineering controls were inadequate and the root cause was that the pre-job hazard analysis was inadequate.

Investigators determined that work planners had required the workers to use local exhaust ventilation, wetting methods, personal air monitors, and full-face high-efficiency particulate air filter respirators for the repackaging operation. Investigators also determined the workers were wearing nitrile gloves, anti-contamination cloth coveralls, chemical aprons, and safety shoes during the work. The respirators used by the workers had a maximum exposure concentration for hexachlorobenzene of 0.2 mg/m³. Facility personnel obtained five personal air monitor samples for analysis and determined that four of the samples indicated hexachlorobenzene concentrations in excess of the ACGIH TLV/TWA limit of .002 mg/m³. Those four samples had the following readings: .303 mg/m³, .120 mg/m³, .037 mg/m³, and 0.046mg/m³. One of the four sample results indicated an exposure that exceeded the maximum exposure concentration for the respirator (0.303 mg/m³). One of the five samples had a reading of .00072 mg/m³.

Investigators determined work control processes were followed, and work planners evaluated work-related hazards to reduce worker exposure to job hazards, including hexachlorobenzene. The planners did underestimate the effectiveness of the local ventilation system and wet methods which resulted in inadequate respirator selection for the hexachlorobenzene. Hazard protection designated by work planners was inadequate.

An occurrence report was filed (ORO--BJC-K25WASTMAN-1999-0004), and notification letters were provided by hand to each of the employees affected by this result, along with a verbal explanation of what had occurred. Workers in the area were provided an opportunity to have bioassay samples (blood drawn) and submitted for analysis. Workers with high potential for exposure elected to have bioassays, and the results were negative. One worker has requested a tissue bioassay.

To address these causes, work planning/control documents will be revised to ensure appropriate engineering measures and personal protective equipment (PPE) are designated when there is potential for exposure to powdery chemicals with a TLV of .010 mg/m³ or lower. This event will be reviewed as a lessons learned with appropriate personnel.

RESOLUTION/RECOMMENDED ACTIONS:

- 1) Environment, Safety, and Health (ES&H) Organization provided Project personnel with information needed to ensure work control procedures are revised to require adequate engineering controls, where feasible, and air-line respirators when there is potential for exposure to powdery chemicals with a TLV of 0.010 mg/m³ or lower.

- 2) Revise and issue project operations procedures to include information provided by ES&H.
- 3) Ensure appropriate personnel review the revised work control procedures.
- 4) Draft a lessons learned of this incident for distribution across the DOE complex.

ORIGINATOR: Bechtel Jacobs Company, LLC

E. J. Lavender, (423) 576-4620

Performance/Quality Assurance

VALIDATOR: Carolyn T. Slay; Environmental, Safety & Health; (423)241-6670

CONTACT: Joanne E. Schutt, (423) 574-1248

NAME OF AUTHORIZED DERIVATIVE CLASSIFIER: C. E. Daugherty

NAME OF REVIEWING OFFICIAL: J. F. Preston

PRIORITY DESCRIPTOR: Yellow/Caution

KEYWORDS: Hexachlorobenzene, personal protective equipment, PPE, exposure, respirators, repackaging

REFERENCES: Occurrence Report: ORO--BJC-K25WASTMAN-1999-0004

DOE FUNCTIONAL CATEGORIES: Occupational Safety & Health, Hazardous/Toxic Materials Protection, Environmental Restoration and Waste Management

BJC FUNCTIONAL CATEGORIES: SH - Occupational Safety & Health, WM - Waste Management, PC - Planning & Controls, Hazardous/Toxic Materials Protection

HAZARDS: Hazardous/Toxic Materials, Personnel Protection

WORK ACTIVITY: Waste Remediation, Hazardous/Toxic Material/Hazardous/Toxic Material Handling, Work Control,

FOLLOW-UP ACTION: Information in this report is accurate to the best of our knowledge. As means of measuring the effectiveness of this report please notify Joanne E. Schutt at (423)574-1248, e-mail at s6u@ornl.gov of any action taken as a result of this report or of any technical inaccuracies you find. Your feedback is important and appreciated.