



Dewar Shatters and Unexpectedly Projects Glass Outward

A Dewar undergoing routine radiological and hazardous metals swipes and radiological surveys shattered and projected glass fragments outward, leaving glass fragments on the technician's head and bare forearms. While the potential for decay and breakage of the Dewar's glass components was a recognized hazard, the outward projection of the fragments was not.

Analysis

While performing internal and external radiological surveys of five glass Dewars (D1 through D5), the technician noticed that the deteriorated vinyl tape placed around one of them had punctured the Mylar on the survey meter. He removed his lab coat (required PPE for survey work was safety glasses, closed-toe shoes, and glove), retrieved a new survey meter from outside the room, and resumed the surveys without donning the lab coat.

The internal and external surveys for D1 through D4 were completed without incident. Before surveying D5, the technician placed it into a plastic bag and used his gloved fingers to flake off most of the deteriorated tape on its exterior. The technician moved D-5 from the bag to the top shelf of the cart and then moved D1 through D4 to the bottom shelf of the cart. While bending over to do this, D-5 shattered and sent glass fragments in a projectile manner away from its location.



Glass fragments were observed on the technician's head and bare forearms. Radiological surveys did not detect any contamination on the technician. After transport to LLNL's Health Services Department, glass fragments were removed from his hair and eyelids.

Analysis determined the following:

- The potential for Dewar glass breakage was a recognized hazard. However, the working assumption was that the Dewar would implode, the glass fragments would drop into the bottom of the Dewar, and people next to the Dewar would not be injured by projectile glass fragments.

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- Handling (over time and that day) may have weakened D5. This possibility was not communicated to the technician.
- Although deteriorated, the presence of the tape around D5 may have had some potential to provide some worker protection. Removal of this tape may have removed a mitigator against the outward projection of glass fragments in the event of breakage. Removal of this tape also may have made D5's glass unstable or more susceptible to handling damage/breakage.
- The decision not to wear a lab coat was in line with the governing procedures for survey work – it is assumed that survey work on equipment, even if made of glass, would not pose a physical hazard to the worker. However, not donning the lab coat before resuming the survey work increased the risk of injury.

Recommended Action

1. Involve the custodians of the equipment receiving swipe/survey work during work planning to ensure that
 - the equipment conditions and potential hazards are identified and communicated to the personnel who may be affected,
 - information about the potential need to dismantle/modify the equipment to ensure appropriate coverage is exchanged, and
 - appropriate limits and pause/hold points and re-start criteria are established.
2. If swipe/survey work or any of the supporting activities (e.g., handling, transport, disassembly, modification) needed to safely complete the task cannot be performed within the original limits in the work control document, stop work and ensure that all appropriate disciplines are involved in evaluating the task modification(s), their potential hazards/impacts, and the proposed barriers/mitigating actions.
3. Always wear the full complement of PPE specified for the task being performed.

Where to Get Help or More Information

- Your ES&H Team representative.
- To search for other LLNL Lessons Learned, go to the "Lessons Learned" web site (https://mas.llnl.gov/lessons_learned/), select the topic of interest or click on "Search" and enter a keyword.

Priority Descriptor: Yellow/Caution.

Work/Function Categories (HSS entry): Conduct of Operations – Work Planning, Conduct of Operations – Work Control, Human Factors, Occupational Safety & Health – Personnel Protective Equipment.

Hazard (HSS entry): Personal Injury / Exposure – Radiation / Contamination.

ISM Category (HSS entry): Analyze Hazards, Develop / Implement Controls, Perform Work.

Keywords (HSS entry): Dewar, glass, shatter.

Subject Category (LLNL LL web page): Chemical, Radiation – Ionizing/Non-ionizing, Transportation, Nuclear Facility Operations, Training and Communication.