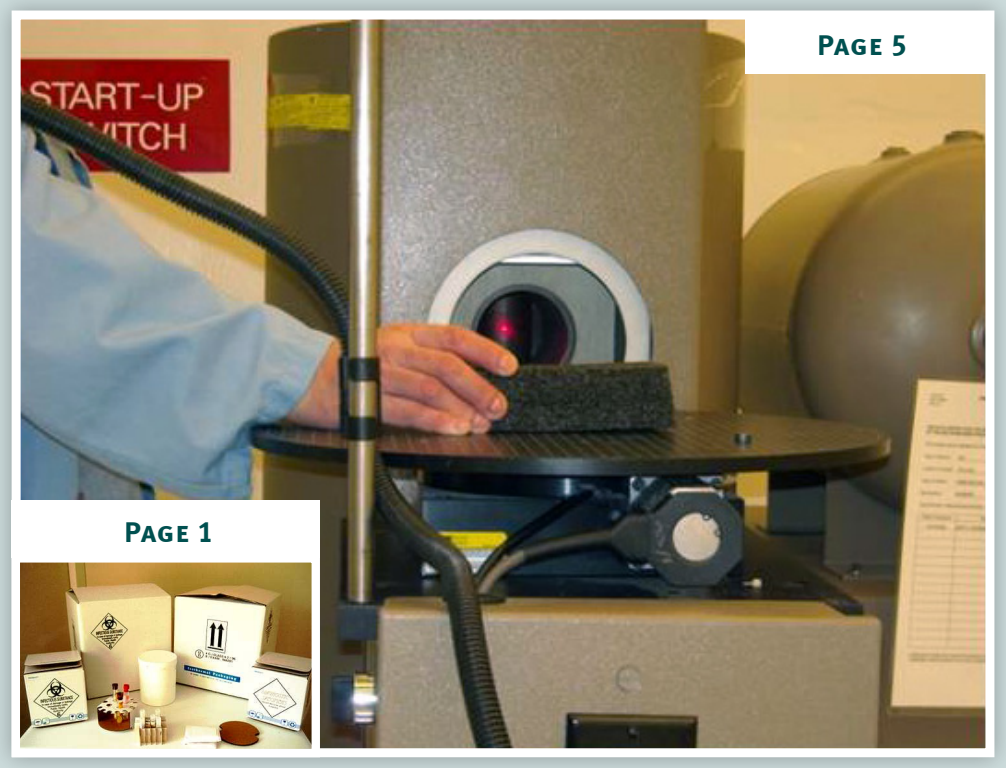
Operating Experience Summary

U.S. Department of Energy
Office of Health, Safety and Security
OE Summary 2011-04
June 9, 2011

Inside This Issue



What's That You're Carrying? Is it Hazardous? 1

The following article discusses Department of Energy events involving the transport of hazardous materials both on- and offsite without following proper Department of Transportation (DOT) procedures or using approved containers and labels for hazardous materials. Nuclear, chemical, and biological hazardous materials pose a significant risk to individuals and communities if improperly handled or released to the environment. DOT has identified human error as a contributing cause for about 85 percent of hazardous material transportation incidents. Therefore, in order to prevent any unwanted and potentially dangerous outcomes, it is important to be knowledgeable of the current DOT regulations and focus on the task when preparing hazardous material for transport.

After you are done reading the article, we encourage you to visit the Operating Experience Summary *Blog at* http://oesummary.wordpress.com *and rate the article in terms of value to you and provide a comment on the article itself and/or identify topics that would be of interest to you for future articles.*

Nuclear, chemical, and biological hazardous materials pose a significant risk to individuals and communities if improperly handled or released to the environment. A release of a hazardous material such as explosives, flammable and combustible substances, and radioactive materials can result in death, serious injury, and long-lasting health effects, as well as damage to buildings, homes, and other property. In addition, individuals who improperly carry hazardous materials may be subject to criminal and civil penalties. Although improper transport by individuals is not a common occurrence at Department of Energy (DOE) sites, several recent events reported to the Department's Occurrence Reporting and Processing System (ORPS) database involved individuals transporting hazardous materials during travel both on- and offsite without the proper containers or labeling. Figures 1-1 and 1-2 show some examples of Department of Transportation (DOT)-approved containers and labels for hazardous materials.

Figure 1-1. Examples of appropriate, certified packaging for transporting hazardous materials

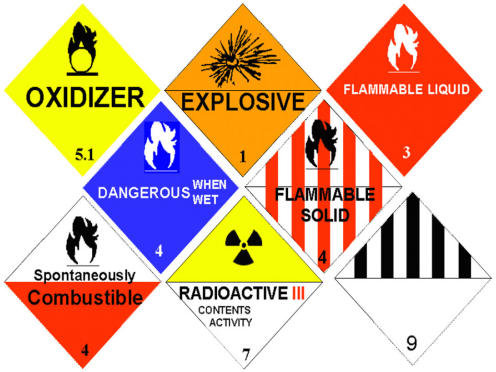


Figure 1-2. Examples of hazardous material shipping and transport labels

Improper Offsite Transport

On November 10, 2010, at Argonne National Laboratory (ANL), Advanced Photon Source (APS), staff members concluded that a "general user" had improperly transported 5 grams of potassium chlorate, a rapid oxidizer that DOT considers a hazardous material, to and from their facility. (ORPS Report SC--ASO-ANLE-ANLEAPS-2010-0003)

The general user, a University of Nevada–Las Vegas post-doctoral student (post-doc), was a foreign national who was in the United States on a student visa. He worked for a university faculty member who frequently travels to and conducts high pressure

research at APS. During one of the trips the faculty member and post-doc made to ANL, they flew from Las Vegas, Nevada, to Chicago, Illinois, and the post-doc put the potassium chlorate in his personal sample preparation kit, which he then put in his checked-in luggage. After they landed, he transported the kit via subway and rental car and carried it into the Argonne Guest House, located on the ANL site. When his work at ANL was completed, the post-doc repacked the chemicals and went to the airport to return home. However, when he missed his scheduled flight and had to carry his luggage onto the plane, airport security personnel discovered the potassium chlorate during a pre-boarding security search. They detained the post-doc until his identity, work, and purpose for carrying chemicals could be verified with ANL. The next day, the Federal Bureau of Investigation contacted the Argonne Division of Security and Counterintelligence, and, after numerous emails and discussions with the APS User Safety Officer and other involved personnel, they determined that the chemicals confiscated from the post-doc had been transported for use in APS experiments.

Although the University of Nevada faculty member had emailed the post-doc to alert him that it was unnecessary to take the chemicals with him, the post-doc did not read his email until after he had arrived at ANL and did not tell the faculty member that he had transported the chemicals. Subsequent investigation showed that the post-doc was current in his required training, which included information on proper transport of hazardous materials; however, he had been involved in only three experiments at APS since he first went there in July 2010.

Improper Onsite Transport

Two events at the Los Alamos National Laboratory (LANL) involved driving onsite with hazardous materials in vehicles. These events occurred within weeks of each other: one on March 25 and the other on April 15, 2010. In the April event, a chemist drove a hazardous material (epoxy) to the Shipping Department to get assistance with shipping requirements and documents. The shipping employee knew that the epoxy was regulated by DOT as a hazardous material and noticed that it was in a non-compliant container that was not properly marked or labeled. Investigators learned that the chemist was unaware that site roadways were regulated as public roads by DOT and, therefore, had not followed the applicable DOT regulations. (ORPS Report NA--LASO-LANL-MATWAREHS-2010-0002; final report issued May 7, 2010)

In the March 25 event, an employee, who normally called for a mobile packaging van to ship his materials, decided to hand-carry a Type A package containing a sealed source with 48 millicuries total activity to the shipping facility to save time. The package was labeled as radioactive material, but a shipping department employee determined that DOT required additional information on the label for transport across public roadways. The employee believed the sealed source was properly packaged and labeled for transport because he did not realize that the packaging experts in the mobile van evaluated each item received, determined what type of packaging and labeling were needed, and packaged or repackaged the materials appropriately. The employee was also unaware that DOT regulations for public roadways applied to transport of hazardous materials on site roadways. (ORPS Report NA--LASO-LANL-MATWAREHS-2010-0001; final report issued May 18, 2010)

Stop, Think, Act

DOT has identified human error as a contributing cause for about 85 percent of hazardous material transportation incidents. The University of Nevada post-doc who improperly transported potassium chlorate admitted he had not thought through his actions and the possible consequences before he placed the kit containing potassium chloride in his luggage and carried it via air and public transportation to ANL. The chemist at LANL knew he needed expert help with labeling his package for shipment, but was unaware that his container was non-compliant for transport on site roadways to the Shipping Department to obtain packaging assistance. The other LANL laboratory worker thought he had labeled his package appropriately and did not know that additional steps were performed routinely by experts in the mobile van. Apparently neither of the LANL workers considered the possible dangers involved in driving hazardous material on site roadways, and neither was aware that driving on site roadways with a hazardous material violated DOT regulations.

Were These Events Preventable?

In all three events, actions by others might have prevented the occurrence: a follow up to an email or more direct communication; reminders to staff or postings in laboratories about DOT regulations for site roadways; or clear communication about what tasks were performed in the mobile van might have alerted all of the workers to regulations intended to prevent potentially dangerous events. However, the individuals who improperly carried hazardous materials were also responsible for their own actions. All of them were aware that hazardous materials were regulated, but either they did not think through their actions, did not think the regulations were applicable to their tasks, were unaware of specific regulations (e.g., site roadways considered to be public roads), or simply forgot to follow applicable regulations. Self-checking would have helped each of them focus, think about the activity they were about to perform, and understand potential outcomes before they improperly carried hazardous materials in violation of regulations.

Federal Hazardous Materials Regulations

DOT hazardous materials regulations are found in Title 49 of the Code of Federal Regulations (CFR) Parts 100 through 180. With regard to transporting hazardous materials on government property, the regulations state:

> Transportation on (across or along) roads outside of Government properties generally is transportation in commerce. If a road is used by members of the general public (including dependents of Government employees) without their having to gain access through a controlled access point, transportation on (across or along) a road on Government properties is in commerce. On the other hand if access to a road is controlled at all times through the use of gates and guards, transportation on that road is not in commerce.

Hazardous materials regulations have changed significantly over the last several years. Detailed information on applicable regulations and requirements for packaging, labeling, and shipping hazardous materials, has been compiled in a searchable document, *How to Comply with Federal DOT Hazardous Materials Regulations,* at Environment, Health and Safety Online (http://www.ehso.com/DOTHow2Comply.htm).

Recommendations

When performing tasks that are normally performed without a lot of conscious thought but could have serious consequences, it is important to stop for a moment, resolve any distractions, and focus on the activity to be performed. Focusing on the task and the potentially dangerous outcomes of transporting hazardous materials in public areas probably would have kept all of those involved in these events from improperly transporting the hazardous materials in their possession. It is important to review regulations and guidelines before acting, rather than basing actions on assumptions. This is particularly important with regard to hazardous material transport regulations, which have changed in recent years.

Good communication is also an essential ingredient of safe task performance. Reminders, such as following up with offsite personnel to ensure they have received instructions; posting signage with information about specific, but perhaps not well known, regulations in laboratories; and conveying information about tasks (e.g., labeling, repackaging) performed during transport by a third party are helpful practices that may avert a potentially dangerous event.

KEYWORDS: Hazardous materials, improper transport, potassium chlorate, non-compliant container, sealed source, epoxy, DOT regulations, hazmat, site roadways

ISM CORE FUNCTIONS: Analyze the Hazards, Develop and Implement Hazard Controls, Perform Work within Controls

Incorporating Human Performance Concepts In Event Analysis Enhances Learning and Continuous Improvement

2

The following article was provided by an Environment, Safety and Health employee within Battelle Energy Alliance at Idaho. The article discusses Organizational Learning, a key concept of Human Performance, and illustrates how an organization can move away from placing blame after an event has occurred and move toward understanding, learning, improving, and preventing future events.

After reading the article, we encourage you to visit the Operating Experience Summary *Blog at* http://oesummary.wordpress.com *and rate the article in terms of value to you and provide a comment on the article itself. We also encourage readers to submit articles of their own for future sharing in the* Operating Experience Summary. *Please let us know if you have something to share.*

In March 2010, an Idaho National Laboratory (INL) employee entered the Gamma Beam Irradiator room of the INL Health Physics Instruments Laboratory (HPIL) while a Cs-137 source was in the exposed position. (Figure 2-1 shows the gamma beam irradiator.) In doing so, the employee bypassed several audible and visual alarm indications. Why, you ask, isn't this clearly personnel error and why don't we just calibrate the individual and move on? The answer is: It just didn't turn out to be that simple.

Facility personnel conducted an investigation; performed a causal analysis; and, based upon the results, developed a corrective action plan. Because of the perception by some that this event was merely an individual performance issue, not much effort was put into the investigation or the resulting corrective action plan. However, further review revealed that both were less-than-adequate and did not identify the actual causes that led to the event or capture all of the corrective actions necessary to prevent recurrence. HPIL line management realized that the response to the event needed to include a more detailed review that addressed human performance concepts. The resulting, more comprehensive analysis revealed human performance improvements that could be implemented to prevent further events of this type, such as the following.

1. Training deficiencies – A quarterly practical exercise was added for all operators of this equipment. Various scenarios have been developed to help guard against complacency.
2. Posting issues – Postings were revised to identify the area as having a potential health risk, if the source is exposed.
3. Equipment design problems – Additional visual and audible warning devices were added that were much more obvious, i.e., a strobe light and alarm tied to a Radiation Area Alarm.

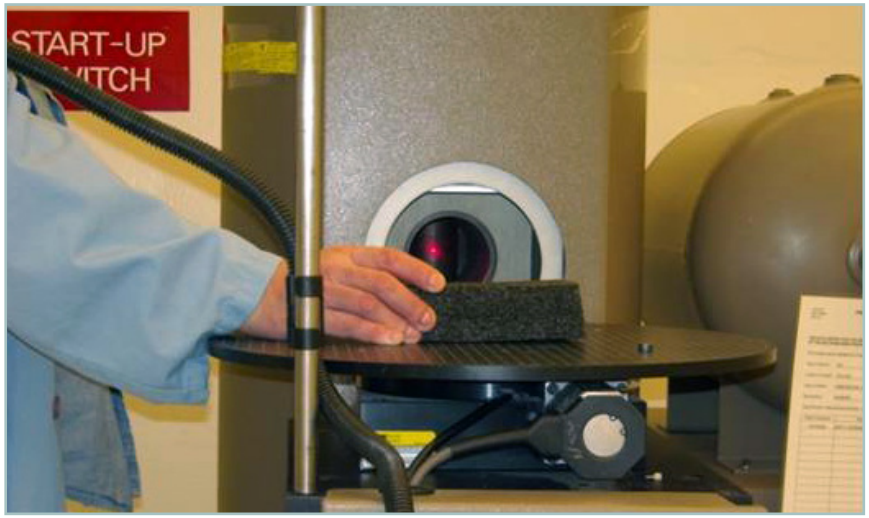


Figure 2-1. Gamma beam irradiator

A key component of the Human Performance Concepts is Organizational Learning, which involves learning from abnormal events and placing a high value on operating experience and the capacity to learn from experience in order to prevent future bad outcomes. The organization, especially its leaders, must regularly examine and learn from its own experiences as well as from others. Organizations benefit most when they swiftly move to uncover lessons and learn from "information rich" events even if the consequences were not significant.

While it initially seemed obvious that the person entering the Gamma Beam Irradiator room with a source exposed made mistakes, the causal analysis was incomplete because it did not consider human performance issues. It is always important to do a thorough causal analysis and look for issues that may cause or contribute to people doing what they do since people as a rule do not purposely put themselves in danger. By looking at ***why*** human errors occur, an organization can move toward understanding, learning, and improving.

This event identified some attributes necessary for organizational learning at the HPIL facility, including the following.

1. Managers can "argue up" the chain of command if they disagree about an event's reportability, but once a decision is made to investigate and determine cause, management should "lead down" and help their employees embrace the problem, recognize errors, and find opportunities for improvement.
2. Managers should involve an appropriate mix of individuals with an adequate level of experience, expertise, and knowledge in the event investigation.
3. Managers should understand that unless a causal analysis is flawed, factually inaccurate, or not supported by facts, it should be accepted as a valid representation of the facts at the time of the event and as a thoughtful determination of the primary and contributing causes.
4. Managers should ensure all actions taken following an event are documented not only for internal reference, but so that others can learn from the event and how it was subsequently handled.
5. Cause analysts should routinely ensure that human performance cause codes are coupled with other non-human performance cause codes. By doing so, the analyst can avoid a causal analysis that is limited to just human error. If the work environment is not improved to reduce the probability of human error, the likelihood of recurring events is high.

Organizations can effectively learn from their mistakes when management and employees accept that mistakes have been made and that opportunities for improvement exist. If personnel begin by denying an error has occurred or downplay its significance, then they miss out on taking full advantage of opportunities to learn and improve. By identifying problems with procedures, processes, and programs, in addition to recognizing human errors, an organization can move away from placing blame and move toward understanding, learning, improving, and preventing future events.

KEYWORDS: Organizational learning, individual performance, human performance concepts, continuous improvement, corrective actions, gamma beam irradiator, exposed source, alarms

ISM CORE FUNCTIONS: Analyze the Hazards, Develop and Implement Hazard Controls, Provide Feedback and Continuous Improvement

The Office of Health, Safety and Security (HSS), Office of Analysis publishes the *Operating Experience Summary* to promote safety throughout the Department of Energy (DOE) complex by encouraging the exchange of lessons-learned information among DOE facilities.

To issue the Summary in a timely manner, HSS relies on preliminary information such as daily operations reports, notification reports, and conversations with cognizant facility or DOE field office staff. If you have additional pertinent information or identify inaccurate statements in the Summary, please bring this to the attention of Mr. Stephen Domotor, (301) 903-1018, or e-mail address stephen.domotor@hq.doe.gov, so we may issue a correction. If you have difficulty accessing the Summary on the Web (http://www.hss.energy.gov/csa/analysis/oesummary/index.html), please contact the Information Center, (800) 473-4375, for assistance. We would like to hear from you regarding how we can make our products better and more useful. Please forward any comments to Mr. Domotor at the e-mail address above.

The process for receiving e-mail notification when a new edition of the Summary is published is simple and fast. New subscribers can sign up at the Document Notification Service web page: http://www.hss.energy.gov/InfoMgt/dns/hssdnl.html. If you have any questions or problems signing up for the e-mail notification, please contact Mr. Stephen Domotor by telephone at (301) 903-1018 or by e-mail at stephen.domotor@hq.doe.gov.