OPERATING EXPERIENCE SUMMARY

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U.S. Department of Energy

Office of Environment, Safety and Health

OE Summary 2004-10

May 17, 2004

The Office of Environment, Safety and Health, Office of Corporate Performance Assessment publishes the Operating Experience Summary to promote safety throughout the Department of Energy complex by encouraging the exchange of lessons-learned information among DOE facilities.

To issue the Summary in a timely manner, EH 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 Frank Russo, 301-903-8008, or Internet address Frank.Russo@eh.doe.gov, so we may issue a correction. If you have difficulty accessing the Summary on the Web (URL http://www.eh.doe.gov/paa), please contact the ES&H 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 Frank.Russo@eh.doe.gov.

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EH Publishes "Just-In-Time" Reports

The Office of Environment, Safety and Health recently began publishing a series of "Just-In-Time" reports. These two-page reports inform work planners and workers about specific safety issues related to work they are about to perform. The format of the Just-In-Time reports was adapted from the highly successful format used by the Institute of Nuclear Power Operations (INPO). Each report presents brief examples of problems and mistakes actually encountered in reported cases, then presents points to consider to help avoid such pitfalls.

1. Deficiencies in identification and control of electrical hazards during excavation have resulted in hazardous working conditions.
2. Deficiencies in work planning and hazards identification have resulted in electrical near misses when performing blind penetrations and core drilling.
3. Working near energized circuits has resulted in electrical near misses.
4. Deficiencies in control and identification of electrical hazards during facility demolition have resulted in hazardous working conditions.
5. Electrical wiring mistakes have resulted in electrical shocks and near misses.
6. Deficiencies in planning and use of spotters contributed to vehicles striking overhead power lines.

The first six Just-in-Time reports were prepared as part of the 2004 Electrical Safety Campaign. In April, the Office of Environment, Safety and Health published a Special Report on Electrical Safety. The purpose of this report is to describe commonly made electrical safety errors and to identify lessons learned and specific actions that should be taken to prevent similar occurrences. This report can be accessed at http://www.eh.doe.gov/paa/reports/Electrical_Safety_Report-Final.pdf.

EH plans to issue more Just-in-Times soon on other safety issues, such as lockout and tagout, fall protection, and freeze protection. All of the Just-in-Times can be accessed at http://www.eh.doe.gov/paa/reports.html.

EVENTS

1. FALLING OBJECTS CAN BE DANGEROUS TO WORKERS

Over the past year, six occurrences have been reported in ORPS resulting from objects falling and striking workers. Most of these events involved decontamination and decommissioning (D&D) activities, as described below.

On July 8, 2004, at West Valley, a D&D worker repositioning a pipe dislodged a 25-pound piece of temporary grating, which fell and grazed another worker's head. The onsite physician diagnosed a tender mass on the worker's head that did not require treatment. (ORPS Report OH-WV-WVNS-CF-2004-0001)

Figure 1-1. Scaffold

On May 24, 2004, at Rocky Flats, a D&D worker on a scaffold (Figure 1-1) was using a portable band saw and accidentally dropped a 6-foot piece of angle iron. The piece fell 5 feet and struck an RCT on the hardhat and shoulder. The RCT was not injured. (ORPS Report RFO--KHLL-374OPS-2004-0002)

At the pre-job brief, management discussed the work activities to take place in the room and the Job Hazard Analysis. They emphasized the need for workers to maintain positive control of the saw and stressed that two people would be needed to perform the job.

Two workers (a saw operator and helper) cut and removed two pieces of angle iron without incident. The saw operator cut the third piece of angle iron while the helper repositioned the movable stair ladder. When he had finished, the operator turned the saw off, laid it on the scaffold platform, and attempted to lower the angle iron to the floor. As he was lowering it, the piece slipped out of the operator's hands and fell.
An initial investigation identified the work planning and conduct of operations deficiencies summarized below.

- The saw operator held the saw with one hand and piece of angle iron with the other while cutting.
- The operator attempted to lower the angle iron to the ground without the assistance of the helper.
- The saw operator was cutting overhead, and the area below was inadequately secured.

To prevent recurrence, facility management will ensure that operators are retrained on the need to use both hands while using cutting tools and on the need to properly barricade areas near overhead work. Management will evaluate other methods for lowering equipment to the ground (e.g., rigging using beam clamps or rope tie-offs).

On February 8, 2004, also at Rocky Flats, a D&D worker accidentally dropped a 10-pound sledgehammer, which fell through two stories to the first floor and struck another worker in the back. The worker suffered a minor contusion and returned to work without restriction. (ORPS Report RFO--KHLL-D&DOPS-2004-0001)

On October 29, 2003, at Savannah River, two D&D workers were cutting pipe when an 8-foot section in a pipe hanger became unbalanced, slid from the hanger, and fell 13 feet, striking an RCT below. The pipe glanced off the inspector's hardhat and left shoulder and scraped his left calf and ankle. Site medical personnel examined his injuries and released him to work with no restrictions. (ORPS Report SR--WSRC-FDP-2003-0008)

OE Summary 2003-12 reported a near-miss event that occurred on May 21, 2003, at Hanford. An ironworker positioning spider columns (Figure 1-2) on a roof failed to notice that the self-retracting

Figure 1-2. Spider column

lanyard on his safety harness had hooked another spider column in an open-faced skiff box next to the roof cutout. The 80-pound spider column fell out of the box, through the roof cutout, and landed 18 inches from an oxyacetylene welding cart 15 feet below. No workers were in the immediate area at the time the spider column fell, and there were no injuries or equipment damage. (ORPS Report RL--BHI-DND-2003-0003)

On April 16, 2003, at the Hanford Waste Treatment Plant construction site, a bolt bag opened, fell 60 feet from a tower crane platform, and spilled its contents, including a scrap piece of angle iron. The piece of angle iron struck a support member about 20 feet above the ground as it fell, bounced outside of the tower cross-section, and landed on the roof of a temporary structure occupied by three workers. The remaining contents fell to the ground near the base of the crane. Fortunately, no one was injured. (ORPS Report RP--BNRP-RPPWTP-2003-0004; OE Summary 2003-09)

Wearing head protection (hardhats) is important when working in areas where falling object hazards are likely to occur because injuries from falling objects are common. According to the U.S. Department of Labor, Bureau of Labor Statistics, there were approximately 74,000 injury and illness cases in private industry in 2001 that resulted from workers being struck by falling objects.

These events illustrate the need to maintain control of tools when working at an elevation, as well as the need to be aware of nearby penetrations and openings.

KEYWORDS: *Near miss, fall, dropped, injury, overhead*

ISM CORE FUNCTIONS: *Analyze the Hazards, Develop and Implement Hazard Controls*

2. ROLL-UP DOOR FAILURES RESULT IN NEAR MISSES

On January 9, 2004, at the Rocky Flats Environmental Technology Site, a roll-up door at an industrial building dropped 10 feet to the floor when the drive chain for the operating mechanism separated. Personnel had heard noise coming from the drive chain prior to the failure. (ORPS Report RFO--KHLL-WSTMGTOPS-2004-0001)

An offsite vendor had replaced the door about a year before it failed. The vendor was contacted and supported the investigation. When the door was checked, inspectors determined that the broken chain was the only failure. Figure 2-1 shows the broken chain on the floor beneath the operating mechanism. Investigators determined that the door had been cycled in excess of its normal expected life cycle and that no preventive maintenance had been performed on it. Since the door failure, the vendor has checked all roll-up doors. The contractor is establishing a preventive maintenance process that will be conducted based on the expected door usage. Figure 2-2 shows the damage to the door on impact.

On March 3, 2004, at the Pantex Plant Vehicle Maintenance Facility, a roll-up door fell and hit the floor with enough force to bounce two or three times. The drive chain on the door broke while the door was opening after a garage mechanic pressed the "OPEN" button to allow a truck to enter the bay. The chain also fell to the floor near where the mechanic had been standing. The garage door controls are located directly below the motor and chain drive assembly. (ORPS Report ALO-AO-BWXP-PANTEX-2004-0023)

Figure 2-1. Fallen drive chain (Rocky Flats)

Figure 2-2. Buckled door slat (Rocky Flats)

Another event occurred at Pantex in November 2002, when a 5-pound chain sprocket for a roll-up door fell within a foot of a security police officer who was operating the door. Preventive maintenance for roll-up doors had not been established at this facility. Figure 2-3 shows the sprocket.

On July 15, 2003, at the Los Alamos Tritium Facility, two sprockets and a drive chain for the motorized opener on a roll-up door fell as an electrician was closing the door. The door dropped at an uncontrolled rate, and the chain glanced off the electrician's right arm. He was standing below the motorized door opener and in front of the controls. The two sprockets landed within 2 feet of the electrician. (ORPS Report ALO-LA-LANL-TRITFACILS-2003-0003)

The roll-up door was installed in 1997 and is in an annual preventive maintenance program that includes a mechanical component and an electrical component. The electrical component had been completed the day before the failure, but manipulation of the door opener sprockets or chain was not part of this inspection. Figure 2-4 shows the sprockets and chain.

On February 25, 2003, at the Idaho Nuclear Technology and Engineering Center, the spring on a warehouse roll-up door failed and rapidly unwound, discharging a small piece of metal from the tension mechanism. Personnel were in the area when the 2.4-inch by 1.5-inch piece of metal flew across the room and hit the floor. The door was not in use when it failed, and no one was struck by the debris. The door had been cycled far beyond the life expectancy of the spring mechanism. (ORPS Report ID--BBWI-LANDLORD-2003-0003)

Some roll-up doors are opened and closed several times per day. In the case of the Idaho event, for example, the life expectancy for the spring mechanism was 10,000 cycles (opened and closed). During the 26 years it was in service (based on 365 days' service per year), the door would have to

Figure 2-3. Fallen drive sprocket (Pantex)

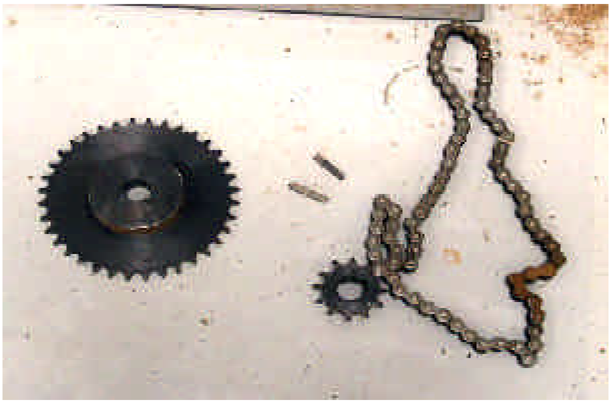

Figure 2-4. Staged photo of sprockets, keys, and chain (Los Alamos)

be cycled a fraction of one time per day to exceed the life expectancy of the mechanism. Investigators determined that the door is being cycled as often as 15 times per work day.

It is important to always follow manufacturer's recommended maintenance and inspection guidelines for roll-up and overhead doors. If such recommendations are not available, the following checks and maintenance should be performed at a minimum:

- Check sectional roll-up doors for loose wheels or other parts that could fall off.
- Check door alignment. Ensure doors open and close without binding or chatter.
- Replace all incorrectly installed brackets or other hardware.
- Inspect for general cleanliness and ease of operation.
- Inspect doors and operating mechanisms for loose fasteners, anchor bolts, and damaged or missing parts.
- Lubricate moving and operating parts (e.g., springs, guides, rollers, sprockets, chains, gears).
- Verify that limit switches are functional and properly adjusted.

Older doors may not have safety features such as chain guards or stop-lock bearings to prevent an uncontrolled descent of the door. Some of the corrective actions for roll-up door failures include installing braking devices and constructing a basket to contain broken parts. Although primarily for machinery and machine guarding, 29 CFR 1910.219 (f)(3), *Sprockets and Chains*, should be reviewed. The standard states that all sprocket wheels and chains shall be enclosed unless they are more than 7 feet above the floor or platform. Where the drive mechanism extends over other machines or working areas, protection against falling shall be provided.

All personnel must stay clear of doors while they are opening or closing. Doors and operating mechanisms typically fail during movement, regardless of the level of maintenance performed. Nothing should be allowed to pass through the doorway until the door has completely stopped.

TYPICAL ROLL-UP DOOR FAILURE MECHANISMS

- Set screw failed and sprocket gear came off shaft.
- Broken door guide caused door to jam.
- Counterweight cable snapped.
- Door rollers came out of sockets.
- Sprocket gear key loosened.
- Deformed grooves and loose bolts caused door slats to separate.
- Weld on drive shaft failed.
- Spring broke and rapidly unwound.
- Retaining ring failed on door idler shaft.
- Bolt sheared and sprocket fell off.
- Sheared pin caused drive chain to separate.

These events stress the importance of performing preventive maintenance and inspections of roll-up and overhead doors and their operating mechanisms. Years of operation can result in increased wear, misalignment, and deterioration of operating parts that can become a safety hazard. Without proper maintenance, door

TYPICAL CAUSAL FACTORS FOR ROLL-UP DOOR FAILURES

- Preventive Maintenance was generic and not specific to individual doors.
- There were no procedures requiring inspection of doors and operating mechanisms.
- There was no maintenance or operational standards for roll-up doors.
- Preventive maintenance was limited to lubrication only.
- Preventive maintenance did not include inspection of welds.
- There was no manufacturer's data or engineering specifications for the doors.
- Doors did not have a braking or free-fall arresting device.
- There was no recordkeeping to track roll-up door problems.
- Resources were not allocated to perform preventive maintenance on doors.
- Roll-up doors were not on routine preventive maintenance.

operating mechanisms can fail unexpectedly. Falling parts (some weighing as much as several pounds) and doors, which can weigh between 1,000 and 1,500 pounds, have the potential to cause serious injury.

KEYWORDS: *Near miss, overhead door, roll-up door, preventive maintenance, inspections, falling parts*

ISM CORE FUNCTIONS: *Analyze the Hazards, Develop and Implement Hazard Controls*

3. USE CARE TO AVOID HAND INJURIES

The U.S. Bureau of Labor Statistics estimates that every year more than 100,000 workers suffer injuries to the hand or fingers that result in lost work days. These common injuries are second only to back strains and sprains. Three such events have occurred within three months, as described below.

On May 29, 2004, at the Idaho Advanced Mixed Waste Treatment Facility, an operations technician attempting to retrieve an O-ring underneath an electrical safety grating (Figure 3-1) cut his finger when the grating dropped as he was replacing a pedestal that had fallen. Six stitches were required to close the wound in his finger. Management briefed work crews on using gloves when hand hazards exist and on obtaining shift manager approval before moving guards, flooring, or grating. (Not reported in ORPS)

Investigators determined that retrieving the dropped O-ring necessitated reinstalling the grating—a task the technician performed without first identifying the hazards. He realigned the grating alignment without the proper tools, personal protective equipment, or work instructions to perform the job. The investigation disclosed that the accident could have been avoided by retrieving the fallen item in a different way or by barricading the area and developing work controls for installation of the grating.

Corrective actions included creating and distributing a "Toolbox" (site-specific publication) that outlined integrated safety management areas for improvement and initiating a hand safety information campaign to raise workers'

Figure 3-1. Electrical safety grating

awareness of potential risks to their hands while performing operational work.

On May 19, 2004, at Lawrence Livermore National Laboratory, a machinist operating a milling machine like the one shown in Figure 3-2 suffered lacerations to his middle and ring fingers when he caught his hand in the conveyor. He needed 20 stitches to close the cuts in his middle finger and 4 stitches in his ring finger. (ORPS Report OAK--LLNL-LLNL-2004-0020; update/final report filed May 27, 2004)

The machinist noticed that the machine's output chute was clogged and cleaned the conveyor system with a metal brush while cycling the machine on and off. After cleaning the conveyor, he noticed that coolant had overflowed from the metal chip discharge chute. He checked the output chute with his right hand to determine the source of the overflow. Unaware that the chip conveyor was running, he entangled his hand in the conveyor system. His fingers were lacerated as he pulled his hand out.

Figure 3-2. Milling machine similar to the one that cut the machinist

A window was installed in the output chute so operators could visually confirm that the machine was not operating before cleaning or making adjustments to it. Other milling machines are being inspected and modified using other positive visual means for verifying operational status such as an indicator light or interlock.

On March 17, 2004, at Oak Ridge National Laboratory, a technician was attempting to loosen the retaining ring on the lid of a pressurized 55-gallon drum when the lid and retaining ring were ejected from the drum, lacerating the technician's finger. (ORPS Report ORO--ORNL-X10NUCLEAR-2004-0001)

The drum was one of eight steel drums loaded with floor tile and dry ice from an asbestos tile removal job. As the drums were being relocated, the technician noticed that they were deformed and potentially pressurized. She reported the problem to facility supervision, but supervisors failed to inspect the drums or evaluate the hazards associated with a pressurized drum. Instead, they allowed the technician to relieve the pressure by loosening the retaining rings. The technician had vented three drums in this manner, and was venting the fourth when her finger was cut. The remaining drums were vented using a remotely operated drum puncture device.

The critique identified two issues that contributed to the accident. The following is a summary of the two issues.

- Work planners did not recognize or evaluate the potential for possible pressurization of the steel 55-gallon drums.

  Facility supervision failed to evaluate the hazards associated with handling the potentially pressurized drums.

Researchers at the Liberty Mutual Research Institute for Safety, collaborating with the Harvard School of Public Health, interviewed 1,166 workers who suffered injuries to the finger, hand, or wrist while at work to determine the risk factors that contributed to these injuries. The study revealed that the most common occupational acute hand injury was laceration, followed by crush injury, avulsion, puncture, and fracture.

The researchers found that the risk of a hand injury was significantly elevated when working with equipment, tools, or work pieces that do not perform as expected; when using a work method other than the usual one to do a task; or when performing an unusual task or being rushed or distracted while performing a task. Wearing gloves reduced the relative risk of injury by up to 60 percent, the study showed. The study results are published in the April issue of *Occupational and Environmental Medicine* (Vol. 61, pp. 305-311; http://oem.bmjjournals.com).

OSHA general requirements for hand protection can be found in 29 CFR 1910.138(a), *Hand Protection*. The standard states that employers shall select and require employees to use appropriate hand protection when employees' hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature extremes.

These events illustrate the potential for hand injuries that can occur while performing daily tasks. The text box below contains suggestions for keeping hands and fingers safe.

PROTECT YOUR HANDS

- Be alert to potential hand hazards before beginning a task.
- Be alert to possible unguarded pinch points.
- Use push-sticks, guards, shields, and other protective devices if possible. Do not remove guards.
- Use brushes to wipe away debris.
- Inspect equipment and machinery before and after tasks to make sure that it is in good operating condition.
- Disconnect power and lock out machinery before repairing or cleaning it.
- Never wear jewelry or loose clothing near moving machine parts.
- Use personal protective equipment — gloves, guards, forearm cuffs — for the task you are performing.
- When wearing gloves, be sure they fit properly and are rated for the specific task you are performing.
- Select tools that keep wrists straight to help avoid repetitive motion injuries.

KEYWORDS: *Hand, finger, injury, near miss*

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

4. BERYLLIUM CAN BE FOUND ANYWHERE

On March 16, 2004, at the Savannah River Site, D&D managers received the results of an analysis indicating that three containers found in a deactivated facility, which was not posted as a beryllium area, contained beryllium. The analysis also indicated that beryllium levels in samples from the surrounding area were higher than the level that the site considers the threshold above which an area is contaminated. An Industrial Hygiene (IH) representative discovered the containers in December 2003 and submitted the swipe samples in February 2004 as a precautionary measure. Investigators determined that the containers were included on a 1998 Risk Identification and Reduction Report, but it is not known how long they had been in the facility before the IH representative found them. No known exposures resulted from this occurrence. (ORPS Report SR--WSRC-FDP-2004-0003; final report issued April 29, 2004)

During a tour of the facility on December 3, 2003, the IH representative found a container with a handwritten label indicating that it contained beryllium metal granules (Figure 4-1). He notified the site D&D managers, who directed workers to lock the building, post it, and barricade the entrances to restrict access. They also ordered the IH representative to obtain follow-up swipes from the immediate area and several other locations in the building as a precaution.

Two months later, in early February 2004, the IH representative took swipe samples from a tabletop where the containers were found (Figure 4-2) and submitted them for analysis. More than a month later, the laboratory returned the

Figure 4-1. Labeled container

results. Analysis indicated beryllium levels ranging from non-detectable to 11.47 micrograms per 100 cm^2. Nine out of 24 samples exceeded the 0.2 micrograms/100 cm^2 that the site selected as their criterion for designating an area as a beryllium legacy area.

Although beryllium's health dangers are well-known, management's additional concern was the less-than-adequate response time in addressing the discovery. The lapse in time increased the potential for unidentified personnel beryllium exposures. This concern is well-founded, considering the beryllium exposures that occurred at the Nevada Test Site (NTS) in 2002.

In 2002, National Nuclear Security Administration (NNSA) Administrator Linton Brooks ordered a comprehensive, independent investigation after NTS workers who had no known work-related exposure exhibited signs of beryllium exposure.

Figure 4-2. Area surrounding containers where swipes were taken

One NTS employee, who worked at the North Las Vegas (NLV) facility, was diagnosed with chronic beryllium disease; 11 additional workers were diagnosed with beryllium sensitization.

The final report on the investigation, *Investigation of Beryllium Exposure Cases Discovered at the North Las Vegas Facility of the National Nuclear Security Administration, August 2003*, concluded that beryllium contamination had been introduced into the NLV facility from an outside source, most likely NTS. Investigators believe contaminated personal articles, vehicles, and documents carried from one site to the other were the likely source of the contamination. Based on the results of the investigation, Administrator Brooks reminded the DOE community in the report's Prologue that historic activities could present a hazard to today's workers.

A search of the ORPS database revealed additional events involving unexpected beryllium or legacy issues, including the following.

- At Sandia National Laboratory in December 2002, construction-like activities generated material that was contaminated with beryllium. That event led to concerns in December 2003, when work was performed in the same building, and pipes and tanks were removed from the area without checking for potential beryllium contamination. Later, it was learned that potentially contaminated coveralls had been sent to a laundry vendor. Follow-up surveys showed no detectable beryllium either in the laundered clothing or at the vendor's facility. The site process for releasing materials is being reviewed to ensure compliance with 10 CFR 850, *Chronic Beryllium Disease Prevention Program*. (ORPS Report ALO-KO-SNL-1000-2003-0010)

- At Oak Ridge Y-12 Site, in February 2004, beryllium samples collected from demolition and remodeling work performed inside a beryllium-regulated area exceeded the Permissible Exposure Limit. Workers had stayed within the scope of the work package and had worn required personal protection equipment that prevented an actual inhalation exposure. This event is a reminder that all D&D work has the potential for unwelcome discoveries—in this case, legacy contamination. (ORPS Report ORO--BWXT-Y12CM-2004-0002)

- At Hanford, in March 2004, area samples taken from a facility showed low levels of airborne beryllium, even though historical use of beryllium was neither suspected nor known to have occurred in the facility. Although the level was below the DOE action level of 0.2 microgram/m^3, the sample was above the occupational medical contractor's employee work restriction limit of 0.01 microgram/m^3. (ORPS Report RL--PNNL-PNNLNUCL-2004-0003)

- At Sandia National Laboratory, in April 2004, swipes taken in a building showed beryllium above background level in one location. Investigators determined that the beryllium had come from work being performed in a nearby location. (ORPS Report ALO-KO-SNL-14000-2004-0001)

- At the Savannah River Site, in May 2004, beryllium samples taken during characterization of a laundry facility revealed elevated levels on various internal and external surfaces. Although 70 site buildings had been identified as having potential legacy beryllium, the laundry was not one of them. A follow-up of equipment moved offsite is underway to determine if contamination existed on that equipment as well as on the clothing sent to the laundry. (ORPS Report SR--WSRC-CLOSEGEN-2004-0002)

These events underscore the importance of a good inventory control system that identifies and tracks the location of all radiological and hazardous materials. They also demonstrate the importance of securing areas suspected of being beryllium areas and of being aware of historical operations that may have used beryllium. It is essential to respond quickly to any indication that beryllium has been discovered in areas where its presence is not expected. Although D&D activities are known to stir up formerly fixed beryllium, workers in non-D&D areas must be vigilant as well. As the Nevada investigation demonstrated, workers can spread contamination by carrying documents and personal items or driving vehicles from one location to another.

As NNSA Administrator Linton Brooks wrote in the Prologue to the investigation report cited earlier, exposures may result from " . . . the failure to recognize the potential significance of beryllium contamination from historic activities at levels sufficient to be of hazard to the current workforce, and the failure to recognize the potential for non-radiological contamination at one location to be transported to another location at levels adequate to represent a hazard to the workers at the second location."

KEYWORDS: *Beryllium, unexpected, legacy contamination*

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

Commonly Used Acronyms and Initialisms

Agencies/Organizations	
ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
DOE	Department of Energy
DOT	Department of Transportation
EPA	Environmental Protection Agency
INPO	Institute for Nuclear Power Operations
NIOSH	National Institute for Occupational Safety and Health
NNSA	National Nuclear Security Administration
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
SELLS	Society for Effective Lessons Learned

Units of Measure	
AC	alternating current
DC	direct current
psi (a)(d)(g)	pounds per square inch (absolute) (differential) (gauge)
RAD	Radiation Absorbed Dose
REM	Roentgen Equivalent Man
v/kv	volt/kilovolt

Job Titles/Positions	
RCT	Radiological Control Technician

Authorization Basis/Documents	
JHA	Job Hazards Analysis
NOV	Notice of Violation
SAR	Safety Analysis Report
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question

Regulations/Acts	
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
RCRA	Resource Conservation and Recovery Act
D&D	Decontamination and Decommissioning
DD&D	Decontamination, Decommissioning, and Dismantlement

Miscellaneous	
ALARA	As low as reasonably achievable
HVAC	Heating, Ventilation, and Air Conditioning
ISM	Integrated Safety Management
ORPS	Occurrence Reporting and Processing System
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control