OPERATING EXPERIENCE SUMMARY

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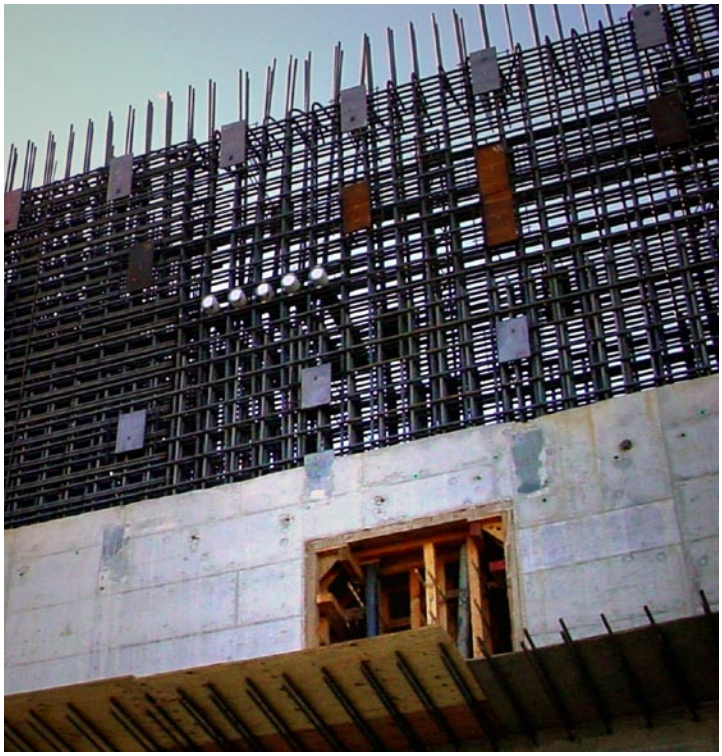

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The Office of Environment, Safety and Health, Office of Corporate Performance Assessment publishes the Operating Experience Summary to promote safety throughout the Department of Energy complex by encouraging the exchange of lessons-learned information 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 has published 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/jit.html.

EVENTS

1. *INCORRECT USE OF KNIFE SHARPENER RESULTS IN SERIOUS HAND INJURY*

On February 9, 2005, at the Hanford Site Waste Treatment Plant (WTP), an insulator craft person accidentally cut his hand, severing two tendons, while sharpening his knife. The worker was wearing leather gloves while using a hand-held AccuSharp® knife sharpener (Figure 1-1), but he was using the sharpener incorrectly. (ORPS Report RP--BNRP-RPPWTP-2005-0005)

Figure 1-1. AccuSharp® knife sharpener

The worker's knife was about 3⅜-inches long and very sharp. He held the sharpener upside down and pulled the knife through the sharpener (Figure 1-2), towards himself and through and over his left thumb, leaving a hairline cut in the thumb.

Figure 1-2. How the worker used the sharpener

The worker was evaluated at the WTP medical facility, where medical personnel determined that the injury appeared to need stitches. However, because he was unable to move his thumb, the nursing staff had the worker transported to an orthopedic surgeon. The attending physician determined that two extensor tendons on the top of the thumb had been severed and would require approximately 6 months to heal.

Proper use of this sharpening tool is important for the user's safety and the manufacturer's instructions for correct use were included with the tool. Figure 1-3 demonstrates how the sharpening tool should have been held and used in accordance with the manufacturer's instructions.

Figure 1-3. Correct use of the knife sharpener

The worker stated that he had used AccuSharp® knife sharpeners for over 10 years but he was unaware of the manufacturer's instructions on the back of the package. This particular sharpener, along with instructions for use, was issued to the worker approximately 2 months before the accident. Inspection of the tool revealed marks on the plastic finger guard indicating that the knife had slipped off the sharpener many times before and cut into the guard. These marks indicate that the worker had narrowly missed being cut in the past but failed to recognize the hazard posed by incorrect use of the sharpener.

Failure to follow manufacturer's instructions results in numerous injuries, both on the job and at home. Manufacturers provide instructions for product use that usually include cautions and warnings for the user's protection. In this event, the manufacturer's instructions for using the knife sharpener included a diagram and clearly written directions on how to use the tool. The instructions also cautioned users that the sharpener moves while the knife blade remains stationary and directs them not to apply heavy pressure that could cause them to lose control of the knife and result in an injury.

The following recent events involving the failure to follow manufacturer's instructions occurred at other DOE facilities.

On February 16, 2005, at the National Energy Technology Laboratory Fitness Facility, a custodial worker added a disinfectant cleaner to a spray bottle without following the manufacturer's instructions for dilution. When the full-strength solution was sprayed to clean exercise equipment, a very strong odor resulted that caused several people in the area to cough involuntarily. (ORPS Report HQ--GOPE-NETL-2005-0002)

On December 9, 2004, at the Nevada Test Site, a repairman was slightly injured when a shop crane tipped over and pinned him against another piece of equipment, resulting in bruises and abrasions. The repairman was using the crane to lift and place an 880-pound planetary gearbox onto a workbench. He did not follow the manufacturer's instructions that required the gearbox to remain on the floor and only uprighted for repairs, not lifted to a workbench. The hoist, which was setup for a 1,000-pound capacity, was not properly positioned over the load and became unstable. (ORPS Report NVOO--BN-NTS-2004-0020)

These occurrences illustrate the importance of reading, understanding, and following the manufacturer's instructions. Manufacturers are responsible for providing directions for safe use of their products and for warning of hazards that could arise from misuse. It is therefore the user's responsibility to follow these directions and observe all caution and hazard warnings to ensure their own safety and the safety of others.

KEYWORDS: *Injury, knife, sharpener, cut, blade, hand, manufacturer's instructions*

ISM CORE FUNCTIONS: *Analyze the Hazards, Perform Work within Controls*

2. DANGERS OF INDUSTRIAL STEAM AND HOT WATER

Although steam burn events do not occur frequently, their consequences can be so severe that periodic reminders are necessary. A recent OE Summary article (OE Summary 2005-03), *Worker Scalded When Hot Water Hose Fails*, described two events—one at the Naval Petroleum Oil Shale Reserves (ORPS Report HQ--GOHQ-NPOSCUW-2005-0001) and one at a well project in Dubai, United Arab Emirates—where severe burns resulted from known equipment deficiencies that had gone unreported. Workers in the DOE Complex have also been in near-miss situations or have actually been badly burned by steam while performing work, as shown by the following events.

On January 18, 2005, at Fernald Environmental Management Project, a hot water pressure washer failed catastrophically while it was being used. The event blew insulation from inside the machine farther than 50 feet, and ejected a 17-inch-diameter, metal retainer disc 53 feet away. Remarkably, there were no personnel injuries because the boiler was located outside the building to prevent carbon monoxide from being released inside the building; only the hose and wand were inside the building.

The pressure washers had recently been refurbished by a local distributor before being placed back into service. Decontamination crew laborers performed the daily hot water pressure washer inspection and noted no deficiencies. The day of the event, they operated the washer for little more than a half hour, then shut off the burner, secured the engine, and left the water supply flowing due to subfreezing outside temperatures. After another half hour, the washer was re-started. The washer had run for 10 minutes when the wand pressure dropped significantly. Workers heard a loud bang, saw smoke, and then watched as a 17-inch metal insulation retainer disk was hurled across the floor. The cause of the failure is still under investigation. (ORPS Report OH-FN-FFI-FEMP-2005-0002)

Workers in the DOE Complex have not always been so lucky. The most serious burn event in recent history occurred September 7, 2001, at the Oak Ridge Life Sciences Division, in Building 9210 ("Mouse House"), when a worker was burned by scalding water from a washer used to clean animal cages and laboratory equipment. The event resulted in a Type B accident investigation because of the severity of the worker's burns, her extended hospitalization, and the resultant prolonged physical therapy.

The worker was working alone in an area overcrowded with tables, cages, and equipment next to a tunnel washer. As she attempted to move a cart containing clean items through a narrow pathway, either she or the cart bumped into the washer's filter assembly, opening the latch near a high-volume circulating pump. As a result, she was sprayed with 194°F water under 30 to 40 psi of pressure. No one heard her cries for help. The worker made her way into the hallway and collapsed. She sustained first- and second-degree burns to 20 per cent of her body; her legs were the most severely burned because her water-soaked socks held in the heat.

The severity of the injury and length of hospitalization caused the investigation to be upgraded to a Type B. Investigators determined that the latch assembly and other components were installed for ease of maintenance, not safety, and should have been installed away from the work area. They also determined that the area's overcrowding was a factor in the event and that the water temperature was excessive. Investigators also found that there were no emergency alarms in the area and that safety and health subject matter experts had not evaluated the hazards of the tunnel washer. (ORPS Report ORO--ORNL-X10ATY12-2001-0006; OE Summary 2001-11)

On October 13, 2003, at Sandia National Laboratory, a boiler safety relief valve released hot water and steam into an equipment room that had been occupied by a craftsperson who had momentarily left. As part of startup work, the craftsperson had inspected and cleaned the boiler, then fired it. While waiting for it to come up to temperature so he could complete the startup procedure, the worker began cleaning the room and then walked 10 feet to his truck. While he was gone, the water reached setpoint temperatures and the system's engineered safety systems failed (i.e., the controller failed to shut down the gas burners and the manual reset control also failed). When the safety release valve discharged, it released water to a sanitary drain, but because it did not drain completely, residual water raised the room temperature even more, resulting in steam. Due to hot water and steam, the room's heat detector activated at 190°F. When the craftsperson saw what had happened, he shut off the boiler switch at the door.

Although the operational controller and high limit control both failed, investigators determined that the worker did not monitor the startup as required by procedure and one of the procedural steps was out of sequence. They also determined that the hot water boiler had been issued two identification numbers; therefore, two job plans were issued to the craftsperson.

Burn Classification

Burns are classified by the amount of damage done to the skin and other body tissue, or depth.

- **First-degree burns**, also called superficial burns, involve only the top layer of skin/epidermis, and, although they are painful, will heal quickly. The tissue will blanch (whiten) with pressure. Sunburn is a classic example.
- **Second-degree burns**, also called partial thickness or dermal injuries, involve the second layer of skin/dermis and are serious injuries that require immediate first aid and professional medical treatment. They may involve sweat glands and hair follicles, but enough of these structures are preserved that the skin can re-grow. The skin is blistered and very painful.
- **Third-degree burns**, also called full thickness injuries, extend to the third layer, subcutaneous tissue that includes fat, sweat glands, hair follicles, and the area where new cells are formed. These severe injuries require immediate professional medical treatment. Because skin and structures are destroyed, healing is very slow and associated with scarring because epithelial cells are not present to repopulate. Full thickness burns require skin grafts.

Although the craftsperson knew the procedure was inadequate, he depended on skill of the craft and went ahead with the job instead of stopping and getting the procedure corrected through specified channels. This was a serious mistake because if he had been in the room when the safety release valve discharged, he would have been burned. (ORPS Report ALO-KO-SNL-NMFAC-2003-0009)

On December 12, 2001, at Rocky Flats, maintenance personnel decoupling an actuator from the facility service steam control valve removed the incorrect valves, and residual steam expelled the packing bore components. No one was injured, but the work instruction identified a step to be performed by "Craft," which assumed more than they could safely perform given the way the work package was written. The work package lacked both sufficient detail and drawings, and the actual valve configuration and work steps hadn't been clearly communicated between the planner and those performing the work. Although no one was injured, this event illustrates that work with steam should always be approached with utmost caution. (ORPS Report RFO--KHLL-374OPS-2001-0004; OE Summary 2002-04)

On March 3, 2001, Kansas City Plant D&D workers in a lift basket 20 feet above ground were lowering a section of a chilled water line when one of them leaned into and broke a 1¼-inch unsupported steam line. The work area was congested, making it difficult for the workers to see the steam line and maneuver around it. The steam line broke at a threaded reducer and bushing and discharged upward. The workers were able to lower themselves to the ground without injury, but the event was classified as a near miss. Investigation revealed that the contractor had used proper safety procedures for high lift work and a lockout/tagout, but the correct procedures related to the unsupported steam line had not been followed. (ORPS Report ALO-KC-AS-KCP-2001-0001)

All of these events underscore the importance of pre-work hazard analysis that involves not only planners but workers who perform the job on a day-to-day basis. Of necessity or by design, workplace steam is high temperature and high pressure. As a result, it can cause extensive injury to skin and lungs. Parts failure cannot always be predicted, but careful pre-work walkdowns would have identified the actual valves to be removed, the congested lines in overhead work areas, or the filter assembly jutting out into the Mouse House pathway. Following work procedures carefully and stopping when an inadequate procedure was encountered could have prevented injury as well. Workers must remember that activities they perform every day have health and safety implications.

FIRST AID FOR BURNS

Although we want to prevent burns, if one occurs, be prepared to treat it properly.

- **Cool the burn:** For first- and second-degree burns, cool the burned area — preferably with cool running water for 10 to 15 minutes. This lowers the skin temperature, which stops the burning process, numbs the pain, and prevents or reduces swelling. Third-degree burns require immediate medical attention.
- **Remove burned clothing:** Lay the victim flat on his or her back. Burned clothing may be stuck to the victim's skin. Unless material is on fire or smoldering, do not attempt to remove it. Remove jewelry or tight-fitting clothing from around burned areas before swelling begins and, if possible, elevate the injured areas.
- **Cover the burn:** After a first- or second-degree burn has been cooled, apply a clean, dry dressing to the burned area.
- **Don't apply butter** or any other grease (including medicated ointments) to a burn. Grease holds in heat, which could make the injury worse.
- **Don't break blisters:** This could allow germs to enter the wound.
- **Treat for shock:** To reduce the risk of shock, keep the victim's body temperature normal. Cover unburned areas with a dry blanket.

KEYWORDS: *Steam, heat, burns, hot water, near miss, injury*

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

3. *HOISTING SLINGS SNAP, DROPPING TWO-TON STEEL BLOCK*

On September 30, 2004, at the Stanford Linear Accelerator Center (SLAC), an improperly rigged 4,400-pound steel corner block that was being lifted with a 50-ton overhead bridge crane fell 8 inches to the floor when two of the slings supporting it broke. No injuries resulted, but the block was slightly damaged. (ORPS Report OAK--SU-SLAC-2004-0009)

Work stopped immediately. The SLAC hoisting and rigging subject matter expert re-created the event based on statements from the operator and helper. Figure 3-1 shows a diagram of how the load was rigged.

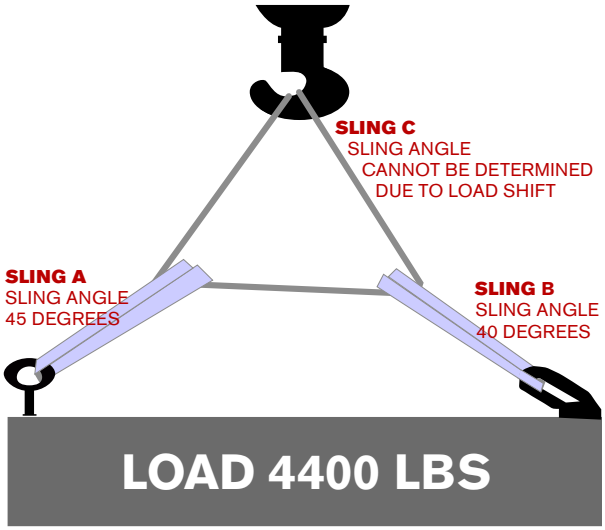

Figure 3-1. Rigging diagram

The rigger folded two 6-foot, 6,400-pound-capacity endless slings in half (shown in the figure as slings A and B), believing that doing so increased their weight capacity, but in actuality, it *decreased* their capacity. He folded sling A around the eyebolt and sling B around the swivel hoist ring. In this configuration, neither sling was long enough to reach the hook, so the operator joined them to the hook using sling C. This put slings A and B at angles of 40 and 45 degrees, which increased the stress on them by up to 1½ times. This additional stress meant that the slings were effectively sharing a 6,800-pound load, while their 6,400-pound weight capacity had been reduced.

Because the load's center of gravity was not in line with the lifting hook, sling C offered no load stability and could have allowed the load to shift or slide through it, even if slings A and B had not failed.

The load could have been lifted safely using a special lifting fixture designed for moving the block. The following corrective actions were taken.

- Revising facility hoisting procedures to include engineering oversight of all lifts and guidance on using special lifting devices for moving irregularly shaped loads such as the steel blocks.
- Comparing facility hoisting procedures to the SLAC hoisting and rigging policy.
- Revising hoisting and rigging training to include a refresher training course and hands-on-rigging practice.

Another example of improper rigging occurred at the Strategic Petroleum Reserve Big Hill Site, on July 10, 2003, when two choker slings that were connected to a 22-ton mobile crane to lift an I-beam column slipped. The beam fell straight down, struck the top rail of a manlift basket, and fell to the ground. There were no injuries. (ORPS Report HQ--SPR-BH-2003-0005)

The following causal factors were identified.

- Subcontractor riggers were unqualified and used an improper rigging technique.
- No one performed a job safety analysis before making the lift.
- The nylon chokers were visibly damaged and had not been inspected before use.

Corrective actions focused on ensuring that all riggers were trained and qualified, documenting rigger qualifications, and inspecting rigging equipment before using it.

DOE-STD-1090-2004, *Hoisting and Rigging (formerly Hoisting and Rigging Manual),* provides guidance for all of the deficiencies

identified in these events, including rigging equipment, training, and roles and responsibilities.

These events illustrate the importance of rigging loads correctly. It is not enough to simply use a sling with greater weight capacity than the load. The shape and orientation of the load must also be considered. Neither "making do" nor jerry-rigging is an acceptable practice. Managers should clearly designate roles, responsibilities, and authorities for all members of a rigging crew and should clearly understand their training and skill limitations.

KEYWORDS: *Rigging, hoist, near miss, sling, dropped load*

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

4. GOOD PRACTICE—PROPERLY TIED-OFF FALL PROTECTION PREVENTS INJURY

On January 25, 2005, at the River Protection Waste Treatment Plant construction project, an electrician slipped and fell about 3 feet from a height of 55 feet before his fall protection equipment (a harness and double lanyard) caught him. Because he correctly maintained tie-off points above his body, he was not injured. The electrician was descending a rebar wall like the one shown in Figure 4-1 when his foot slipped and he fell. He continued his descent down the wall and reported the incident to his supervisor. (ORPS Report RP--BNRP-RPPWTP-2005-0002)

Many people across the complex work at elevations and must therefore use the appropriate fall protection for the work they are doing. The following list shows the OSHA regulations for various types of elevated work.

- 29 CFR 1910 Subpart D, *Walking-Working Surfaces*
- 29 CFR 1910 Subpart F, *Powered Platforms, Manlifts, and Vehicle-Mounted Platforms*

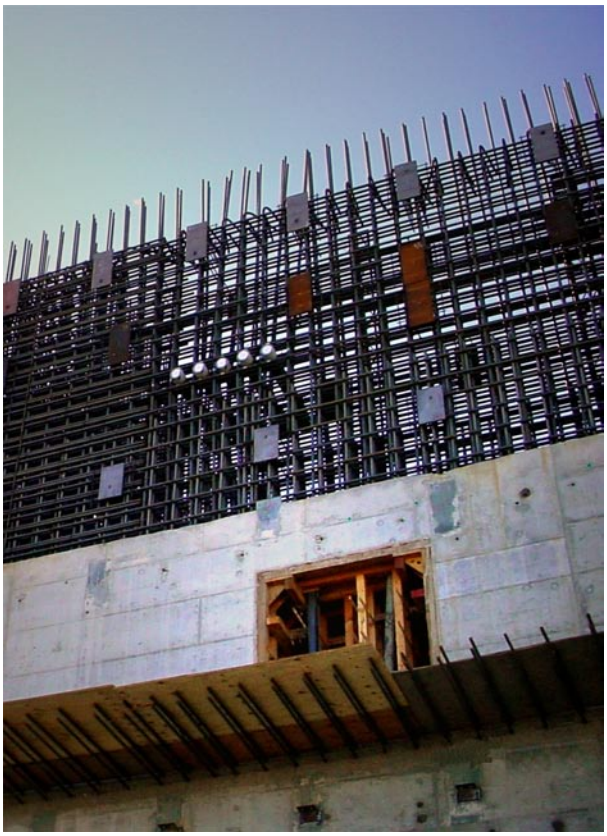

Figure 4-1. Rebar wall

- 29 CFR 1926 Subpart M, *Fall Protection*
- 29 CFR 1926 Subpart X, *Ladders*
- 29 CFR 1926.451, *Scaffolding*
- 29 CFR 1926.760, *Fall Protection* (for steel erection activities)

In at least 10 events identified in ORPS workers were observed wearing harnesses, but their lanyards were not connected to a tie-off point or their lanyards were not tied off properly. Examples of these events include the following.

On September 16, 2003, at the Fernald Closure Project, a DOE facility representative observed an ironworker climbing out of the basket of an aerial lift wearing a harness and lanyard secured to the basket. The ironworker did not realize that the basket was not designed to withstand the force of a fall and should not be used as a tie-off point. (ORPS Report OH-FN-FFI-FEMP-2003-0023)

The ironworker stated in an interview that he understood that workers were allowed to leave a manlift basket if they were tied-off and that the only tie-off point available was the basket itself. The steel erection contracts for the Fernald Silos Project state, in part, that manlifts "shall not be used as a means of access and egress to other elevated workstations without prior approval of Fluor Fernald." Fluor Fernald procedure directs operators of power lifting platforms: "Do not climb out of the platform to an elevated work location without a documented evaluation and approval performed by Safety and Health"; however, there was no documentation indicating that either occurred for this task.

On December 12, 2002, at Los Alamos National Laboratory, a construction safety inspector suspended work when he saw four subcontractor roofers wearing fall-protection harnesses with lanyards that were not attached to any point on the roof, as required by the activity hazard analysis and safety plan. The inspector also found that the subcontractor had failed to establish a warning line or assign a safety monitor as required. (ORPS Report ALO-LA-LANL-HEMACHPRES-2002-0006)

OE Summary 2004-05 described an earlier near-miss fall at the Waste Treatment Plant construction site. On March 22, 2004, an ironworker securing a splice curtain repositioned himself but failed to ensure that the positioning hook on his lanyard was fully engaged. When he leaned back, the positioning hook came free and he fell nearly 6 feet before his fall protection equipment stopped him only 3 feet above a concrete slab. (ORPS Report RP--BNRP-RPPWTP-2004-0004)

Personnel working at heights must take their own safety seriously. They need to wear fall protection correctly, avoid potential fall areas whenever possible, and comply with safety procedures. Disregarding safety requirements cannot be tolerated and must be dealt with immediately and unequivocally. Fall protection is only as effective as the existence, use, and strength of the tie-off points. Maintaining tie-off points above the body can reduce the potential for injuries if a fall does occur.

KEYWORDS: *Fall protection, near miss, lanyard, good practice*

ISM CORE FUNCTIONS: *Analyze the Hazards, Perform Work within Controls, Provide Feedback and Improvement*

Follow-Up

OE Summary 2005-03 featured an article entitled *D&D Workers Engage in Unsafe Horseplay* that described workers shooting small objects around the room with an air hose. Some of the objects penetrated a wall of an adjacent room where pressurized gas cylinders were stored.

One of our readers raised safety concerns about the configuration of the cylinders and the manner in which they were stored. The facility manager has assured us that the gas bottles in question were removed from the building shortly after the picture was taken and were safely dispositioned.

Commonly Used Acronyms and Initialisms

Agencies/Organizations	
ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
CPSC	Consumer Product Safety Commission
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

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

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

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