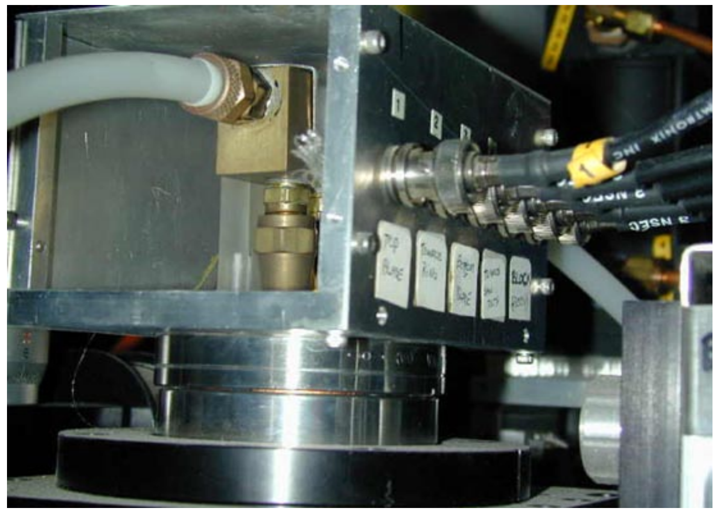
OPERATING EXPERIENCE SUMMARY



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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 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/jit.html.

EVENTS

1. INADEQUATE EQUIPMENT ISOLATION RESULTS IN ELECTRICAL SHOCK

On August 10, 2004, at the National Synchrotron Light Source, a utilities technician received an electrical shock when his wrench contacted an energized source when he attempted to disconnect a water hose on a photon beam position monitor. The technician believed that the power to the equipment had been shut off and the equipment was safe to work on; however, that was not the case. Medical staff examined the technician, performed an EKG, and released him to return to work. (ORPS Report CH-BH-BNL-NSLS-2004-0002)

The utilities technician was assigned to perform preventive maintenance on the X1 beamline that involved replacing the cooling water hoses. Because he was not familiar with the beam position monitor (located on the front-end area of the beamline) where water hoses were attached, he was directed to speak with a Local Beamline Contact (researcher). The researcher was well informed about the beam position monitor and had used it during beamline operations.

The researcher met with the technician and helped him remove the front plate of the box around the top of the monitor to access the hose connection inside. The researcher told the technician that the beam position monitor motors were off (signal/power cables with bayonet-type [BNC] connectors were disconnected from the motor controller at the time). Believing that area was safe, the technician reached inside with his wrench and made contact with the nut that secured one of the hoses, while his other hand was touching the aluminum foil surrounding the beam pipe, and immediately received an electrical shock. Figure 1-1 shows the hose and connection nut inside the box on the beam position monitor.

A team of experts from the electrical section located the source of power to the beam position monitor, de-energized it, and locked and tagged it out. Later, during controlled testing they determined that the power supply could provide approximately 300 volts DC and 18 milliamps.

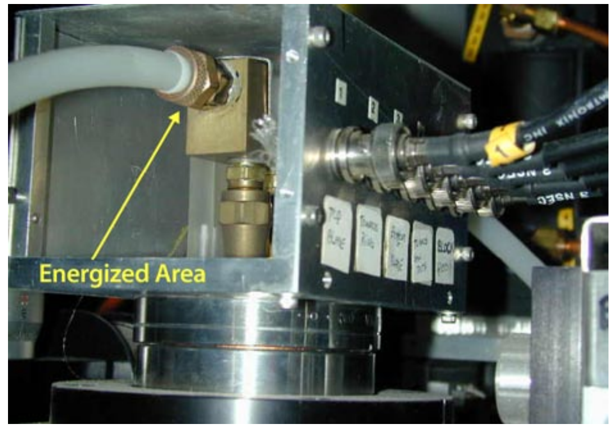

Figure 1-1. Beam position monitor and location of the energized nut

A causal analysis of this incident was conducted and investigators identified six factors that, if corrected, would have prevented this event. The following is a summary of these causal factors.

1. The technician assumed that the system was in a safe configuration to begin work based on the actions and information given by the researcher. He did not seek confirmation that power was off. The technician is lockout/tagout-qualified and should have taken steps to ensure all high voltages were locked and tagged out and verified the absence of energy.

2. The researcher was not aware that the beam position monitor was energized at 300 volts and not aware of the location of the power supply. Although she had used the equipment, the researcher was not knowledgeable about either the hazards or how to safely secure the monitor.

3. A caution sign that clearly warned of hazards (i.e., "300 VDC Power Supply") inside the box was found lying face down near it. The tape holding the sign had degraded over time, and the sign eventually fell off.

4. Previous use of a lockout/tagout to secure the power supply was not documented, resulting in a loss of historical information. In April 2001, the hoses were replaced without incident because a lockout/tagout was used; however, when the job was scheduled again for this year, no one could remember the hazards.

5. Based on the material covered in a safety training module the researcher believed that BNC cables were only used for less than 50 volts AC or DC. Although information in the safety training module limits the use of BNC cables and connectors for new applications to less than 50 volts, there was no mention that older, existing BNC cabling could contain higher voltages.

6. Equipment responsibility was not adequately assigned for the beam position monitor. The department list of equipment and responsible persons was incomplete and did not identify a person responsible for the photon beam position monitor.

DO NOT ASSUME that the system is in a safe configuration to begin work. Always verify that hazards have been isolated.

Another important issue identified by the investigation team was that the procedure for hose replacement did not contain any safety instructions or identify knowledgeable people.

This event illustrates the importance of conducting a proper hazards identification and use of physical barriers, such as a lockout/tagout, to prevent electrical shock or injury. Subject matter experts should be consulted in this process to ensure that all hazards are addressed and correct isolation points are identified. Work procedures for maintenance activities should include standardized lockout/tagouts and zero-energy checks, which improve job preparation and document important safety information, thus eliminating reliance on recollection or inexperience.

KEYWORDS: *Shock, electrical safety, lockout/tagout, communication, warning sign, beamline*

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

2. RECENT TREND INVOLVING DECOUPLED FIFTH WHEELS

During the first 9 months of 2004, there were six events involving trailers that uncoupled from the semi tractors pulling them. The cause of most of these events was the driver's failure to ensure that the latching mechanism (fifth-wheel coupling) was fully engaged. The Office of Environment, Safety and Health has examined these events to discover lessons learned and good practices that can be passed on to other facilities. A brief description of fifth wheels is given below, along with a synopsis of each event.

A tractor and trailer are joined together by a fifth-wheel coupling, which consists of two metal plates: the lower fifth wheel, which is mounted on the tractor; and the upper fifth wheel, which is mounted on the trailer (Figure 2-1). The upper fifth wheel consists of a flat plate and a kingpin. The lower fifth wheel has locking jaws that lock around the kingpin to connect the tractor and trailer. The two parts, locked together, allow rotational and vertical movement between the tractor and trailer.

On February 12, 2004, at Rocky Flats, a flatbed trailer loaded with low-level waste (LLW) packages disconnected from the tractor. The

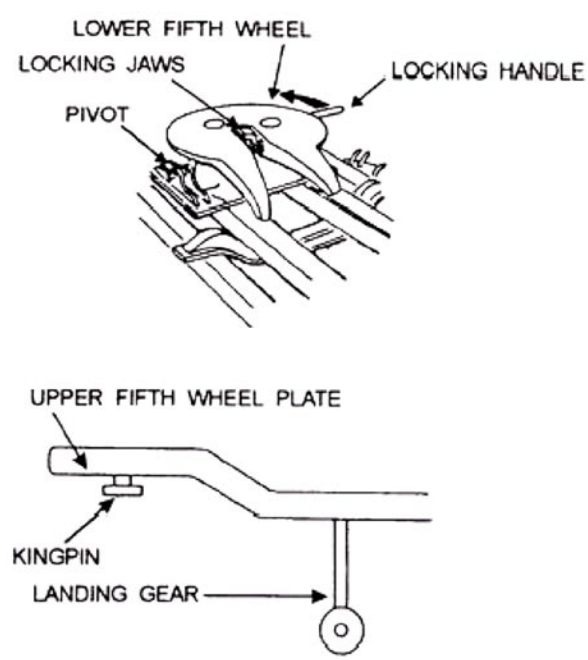

Figure 2-1. Diagrams of lower and upper fifth wheels

trailer came to rest on the right-side wheels of the tractor and the trailer's right landing gear. The LLW packages remained on the trailer, and there was no release of material and no personnel injury. An investigation disclosed that the driver failed to ensure that the fifth-wheel coupling was fully engaged. (ORPS Report RFO--KHLL-TRANSOPS-2004-0003)

Two months later, on April 14 (also at Rocky Flats), a flatbed trailer carrying two cargo boxes containing LLW to an offsite disposal facility disconnected from the tractor as the driver entered a state highway from a site access road. The trailer's landing gear collapsed, but the trailer remained upright, and the cargo boxes remained secured to the trailer. This event also resulted from the driver's failure to ensure that the fifth-wheel plates were properly latched. There was no injury or release of material. (ORPS Report RFO--KHLL-TRANSOPS-2004-0003)

As a corrective action, all drivers have been requalified, including requalification on fifth-wheel engagement verification. Annual refresher training will also include the topic of the fifth-wheel coupling. The site has also instituted a preoperational procedure for all drivers requiring them to get out of the cab and physically verify that fifth-wheel latches are fully engaged. For the first several weeks following the adoption of this procedure, senior supervisors accompanied drivers to ensure they were performing these inspections, thereby helping to establish the inspection as a habit. Supervisors continue to enforce this procedure by spot-checking drivers periodically.

On August 3, 2004, at Argonne National Laboratory–West, maintenance personnel were moving a tractor and trailer following routine maintenance when the kingpin came free from the tractor hitch. The trailer slid back to the tractor frame, causing minor damage to the trailer. No injuries occurred, and no nuclear material was involved. (ORPS Report CH-AA-ANLW-ANLW-2004-0009)

The driver and two operators heard the hitch engage and tested the connection by pulling the tractor forward with the brakes locked. Following the satisfactory test result, the driver locked the hitch and began backing the trailer, with the two operators watching. As the driver began pulling the trailer forward, he noticed that the trailer had stopped moving and stopped the truck. The driver and operators chocked the trailer wheels, lowered the jacks to take the weight off the front of the trailer, and notified management. An extensive investigation has failed to uncover a definitive cause for this incident.

On August 9, 2004, at the Kansas City Plant, two workers connected a tractor to a government-owned trailer, following the necessary steps, including a pull test, to make sure that the trailer was secured to the tractor. The tractor had pulled the trailer through a parking lot intersection about 150 to 200 feet when the trailer disconnected from the tractor. The tractor-trailer was traveling approximately 10 miles per hour when the trailer disconnected. The trailer landed on the retracted landing gear and slid approximately 20 feet through the north parking lot. No one was injured. (ORPS Report ALO-KC-AS-KCP-2004-0024)

Investigators determined that the kingpin (shown in Figure 2-2) was probably not fully engaged and locked during the coupling procedure. They believed that the trailer was likely too high when the coupling procedure was initiated. This allowed the fifth wheel latch to engage but not completely grasp the kingpin. In effect, the kingpin was resting on a lip within the fifth-wheel latch and was not completely secured. This condition allowed the operator to think that the coupling was completed. When the operator accelerated from a dead stop, the trailer kingpin lifted out of the fifth-wheel latch and the trailer slid off the tractor and fell to the pavement.

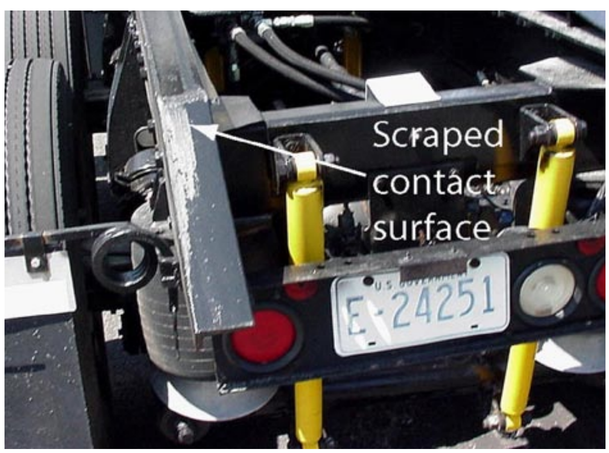

Figure 2-2. Upper fifth-wheel plate

As a result of this event, the following corrective actions have been completed:

- The drivers and independent verifiers were trained to visually check the coupling and sign off per procedure that a positive coupling had been made before any movement of a trailer.
- Complete vehicle inspection checklists and coupling charts with pictures (courtesy of the Holland Group, Inc.) are provided to the driver and independent verifier so that they know exactly what to look for to ensure a positive hookup to the trailer. This information is available on each tractor.
- After verification of positive coupling, a pull test is performed to verify positive hookup.
- Lights have been installed on the tractors to assist in coupling verification.

On August 25, 2004, at the Pantex Plant, transportation personnel coupled a tractor to a secure transporter trailer and performed a pull test. The driver pulled off of the parking pad and turned onto the roadway. After traveling about 100 feet, the driver felt the trailer disconnect from the fifth-wheel mechanism and immediately stopped. The trailer landed on the tractor frame and tires and caused slight damage to the front of the trailer. (ORPS Report ALO-AO-BWXP-PANTEX-2004-0088)

Trailers can uncouple from smaller vehicles as well. On September 10, 2004, at the Nevada Test Site, a pickup truck towing a trailer and generator was traveling on a highway when a low spot in the road caused the trailer to jump and disengage from the trailer hitch ball. The driver stopped on the side of the highway. The trailer and generator sustained minor damage. During a critique, the participants determined that the safety tongue of the trailer hitch was wedged in the upper portion of the hitch housing, which prevented the latch from engaging. The driver inspected the trailer after it was connected to the pickup truck and was unable to visually confirm that the latch was properly engaged. The site has instructed its drivers to look under the housing to do a second check of the trailer hitch before placing the hitch ball. (ORPS Report NVOO--SN-NTS-2004-0001)

Subpart F to 49 CFR, *Coupling Devices and Towing Methods,* contains clear requirements on locking fifth-wheel assemblies. Section 393.70(b)(2) states,

> Every fifth wheel assembly must have a locking mechanism. The locking mechanism, and any adapter used in conjunction with it, must prevent separation of the upper and lower halves of the fifth wheel assembly unless a positive manual release is activated.

These events illustrate the importance of using all possible means to ensure that fifth-wheels are fully engaged before departure, including physically looking under the latch to ensure that it is locked in place. The corrective actions taken at Rocky Flats and at Kansas City constitute Good Practices that other sites may consider implementing. The Office of Environment, Safety and Health published an OE Summary article on fifth wheels in OE Summary 2002-24.

KEYWORDS: *Tractor, trailer, hitch, fifth wheel, disconnect, coupling*

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

3. OSHA ISSUES SAFETY AND HEALTH BULLETIN ON WIRE FORM ANCHORAGE CONNECTORS

Figure 3-1. A spring-loaded wire form anchorage connector

The Occupational Safety and Health Administration (OSHA) recently issued a safety and health bulletin on the hazards of misusing wire form anchorage connectors (Figure 3-1) for fall protection. These are used as portable and temporary connectors for fall-arrest systems and to position equipment.

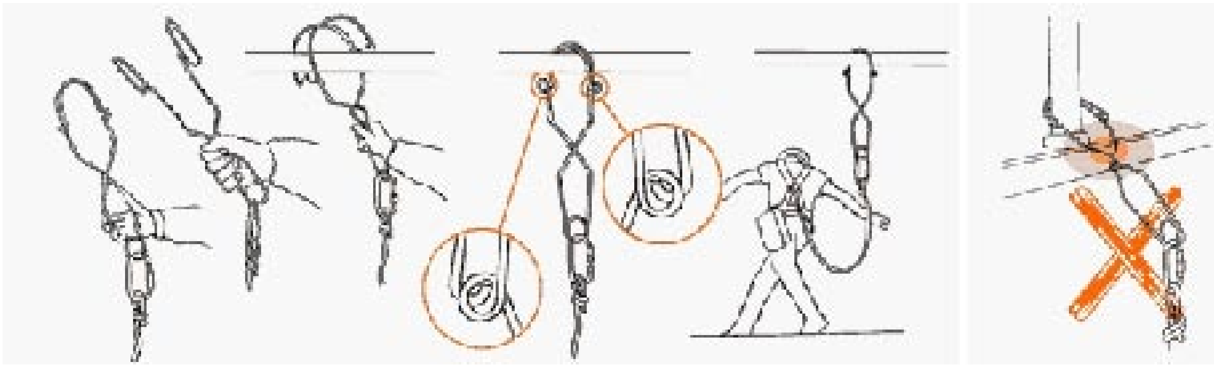

Figure 3-2. Correct (left) and incorrect (right) way to connect to an anchorage

OSHA issued the bulletin following a fatal accident in North Dakota that occurred when a worker used a spring-loaded wire form anchorage connector as part of a fall-protection device while upgrading the structural members of a tower. The worker fell approximately 75 feet when the device failed.

The worker apparently attached the wire form anchorage connector to a diagonal tower member instead of connecting his fall arrest system directly to an anchorage, as the manufacturer recommends. Figure 3-2 illustrates the difference. This positioned the anchorage connector so that the worker's weight exerted a significant side load on the connector. These connectors are designed to be used vertically by being hooked to an anchorage directly above the worker — they are not designed to hold side loads.

The OSHA bulletin included requirements for the use of personal fall-arrest systems and positioning device systems for construction, which are given in 29 CFR 1926.502 9(d) and (e). In addition, the bulletin advises:

- Employers must only use personal fall-arrest system connectors and positioning device system connectors that meet applicable OSHA regulations.
- Employers must train employees on the appropriate use of personal fall-arrest systems and positioning device systems and ensure that such systems are connected only to compatible components.
- Contractors and other employers should review manufacturer instructions and markings and must ensure that the wire form anchorage connector is the appropriate anchorage connector for the situation and work environment in which it will be used.

The OSHA Safety and Health Bulletin can be found on the OSHA website at: http://www.osha.gov/dts/shib/shib090104.html.

4. REMINDER: SEASONAL WEATHER CHANGES ARE ON THE WAY

Once again it is time to review site freeze protection activities and begin to prepare for snow, freezing rain, sub-zero temperatures and the resulting burst pipes, frozen water lines, cracked sprinkler heads, and power outages. At some DOE sites, inclement weather begins early in the season. Last year, for example, rapidly dropping temperatures and freezing rain resulted in two late October events at Rocky Flats.

On October 30, 2003, ice buildup on power lines resulted in loss of power to a building at Rocky Flats. Consequently, power was also lost to building exhaust fans. Workers had left transuranic waste in a repacking glovebox at the end of shift, and the fans are required to be operable if transuranic waste is in a glovebox. Operations were suspended in the affected area until power could be restored and the fans could be restarted. (ORPS Report RFO--KHLL-WSTMGTOPS-2003-0024).

On the same day, a cold front caused temperatures at Rocky Flats to drop rapidly in the early evening hours. A bank of electric pre-heaters that had been newly installed during a recent conversion from steam to electric heating failed and did not supply heat to incoming air. When the temperature dropped below the freeze-protection setpoint, a facility ventilation system automatically cycled to a minimum vent condition. Operations were suspended until portable heaters raised the air temperature enough to return to normal operating conditions. (ORPS Report RFO--KHLL-ANALYTOPS-2003-04)

A number of actions can be taken now to ensure that damage to systems and facilities is avoided when inclement weather arrives. Current freeze protection plans should be reviewed and updated, and contingency plans for especially severe weather should be made and incorporated into written procedures. In addition, the following list identifies some typical freeze protection measures that can be put in place before winter arrives.

- Establish a task team to develop, implement, and verify severe weather protection plans.
- Inspect, service, and test facility heating systems and ensure that power and temperature controls cannot be deactivated inadvertently.
- Check antifreeze in cooling systems and replace it if necessary.
- Install temperature alarms or automatic backup heat sources on vulnerable systems.
- Inspect outside storage pads and unheated storage areas and provide any additional protection necessary to ensure that stored materials are not affected by inclement weather or freeze damage.
- Inspect heat-trace tape for signs of degradation and replace as necessary.
- Examine wet-pipe sprinkler systems for areas susceptible to freezing and develop preventive or compensatory measures to ensure continued operation.
- Inspect dry-pipe fire-suppression systems and ensure that all water is drained.
- Review controls on temporary equipment to ensure availability of freeze protection measures when needed.
- Review procedures to ensure that compensatory measures are in place should power be lost to heat-tracing tape or other freeze protection equipment.
- Review the current status and configuration of shutdown facilities to determine if freeze protection is required.

It is also important to inspect and repair outdoor circuits, such as those used for vehicle block heaters or power tools, before the onset of winter weather. Also, even though ground fault interrupters should be tested monthly, this may not always be the case, and they should be checked to ensure that they are working properly before heavy seasonal usage begins.

A lessons-learned report, *Freeze Protection during Extreme Temperature Excursions* (SELLS Identifier 1996-05-15), recommends factoring experiences from previous winters into checklists and procedures and setting "triggers" to start precautionary actions in preparation for cold weather. Additional freeze protection recommendations can be found in OE Summary articles 2002-22 and 2003-23. In addition, an INPO (Institute of Nuclear Power Operations) Just-In-Time Operating Experience Report, *Cold Weather Preparations* (October 2003), discusses the impact of cold weather on recirculation and instrumentation lines and on cooling systems and provides a list of actions to take when preparing for cold weather.

Section 4.18 of DOE G 433.1-1, *Seasonal Severe Weather and Adverse Environmental Conditions Maintenance*, provides guidance for cold weather preparation, including guidance to assist facility maintenance organizations in reviewing existing freeze protection plans and developing new methods for establishing a seasonal maintenance program. An example of a cold weather checklist is also provided in this Guide (see textbox).

In addition to ensuring that all facility systems are protected against freezing temperatures, it is also important to remind employees of the risks involved in traversing roads and sidewalks

Example Cold Weather Checklist

In September —

- ✓ Increase facility surveillance to identify areas with a high probability for freeze damage and generate corrective actions.
- ✓ Check status of winter/foul weather gear, tools, and equipment to ensure adequacy for personnel use during outdoor work.
- ✓ Plan and schedule final outages on steam systems.
- ✓ Coordinate semiannual boiler inspections.
- ✓ Plan and schedule seasonal facility preservation work orders and job requests.

In October —

- ✓ Disseminate annual reminder on seasonal facility preservation precautions.
- ✓ Coordinate between building and maintenance managers to ensure timely scheduling and completion of seasonal facility preservation.
- ✓ Complete semiannual boiler inspections.
- ✓ Complete maintenance activities that require steam system outages.

in snow and ice. Winter slips and falls can result in broken bones; icy roads can cause drivers to lose control of their vehicles, resulting in serious injuries or fatalities. Notices about these hazards, urging caution in treacherous weather conditions, should be issued to all employees, and a policy should be in place that guides supervisors in deciding when to cancel outside work tasks in inclement weather.

These events demonstrate that inclement weather can arrive as early as late fall. It is essential to ensure that freeze protection plans have been reviewed and updated and that freeze protection measures are in place before the onset of winter weather. Preventing freeze damage requires diligence in performing the preliminary inspections, attention to detail in correcting deficiencies, incorporating lessons learned from previous winters, and continued monitoring during cold weather. Employees should be reminded to take precautions when driving or walking on snow and ice to avoid injuries from slips and falls or vehicular accidents.

KEYWORDS: *Freeze protection, maintenance, winterize, ice, slips and falls*

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

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