OPERATING EXPERIENCE SUMMARY

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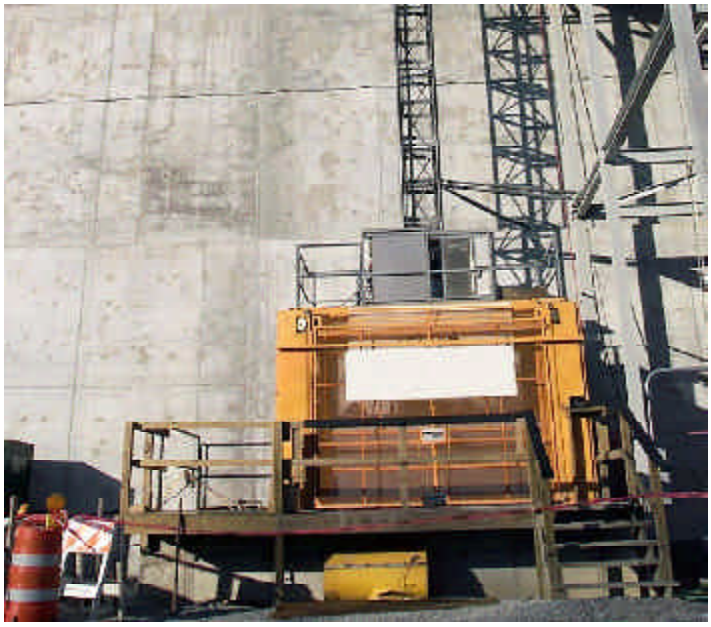

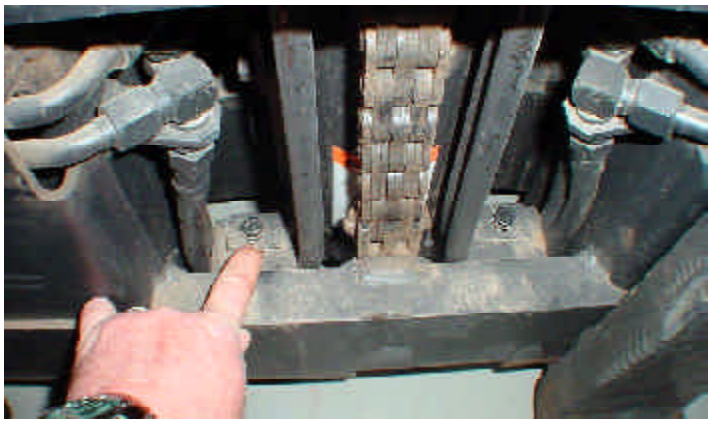

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The Office of Environment, Safety and Health, Office of Corporate Performance Assessment publishes the Operating Experience Summary to promote safety throughout the Department of Energy complex by encouraging the exchange of lessons-learned information 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 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. WORKER INJUREDWHEN PERSONNEL HOIST FALLS

On January 6, 2004, at the Fernald Environmental Management Project, a hoist operator was injured when the car of a personnel hoist dropped approximately 20 feet before a pneumatic safety buffer stopped it. Medical personnel characterized the worker's injury as "soft tissue swelling" in her lower back. Despite a 7-week investigation of the incident, investigators were unable to identify any combination of mechanical or electrical material conditions or personnel errors that caused the incident. (ORPS Report OH-FN-FFI-FEMP-2004-0001, final report filed April 15, 2004)

The hoist operator was performing daily operational checks and began to drive the car to the upper platform. Approximately halfway up the car suddenly stopped, and the operator could not re-start it. She called her supervisor on a cellular phone, told him what had happened, and said that her back hurt. She asked him to arrange for a bucket truck to get her out of the inoperable hoist.

When the supervisor and two others arrived with a bucket truck, the hoist car was fully lowered into the bottom enclosure, resting on the buffer limit stop connected to a pneumatic piston, and the car floor was 14 inches below the normal bottom platform position. The operator was standing in the hoist car, but she was bent over and complained of a sharp pain in her lower back and a loss of feeling in her legs. Responders placed the operator on a backboard to support her injured back and transported her to a local hospital, where she was examined and kept overnight for observation.

The rented personnel hoist (one car on a tower) had been in use at the Fernald Silos Project Tank Transfer Area since August 14, 2003. It has a 3-ton capacity and a vertical travel path (lower to upper platform) of 36½ feet. Figure 1-1 shows the hoist involved in the accident. An inspection of the hoist following the incident revealed that the housing for the high speed up/down switch was filled with water. This water probably came from a severe rain storm 2 days

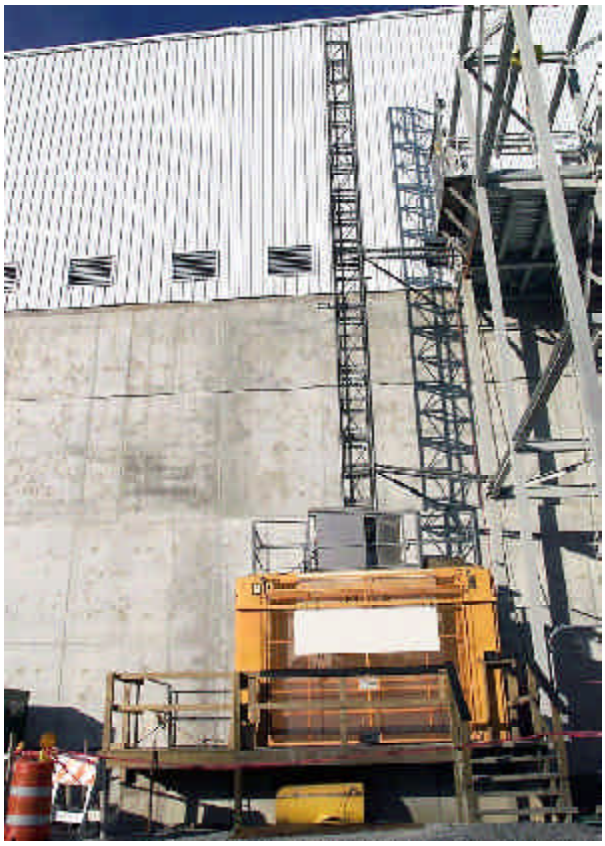

Figure 1-1. Hoist involved in the incident.

before the incident that dropped 3.3 inches of rain. It is possible that the submerged high-speed up/down switch contributed to the occurrence, but investigators could not substantiate this theory. However, they believe the rain may have been the cause of a "squealing" noise heard during hoist operation the day before the incident.

Investigators interviewed the hoist operator, those who responded to her call for assistance, and hoist manufacturer and equipment rental company personnel during the investigation. They also had an independent hoist inspector examine the hoist. The hoist was operated numerous times in the course of the investigation, and it never exhibited the behavior described by the operator. Investigators did learn that a similar abrupt stop of the hoist had occurred a week before the event; however, no deficiencies were found during subsequent troubleshooting.

Investigators could not identify any failures on the part of the hoist operator or find any

problems with the material condition of the hoist that might have caused the hoist to suddenly stop and fall.

Anomalies associated with the hoist and its operation that may have contributed to the incident included the following.

- The manufacturer's manual for the hoist, and a plaque mounted inside the hoist car, state that the hoist is not to be operated with ice on the mast or power cable. The temperature at the time of the incident was 14°F, and there was ice on the mast roller bearings and the power cable.

- The hoist rental contract requires operators to receive training in hoist operation. No records of such training could be found.

- Periodic preventive maintenance is required by the hoist rental contract. Records of hoist maintenance are incomplete. Only one completed monthly service checklist was located, no documentation was found on a required lubrication schedule, and numerous maintenance log-keeping errors were identified.

- Corrective maintenance records were also incomplete. No service ticket was located for a service call a week before the incident when the hoist stopped unexpectedly.

- The day before the incident, a worker reported that the hoist had made a "squealing" noise as it moved from the lower platform to the upper platform.

Because of the lack of conclusive evidence that the hoist failed because of some electrical or mechanical malfunction or personnel action, the reliability of the hoist could not be demonstrated. In accordance with this conclusion, site management decided to dismantle the hoist remove it from the site.

OSHA regulation 29 CFR 1926, Subpart N, *Cranes, Derricks, Hoists, Elevators, and Conveyors*, section 1926.552(c), *Personnel Hoists*, contains requirements related to hoist towers, hoist cars, doors, and gates, car enclosures, normal and emergency stopping devices, materials of construction, inspection frequency, and maintenance. The rented personnel hoist reportedly was inspected before it came to the site and was judged to be in compliance with OSHA regulations.

A search of the ORPS database revealed no occurrences similar to this one in the last several years. However, there are a number of occurrence reports describing unanticipated safety hazards associated with rented equipment or equipment brought onsite by vendors. For example, on March 29, 2004, at the Nevada Test Site, an equipment inspector started a previously rented trailer-mounted electrical generator and immediately saw electrical arcing. Investigators determined that the bare conductors of a coiled power cable, located inside a metal box on the trailer, were touching metal while the other end of the cable was connected to the bus bars. (ORPS Report NVOO-BN-NTS-2004-0004)

GOOD PRACTICES FOR OBTAINING AND USING RENTAL EQUIPMENT

- Prepare specifications listing the functional requirements of the equipment to be rented and verify that they are met.

- Ensure that the rental contract reflects the interests of the contracting facility and appropriately distributes liability issues associated with the equipment.

- Inspect equipment to be rented before executing the contract and bringing the equipment to the site.

- Ensure that equipment meets all appropriate regulations and standards (e.g., OSHA requirements and national standards for design and manufacture).

- Inspect the equipment when it is on site and before it is put into use.

- Perform preventive and corrective maintenance on the equipment in accordance with the rental agreement and as if it were owned, rather than rented.

- Prepare and retain comprehensive records on the operation, inspection, and maintenance of equipment, as well as any equipment malfunctions.

On August 20, 2003, at Fernald, the hinged lid to a sandblasting pot blew off while being pressurized and flew approximately 500 feet. The sandblasting unit was brought on the site by a painting subcontractor. Investigators determined that hold-down fasteners had failed because of excessive wear. The Fernald contractor's lesson learned emphasized the need to ensure that subcontractor and vendor-owned equipment is safe to operate on their site. Safety inspections for wear or abuse should be performed when rented equipment is in use because the vendor may not have the same commitment to quality and safety as the contractor.

These events underscore the need to perform comprehensive safety inspections and regular maintenance on equipment rented from others. The equipment user organization is responsible for ensuring that the rented equipment does not present unanticipated safety hazards to workers. Contracts with equipment rental companies need to address liability issues and responsibility for correcting defective or malfunctioning equipment.

KEYWORDS: *Personnel hoist, personal injury, rented equipment, maintenance, training, operations manual precautions*

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

2. LACK OF CONFIGURATION MANAGEMENT RESULTS IN NEAR MISSES

Since January 2003, eight near misses across the DOE complex have been attributed to inadequate configuration management. Although no one was injured in these events, a lack of up-to-date, accurate building/project drawings presents the potential for injury and even death.

On March 16, 2004, at the Savannah River Site, workers conducting a general preventive maintenance inspection performed a voltage check and discovered 100 volts potential on a locked out/tagged out terminal switch. Investigators determined that configuration management for the equipment was inadequate. No injuries resulted from this near-miss incident, and there was no equipment damage. (ORPS Report SR--WSRC-FCAN-2004-0003)

Investigators determined that during job scoping workers did not identify the energized circuit and its connection to another feed before they locked out the switchgear. Workers reviewed the applicable electrical prints and reference drawings before work began, but the drawings had not been updated to reflect equipment modifications during installation. Investigators determined that the configuration management process to validate the lockout/tagout was inadequate, as was the availability of electrical prints or equivalent drawings.

In January 2004 at the Hanford Site, an electrical near miss occurred during concrete core drilling. Based on drawings, scans, and facility knowledge, workers believed that they were drilling into rebar; however, the "rebar" was actually an electrical conduit. No as-built or other facility drawings in files or on microfilm showed embedded conduit, and extensive records apparently did not reveal all historical construction details. In addition, the procedure contained adequate instructions, but workers received inadequate information that led them to believe that certain steps, such as "use controls in the presence of electrical circuits," did not apply. (RL--PNNL-PNNLBOPER-2004-0001)

Also in January 2004 at Oak Ridge National Laboratory, a stainless steel gasket was found to be missing from a reactor mockup shroud flange, resulting in a Potentially Inadequate Safety Analysis. Investigators determined that the shroud flange gasket was not there when the spare outer shroud was installed in 1983. An Unreviewed Safety Question Determination concluded that reactor operation without the gasket did not constitute an unreviewed safety question and a design change was issued directing that the O-ring was to be eliminated from designs and drawings. Requirements have significantly changed since 1983, providing reasonable assurance that current documentation reflects as-built status. (OR--ORNL-X10HFIR-2004-0002)

Last October, at Pantex, a worker excavating a hole by hand to install a door counterbalance discovered unmarked wires in a corroded, broken conduit. The worker was following an approved procedure, and an approved excavation permit had been issued that specifically ordered hand-digging because of unknowns in the area. Available drawings did not include the wire lines discovered at the excavation site, and the utility locator did not find them when he performed a pre-permit scan of the area. It is likely that the lines and steel conduit were installed more than 35 years ago, before configuration management was implemented at the site. In addition, the conduit had not been wrapped to protect it from deterioration, as is the current practice. Both managers and workers are aware that there is no accurate, complete description of underground utilities for old installations at Pantex. Although processes are in place to ensure checks for underground utilities, the existence of some may still be obscured or unknown. As a result, the excavation- permitting process provides for conservatism and, as in this case, prescribes hand-digging. Drawings will be updated to indicate where conduit and wiring are located at the site. (ALO--AO-BWXP-PANTEX-2003-0050)

Also in October 2003, at Lawrence Livermore National Laboratory, a fan shutdown caused loss of negative air pressure, releasing contamination into a room. Subsequently, investigators discovered that the door seals were missing. Further investigation revealed that the seals had been removed 8 to 10 years earlier and were never replaced. Lack of a configuration management system allowed the seals to be removed without other controls being implemented. In this event, airborne contamination was localized, but there was the potential for wider dispersion in the seals' absence. (OAK--LLNL-LLNL-2003-0035)

Last August, at the Oak Ridge Y-12 Site, the Fire Department responded to a call about an acrid odor on three floors of a building and smoke coming from a covered structure running along the ceiling of an unoccupied second floor laboratory. The duct-like structure looked like sheet metal covering for a ventilation duct and was not labeled. Information available to Fire Department and operations personnel indicated that the structure was a ventilation duct, but when the duct was opened, they found it was a cover for a bus bar that heated a third-floor induction furnace. Since 1961, power supply, furnaces, water supply, and other equipment have been reconfigured and relabeled four times; the ventilation system was upgraded in 2002. Inadequate as-built drawings for furnaces and supporting equipment resulted in a near-miss event when the Fire Department broke into the electrical chase. (ORO--BWXT-Y12SITE-2003-0033)

Last June, at Los Alamos National Laboratory, Chemistry and Metallurgy Research Facility staff were in the process of upgrading deficient as-built drawings to more accurately report and perform surveillances on combustible loading controls in the facility, which had inaccurate room numbers. However, changes were made without reviewing the impact on Authorization Basis documents. If the fire suppression system or the fire alarm system had been deemed inoperable, the appropriate limiting condition of operation would have invoked required actions (e.g., establishing a fire watch over a defined area or terminating operations in certain rooms) that could not be implemented. More than 1,000 rooms had been renumbered, and only 1 was numbered incorrectly, but a better understanding of configuration management would have led workers to realize changing a room number is a change to the facility, not routine maintenance. As a result, work planners would have ensured that the work plan considered impacts to the Authorization Basis. (ALO--LA-LANL-CMR-2003-0012)

In February 2003, at Pantex, an electrical arc occurred while an electrician was verifying an electrical outage above a suspended ceiling. A joint lockout/tagout had been performed on the halon circuit and the fire alarm panel circuit. The electrician followed applicable procedures and was in the process of verifying absence of energy when the event occurred. He removed a ceiling tile, climbed a ladder to access the duct detector, and found that a metal hanger supporting the suspended ceiling grid had been installed in front of and wrapping around the smoke duct detector, blocking his access. He pulled the hanger aside and removed the duct's cover so he could verify the absence of energy. As he did so, the hanger slipped out of his hand and contacted a bare conductor on the detector, causing an arc. During the subsequent investigation, investigators determined that the root cause was that project drawings did not

identify an additional circuit connected to the existing smoke duct detector. The poor work practice demonstrated by the unorthodox installation of the ceiling tile hanger during a previous modification was identified as a contributing cause. Although he correctly followed lockout/tagout procedures, the electrician did not consider whether additional circuits might be present and thus inadvertently caused the arc. (AL--AO-BWXP-PANTEX-2003-0008)

These events demonstrate that, despite other potentially contributing factors, even applying a lockout/tagout is not always sufficient in the absence of plans, drawings, or other indicators that may alert workers to hazardous conditions. Inadequate drawings are a recurring problem with older buildings that were constructed or modified before current National Electrical Code requirements and before Integrated Safety Management requirements for work planning and work package development. Configuration management plays a vital role in today's work control process. All modifications must go through a formalized work control system to ensure all changes and safety issues are addressed. Workers at aging facilities must have a healthy cynicism toward and suspicion of all systems in the absence of complete, updated as-built drawings.

KEYWORDS: *Near miss, configuration management, drawings, documentation not complete, modifications, design; as-builts*

ISM CORE FUNCTIONS*: Define the Scope of Work, Analyze the Hazards, Develop and Implement Hazard Controls, Perform Work Within Controls, Provide Feedback and Improvement*

3. SUSPECT/COUNTERFEIT ITEMS AWARENESS

Thanks to increased awareness and diligence, suspect/counterfeit items (S/CI) continue to be found. Last year, DOE instituted a complex-wide process to identify and investigate S/CI and disseminate information to Departmental organizations. The Department has also established an S/CI website and issued two Safety Alerts about S/CI. In addition, DOE initiated a major 2-year training effort in 2004.

In 2003, 46 S/CI discoveries were reported to ORPS. In the first 5 months of this year ORPS reports were submitted identifying 26 S/CI discoveries. The suspect bolts identified in ORPS reports fell primarily into two categories: those found in forklifts and those in ratchet straps.

Eight ORPS reports identified suspect/counterfeit bolts found in ratchet straps being used in a variety of applications, as shown by the following examples.

- S/C bolts were found in one of five Liftex ratchet strap assemblies. The assemblies were being used to secure an electric motor to a flat deck waste transportation unit on its way to disposal. (ORPS Report RL--BHI-ERDF-2004-0005)

- S/C bolts were identified in three nylon ratchet straps being used to secure B-25 radioactive waste containers to a trailer for local transport. The straps were immediately removed and replaced with straps containing approved bolts. Twenty-one additional, unused ratchet straps with S/C bolts were found in a work van at the job site. (ORPS Report ORO--BJC-PGDPENVRES-2004-0005)

- S/C bolts were discovered in LiftAll ratchet straps recently obtained for use on a D&D project. The discovery prompted a project-wide review for other equipment that might contain S/CI. (ORPS Report RFO--KHLL-D&DOPS-2004-0007)

- A ratchet strap assembly in material handling equipment contained S/C bolts. A sitewide effort resulted in identifying eight additional S/C bolts in ratchet strap assemblies not in service. (ORPS Report CH-BH-BNL-BNL-2004-0004)

Six ORPS Reports identified S/CI in forklifts and powered industrial trucks during the same 5-month timeframe.

- S/C bolts were discovered in load-bearing areas of the lift systems in CROWN Lift (Figure 3-1) and Allis Chalmers powered industrial trucks. These bolts (Figure 3-2) were marked Grade 5 or Grade 8 and appeared on the DOE Suspect Head Mark List. (ORPS Report RFO--KHLL-D&D OPS-2004-0007)

Figure 3-1. S/C bolts found in this CROWN Lift

- Fourteen S/C bolts were found in non-load-bearing positions on a Clark 2-ton forklift. Eleven bolts were in the door mounting; three had been used to attach the radiator cover. (ORPS Report CH--AA-ANLW-ANLW-2004-0005)

- S/C bolts were discovered in structural components. During an inspection, S/C bolts were identified on a Genie Aerial work platform and on an Up-Right Tiger Scissor Lift. (ORPS Report OAK--LLNL-LLNL-2004-0016)

- S/C fasteners were found on the battery compartment frame of a Toyota electric forklift. S/C fasteners were also found on the hydraulic box that attaches to a Walden lifting device. (ORPS Report ID--BNFL-AMWTF-2004-0007)

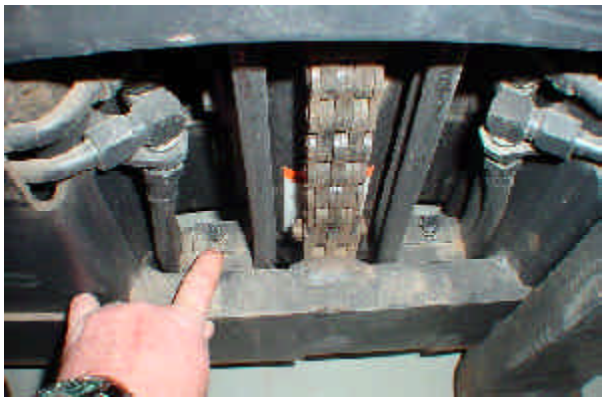

Figure 3-2. Location of S/C bolts in CROWN Lift

- S/C bolts on were discovered on Yale, Drexel, and Taylor forklifts. In the resulting sweep S/C bolts were found on four more trucks. (ORPS Report ID--BBWI-INEELPROGM-2004-0001)

In all of these events, the ratchet straps were destroyed, and the trucks were removed from service.

Alert workers found and reported S/CI in these unexpected places:

- A General Electric breaker arrived in a box without a GE logo; the hand-written part number (THED 1360) on the box did not match the number on the part. In addition, workers remembered that the THED 1360 breaker series had previously been identified as suspect/ counterfeit. (RL--PHMC-PFP-2004-0010)

- S/C bolts were found holding a fire alarm bell to the body of its alarm box. The box been in place since the building was constructed in 1986. Since the bolts pose no safety risk, they were categorized as "use as is." (ORPS Report ALO--WTS-WIP-2004-0004) At another site, an electrical panel mounting bracket had 22 suspect fasteners (1/2-inch UNC Grade 5 bolts with KS Headmark). The panel was installed in 1985. Although the bolts do not affect the panel's structural integrity, they will be replaced. (ORPS Report ID--BBWI-TRA-2004-0001)

- A worker using the DOE Head Mark List discovered 14 S/C bolts in the structural beams of a floor mezzanine structure used primarily for storing utility parts and materials. The bolts were probably installed when the mezzanine was constructed in 1989. Quality Assurance staff inspected the mezzanine and identified a total of 69 S/C bolts in the structure. Based on an engineering evaluation, some bolts will be replaced; in other cases, the joist capacity significantly exceeds the demand. (ORPS Report ALO--LA-LANL-ESHSUPT-2004-0001)

- For sheer numbers, the most dramatic finding was 275 S/C bolts discovered during a scheduled surveillance in a maintenance shop by a Program Coordinator using the DOE Head Mark List. (ORPS Report RL--PNNL-PNNLBOPER-2004-0006)

OE Summary 2004-02, *Good Practice: Impound Salvaged Suspect/Counterfeit Bolts to Prevent Reuse,* discusses good practices at DOE sites for identifying and impounding S/CI and provides additional resources for information about S/CI.

The continued discovery of suspect or counterfeit items is a "bad news/good news" story. Such parts may not meet government- or industry-established specifications and present a hazard when they are introduced into or used in safety or mission-sensitive systems. The potential exists for injury, particularly when such parts are installed in lifting devices and container-securing systems. We must recognize that this is a recurring problem and enlist everyone's help in identifying and reporting. The existence and discovery of S/CI underline the importance of training not only the Quality Assurance staff and receipt inspectors, but also the end-users such as truck drivers, lift and equipment operators. At some sites, general S/CI awareness training is given to everyone, and laminated cards with the DOE Head Mark List are distributed for personnel to carry on their badge lanyards. Such a useful tool helps everyone be more aware and speeds identification and reporting.

KEYWORDS: *Suspect parts, counterfeit, bolts, fork lift, S/CI*

ISM CORE FUNCTIONS*: Analyze the Hazard, Feedback and Improvement*

4. INADEQUATE PLANNING LED TO EXPOSURE AND ILLNESS

On September 27, 2003, five Los Alamos National Laboratory (LANL) workers cutting a glovebox coolant line became ill from toxic vapors caused by thermal decomposition of refrigerants in the line. All of the workers were wearing personal protective equipment, including Level II anti-contamination clothing. Investigators determined that the potential hazard had not been identified before work began and that the situation was exacerbated by performing work in a tent that had limited air flow. (ORPS Report ALO-LA-LANL-TA55-2003-0022; update/ final report filed April 16, 2004)

All five workers wore Tyvek coveralls, hoods, full-face respirators, double booties, and double latex gloves. They were working in a tent constructed around the glove box for radiological contamination control. The tent had an air inlet on one side and a fan equipped with a HEPA filter on the other. One of the workers noticed an acrid smell, felt dizzy, and began coughing. Soon they all were coughing, so they exited the tent. They drove themselves to the Los Alamos Medical Center, where they were admitted for overnight observation and released the following day.

LANL Occupational Medicine Group staff evaluated the workers on September 29, 2003. The workers exhibited symptoms including nausea, spitting of white phlegm, and redness in the face. One worker had irregular heart rhythms and was re-admitted to the medical center. His condition was later found to be unrelated to the event. The other four workers returned to work; one with no restrictions, and the other three with restrictions, including no respirator work and no welding.

The work plan required the workers to cut the coolant line, which was connected to the glovebox. Operations in the glovebox had been terminated in 2002, and the workers had been told that that the line was empty. However, the line had contained Freon® at one time, and the Freon was later replaced with SF2I liquid.

When the workers cut the line, liquid sprayed from the line, vaporizing before it hit the floor. The workers had no experience working with coolants such as SF2I, which is no longer sold in the United States, so they did not perceive a hazard. They continued working, attaching caps to other lines identified in the work plan, then soldering them with an acetylene torch. The estimated temperature of the torch flame was 1200°F, and SF2I decomposes at temperatures greater than 392°F, giving off hydrogen fluoride (HF) and perfluoro-isobutylene (PFIB).

The leaking line was next to one of the lines being soldered, and the coolant continued to leak from it, so the workers placed a plastic bag, secured with tape, over the line. As they finished soldering, the workers began to feel ill from the toxic vapors that resulted from the thermal decomposition of perfluoro compounds in the SF2I.

Investigators determined that the root cause of this event was a failure to analyze hazards. The workers did not know that the SF2I was present or that it presented a thermal decomposition hazard at high temperatures. Investigators also determined there was a failure to define the work so as to include hazards and controls into work instructions.

The 3M Material Safety Data Sheet (MSDS) for SF2I identifies a decomposition hazard at temperatures above 200°C, and discusses the decomposition byproducts, as well as the health effects of exposure to those byproducts. The MSDS also provides direction on exposure controls and on personal protection.

Better job planning would have identified the hazards and the appropriate safety measures to be taken.

Information was available that would have enabled a more complete hazard analysis. At LANL, the affected line was known to have contained SF2I liquid. A review of a manufacturer's MSDS would have given suitable direction on hazards, health effects, appropriate protection and ventilation. Better use of available information would have prevented the incident.

KEYWORDS: *Inadequate job planning; industrial hygiene exposure*

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