OPERATING EXPERIENCE SUMMARY

Inside This Issue

U.S. Department of Energy
Office of Environment, Safety and Health
OE Summary 2003-26
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With the full implementation of the redesigned Occurrence Reporting and Processing System (ORPS) on December 1, 2003, the Occurrence Reporting Binning and Tracking Tool (ORBITT) database has been discontinued. The ORPS database includes HQ Keywords that are equivalent to ORBITT bins to assist users in sorting through events to perform specific searches.

The old ORBITT bins have been crosswalked to the new HQ Keywords to provide data continuity.

Users may direct questions to Bal Mahajan by e-mail at bal.mahajan@eh.doe.gov.

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The OE Summary can be used as a DOE-wide information source as described in Section 5.1.2, DOE-STD-7501-99, *The DOE Corporate Lessons Learned Program.* Readers are cautioned that review of the Summary should not be a substitute for a thorough review of the interim and final occurrence reports.

EVENTS

1. OVERLOADED EXTENSION CORDS CAN CAUSE ELECTRICAL FIRES

Consumer Product Safety Commission (CPSC) investigations have found that overloaded, worn, and damaged cords are major factors in fires and accidents both at home and in the workplace. A recent fire at a DOE facility occurred because an air conditioner plugged into an extension cord overloaded the capacity of the cord.

On November 11, 2003, an early morning fire at Stanford Linear Accelerator Center (SLAC) resulted in severe smoke damage to electronic equipment and destroyed an air conditioner. No one was in the building at the time, but a maintenance worker saw the fire and alerted the fire department. Responders found the wall-mounted air conditioner plugged into an extension cord instead of a single-outlet circuit, as required. Based on burn patterns and damage to the extension cord, the SLAC fire marshal determined the extension cord was overloaded and was the point of origin for the fire.
(OAK--SU-SLAC-2003-0004)

The fire was limited to the air conditioner and the extension cord. Photographs of the scene show that the fire originated at the floor and moved up the wall to the air conditioner (see Figure 1-1). An inspection of the electrical connection and interior components of the air conditioner indicated that the damage was from external heat (i.e., from the fire), not from the failure of any air conditioner components. Figure 1-2 shows the burned cords.

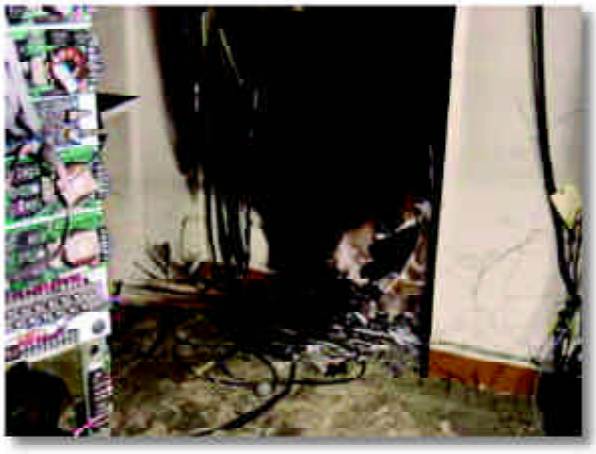

Figure 1-1. Burn pattern indicating point of origin

Light-duty, household extension cords should never be used with high-wattage appliances such as air conditioners. Special, heavy-duty cords should be used instead. It is also essential for an extension cord to have a ground connection if the tool or appliance being plugged into it has a ground plug, and a three-prong connector should never be plugged into a two-pronged cord.

Figure 1-2. Burned cords

The gauge (diameter) of an extension cord wire must be large enough to handle the power being transferred through it. The gauge is based on the American Wire Gauge (AWG) system in which the larger the wire, the smaller the AWG number. For example, a 16-gauge (16 AWG), light-duty extension cord is rated to carry 13 amperes (up to 1,560 watts). A 16-AWG cord could be used safely for a typical table lamp, but a power tool that draws more power, such as a circular saw, would require a heavy-duty, 12-AWG cord.

To determine the proper gauge cord to use for a tool or appliance, find the amperage or wattage, which is usually displayed on a metal plate located on the housing, then choose the cord with the correct rating for the wattage. (Extension cords are usually labeled or tagged with rating information.) It is better to use a cord with a

heavier gauge (i.e., lower AWG number) than a lower-rated cord when the wattage of the appliance is not known. The rule of thumb is to use an extension cord with the same or larger wire size as the cord being extended.

Extension cords should not be used in place of permanent wiring. They should be used only for temporary service and for short periods of time and not as a "quick-fix" instead of installing an electrical outlet. Temporary extension cords that are forgotten or overlooked can easily become a fire hazard. Had the air conditioner at SLAC been plugged into an electrical outlet, rather than an extension cord, the fire would not have occurred.

EXTENSION CORD SAFETY

- Use extension cords only when necessary and only on a temporary basis.
- Use only special, heavy-duty extension cords for high-wattage appliances such as air conditioners, portable electric heaters, or freezers.
- Do not overload extension cords by plugging in equipment/appliances that draw more watts than the rating of the cord.
- Check the plug and the body of the extension cord while it is in use. If the cord feels hot or if there is a softening of the plastic, the plugs or connections may be failing, and the extension cord should be replaced.
- Never use an extension cord while it is coiled or looped, and never cover any part of the cord with newspaper, clothing, rugs, or other objects while it is in use.
- Never place an extension cord where it may be damaged by heavy furniture or foot traffic or use staples and nails to attach the cord to baseboards or another surface.
- Use only extension cords with labels indicating certification by an independent testing lab, such as UL (Underwriters Laboratories) or ETL (Electrical Testing Laboratories). These cords meet current industry safety standards.
- Never leave an extension cord plugged in when it is not in use. The cord will conduct electricity until it is unplugged from the outlet.
- Do not use extension cords that are cut or damaged.

In their "Extension Cords Fact Sheet," the CPSC estimates that an extension cord fire occurs approximately every 6 minutes. Such fires are responsible for more than $50 million in property damage each year. CPSC also estimates that about 3,300 residential fires originate with extension cords each year, killing 50 people and injuring about 270 others. The most frequent causes of these fires are short circuits and overloading, damage, and misuse of extension cords. The fact sheet and other pertinent information can be accessed at http://www.cpsc.gov/CPSCPUB/PUBS/16.html.

A far more tragic fire occurred on June 11, 2002, in Siler City, North Carolina. That fire also started with an overloaded extension cord connected to an air conditioner. The cord "melted right into the floor and ignited the couch above it," according to the county fire marshal. Firefighters found the light-duty extension cord stretched across the living room from the kitchen, powering a window-unit air conditioner that had been running steadily for days in 90° temperatures. Six family members, including three children, died in the fire.

Not only was the cord overloaded in the Siler City fire, but the length of the extension cord contributed to an already hazardous condition. Based on its gauge, an extension cord can power an appliance of a certain wattage only at specific distances. As the cord gets longer, its current-carrying capacity is reduced. For example, a 16-AWG cord less than 50 feet long can power a 1,625-watt appliance, but if the cord is longer than 50 feet, it can power an appliance only up to 1,250 watts.

Damaged extension cords can also be dangerous. Touching even a single exposed strand of wire on a damaged cord can result in an electrical shock or burn. OE Summary 2003-20 reported on the safety hazards of miswired or damaged extension cords. The Office of Environment, Safety and Health reviewed 24 events across the complex that involved extension cords or power strips and found that 13 of these events resulted in electrical shocks.

An August 12, 2003, UL news release, "Extension Cords: Not 'One Size Fits All,'" contains more information about safely using extension cords. The news release is available at the UL website, http://www.ul.com/consumers/cords.html.

Extension cords should not be used in place of permanent wiring. When extensions cords are used, it is important to ensure that they are the correct type, gauge, and length to handle the power draw of the appliance/equipment being plugged into the cord.

KEYWORDS: *Extension cords, power cord, miswired, electrical fire*

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

2. STEEL PLATES ACCIDENTALLY FALL FROM CEILING WHEN ROOFERS CUT SUPPORT BOLTS

On August 28, 2003, at the Oak Ridge Y-12 Site, roofers cut several bolts protruding above the roofline of a building, allowing steel plates inside the building to fall to the floor. One of the 5-pound steel plates fell from the ceiling and landed about 15 feet away from a worker. The roofers assumed they were authorized to eliminate obstructions that interfered with a smooth roof surface. No injuries or damage to equipment resulted from this near-miss occurrence. (ORPS Report ORO--BWXT-Y12NUCLEAR-2003-0041; final report filed October 29, 2003)

Roofers were installing new insulation and a new roof membrane above a processing area in the building and needed to cut several protruding bolts. They believed the bolts only held angle irons in place on the roof, not the ceiling plates inside the building. Three steel plates (6 inches by 6 inches by ¼-inch), weighing about 5 pounds each, fell more than 10 feet to the floor. Two other plates were dislodged; one was on an I-beam and the other remained attached by a single intact bolt. Roofers had cut similar bolts in the past, but in those cases the steel plates were supported by steel beams directly below the roof deck and were not dislodged. Investigators identified work planning, work authorization, and work execution deficiencies as causal factors for this event. They determined that the job hazard analysis for the task did not address the potential for falling objects that could affect operations areas inside the facility. In addition, work planners did not properly identify which penetrations were to be removed and did not specify that the area below the roof was to be cleared and roped off to protect personnel against falling objects.

GOOD PRACTICES FOR WORK MANAGEMENT

- Ensure that a comprehensive job hazards analysis is performed and documented.
- Ensure that controls for the hazards identified in the job hazards analysis are developed.
- Ensure that the work package includes the means to implement the hazard controls identified.
- Ensure that the work authorization process follows established processes and does not take shortcuts.
- Perform an independent assessment of the work planning and authorization processes before the work is started.
- Execute the work in accordance with established personnel safety requirements and practices.
- Provide direct and detailed oversight of subcontractors to ensure that they do not create hazards while performing their tasks.

Work authorization deficiencies included directing the roofers to cut the bolts without specifying that they needed to inspect the inside of the roof and consider the potential hazards. Work supervisors did not use established processes and procedures for authorizing removal of the bolts. Investigators also identified flaws in work execution, including the following.

1. The roofers did not notify shift operations personnel in the building before starting work.

2. The roofers did not stop work and evaluate the change in the scope of the work package when they encountered the bolts protruding above the roofline.

A similar incident in which roof repair workers compromised the safety of building inhabitants occurred at the Los Alamos National Laboratory on April 24, 2003. In this near-miss occurrence, a monorail crane I-beam support at roof level was discovered with all 12 of its support bolt heads ground off. The I-beam weighed approximately 1½ tons, and was located at ceiling level in an area occupied by workers on a daily basis. The I-beam did not fall because it was anchored at one end by four bolts in an 8-inch-thick reinforced concrete wall. This semi-detached condition of the crane rail, cantilevered from a concrete wall at one end, may have existed without detection for nearly 2 years. (ORPS Report ALO-LA-LANL-NUCSAFGRDS-2003-0001)

Facility managers had the crane removed after this occurrence because it had not been used for several years and its maintenance requirements outweighed its usefulness. Technical personnel revised the annual inspection checklists for cranes and hoists to specifically identify what components should be inspected (e.g., support plates, anchor bolts) and to require detailed scrutiny by inspectors.

Figure 2-1 shows the as-discovered condition of the I-beam crane rail that was unsupported from above. As shown in the figure, the free end of the beam (opposite the hoist location) is lower than the end attached to the wall. (The visible portions of the three detached support struts increase in size from left to right in the photo.) Figure 2-2 shows where one of the three I-beam support struts was attached to the roof structure above the drop ceiling. Each of the three struts was attached by four bolts, one in each corner of the strut plate. Figure 2-3 shows one of the 12 bolts after the bolt head had been ground off.

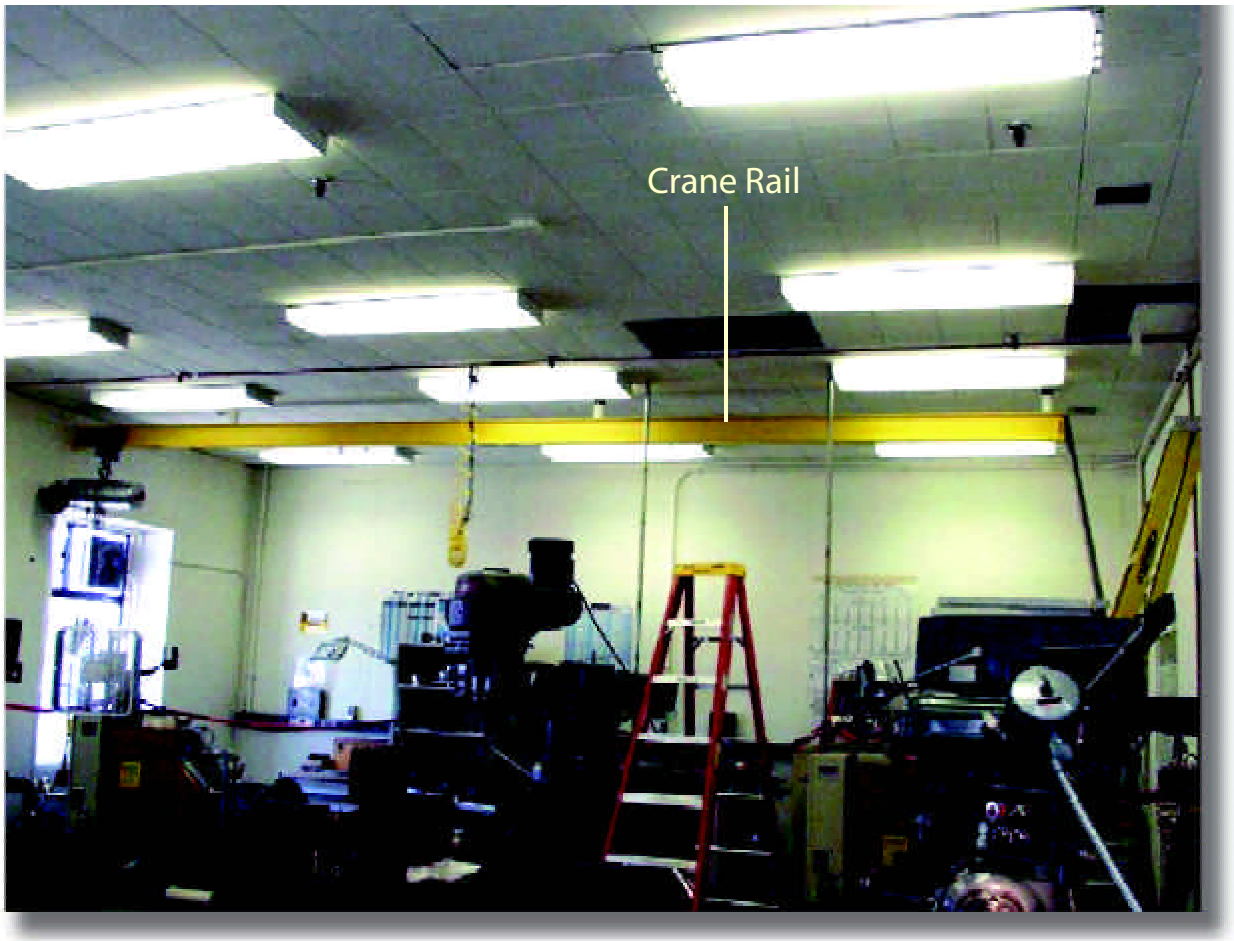

Figure 2-1. As-found condition of the I-beam crane rail

A Lessons Learned document was prepared for this event, (SELLS identifier 2003-LA-LANL-PS7-0004), entitled *Near Miss to a Serious Personal Injury: Monorail Crane I-Beam Support Found with Support Bolt Heads Cut.* This document is available from the SELLS website at http://tis.eh.doe.gov/ll/listdb.html.

Figure 2-2. Strut and support plate, with four missing bolts

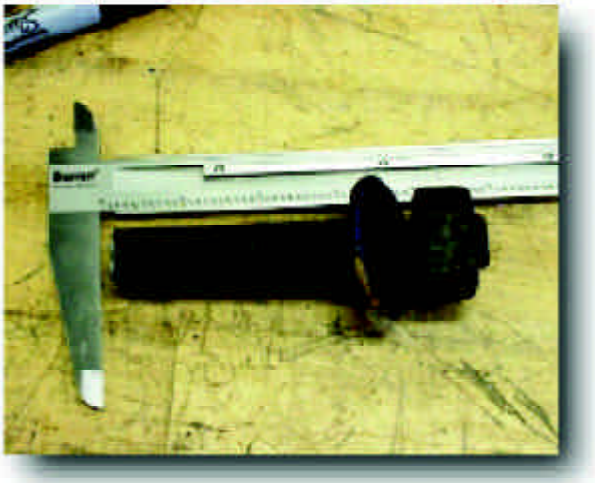

Figure 2-3. Support bolt after its head was ground off

These events underscore the importance of following established procedures and practices in the planning, authorization, and execution of work tasks. Planning includes preparation of a comprehensive job hazards analysis, where potential hazards such as falling objects are identified and analyzed. The authorization step includes verification by senior managers that relevant processes and procedures have been addressed during work planning. Work execution includes ensuring that workers are sufficiently experienced and trained to perform the tasks safely and providing sufficient oversight of subcontractors to ensure that they do not create hazards (such as falling objects) as they perform their tasks.

KEYWORDS: *Falling objects hazard, roof refurbishment, near miss*

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

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Waste Stack Topples onto Forklift	ID--BBWI-RWMC-2003-0005

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OE SUMMARY 2003-23 (Published 11/17/03)

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Title	OR Number
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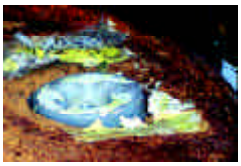
Worker Punctures Arm with Knife	RFO--KHLL-SOLIDWST-2003-0018



OE SUMMARY 2003-15 (Published 07/28/03)

Title	OR Number
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Near Miss—Pressurized Air Hose Whips Violently	RFO--KHLL-771OPS-2003-0005
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Combustible Materials Near Torch Cutting Catch Fire	SR--WSRC-FDP-2003-0008

OE SUMMARY 2003-10 (Published 05/19/03)

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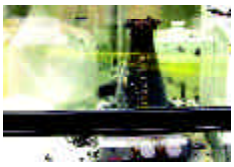
Electrical Near Miss Cleaning HVAC System	RP--BNRP-RPPWTP-2003-0002
Hydraulic Shear Failure Causes Worker Injury	SR--WSRC-FDP-2003-0001



OE SUMMARY 2003-07 (Published 04/07/03)

Title	OR Number
Near Miss when Chemical Reaction Vessel Explodes	ALO-LA-LANL-CHEMLASER-2002-0001
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Banned Respirator Hoods Purchased and Used	RL--PHMC-CENTPLAT-2003-0005
Unsafe Use of Hydraulic Power Unit Results in Near Miss to Severe Injury	ALO--WWID-WIPP-2003-0001
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