



December 10, 2008

Causal Analysis Review

Winter Hazards, Site Safety Measures and Worker Injuries

Now that the fall season has settled in across the Department of Energy (DOE) complex, this is the time DOE facilities should consider advance planning, review and re-prioritization of winter seasonal protection measures, including snow removal and response plans. The Office of Health, Safety and Security's Office of Corporate Safety Analysis has identified some relevant causal analyses conducted by reporting organizations in the Occurrence Reporting Processing System (ORPS) which demonstrate lessons learned through insightful, comprehensive and valuable reporting. The featured occurrence report of interest was submitted by Hanford on January 9, 2008 and provides a beneficial discussion on how to reduce the risk of worker injury in inclement weather through procedural changes, appropriate identification of affected site geographical areas for closures and delays, communication methods, and limiting employee access to areas not cleared of snow or ice. Two additional Occurrences reported by Los Alamos National Laboratory are also synopsized and attached as they provide relevant and noteworthy causal analyses.

Also provided are links to two relevant OE Summary Articles published in December 2006 and November 2007. In addition, a 2004 Lessons Learned report on snowfall injuries at Oak Ridge National Laboratory is attached. Finally, we recommend that you consult DOE G 433.1-1 (Nuclear Facility Maintenance Management Program Guide for Use with DOE O 433.1). This manual provides guidance on cold weather preparation and an example cold

weather checklist. We commend the reporting organizations for offering detailed causal analyses of these occurrences, which stress the importance of thoughtful planning, work control, communication and workers situational awareness as key elements in preventing winter related worker accidents and injuries.

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Featured Occurrence:

1) **Hanford Site, 100K Area**
EM-RL-PHMC-SNF-2008-0001 - **Personnel Injury Outside Cold Vacuum Drying Facility** – (Significance Category 3)

HQ Summary: On January 8, 2008, a worker slipped and fell on the ice/snow-covered tarmac located to the east of the Cold Vacuum Drying Facility while walking from his parked vehicle to 105 KW Basin to report to work. The worker was transported to Advanced Medical Hanford, where he was diagnosed with a chip to the bone in the shoulder, and he was referred to Kadlec Hospital for additional evaluation and treatment. Immediate actions taken were to establish a clear walk area on the tarmac and to block pedestrian access to the area until it was deemed safe to use.



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Causal Summary: While the apparent cause of the injury was weather related, causal analysis revealed several additional factors. First, decisions to delay or suspend work on the Hanford Site are made by authorities generally located in Richland. The injury occurred at 100K Area, approximately 40 miles away, and it is not unusual for an entirely different weather pattern to be present there. On this occasion, the snow removal crew was not able to keep areas clear as snowfall continued. It may be appropriate to evaluate a process where delays and closures are determined by specific site area, rather than only for the Hanford Site as a whole. Also, snow removal crews had no existing mechanism for effectively communicating to others regarding the severity of the hazard. Therefore, it was not possible for the snow removal crews to communicate the level of hazard to management in advance of employee arrival or directly to incoming workers. Finally, there was no process in place for crews to proactively barricade off parking lots and walkways that could not be effectively cleared, and more appropriately direct workers to use a central parking lot or walkway so that they could have concentrated their efforts on a smaller area and been able to maintain it clear. Such a process would have more effectively mitigated the hazard that they were attempting to address.

Lessons Learned: The primary lesson learned from this event is the necessity of establishing and exercising a comprehensive plan in advance of inclement weather that ensures good communication between the snow removal crew, site management and potentially affected workers. This plan should include appropriate measures to support effective and immediate response by the snow removal crew to rapidly changing weather conditions. With the contingency plan of limiting snow removal to a central parking lot and walkway, available resources could have more effectively mitigated

the hazard to workers. As the first to arrive on site at 100K Area, the provision for the Teamsters crew to evaluate the hazard, recommend appropriate closures and delays, and determine the most effective snow removal response is vital to achieve maximum site and worker safety.

Additional Occurrences

In addition to the featured occurrence, we draw your attention to similar occurrences reported by Los Alamos National Laboratory (LANL) in February 2008, and in January 2007, in which the breadth of suspected weather related problems were not effectively communicated to appropriate facility management. These events are summarized below, with the full reports included in the attachments.

Los Alamos National Laboratory, NA-LASO-LANL-PHYSTECH-2008-0006 Worker Slips on Ice and Falls Striking His Head on the Ground (Significance Category 3)

HQ Summary: On February 25, 2008, an employee walking on a paved road on the north side of Technical Area 3, Building SM-30 (warehouse), slipped on ice and fell, striking his head on the ground. He immediately got up and continued walking to his meeting in another facility. Later, he was taken to the LANL occupational medicine facility for evaluation complaining of muscle aches and pain. He was released back to work with no restrictions. That evening, he experienced flashes of light and "floaters" and sought medical treatment at the emergency room of the St. Vincent's Hospital in Santa Fe, New Mexico. The on-call ophthalmologist identified a detached retina in his right eye, and scheduled emergency laser



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surgery for February 26, 2008. Because the initial treatment on February 26th and the second laser treatment on the morning of February 27th were not successful, the employee underwent eye surgery (vitrectomy) later in the afternoon. He was released after his surgery and has been instructed to stay home and avoid rapid eye movement for at least one week.

Causal Summary: While the most evident cause of the injury is weather related, causal analysis revealed several additional key factors that may have contributed to this event. The road where the accident occurred was designated as a low priority for snow removal. The injured party was unaware that hard ice was present under the snow on the short-cut road he was traversing. A facility representative for TA3-30 noted that this road was hazardous and made a request for the road to be plowed, but no record was maintained in the logbook and the appropriate supervisors were not notified. Subsequently after the event, the current TA3-30 facility coordinator and the Institutional Facilities and Central Services (IFCS) facility management stated that they were unaware of the issue. The key prevailing causal factor was that the suspected problem was not adequately communicated to the appropriate supervision to allow for mitigation of the snow and ice hazard that they were attempting to address.

Lessons Learned: The primary lesson learned from this event is the necessity to communicate snow-related hazards in a timely fashion to appropriate site facility supervision. In addition, careful precaution should be exercised by workers when walking on unplowed snow-covered roads at the site. Follow-up discussions between LANL site management and employees emphasized the need for safety over expediency and encouraged

employees to take the longer, safer path instead of the quickest/shorter path if ice is suspected to be present.

**Los Alamos National Laboratory,
NA-LASO-LANL-BOP-2007-0001
Worker Slips and Falls on Ice Resulting in
Tricep Muscle Damage (Significance Category 3)**

HQ Summary: On January 2, 2007, an employee slipped on ice in the lower parking lot of TA-59, near Building 3, and was taken to the site occupational medicine facility (OMF) for evaluation. An initial x-ray did not indicate any bone fractures and the employee returned to work with no restrictions. Two days later, after further medical evaluations and the receipt of MRI results, it was discovered that the employee sustained a complete tear to his left tricep muscle which required surgery.

Causal Summary: Although the apparent cause of the injury is weather related, causal analysis revealed several relevant factors that may have contributed to this event. Snowfall the previous week resulted in over a foot of accumulation in the Los Alamos area. The parking lot and space where the employee parked was located at the bottom of a hill and was previously cleared by snow removal crews, but an unnoticed layer of black ice had formed due to daytime melting and re-freezing the previous night. This snow melt and subsequent re-freezing was due to the inability of the site snow removal crews to remove snow from the upper parking lot due to an abundance of parked cars and risk of damage to the vehicles. Per the "Snow and Ice Control Plan for the Los Alamos Laboratory" a hotline for employee call-ins to report snow/icy conditions is available so that problem areas can be addressed. It was determined that the availability of this hotline had not been adequately



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communicated to LANL employees for their use. If privately owned and government operated vehicle owners had moved their vehicles to another area of the parking lot that had been cleaned, and promptly utilized the hotline to contact the site snow removal crew, then the uphill area could have been cleaned, which most likely would have mitigated the hazard that led to this injury.

Lessons Learned: The primary lesson learned from this event revealed that LANL management needs to review planning actions and procedures to improve post-storm communication and responses to deal with ongoing hazards created from the melting and re-freezing of snow and ice in parking lots and walkways.

Closing Note:

Comprehensive work planning, effective hazard communication and workers situational awareness are essential in preventing occupational injuries in winter weather environments. Work control and communications deficiencies can place workers at additional risk and may be representative of underlying issues across the site, in addition to the hazardous winter conditions. Furthermore, hazardous conditions discovered by workers should be promptly communicated to appropriate site authorities to aid in mitigating site hazards and reducing potential winter weather related injuries at DOE sites.

The Office of Health, Safety and Security requires no response to this transmittal. If you no longer wish to receive this information, please contact Dr. Robert Czincila [(301) 903-8008; robert.czincila@hq.doe.gov]. If you are aware of other organizations that may wish to receive this information, please contact Dr. Czincila.

Attachments

- ORPS Winter Injuries Full Reports:
- 2004 Lessons Learned Report:
Incident Weather Leads to Multiple Falls
- DOE G 433.1 – Nuclear Facility Maintenance Management Program Guide for Use with DOE O 433.1, found at the link below, contains a chapter on cold weather preparation and a cold weather checklist.
(4.18, *SEASONAL/SEVERE WEATHER AND ADVERSE ENVIRONMENTAL CONDITIONS MAINTENANCE*)

<http://www.hss.energy.gov/nuclearsafety/re/g/g4331-1.pdf>

- Please also follow these links to winter safety discussions in previous Operating Experience Summary Articles from 2006 and 2007:

<http://www.hss.energy.gov/csa/analysis/oesummary/oesummary2006/2006-14-03.pdf>

<http://www.hss.energy.gov/csa/analysis/oesummary/oesummary2007/2007-07-03.pdf>