Office of Environment, Health, Safety and Security
Operating Experience Level 3

OE-3: 2014-05 October 2014

Losing Control: Material Handling Dangers

Purpose

This Operating Experience Level 3 (OE-3) document provides information about the dangers inherent in material handling and the role hazard analysis, work planning, and walkdowns can play in preventing injuries during heavy equipment moves.

Background

Recent Department of Energy (DOE) events demonstrate the importance of adequate hazard analysis, walkdowns, and detailed pre-job briefings for material handling. More than 200 material handling events reported to the Occurrence Reporting and Processing System (ORPS) from January 1, 2010, through August 31, 2014, were reviewed to determine common factors and identify lessons learned. This discussion is limited to five events because they involve issues common to a majority of the reported events, and the lessons learned from three events whose reports have been finalized apply to a wide range of material handling situations.

On August 21, 2014, a worker at Y-12 who was manually moving drum-type containers sustained multiple leg fractures when the 300-plus pound container fell on his leg. As the worker moved the container from a box truck to a dock-leveler ramp, the container caught and became unstable. While attempting to stabilize the container, his left leg went down into the gap between the leveler and truck, and the container fell onto his lower right leg. He was transported to the local hospital where surgery was performed for multiple leg fractures. Moves of similar containers were suspended and an extent of condition review was ordered. (ORPS Notification Report NA--NPO-CNS-Y12NSC-2014-0006)

On April 3, 2014, at Argonne National Laboratory (ANL), Central Shops workers were moving a 2,600-pound milling machine using a set of casters known as "skates." As they pulled, workers lost control and the upright mill fell to the side, striking and coming to rest against a steel column. A rough spot in the floor may have contributed to the loss of control. There were no injuries, and property damage was minimal since the mill was on its way to be stripped for spare parts. However, the event presented a clear potential danger to workers because the machine weighed more than a ton. (ORPS Report SC--ASO-ANLE-ANLEFMS -2014-0004)

On September 24, 2013, six ANL workers were staging equipment on a dock in preparation for pick-up and shipment off site. Only one worker had experience in this type of move. The process had taken all day, and by 4:00 p.m. the workers were fatigued. One 800-pound piece of equipment was on rollers; workers had to maneuver it through two 90-degree turns and push it over legacy railroad tracks embedded in the floor. While it was being maneuvered, the equipment shifted, pinching a worker's hand between the equipment and a tool chest in the hallway, tearing his skin off through the glove and fracturing his ring finger. (ORPS Report SC--ASO-ANLE-ANLEMSD-2013-0001)

On August 2, 2010, at Y-12, a material clerk was knocked to the ground when he attempted to steady an improperly-loaded piece of exercise equipment as it was lowered to the ground by forklift. The forklift operator had improperly loaded

the heavy side of the equipment to the front of the forks instead of against the load backrest and had not tied down/stabilized the load. In addition, the clerk made an error in judgment by placing himself in the path of a heavy falling object and was fortunate to avoid injury. (ORPS Report NA--YSO-BWXT-Y12SITE2010-0026)

Serious Injury Event

On March 31, 2014, at the Oak Ridge National Laboratory (ORNL) Excess Property Sales Facility, a 1,550-pound scattering chamber overturned while being moved and pinned a salvage handler (SH) underneath, fracturing both his legs. The event resulted in an ORNL accident investigation (AI).

Two SHs were rolling a scattering chamber – a magnet and vacuum tube assembly on a wheeled stand – down a loading dock ramp to a box truck, with one handler in front and the other behind. The "wheels" on the chamber were designed not for travel, but for positioning the chamber with other research equipment. As the leading wheels reached the transition between the ramp and the truck bed, the equipment tipped over and onto the SH in front, pinning and fracturing both his legs and his thumb. He was transported to the local hospital where surgery was performed.

The investigation team determined that a number of causes contributed to the event. Recent organizational changes due to retirements had resulted in a rapid transition, and SH staff members has not been trained or mentored in activities similar to those they faced March 31. The chamber had been moved five weeks earlier and, although the excess property form required trained riggers to perform the move, the SHs decided they could move the chamber easily and elected to move it themselves. However, during transportation, the chamber tilted, and a vacuum tube punctured the side of the delivery truck. The SHs notified a supervisor and repairs were made, but no further notifications or evaluations took place. The day of the event fell immediately after a public sale at the Excess Property Sales facility, so staff expected a busy day loading equipment for customers. When an SH called in sick, a replacement arrived from another area and began work immediately, without being briefed or trained. He and another SH successfully loaded several pieces of equipment before they approached the scattering chamber.

The AI team determined that the accident was preventable; that inadequate safety culture had led to poor decision-making and inadequate recognition of risk; that requirements for implementing work processes were not followed with sufficient rigor to provide proper hazard analysis and control; and that recent organizational changes had resulted in use of inexperienced and inadequately trained workers for key tasks. (ORPS Report SC-ORO--ORNL-X10BOPLANT-2014-0002)

ANALYSIS AND DISCUSSION

The five events were reviewed to determine common factors, lessons learned, and areas for improvement.

All moves would have benefitted from more careful work planning and hazard analysis, including walkdowns to discover the obstacles and "what if?" aspects. Walkdowns should include all workers involved in the upcoming task and a discussion of worker experience. In the April 2014 ANL event, a walkdown of the route with special attention to floor hazards might have prevented the loss of control of the milling machine. Although the employee pulling the mill and the employee acting as spotter were both outside the immediate danger/tip-over area, a similar move over rough flooring could have resulted in injury or even a fatality. After the event, a Work Planning and Control (WPC) workshop was held, and the deficient floors were repaired.

In the September 2013, ANL event, only one of the six workers was experienced in that type of move, and the six had not worked together as a team before. The job was incorrectly considered to be "skill of the craft" and had not been walked down. The workers were not aware that the

equipment could move side-to-side, thus complicating issues of space and maneuverability. The injured worker was wearing correct Personal Protective Equipment, including steel-toed boots and work gloves, but the gloves were not enough to prevent 800 pounds of shifting equipment from pinching a finger against another metal object.

Both ANL moves were considered "skill of the craft," where workers could work safely and effectively at tasks that were low hazard or below, using basic knowledge, skills, and abilities. Tasks considered "low hazard and below" may include machinery moving, faucet and plumbing repair, backflow testing and repair, and similar tasks, and would not include moving heavy pieces of equipment that could potentially fall and injure the worker performing the task. During the follow-up causal analysis to the April 2014 event, it was determined that a work package had not been developed because the new supervisor was not well-versed in the WPC process and believed that the moving task was within the skill of the workers; that is, "machine moving" is listed on a machine repairman's position description. However, because machine moving involves hazards, future moves will require specific WCP packages.

Following ANL's example, other sites may want to review tasks currently classified as "skill of the craft" by walking down and reevaluating tasks to determine if they require "everyday" skill or if the task requires additional hazard analysis.

In the 2010 Y-12 event, the forklift operator – who had taken the required training – failed to secure the unwieldy piece of equipment or place it on a pallet to stabilize it. Had the load been properly secured, it would not have shifted or fallen, eliminating the opportunity for a near-miss event. After the event, the operator was retrained in forklift use.

Corrective Actions

The following corrective actions are among many that the sites performed after filing ORPS reports on these occurrences. They are provided as representative examples only.

- Walk down the job with all workers involved, so everyone knows expectations for movement and any potential hold points.
- Walk down the space through which equipment has to move to ensure there is enough space to work safely. Look for things that could impact the move: e.g., floor drains and other potential wheel traps; changes in grade that could affect the load's center of gravity; and transitions between floor surfaces such as ramps, loading docks, doorway sills, expansion joints, and grating.
- If space is limited and a path cannot be altered, remove articles that could interfere.
- Discuss hand safety and avoiding possible pinch points by placing hands on top of equipment instead of on the sides.
- Perform follow-up surveillance(s) of the activities after the briefing to determine if work is being properly performed.
- Schedule work to allow sufficient time for the unexpected and to complete the work before workers are fatigued and may fail to recognize potentially hazardous conditions.
- Ensure that temporarily assigned workers are briefed before being placed on the job.
- Provide formal on-the-job training so that workers understand the risks associated with moving potentially unstable loads.

In addition, supervisors must maintain frequent contact with their personnel in order to detect work habit/attitude changes.

Conclusion

These events demonstrate that work planning for material moves must include walkdowns of the area(s), review of collateral tasks that may affect work completion and result in worker fatigue, and

possible re-evaluation of the work categorized as "skill of the craft." Additional hazard analysis may be necessary to ensure that material moves can be completed safely.

REFERENCES

NA--NPO-CNS-Y12NSC-2014-0006, *Drum Falling During Move Causes Leg Fractures*

SC--ASO-ANLE-ANLEFMS -2014-0004, *Material Handling Near Miss Involving a Milling Machine*

SC--ASO-ANLE-ANLEMSD-2013-0001, *Employee Sustains Comminuted Fracture to Right Ring Finger*

NA--YSO-BWXT-Y12SITE2010-0026, *Near Miss – Employee Struck by Falling Exercise Equipment*

SC-ORO--ORNL-X10BOPLANT-2014-0002, *Employee Injured while Loading Excess Equipment*

Questions regarding this OE-3 document can be directed to Ashley Ruocco at 301-903-7010 or ashley.ruocco@hq.doe.gov.

This OE-3 document requires no follow-up report or written response.

Matthew B. Moury
Associate Under Secretary for
Environment, Health, Safety and Security