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

OE-3: 2014-07 December 2014

Dangers of Objects Falling into Normally Occupied Areas

PURPOSE

This Operating Experience Level 3 (OE-3) document provides information about a safety concern related to the dangers of items falling from heights into spaces normally occupied by workers at Department of Energy (DOE) facilities. The events described below – all of which occurred in March through July of 2014 – serve as a reminder that employees must have 360-degree situational awareness for unexpected dangers.

BACKGROUND & EVENTS

Reports of items falling into spaces normally occupied by workers are regularly made to the DOE Occurrence Reporting and Processing System (ORPS). Every event demonstrates how important it is for both the workers at height, and workers and passersby below to know the dangers and the steps that they must take to remain safe. In most events, precautions had been taken before work started to protect passersby; however, workers inside the barricades can be hurt, too, and this was not considered in the precautions.

On July 10, 2014, at the Strategic Petroleum Reserve West Hackberry location, a portable Honda generator weighing approximately 43 pounds fell 18 feet while being lowered from a fixed elevated platform. A three-fourths-inch rope was double-knotted around the generator's handle to secure it. According to the safety representative, the rope had several rubber strands at its core to help it stretch and not break while under stress, but the knot in the rope securing the generator loosened, allowing the generator to fall to the concrete floor. Before the task started, a spotter had been posted on the ground level to prevent workers from entering the area, so there were no injuries. (ORPS Report FE--SPRO-SPR-WH-2014-0002)

On July 9, 2014, at Hanford River Protection, a 1.5-pound cat's paw nail puller fell 18 feet from a carpenter's tool bag and hit the ankle of a carpenter working below. The area had been red-barricaded to prevent passersby from entering, but the carpenter who was hit by the nail puller was working within the barricaded boundary. The work was paused, and the carpenter was taken to Medical and evaluated, then released back to work. After the carpenters, foreman, and supervisor discussed the event, they decided that, going forward, ground workers would wait to enter the barricaded work zone until the worker overhead had completed his transitions and/or work. They also decided that there should be more communication between the workers on the ground and those at elevation. (ORPS Report EM-RP--BNRP-RPPWTP-2014-0007)

On April 30, 2014, at the Strategic Petroleum Reserve West Hackberry location, a wrench fell from an elevated deck and hit the hard hat of a construction worker seated below with enough force that it knocked the hard hat off of the worker's head. Although the wrench had been stored in a collapsible tool bucket, it was not completely seated in the bottom of the bucket and fell out when the bucket was bumped. The worker – who had chosen to sit beneath the overhead platform activity -- was evaluated at Site Medical and was determined to have no injuries. As a result of the subsequent review, workers were briefed about the importance of tethering tools while in use, storing them securely, and

barricading the areas below elevated work. In addition, workers will no longer be allowed within barricaded areas unless they are actively involved with the work activity. (ORPS Report FE--SPRO-SPR-WH-2014-0001)

On April 4, 2014, at the Kansas City Plant's newly constructed National Security Campus, a piece of sheet metal approximately one-quarter-inch thick, 10 inches long, and 5 to 6 inches wide being used as an insulation shield on a chilled water line, unexpectedly fell 15 feet to the floor. The metal landed near three contractors who were wearing safety shoes and hard hats. There were no injuries. During a review of the pipe section where the sheet metal insulation shield fell, a water hammer caused by a fast-acting valve occurred on the chilled water line. Hearing the water hammer, the investigators began to consider the possibility that the water hammer may have caused the pipe movement that, in turn, caused the insulation shield to fall. The developer was contacted to take actions necessary to prevent recurrence. (Water hammer is a pressure surge caused when a fluid in motion is forced to stop or change direction suddenly. This pressure wave can cause problems ranging from noise to vibrations to pipe collapse.) (ORPS Report NA--KCSO-AS-KCP-2014-0002)

On March 20, 2014, at Los Alamos National Laboratory, part of a drop ceiling installed during a construction upgrade came loose, bringing a light fixture down with it and spilling several ceiling tiles to the floor. Work in the area was curtailed until a path forward could be determined. Meanwhile, the room was posted as *No Entry*. An Extent of Condition review indicated potentially compromised ceiling installation in other areas where the construction upgrade occurred. Most notably, the anchors were not adequate to attach to the cement ceiling, and the framing had not been installed in accordance with drawings. (ORPS Report NA--LASO-LANL-ESHSUPT-2014-0001)

On March 17, 2014, at Y-12's Building 9204-2, an area of concrete delaminated from the ceiling and fell, striking a portable welding exhaust unit, then rebounding into a frequently used walkway. Some concrete chunks were more than a foot in diameter and 2 inches thick. Because that portion of the ceiling had been identified as degraded, the area below was controlled with marker tape and boundary markers. Personnel entering the controlled area were required to notify the Shift Manager and to don hard hats before entry. However, falling concrete spread into areas outside the existing boundary. Structural evaluations determined that corrosion had been caused by Kathene (aqueous lithium chloride) from a dehumidification unit on the floor above the area in question. (The unit had been drained and tagged out of service in 1988.) Immediately after the event, the exclusion area under and around the area was expanded and the controls were reevaluated as adequate for safety. (ORPS Report NA--YSO-BWXT-Y12NUCLEAR-2014-0003)

DISCUSSION

Workers on scaffolds or ladders must ensure that boundary controls are established before work starts, be aware of their surroundings, such as loose tools, and practice good housekeeping so that nothing falls into the area below them. Passersby or other workers in the area must obey boundary signs and be aware that something could fall on or near them without warning. Everyone inside the work area must wear appropriate Personal Protective Equipment (PPE).

Existing conditions where elevated work takes place should be evaluated before work starts to ensure barriers such as toeboards or tool-catching netting is in place. For example, toeboards or screens can be used to close the space above the floor of a scaffold so tools cannot inadvertently be kicked off, and so debris netting catches tools or materials before they hit workers below. Workers should be trained about the hazards of working below elevated work, so that they wear appropriate PPE, communicate with workers above them, and follow requirements to place floor-level barriers and/or signs to prevent others from entering an unsafe space.

Title 10, Code of Federal Regulations (CFR), Part 851, *Worker Safety and Health Program,* commits to providing DOE contractor workers with safe workplaces where hazards are abated, controlled, or otherwise mitigated. In addition, the Occupational Safety and Health Administration (OSHA) 1926.450 provides guidance for the use of scaffolds and 1926.451(h) for falling object protection.

RECOMMENDATIONS

The following recommendations are provided to prevent injury from objects falling into a normally occupied space.

- Post the entry to the work area with a warning of the particular hazard (e.g., *Overhead Work*).
- Prevent entrance of nonessential personnel by establishing barricades, roping off the area with appropriate signage, and/or positioning spotters.
- Allow only employees actively involved in work inside the barricade.
- Ensure that tools are tethered while in use at elevated positions and secured inside a tool bucket or pouch when not in use.
- Walk down all work steps with an eye to where and when objects could fall.
- Periodically inspect areas subject to vibrations from water hammer, high winds, or motors.
- Where it is difficult or impossible to ensure the safety of workers below, reschedule the work to be performed off-shift or at night.
- Inspect barriers or scaffolds with a questioning attitude: "What is the smallest item that can fit/fall through that opening?"
- Perform Extent of Condition reviews to determine if similar conditions exist in other areas or buildings.

CONCLUSION

Events involving items dropped into spaces normally occupied by workers occur on a regular basis and underscore the importance of work planning. Pre-work walk arounds should include a look **up** as well as **down** to protect workers who have to be at floor-level during elevated work. In addition, barriers and/or spotters should be in place to prevent nonessential personnel from passing through the area. And all workers should maintain situational awareness for anomalous events, such as the chunks of concrete that fell at Y-12. In all cases, immediate corrective actions and notification to other sites are essential for protecting worker health and safety and preventing recurrence.

REFERENCES

- Title 10, CFR, Part 851, *Worker Safety and Health Program*
- OSHA 1926.450 Subpart L, *Scaffolds*
- ORPS Reports:
  - FE--SPRO-SPR-WH-2014-0002, Fallen Generator Management Concern
  - EM-RP--BNRP-RPPWTP-2014-0007, Management Concern Regarding Dropped Tool
  - FE--SPRO-SPR-WH-2014-0001, Falling Wrench Near Miss
  - NA--KCSO-AS-KCP-2014-0002, Near Miss: Sheet Metal Insulation Protector Falls 15 Feet to Floor
  - NA--LASO-LANL-ESHSUPT-2014-0001, Recently Installed Drop Ceiling Partially Falls
  - NA--YSO-BWXT-Y12NUCLEAR-2014-0003, Concrete Delaminated from Ceiling 9204-2

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

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