Look Out Below — The Hazards of Falling Objects

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On November 7, 2007, at Hanford, a worker on a subcontractor survey crew dropped a metal flat bar for a laser sight instrument from a scaffolding platform. The bar, which weighed about 7 pounds, fell 17 feet and landed near a carpenter working directly below the survey crew. The carpenter was standing within 2 or 3 feet of where the bar landed and could have been seriously injured had it hit him. (ORPS Report EM-RP--BNRP-RPPWTP-2007-0020; final report issued December 19, 2007)

Workers had attached the flat bar to a stainless steel member of an elevator using magnets. (Figure 1-1 shows the scaffolding and the placement of the flat bar.) The laser sight also has a magnetic base, which is used to connect the instrument to the metal bar and hold it in place. When the crew member reached down and put the laser sight on the flat bar, the magnets holding the bar to the stainless steel member detached, and the bar fell. The worker was able to grasp the laser sight instrument and keep it from falling along with the bar. Figure 1-2 shows where the bar landed underneath the scaffolding and the location of the carpenter at the time of the incident.

Investigators determined that the surveyors failed to ensure that the flat bar was attached securely. However, they also determined that the work package documentation for both work groups was inadequate and did not provide for thorough job scoping and planning for any associated hazards. As a result of the work package deficiencies, signs for overhead work had not been posted before work began and no barrier tape or other restrictive measures were in place.

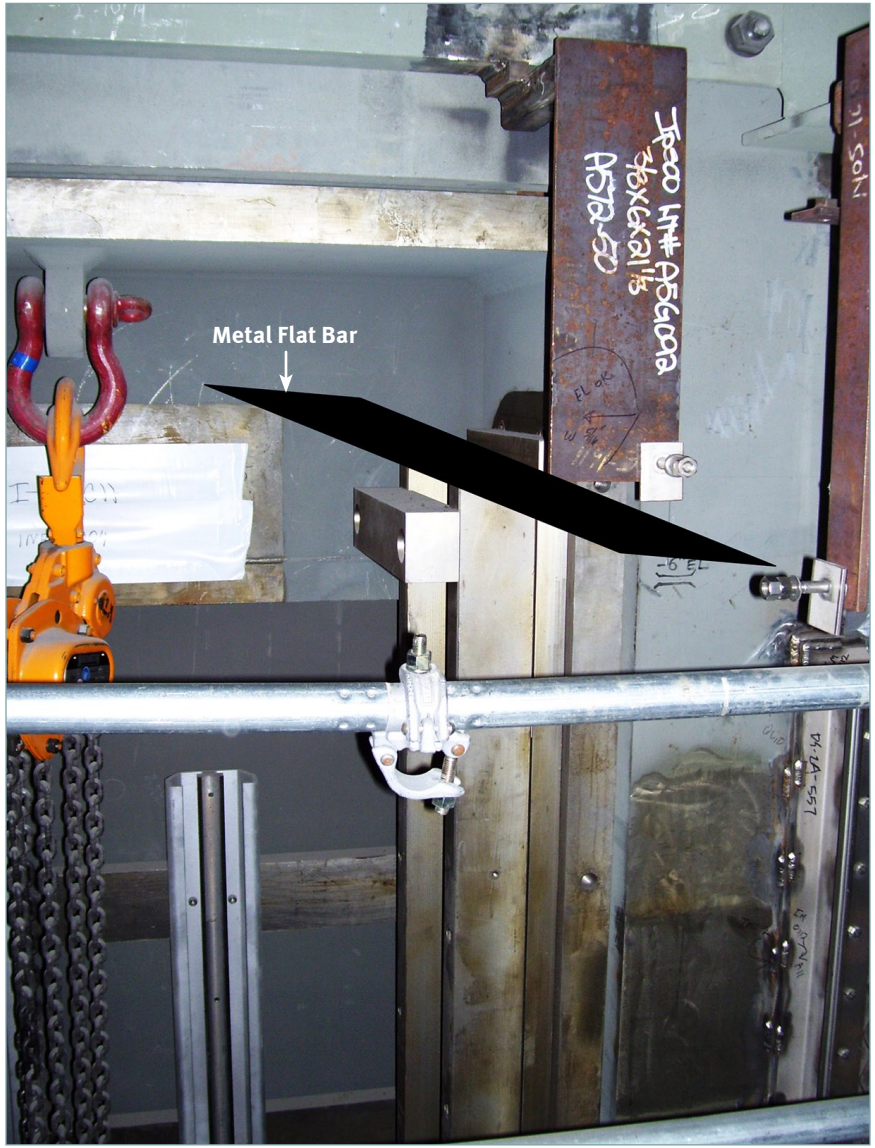


Figure 1-1. Illustration of metal piece placed on scaffolding

The investigators' review of the work packages indicated that the survey crew's work package inadequately addressed the requirements of working at heights and working outside the boundary of the scaffolding. In addition, they found that the work package did not address the possibility of having others working directly below them. The carpenters' work package addressed barricading, if required, but no barricades were used because the carpenters were not working at heights. Investigators also learned that the carpenters and the survey crew had not communicated about the work project. The carpenters knew that work was going on above them, but did not know what type of task was being performed.

Figure 1-2. Location of bar after falling and area where carpenter was standing

Two similar events occurred at Hanford earlier in 2007; one in January and one in February.

On January 29, 2007, a hot stick fell from a bucket truck and glanced off a worker below. The hot stick, which was approximately 6 feet long and weighed 3 to 5 pounds, fell approximately 12 to 15 feet from the bucket to the ground and glanced off the shoulder and hardhat of an electrician working below. Investigators determined that a spotter did not tell the electrician to leave the area before the lineman moved into position and did not let the electrician know that the bucket was moving into position above him. They also determined that the lineman did not understand the potential falling hazard presented by the hot stick and did not secure it to the bucket. (ORPS Report EM-RL--WCH-GENAREAS-2007-0001)

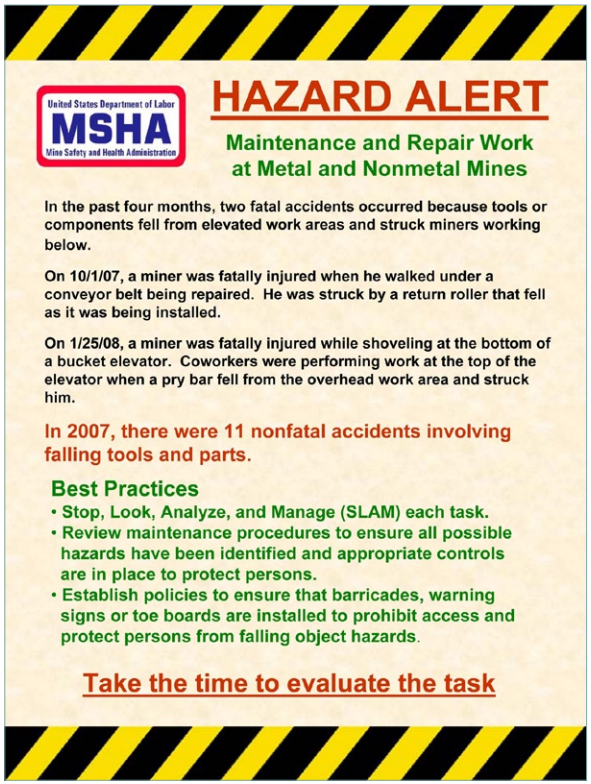
The second event occurred on February 19, 2007, when a 15-inch-long section of piping fell 12 feet to the floor and landed within 3 or 4 feet of a carpenter working below. Pipefitters were working from a scissor lift. As they moved a 100-foot section of pipe, it pushed the 15-inch section out of the pipe rack. When the section of pipe fell, it slid across the floor into a barricaded area the carpenters had set up and narrowly missed the carpenter. Investigators determined that the job hazard analysis did not provide sufficient guidance to address the possibility of piping falling because the spool of piping that fell was over 100 feet from where the pipefitters were working. Workers incorrectly assumed that the usual methods of securing the piping (e.g., using clamps, extending the piping over two racks) would be sufficient to keep the pipe from sliding out of the rack. To address these concerns, a new job hazard analysis,

which included a requirement to use three supporting points when moving piping, was issued to address the specific hazards associated with installing piping in overhead or elevated areas. (ORPS Report EM-RP--BNRP-RPPWTP-2007-0002; final report issued March 22, 2007)

Worker injuries resulting from falling objects have also been reported to ORPS. In April 2004, a Stanford Linear Laboratory worker standing on a ladder while removing communications cables dropped a cable splice enclosure containing two cables. The enclosure hit his co-worker in the face, lacerating the area around his right eye. Investigators determined that the pre-work hazard analysis did not identify all job hazards. (ORPS Report SC-OAK--SU-SLAC-2004-0003)

A second injury event that also occurred in 2004, at Rocky Flats, resulted in a worker being hit by the handle of a sledge hammer. The sledge hammer fell from the second floor of a building, dropped through a hole, and struck the floor 16 feet below. When it hit the floor, the sledge hammer bounced, and the handle struck the worker in the back. The worker suffered minor contusions, but could have been severely injured or killed if the sledge hammer had hit him directly. (ORPS Report EM-RFO--KHLL-D&DOPS-2004-0001)

Although none of these events resulted in fatalities, both serious injuries and fatalities can result if an object falls from a height and strikes someone below. On February 12, 2008, the Mine Safety and Health Administration (MSHA) issued a Hazard Alert following two fatalities in 4 months that occurred when tools or components fell from elevated work areas and struck workers below. Figure 1-3 shows the bulletin, which cautions workers to take time to evaluate each task and provides best practices to avoid the risks of falling object accidents.


United States Department of Labor
MSHA
Mine Safety and Health Administration

HAZARD ALERT

Maintenance and Repair Work at Metal and Nonmetal Mines

In the past four months, two fatal accidents occurred because tools or components fell from elevated work areas and struck miners working below.

On 10/1/07, a miner was fatally injured when he walked under a conveyor belt being repaired. He was struck by a return roller that fell as it was being installed.

On 1/25/08, a miner was fatally injured while shoveling at the bottom of a bucket elevator. Coworkers were performing work at the top of the elevator when a pry bar fell from the overhead work area and struck him.

In 2007, there were 11 nonfatal accidents involving falling tools and parts.

Best Practices
- Stop, Look, Analyze, and Manage (SLAM) each task.
- Review maintenance procedures to ensure all possible hazards have been identified and appropriate controls are in place to protect persons.
- Establish policies to ensure that barricades, warning signs or toe boards are installed to prohibit access and protect persons from falling object hazards.

Take the time to evaluate the task

Figure 1-3. MSHA Hazard Alert, February 12, 2008

A Lawrence Livermore National Laboratory Lessons Learned document issued in April 2005 (LL-2005-LLNL-10), following two falling object accidents that occurred during roofing projects at the Laboratory, reported that an analysis of 13 events that had occurred across the Complex in the previous 17 months identified the following similarities among the events.

- Work planning, work authorization, and work deficiencies were causal factors in most of the events.
- Job hazard analyses often did not address the potential for falling objects.
- Work planners did not specify that the area below elevated work should be cleared and roped off to protect personnel from falling objects.
- Ground workers became complacent about yellow boundary tape and crossed the boundary to perform work.

To address these issues and the hazards of falling objects, the Lessons Learned Bulletin listed the following recommendations.

1. Ensure a comprehensive job hazards analysis is performed and documented when planning construction, repair, and D&D activities with elevated work areas. Emphasis should be placed on the control of falling objects and avoidance of working below other work activities.
2. Adequately secure the area below elevated work. Install barricades, post warning signs, and require all personnel to remain clear of the hazard area to protect against falling objects.
3. Wear hardhats when working in areas where falling object hazards are likely to occur.
4. Maintain control of tools and materials when working at an elevation. Use wrist straps, tool tethers, toe boards, screens, and guardrails to prevent falling objects, and use debris netting or canopies to catch falling objects.
5. Adequately secure equipment and tools before raising or lowering them.
6. Obey posted warning signs and all boundary tape and barriers.
7. Remove debris and remove or secure tools from the scaffold at the end of the shift.
8. Ensure toe boards are installed on scaffolds.

OSHA requirements in 1926.451(h), "Falling Object Protection," state that "where there is a danger of tools, materials, or equipment falling from a scaffold and striking employees below, the area below the scaffold…shall be barricaded, and employees shall not be permitted to enter the hazard area."

The requirements further state that either a guardrail system must be installed (with openings small enough to prevent passage of potential falling objects), or a canopy structure, debris net, or catch platform strong enough to withstand the impact forces of the potential falling objects must be erected over the employees below. In addition, an OSHA Construction e-tool, available at www.osha.gov/SLTC/etools/construction/struckby/falling_flying.html, provides information on protecting workers from the dangers of falling objects, including general precautions (e.g., wear a hardhat) and specific precautions (e.g., barricading hazard areas) that should be taken for overhead work.

These events illustrate the importance of ensuring that workers are protected from the hazards of falling objects and that those working on the ground are aware of work going on overhead. It is essential to identify potentially hazardous conditions before work begins and to take the appropriate precautions, such as barricading hazard areas and ensuring that workers are wearing hardhats. It is also important to ensure that workers at elevations and those working below them communicate before work begins so that both groups are aware of the potential for falling object hazards and can take appropriate actions.

KEYWORDS: Falling objects, laser sight, flat bar, scaffolding, injuries, job planning, barricades

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