Office of Environment, Safety and Health • U.S. Department of Energy • Washington, DC 20585

OPERATING EXPERIENCE SUMMARY

Office of Environment, Safety and Health

Summary 2002-12
June 17, 2002

The Environment, Safety and Health (EH) Office of Performance Assessment and Analysis publishes the Operating Experience Summary to promote safety throughout the Department of Energy (DOE) complex by encouraging the exchange of lessons-learned information among DOE facilities.

To issue the Summary in a timely manner, EH relies on preliminary information such as daily operations reports, notification reports, and, time permitting, conversations with cognizant facility or DOE field office staff. If you have additional pertinent information or identify inaccurate statements in the Summary, please bring this to the attention of Frank Russo, 301-903-1845, or Internet address Frank.Russo@eh.doe.gov, so we may issue a correction.

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.

Operating Experience Summary 2002-12

TABLE OF CONTENTS

EVENTS

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EVENTS

1. INADEQUATE ADMINISTRATIVE CONTROL OF ELECTRICAL WATER HEATER INSTALLATION

On January 23, 2002, at the Savannah River Site, electrical personnel from the Site Utility Department were tasked with troubleshooting an on-demand hot water heating system. An electrician found the system's two disconnects in the "off" position. When he removed cover plates from two control panels, he discovered all of the 480-volt conductors disconnected and bare wires exposed in the terminal junction box. Some of the bare wires could potentially have touched the metal disconnect boxes. There were no lockouts on the system, and "Do Not Operate" tags were not attached to the disconnects. No injuries occurred as a result of this event. (ORPS Report SR--WSRC-SUD-2002-0002; final report filed March 25, 2002)

The electrician removed the fuses from the disconnect boxes to place the exposed conductors in a safe configuration and de-energized the 480-volt circuit breaker that feeds power to the disconnects. He then installed a lockout on the system and properly connected the loose conductors to the terminals. A critique of the occurrence identified the concerns described below.

- The organization responsible for installing the system failed to leave it in a safe configuration upon completion of the project (e.g., wires not terminated and left energized).
- The system was not turned over to the operations organization (owner).
- An acceptance inspection of the as-installed system was not performed in accordance with the Site Safety Manual.

The root cause of this event was inadequate administrative control over the project. There was no agreement or understanding as to which organization was responsible for overseeing the system installation process. Some of the corrective actions that have been taken include the following.

- Contacted the Senior Electrical Review Board to improve communications among work groups within the facility management process.
- Reviewed the facility lockout log to determine methods for improving lockout and tagout procedures.
- Formalized custodial responsibilities at the facility for improving accountability.
- Reviewed the cost project process to identify the proper protocol for transferring ownership as work milestones are achieved.
- Applied an administrative electrical lockout to prevent inadvertent energizing of the on-demand hot water heating system until it is restored to operational status.

This event underscores the importance of sound and effective project management practices during new system installation, maintenance, system upgrade, decommissioning, and disposition of facilities and equipment. Although no injuries occurred as a result of this event, it is significant because an improperly secured electrical system with exposed conductors poses a potential safety hazard. A formal protocol should be developed and implemented to ensure adequate communications between project management and facility management during various project stages. If a project stalls for technical or budgetary reasons, the protocol needs to include procedures by which project components are properly secured in the interim to ensure personnel safety.

KEYWORDS: *Project management, communications, lockout/tagout, administrative control, electrical safety, system turnover*

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

2. FOLLOW-UP MEDICAL MONITORING IDENTIFIES FALSE POSITIVE FOR CADMIUM UPTAKE

On February 13, 2002, at the Paducah Gaseous Diffusion Plant, the prime contractor for the Environmental Restoration facility reported that a radiological control technician's bioassay indicated a potential cadmium uptake. A urine sample indicated 6.7 micrograms per gram (µg/g) creatinine, which exceeded the Occupational Safety and Health Administration (OSHA) action level of 3.0 µg/g and the American Conference of Government Industrial Hygienists (ACGIH) biological exposure index of 5.0 µg/g. However, the creatinine level from the sample was below the OSHA Permissible Exposure Limit of 7.0 µg/g. To ensure worker safety and health, follow-up medical monitoring was conducted, which determined the initial bioassay results were false positive. (ORPS Report ORO--PGDPENVRES-2002-0004; final report filed April 22, 2002)

Creatinine is a protein produced by muscles and released to the blood. Excessive serum creatinine could indicate kidney damage from a cadmium uptake. Exposure to cadmium can damage lungs, cause kidney disease, and irritate the digestive tract. Chronic exposure can result in pulmonary emphysema, kidney dysfunction, and possibly lung or prostate cancer.

On January 31, 2002, the radiological control technician, who was supporting a decontamination project, submitted a 24-hour urine sample that was analyzed for heavy metals and other regulated analytes. Laboratory results, received by the prime contractor on February 13, 2002, indicated a cadmium exposure level that exceeded both the OSHA action level and the ACGIH biological exposure index. Another sample was submitted to check the accuracy of the earlier test results. In addition, a team comprising two subcontractor organizations and prime contractor personnel initiated an investigation of the cadmium exposure to determine whether the exposure occurred at the Paducah site. The team coordinated the following investigative activities.

- A complete physical examination was performed including a blood test, a second urinalysis, and beta-2 microglobulin tests. The results of these tests exhibited less than detectable levels of cadmium in both blood and urine, and results within limits on the beta-2 microglobulin. Based on these follow-up tests, there was no indication of a cadmium uptake.

- Investigators used the Internet to search for available information on possible exposure/intake pathways.

- Investigators interviewed the radiological control technician about his personal habits and work history and determined that they did not appear to have caused the elevated cadmium levels indicated in the original urine sample.

- Laboratory analyses of the work areas and breathing zone air-monitoring filters indicated no significant amount of airborne cadmium, and at no time did the level of cadmium reach or exceed the OSHA action level.

- Investigators reviewed the heavy metal baseline results for coworkers and other project personnel and determined that none had cadmium levels equaling or exceeding any limits.

- Investigators discussed the initial high cadmium results and later sampling with physicians, who agreed that the radiological control technician did not receive a significant cadmium uptake and that the initial results were obviously in error.

Based on the results from this examination, investigators determined that the high cadmium levels reported from the first set of urine tests resulted from an error in the data from the contracted medical laboratory. The probable direct and root causes of the erroneous results may be one or more of the following: contaminated sample container, improper instrument calibration, cross-contamination, expired

or incorrect standards or reagents, incorrect sample preparation, accidental spiking, calculation errors, or failure to follow procedures.

This event demonstrates the importance of reviewing all relevant evidence for a potential uptake. In this event, correlation of cadmium test results of all workers and the industrial hygiene monitoring results cast doubt on the positive cadmium result with this one worker. Any suspect results need to be investigated and checked for accuracy through a thorough medical examination and additional testing. In addition, information must be gathered on possible causes of exposure so that a final conclusion can be drawn.

KEYWORDS: *Cadmium exposure, medical monitoring, monitoring data, false positive*

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

3. CRANE LOSES BALANCE DURING LIFTING OPERATION

On May 1, 2002, at the Sandia National Laboratory, a crane operator was using a 90-ton hydraulic crane to lift a 30,000-pound communications manhole when the crane became unbalanced and tipped forward, raising the back outriggers approximately 4 feet off the ground. The crane operator immediately released the load, which was approximately 3 feet off the ground at the time, righting the crane. The lift was temporarily stopped to adjust the position of the crane before the lift could finally be completed safely. No injuries, material damage, or programmatic impact occurred as a result of this event. (ORPS Report ALO-KO-SNL-1000-2002-0002; final report issued May 20, 2002)

The prime construction contractor subcontracted a crane services company to lift and place the communications manhole. The crane subcontractor provided a state-licensed crane operator and a 90 ton-capacity hydraulic crane to perform the lift. The crane was inspected by a Sandia-certified crane inspector and was approved to perform the lift. Employees from the construction contractor rigged the manhole structure, and the lift was initiated (Figure 1). At about one minute into the lift, after laterally maneuvering the crane approximately 40 feet, the crane operator extended the boom in order to exactly place the manhole in the excavation. The crane tipped forward, raising the back outriggers off the ground, requiring the load to be immediately released.

Figure 1. Crane lifting the manhole structure

The direct cause of this event was the operator's inattention to detail because he failed to correctly calculate the boom angle relative to the load weight. A significant contributing cause was the lack of specific direction in the construction contractor's Contract-Specific Safety Plan regarding supervisory oversight of subcontractors during crane operation.

The root cause of this event was a failure to follow established procedure by the crane subcontractor, which specifically requires "…a qualified crane superintendent or supervisor to check the job, size the crane, and be present and responsible to see that the job is carried out as planned and on time." If this requirement had been met, the event could have been prevented.

The following are some corrective actions that have been or will be implemented as a result of this event.

- The construction contractor issued an addendum to the Contract-Specific Safety Plan that provides specific guidance to their supervisory personnel regarding oversight of crane subcontracting activities. This oversight will ensure the subcontractor's procedures require that a supervisor approves the lift plan and is present during the lift, the operator is experienced and licensed, and the crane is rated for the load and has documented inspections.

- The Sandia Construction Inspection and Acceptance organization will increase the level of inspector involvement in crane lift activities for all Laboratory construction.

On March 3, 2001, a similar event occurred at Sandia National Laboratory, when a mobile crane became unbalanced while lifting a 16,000-pound air conditioning unit, causing the left front outrigger to lift off the ground approximately 2 feet. The operator was able to bring the load under control. Investigators determined that the crane operator failed to follow the manufacturer's load chart or evaluate the position of the crane relative to the load. The lift was more than 15 feet outside the load chart for the weight and boom length. One of the corrective actions taken was to clarify guidance to prime contractor and subcontractors involved with this event that required safety plans are to be transmitted to all subcontractors regardless of tier. (ORPS Report ALO-KO-SNL-NMFAC-2001-0001)

These occurrences illustrate the importance of supervisory oversight during lifting operations. Proper oversight of the lift, in accordance with established procedures, would have prevented these events. Another lesson learned that the site identified in the more recent occurrence is that implementing the principles of Integrated Safety Management is critical to the safe performance of crane lifting activities. Failure to follow established procedures by crane operators can lead to serious personnel injury and loss of property. Hoisting and rigging best practices and requirements can be found in DOE-STD-1090-2001, *Hoisting and Rigging (*Formerly *Hoisting and Rigging Manual*).

Both of these occurrences illustrate the importance of adequately defining the scope of work, performing a pre-job hazard analysis, and working within controls.

KEYWORDS: *Balance, crane, lifting operations*

ISM CORE FUNCTIONS: *Define the Scope of Work, Analyze the Hazards, Perform Work within Controls, Provide Feedback and Continuous Improvement*

4. FALLING PART FROM ROLL-UP DOOR RESULTS IN NEAR MISS

On May 13, 2002, at the Idaho National Engineering and Environmental Laboratory, a facility manager reported a near miss when a half-pound metal part from the operating mechanism of a roll-up door fell and landed approximately 3 feet from an operator. The operator was closing the door when a metal collar for retaining a bearing fell approximately 25 feet to the floor. No injuries to the operator resulted from the occurrence. Preventive maintenance on the roll-up door had not been performed in several years. (ORPS Report ID-BBWI-TAN-2002-0001)

Figure 1. Rollup door

The operator was performing a weekly inspection required by the Resource Conservation and Recovery Act compliance program, which included a test of the metal roll-up door for proper operation. The door is 35 feet in height (Figure 1), and is equipped with an electric/manual door opener. The door opener mechanism comprises several gear reductions, a clutch, a motor, and a brake. The bearing locking collar that came loose is held in place by two setscrews, and is on an idler shaft to prevent the idler sprocket from moving laterally (Figure 2).

In August 2001, a drive gear-retaining washer fell from the operating mechanism of this door during door operation. Investigation of this event revealed that the drive gear bushing was severely worn, causing the gear-retaining washer and bolt to work loose. A craftsman repaired the bushing and returned the door to service. Upon reviewing this previous failure, two issues were identified: (1) the falling part was not identified as a near-miss occurrence, and (2) the craftsman's comment in the work order — that the door operating mechanism "had poor gear mesh engagement and warranted frequent visual inspection" — was not acted upon.

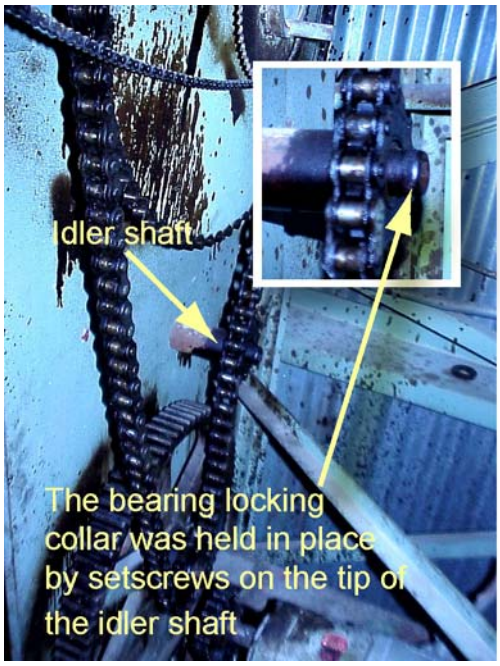

Figure 2. The gear arrangement

The contractor's review of the preventive maintenance status for this door revealed that no preventive maintenance had been performed on the door since February 1999. During 2000, preventive maintenance on overhead doors evolved into a semiannual general inspection of the door and the electric operating mechanism. The locking collar was not specifically checked, and the only check specified in the preventive maintenance work order that could have helped maintenance personnel detect loose setscrews was the procedural step, "Check clutch and brake for condition and drive parts for loose bolts."

The contractor's corrective actions included the following measures: The door in question was locked and tagged out of service and a work order was prepared to replace the locking collar and inspect the door for loose or damaged parts. Other overhead doors that have not had regular preventive maintenance were taken out of service and inspected for loose or damaged parts under a Minor Maintenance work order. Doors that are required to be opened for essential operations before inspections are completed must have a barrier that precludes personnel access to the area underneath the operating mechanism. Doors that passed inspection were put back in service, and doors that failed will remain out of service until corrective maintenance is performed. Preventive maintenance schedules will be developed for all overhead doors that are considered in service. The gear mesh issue will be formally evaluated, and corrective actions will be developed based on the results.

A search of the Occurrence Reporting and Processing System database for similar events identified eight reported roll-up door failures, none of which were recent. However, an event at the Oak Ridge Y-12 Site is worthy of mention because of its similarity. On December 1, 1994, a 9¾-inch sprocket gear dislodged from a motor shaft on a roll-up door and fell, striking a material clerk in the chest, causing minor injuries. The gear fell after the clerk had engaged the door opener. Investigators determined that a setscrew that secured the sprocket gear to the motor shaft had loosened, allowing the gear to slide to the end of the shaft and fall. The root cause was the failure of management to provide necessary resources to perform required preventive maintenance and ensure safe operation of the door.

These events illustrate that operating mechanisms associated with overhead doors require periodic inspection as part of a preventive maintenance program. Falling parts from overhead door mechanisms have the potential for causing serious injury to facility personnel.

KEYWORDS: *Overhead doors, preventive maintenance, inspections, near miss, falling parts*

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

5. BLISTERED AND LEAKING SHIPPING CONTAINERS DISCOVERED

On May 13, 2002, at the Portsmouth Gaseous Diffusion Plant, a compliance inspector discovered a leaking shipping container in a waste storage facility. On May 16, further inspections discovered two other containers that were blistering. The containers had been loaded with demolition debris (mostly acid brick) in the summer of 2001, but scheduling delays had prevented shipment of this waste for disposal. (ORPS Report ORO-BJC-PORTENVRES-2002-0012)

The damaged containers are of the MacTec B-25 type, and are used without liners. Most of the B-25 containers exhibited obvious outward dents and bulges from workers dropping the bricks into the containers as they filled them. Some have bowing bottoms and are filled to capacity, but none appear to be overloaded. The bricks contained residual water when they were loaded into the containers. A solid material was accumulating and hanging from the bottom of the leaking container and building up on the container directly beneath it (Figure 1). Sample testing of the liquid from the leaking container indicated a pH of between 3 and 4.

Figure 1. Material leaking from container

A critique held by the contractor indicated that leaking containers are a common and expected occurrence.

Workers placed the leaking B-25 container into a B-26 overpack and patched the two blistered containers. There has been no noticeable leakage from these repaired or overpack containers. However, there is concern that the acid leakage from the B-25 container will eventually cause leaks in the B-26 overpack as well. The contractor has also decided that the B-25 containers will no longer be stacked.

This event illustrates that delays in shipping schedules can result in material being stored for extended periods of time in shipping containers that were not intended for storage. Evaluations should be performed on shipping containers and their contents to anticipate the impact of a storage time onsite before loading operations commence. Additionally, as is the case with many decontamination and decommissioning projects, none of the original project personnel are still on this site, making documentation and accessibility of project files extremely important.

KEYWORDS: *Shipping containers, D&D, corrosion*

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