

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

# OPERATING EXPERIENCE SUMMARY



**Office of Environment, Safety and Health**

Summary 2001-05

The Office of Environment, Safety and Health (EH) 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](mailto: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 2001-05

## TABLE OF CONTENTS

1.	ACCIDENT INVESTIGATION OF HEAD INJURY .....	1
2.	HYDROSEEDER CAUSES POWER OUTAGE.....	3
3.	ENERGIZED ELECTRICAL LINES UNEXPECTEDLY CUT.....	4
4.	EXCAVATION FLOODED DURING FIRE HYDRANT REMOVAL .....	5
5.	DOE FINES KAISER-HILL FOR SAFETY VIOLATIONS.....	6



## Visit Our Web Site

Please check our web site every two weeks for the latest OE Summary. The Summary is available, with word search capability, via the Internet at [www.tis.eh.doe.gov/oesummary](http://www.tis.eh.doe.gov/oesummary). If you have difficulty accessing the Summary at this URL, please contact the ES&H Information Center, (800) 473-4375, for assistance. We would like to hear from you regarding how we can make our products better and more useful. Please forward any comments to [Frank.Russo@eh.doe.gov](mailto:Frank.Russo@eh.doe.gov).

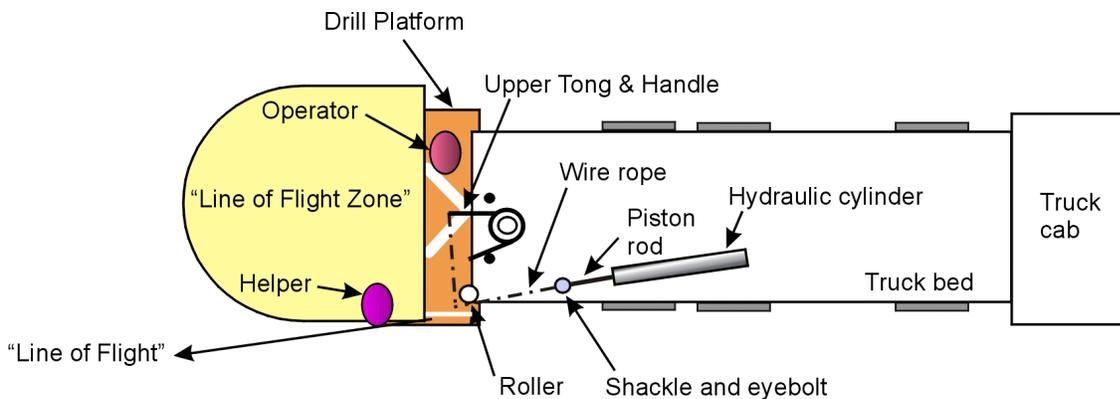
This page is intentionally blank.

## EVENTS

### 1. ACCIDENT INVESTIGATION OF HEAD INJURY

Operating Experience Summary 2001-01 notified readers about the pending formal investigation of a head injury at Fermilab. A Type A Accident Investigation Board was appointed to analyze causal factors, identify root causes, and determine judgments of need to prevent similar accidents in the future. The full report, documenting the results of the Board's investigation, is available electronically at <http://tis.eh.doe.gov/oversight>. (ORPS Report CH-BA-FNAL-FERMILAB-2001-0006)

On June 21, 2001, a construction sub-tier contractor employee at the Fermi National Accelerator Laboratory received serious head injuries requiring hospitalization when he was struck by part of the drilling rig (a "tong") that he was operating. The tong, a 32-inch steel bar with a handle, was used as a pipe wrench to connect and disconnect drill piping. Figure 1 provides an overhead view of the drilling rig. The accident occurred when a welded connection in the hydraulic system used to apply force to the tong failed as the two-man crew was removing lower sections of the drill assembly. The drill rig helper indicated that at the time of weld failure, the operator was standing with his head near the tong and operating the hydraulic cylinder to disconnect a drill section joint. The operator remained hospitalized until July 9, 2001.



**Figure 1. Overhead Schematic of Drilling Rig**

Although this incident was apparently an equipment failure, unlike previous incidents where the lack of planning and adequate hazard analyses were contributing factors, another suspension of work order was issued to check all equipment for proper and safe operation. Criteria for restart of production work were developed, and full production was resumed on July 19, 2001.

A detailed description of the causal factors is available in the Type A investigation report. The direct cause of the accident was the weld failure on the eyebolt and piston rod connection released tension on a wire rope sling attached to the tong; the tong recoiled toward the Operator and struck him in the head. The original threaded connection had failed on the aging equipment and had been field repaired with a welded connection.

The Root cause was determined to be Fermilab's failure to implement a hazard analysis process that was effectively applied to task-specific hazards for construction subcontractors and sub-tier contractors.

**Judgments of need** are managerial controls and safety measures believed to be necessary to prevent or minimize the probability of a recurrence. They are derived from the causal factors, and are directed at guiding managers in developing corrective actions. Below is a summary of the judgments of need, as determined by the Investigation Board.

- Fermilab needs to improve the existing hazard analysis process as specified in the Fermilab Environment, Safety, and Health Manual (FESHM) 7010 by developing instructions and guidance to ensure that the process applies to sub-tier construction contractors at the work activity level.
- Fermilab needs to ensure that root and contributing causes from incidents and occurrences are thoroughly evaluated against Integrated Safety Management (ISM) core functions and guiding principles, and that resulting lessons learned are disseminated and communicated to all appropriate personnel. Additionally, Fermilab needs to conduct follow-up reviews to ensure that the information is used to improve the level of safety at the site.
- Fermilab needs to establish and implement a process to ensure that all safety and health requirements flow down to subcontractors and sub-tier contractors.
- The Fernald Area Office (FAO) needs to ensure that Fermilab establishes and implements processes to verify and validate that safety and health requirements are translated into subcontractor and sub-tier contractor procedures.
- The Chicago Operations Office Manager needs to validate the processes and procedures used by FAO and Fermilab to verify that work controls are established and implemented before the start of work.
- The Chicago Operations Office and Fermilab need to revise contracting, procurement, and project management processes to ensure that safety and health requirements associated with construction operations (by subcontractor and sub-tier contractors) are clearly conveyed.
- The Office of Science needs to implement the requirements established in the Office of Science Functions, Responsibilities, and Authorities Manual for measuring line environment, safety and health oversight effectiveness of the Chicago Operations Office.

Facility managers and DOE Field Element Managers should consider the Root and Contributing Causes in this lessons learned alert and take appropriate actions as follows:

- Ensure safety and health requirements are contained in procurement and contracting documents.
- Ensure that processes are established that translates safety and health requirements into subcontractor procedures, ensuring flowdown to all sub-tier contractors.
- Establish and implement a formalized safety management system with clearly defined roles, responsibilities, and authorities when multiple organizations, subcontractors and/or sub-tier contractors are involved in a construction project.
- Ensure that workplace and job/task-specific hazards are properly identified and understood so that controls are properly developed and implemented.
- Ensure that contracting, procurement, and project management mechanisms are consistently conveyed.
- Enforce safety and health expectations to construction subcontractor and sub-tier contractors.
- Ensure that Oversight programs identify fundamental weaknesses in construction subcontractor and sub-tier contractor safety and health programs.

**KEYWORDS:** Type A investigation, injury, hazard analysis

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

## 2. HYDROSEEDER CAUSES POWER OUTAGE

On June 12, 2001, at the Y-12 Site, the water cannon of a hydroseeder snagged and pulled a communications cable as the hydroseeder was driven under electrical lines. This caused a transmission line to part from its insulators, resulting in a power outage to the Environmental Management Waste Management Facility (EMWMF) and the Liquid Storage Facility (LSF). (ORPS Report ORO--BJC-Y12WASTE-2001-0005)

A work crew was seeding grass on an area of the EMWMF construction site on June 12, 2001, using a truck-mounted hydroseeder. Figure 1 shows the type of hydroseeder that was used. A span of communication lines and 13.8 kV electrical transmission lines cross over an entrance road to this area. A construction crew had previously raised the road several feet, but neglected to maintain a minimum height between the road and overhead wires. The site environment, safety and health (ES&H) plan requires a minimum clearance of 15 feet, and the National Electrical Safety Code requires a minimum clearance of 15½ feet.



**Figure 1. Hydroseeder with Unsecured Water Cannon on Top**

During the afternoon, the work crew drove through the entrance with the water cannon atop the hydroseeder in an unsecured, upright position. The maximum height that the water cannon and its arm can extend is 15 feet 3 inches above the ground. The water cannon caught the communication line and pulled the line and nearby utility poles. As the water cannon broke from its holder, tension was suddenly released in the line and the poles sprung back, causing the 13.8 kV phase line to be pulled from its insulators on three adjacent poles. This caused several fuses to trip, causing a power outage to the EMWMF and LSF sites. Immediate actions taken included ensuring that the area was safe and no workers were injured, closing the entrance, and initiating an investigation. The investigation revealed that:

- Project management identified concerns about changing site conditions and potential overhead line problems, but did not communicate these to all affected parties.
- Although the site ES&H plan addressed the overhead lines, the activity hazard analysis and pre-task safety plan for hydroseeding did not.
- No one evaluated the height of the hydroseeder, its water cannon, and the overhead lines prior to the start of the task.
- The water cannon was not secured in a lowered position.
- No observer (spotter) was used while the hydroseeder was moving under the lines, as required by the site ES&H plan.
- The construction crew that raised the entrance road did not maintain the minimum clearance between the road and overhead lines, as required by the National Electrical Safety Code.

The contractor has yet to formalize corrective actions and lessons learned. One action under consideration would be to modify the site ES&H plan so that its minimum clearance requirement for overhead lines is consistent with that specified in the National Electrical Safety Code.

A similar occurrence took place on December 12, 2000, when the raised boom of a trackhoe struck overhead lines at Ashtabula, Ohio. (ORPS Report OH-AB-RMI-RMIDP-2000-0007) OE Weekly Summaries 99-16, 99-28, and 99-29 discuss several other similar occurrences. More recently, on September 4, 2001, the raised bed of a dump truck struck and damaged an overhead lighting circuit. (ORPS Report ORO--BJC-PGDPEVRES-2001-0021)

These occurrences demonstrate the importance of identifying the hazards overhead electrical lines pose to moving equipment, and the need to establish controls at the worker level.

**KEYWORDS:** *Overhead lines, transmission lines, hydroseeder, power outage*

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

### 3. ENERGIZED ELECTRICAL LINES UNEXPECTEDLY CUT

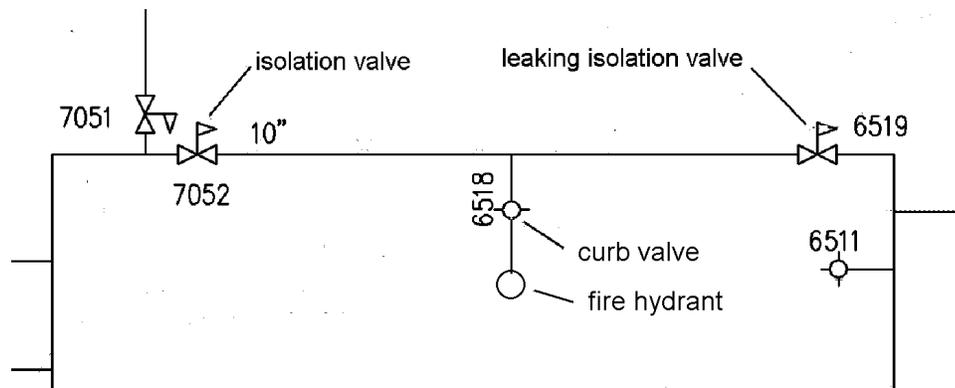
There have been a number of incidents in recent weeks where energized cables have been severed during construction activities. No injuries resulted from these incidents, and they were categorized as near misses. The workers were unaware that the energized cable was in their path of work, or they were aware that the energized cables existed but inadvertently breached them anyway. Extra care should be employed when planning an excavation including a review of drawings and a check for buried utilities including energized electrical cables or pressurized piping. EH is developing special report detailing the lessons learned and significant corrective actions from these occurrences. (Examples include ORPS Report OAK--LLNL--LLNL-2001-0024, RFO--KHLL--WSTMGTOPS-2001-0030, ORO--BNFL-K31-2001-0003, CH-AA-ANLW-ANLW-2001-0002, ALO-LA-LANL-FIRNGHELAB-2000-0003).

## AUTOMATIC FIRE SPRINKLER SAFETY & HEALTH HAZARDS ALERT

A new Safety & Health Hazards Alert has been posted on the ES&H homepage at <http://tis.eh.doe.gov/portal/home.htm>. The Alert focuses on the recent fire sprinkler recall and recent series of ORPS events involving defective sprinkler heads. It also discusses actions that should be considered for potentially defective fire sprinklers that have either been addressed by the Consumer Products Safety Commission or past DOE notices.

### 4. EXCAVATION FLOODED DURING FIRE HYDRANT REMOVAL

On July 30, 2001, a fire hydrant's water supply line flooded an excavation at the Idaho Nuclear Technology and Engineering Center (INTEC) at the Idaho National Engineering and Environmental Laboratory (INEEL). The line separated during a maintenance activity in which the hydrant was being removed for repair. The workers had closed isolation valves and checked for water pressure in the line. However, the pressure check was done incompletely, and failed to indicate that one of the isolation valves leaked. No one was in the excavation when it flooded, and no one was injured. (ORPS Report ID--BBWI-LANDLORD-2001-0014)



**Figure 1. Fire hydrant piping and valve diagram**

Figure 1 is a schematic of the hydrant and its valves. Before excavation to remove the hydrant began, the utility maintenance crew closed, locked, and tagged two isolation valves (Valves numbered 6519 and 7052 in Figure 1) in the hydrant's water supply loop. When the crew opened the line to verify zero pressure, the hydrant leaked only a small amount of water, indicating successful isolation. However, no one had opened the curb valve near the base of the hydrant's riser pipe. Thus, the pressure check reflected line isolation only at the closed curb valve and failed to disclose that one of the isolation valves was faulty and leaked, and that the line upstream of the curb valve was still pressurized.

The maintenance crew excavated soil around the hydrant's riser pipe and curb valve. As the crew removed one of the concrete thrust blocks supporting the riser pipe, a mechanical slip joint upstream of the curb valve separated due to water pressure, gravity load, and movement of the riser pipe. Water escaped through the joint at approximately 120 pounds per square inch (psi). The resulting pressure fluctuation in the fire main caused a diesel firewater pump to start and to feed high-pressure water to the main, as designed. High-pressure water continued to flow past the malfunctioning isolation valve, out the separated joint, and into the excavation, which overflowed. There were no workers in the excavation when it flooded, and no one was injured. However, had workers been in the excavation, the flooding could have posed a risk of workers drowning or the excavation walls caving in. The contractor identified this occurrence as a near miss.

Figure 2 shows the flooded excavation after the event. A critique performed soon after the occurrence found that the work order and training for this maintenance operation clearly required that the curb valve be opened during the pressure check. Several factors appear to have resulted in the failure to do so. A Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) work area boundary around the hydrant during the isolation process prevented the utility maintenance crew from performing the pressure test. The maintenance foreman assigned responsibility for the pressure check to the CERCLA lead man, who was not trained to perform the check and did not open the curb valve during the check. The critique found several authorization approvals had been omitted, including utility operations' approval to start work.



**Figure 2. The flooded excavation after the event**

The unexpected excavation flooding and near miss of worker injury in this occurrence illustrate the importance of performing work within controls, and only by those trained and authorized to perform the work.

**KEYWORDS:** *Flooding, excavation, fire hydrant, lockout/tagout, LO/TO*

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

## 5. DOE FINES KAISER-HILL FOR SAFETY VIOLATIONS

On July 17, 2001, DOE issued a Preliminary Notice of Violation (PNOV) and a proposed civil penalty of \$385,000 against Kaiser-Hill Company, L.L.C., (KH), the contractor at the Rocky Flats Environmental Technology Site. This action is a result of a series of procedural nuclear safety violations related to criticality, work controls, procurement, radiological controls, and quality assurance. (ORPS Reports RFO--KHLL-PUFAB-2000-0070 and RFO--KHLL-PUFAB-2001-0001 are associated with Sections I and II of the PNOV, and RFO--KHLL-771OPS-2000-0042, RFO--KHLL-771OPS-2000-0053 and RFO--KHLL-771OPS-2000-0057 are associated with Section IV of the PNOV.)

Specifically, the five sections of the PNOV address 1) Criticality Safety Operating Limit (CSOL) and related procedural violations at multiple facilities, 2) work control and authorization basis implementation deficiencies at the Transuranic Waste Facility, 3) failure to comply with established procurement review and approval processes, 4) deficiencies in radiological control processes in Building 771, and 5) failure to establish processes to detect and prevent quality problems. Each of these areas is described in more detail below.

- Sections I and II of the PNOV describe deficiencies related to the implementation of Criticality Safety and Waste Facility work control requirements. These deficiencies were associated with a series of events during calendar years 2000 and 2001 involving transuranic material size reduction, container loading, and assay activities. Although the safety significance of the individual events was relatively low, the recurring nature and supervisory involvement associated with several of the events reflect more fundamental concerns requiring management attention. In response to these findings, KH instituted a Safety Pause in January and February 2001, during which waste management operations were suspended pending completion of a detailed review of work control processes, work requirements and related procedures. During this time, KH personnel reviewed and revised procedures related to nuclear operations in Building 707; reviewed all Criticality Safety Evaluations for compliance issues; convened a Senior Review Board to ensure operators were properly trained before resuming activities; and initiated a Senior Supervisory Watch program for the restart of operations after the Safety Pause. With respect to the Criticality Safety and Waste Facility Work Control violations, 25 percent mitigation of civil penalties was awarded because several of the events were self-identified by the contractor. Full mitigation for self-identification was not warranted because some of the events were self-disclosing. No mitigation was awarded for corrective actions, since the deficiencies were largely long-standing and recurrent in nature. The civil penalty imposed for this portion of the PNOV was \$82,500 for two Severity Level II violations.
- Section III of the PNOV describes violations associated with the breakdown of work and procurement processes that occurred during the August 2000 procurement of 500 replacement lids for 55-gallon drums. The drum lids were intended for interim storage and eventual shipment of nuclear waste to the Waste Isolation Pilot Program (WIPP). During the procurement action, KH ordered the drum lids despite the fact that two mandatory quality assurance reviews and approvals of the requisition had not been obtained. Furthermore, the drum lids were ordered to a specification that was not designed for replacement drum lids, and KH did not formally establish receipt inspection criteria. All 500 drum lids were ultimately rejected for use because of design and fabrication defects or transportation damage. In response to the event investigation findings, the contractor reorganized the Procurement Systems Department to report directly to the Chief Operating Officer. In addition, KH strengthened internal procedures/requirements for documenting and disposing of suspect items that are identified during receipt inspections. No mitigation for identification or for corrective actions was awarded for the cited procurement violations. Deficiencies in the procurement program have been long-standing and the subject of repeated DOE enforcement actions and penalties, including the issuance of civil penalties in calendar years 1999 and 2000, and an Enforcement Letter in 2000. As a further specific example, subsequent to the June enforcement conference, KH identified an additional procurement-related noncompliance associated with the inadequate control of suspect/counterfeit electrical circuit breakers. Although not specifically cited as part of this PNOV, this later event emphasizes the recurrent nature of deficiencies in this area. Because of the recurrent nature of procurement problems and to emphasize the need for management to effectively resolve these issues, DOE escalated the monetary civil penalty by 50 percent. The civil penalty assessed in this section of the PNOV was \$165,000 for two Severity Level II violations.
- Section IV of the PNOV describes procedural noncompliances and As Low As Reasonably Achievable (ALARA) deficiencies in the Building 771 Radiation Safety Program. These deficiencies were identified from specific events that occurred in August and September 2000 involving inadequately controlled work activities associated with use of a contaminated air mover and air line removal. The KH investigation into an October 2000 event involving an out-of-calibration air sampler identified additional concerns related to radiological procedural compliance, adequacy of and compliance with work controls, and effectiveness of management oversight. In response to the

findings of the investigation, KH has completed a number of corrective actions. These include performing a complete survey of the building and continuously monitoring it to maintain an accurate record of the facility condition and to identify sources of contamination; taking bioassay samples from a representative group of employees to determine potential exposures; requiring that respiratory protection be worn during all waste handling operations; assigning additional management and supervisory personnel to the Building 771 Radiation Safety Program; and strengthening the Radiological Work Permit system. No mitigation for identification was awarded because of the self-disclosing nature of the events. Fifty-percent mitigation for corrective actions, however, was awarded in recognition of the depth of the contractor's investigation into the air sampler calibration event and the scope of the corrective actions taken. The civil penalty imposed in this section of the PNOV was \$82,500 for three Severity Level II violations.

- Section V of the PNOV describes violations of the provisions of Criterion 3, Management-Quality Improvement, of 10 CFR 830.122, *Quality Assurance Criteria*. The deficiencies cited in this section demonstrate the failure of KH to correct previously identified problems in the areas of procurement, criticality safety, and authorization basis compliance. Effective, timely correction of these problems would have prevented the majority of the events and deficiencies cited in the PNOV. An associated underlying weakness was the ineffective implementation of the earlier KH corrective action implementation programs. This concern was recognized by several of the KH root cause determinations performed in conjunction with the subject events. The civil penalty imposed in this section of the PNOV was \$55,000 for one Severity Level II violation.

The Price-Anderson Amendments Act of 1988 requires the Energy Department to undertake regulatory enforcement actions against contractors for violations of its nuclear safety requirements. The program is implemented by the Office of Price-Anderson Enforcement. This action was taken with the support and participation of the Department's Rocky Flats Field Office, which will ensure that the corrective actions are fully implemented. Additional details can be found on the Internet at <http://tis.eh.doe.gov/enforce>.

**KEYWORDS:** *Enforcement, Price-Anderson Amendments Act*

**ISM CORE FUNCTIONS:** *Define Scope of Work, Perform Work Within Controls, Provide Feedback and Continuous Improvement*