Date sent: Thu, 06 Aug 1998 08:31:56 -0500
From: Meredith Brown <racer@lanl.gov>
Subject: Yellow Alert: Serious Flash Burns from Electrical Arc

Although this event was covered in OEWS 98-27, it is reissued here as an example of how ISMS relates to Lessons Learned. See the analysis section for more details.

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Project Hanford Lessons Learned

Title: **Serious Flash Burns from Electrical Arc**

Date: July 31, 1998
Identifier: 1998-RL-HNF-0023

Lessons Learned Statement:

Extreme caution should be exercised when inserting screws into any electrical components to be sure they do not penetrate energized cables.

Work performed under "skill of the craft" guidelines needs to be evaluated for safety hazards and, in some cases, may need to have more controls applied to ensure worker safety.

Several Core Functions of the Integrated Safety Management System could have prevented this incident had they been more effectively applied.

Discussion of Activities:

Summary: An electrician received second degree burns from an arc flash when the breaker mounting screws he was reinstalling penetrated a bundle of energized wires behind the breaker.

Details: On June 12, 1998, an electrician was completing modifications to Motor Control Centers (MCC) 2 and 3, in the Waste Encapsulation and Storage Facility (WESF). The electrician removed the door operating mechanism from a spare circuit breaker in MCC-2 to use on a circuit breaker in MCC-3. The electrician was reinserting the screws holding the circuit breaker to the mounting plate on MCC-2. As he tightened the third of four screws on the circuit breaker, the screw made contact with the line side wiring behind the circuit breaker bucket wall and penetrated the wire insulation. The resulting short circuit created vaporized metal and ionized air in the bucket area, which then resulted in a phase-to-phase fault and flash at an

adjacent circuit 480-volt breaker within the bucket. The substation circuit breaker feeding MCC-2 tripped, causing loss of normal power to the facility and the backup diesel to start as designed.

Analysis: At the time of the accident the electrician was performing No Release Required (skill of craft) work, assembling components in preparation for completing specific steps in the work package. No Release Required work is not guided by formal written direction. However, removing parts from operating plant equipment is considered changing plant configuration and falls outside expectations for No Release Required work. With the breaker in its normal configuration, the mounting screws for the breaker did not contact the wire bundle behind the breaker bucket. With the door operating mechanism removed, however, the bolts penetrated further through the mounting plate and thus contacted the energized wire bundle that was routed too close to the affected breaker by the motor control center manufacturer.

Several Core Functions of the Integrated Safety Management System could have prevented this incident had they been more effective:

- Define Scope of Work - Facility management integrates ES&H activities into work planning. A closer review of the work for safety issues might have revealed the need for shorter mounting bolts.
- Analyze Hazards and Implement Controls - Major Subcontractors develop and maintain a graded approach to work planning based on risk, complexity, and routine versus non-routine nature of work activities. Modifying the breaker by removing its door operating mechanism may have been performed with too few controls based on the risk involved.
- Perform Work Within Controls - Work Supervisor incorporates ES&H requirements, implementing procedures, and permits (e.g., confined space, radiological work, etc) into individual work activities. The work was being performed without a formal release so the necessary safety requirements were not incorporated.

Recommended actions: Whenever there is a change in work site conditions or change in work practices, the work should not proceed until the hazards have been analyzed and resolved.

Appropriate PPE equipment would have lessened the severity of burns due to the arc flash.

Estimated Savings/Cost Avoidance: N/A

Priority Descriptor: YELLOW/Caution
Functional Categories (DOE): Conduct of Operations, Occupational Safety and Health, Maintenance
Functional Categories (Hanford specific): Electrical
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Name of Authorized Derivative Classifier: Jim Stowe (509) 376-1915
Name of Reviewing Official: John Bickford
Keyword(s): breaker, second-degree burn, electrical fault, arc flash, work boundaries
References: Occurrence Report Number RL--PHMC-WESF-1998-0006, Investigation report

from B.J. Gray to R.W. Bailey dated July 6, 1998 (ref: BWHC-9855680) FDH ISMS Information Network Operating Experience Weekly Summary 98-27, Article 2