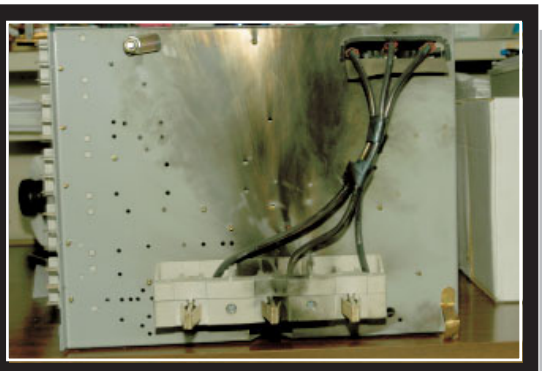
1st TAKE Safety ACTION
Incident ALERT Message from Operational Assurance

FOR DETAILS:

- **Occurrence Report:** NA-LASO-LANL-FIRNGHELAB-2006-0005
- **QA-OA Occurrence Investigator:** Joe Richardson, 667-4844
- **Electrical Safety Contact:** Carl Geisik, 667-1818

For more information about "1st Take," please call LANL QA-OA at 665-0033.

October 3, 2006
FIRNGHELAB 2006-0005



Left: Facility employee assisting in the investigation shows front of motor control center bucket where arc occurred. Above: Burn marks are evident on the back side of the bucket where self-tapping screw contacted terminal block.

Subcontractor electrician triggers 480V arc flash

On August 11, 2006, a subcontractor electrician triggered a 480V arc flash when he used a cordless drill to drive a self-tapping screw through the back of a motor control center (MCC) bucket, contacting the 480V power system and tripping the breaker for the primary electrical service to the entire building (Bldg. 313) at Technical Area 15. The Automated Control Systems, Inc. (ACS) employee did not receive a shock, but he experienced a retained retinal image of the arc for about 20 minutes and a slight burning sensation on his face for about one hour after the arc flash occurred. He was transported to the Los Alamos Medical Center as a precautionary measure, and was released later the same afternoon with no residual symptoms and no work restrictions. The management for KSL Services, the primary support services subcontractor, suspended all work by its subcontractor on this project pending a review of ACS's work packages. The Laboratory is investigating the event.

EVENT

The ASC employee, a licensed journeyman electrician with 25 years experience in the electrical industry, was adding the relay as part of a retrofit to the building's heating, ventilation and air conditioning (HVAC) controls. The employee had disconnected power within the bucket and confirmed zero voltage using both an induction tester and a digital voltage meter. However, the rest of the array was still energized because the employee did not disconnect the 480V power feeding the MCC. After determining a suitable location for the relay within the bucket, the employee used a cordless drill with a Phillips bit to drive the first of two one-half inch self-tapping screws into the rear surface of the bucket. After the screw penetrated the steel rear panel of the bucket, it came into contact with the 'B' phase on the terminal block carrying 480V power to the bucket. The contact with the energized lead within the terminal block caused an arc flash and tripped the breaker that supplies primary electrical service to the entire building.

PRELIMINARY ANALYSIS

Investigators report that ACS was working under subcontract to KSL Services using an existing blanket work order. The work was covered by a valid Integrated Work Document (IWD) provided by KSL, but the IWD did not cover specifics of tasks such as the location and voltage of the MCC. Investigators noted that the IWD required that lock out/tag out (LO/TO) equivalent to LANL standards be employed, but the ACS employee did not utilize LO/TO when he attempted to add the relay to the MCC bucket. According to investigators, the employee had safety glasses with him but there were indications he was not wearing them at the time of the event, and he was not wearing other personal protective equipment (PPE) intended for electrical safety.

INITIAL RECOMMENDATIONS

Investigators are focusing on the work control processes for electrical work. Formal findings will be made available when the investigation is complete, and corrective actions will be developed based on the findings. In the interim, managers, supervisors and workers involved in similar work activities can mitigate hazards by considering the following preliminary recommendations:

- Managers and supervisors must ensure that employees have taken required training as specified in IWDs and Statement of Work agreements prior to authorizing employees to begin work.
- Persons in Charge (PICs) must be trained, and they must ensure the IWD they are using is complete.
- Within IWDs, unique process must be described with sufficient detail to ensure that the work can be accomplished with all hazards and associated controls identified. Controls should be specific and not simply reference another document.
- Design drawings for work involving modifications to electrical systems should identify tie-in points on the electrical interface drawings, and these drawings should be reviewed by a systems engineer.
- When the scope or magnitude of the work significantly exceeds the original estimate, workers should stop and verify that the existing IWD and supporting work documents still adequately describe the work, identify the hazards, and prescribe specific and effective controls.

GUIDANCE: Resources at hand

- LIR 402-600-01.3, **Electrical Safety**
- LIG 402-600-01.2, **Electrical Safety Implementation Guide**
- LIR 402-860-01.1, **Lockout/Tagout for Personal Safety**
- LIR 402-860-02.1, **Locking and Tagging Equipment, Machinery and Systems**
- DOE-HDBK-1092-98, **DOE Electrical Safety Handbook**
- IMP 300.3, **Integrated Work Management for Work Activities**