

# Final TAKE

Incident ALERT Message from Performance Surety

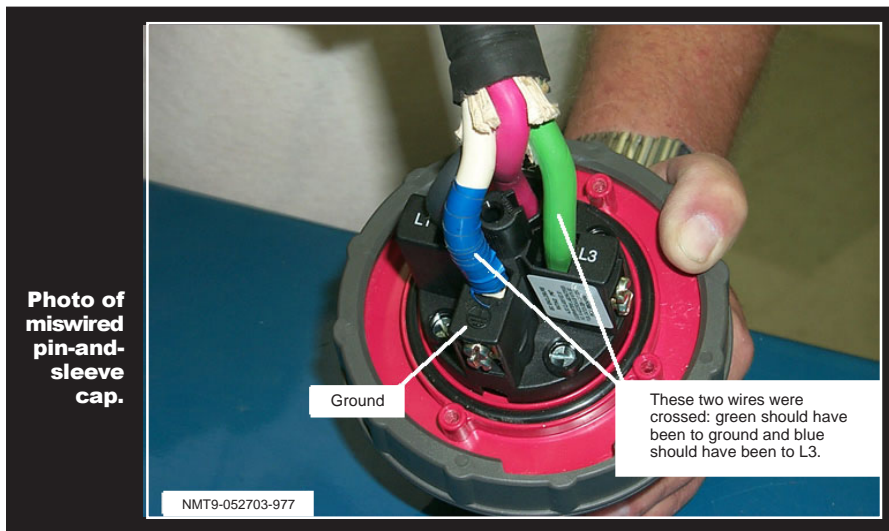


## FOR DETAILS:

- **Occurrence Report:**  
ALO-LA-LANL-NUCSAFGRDS-2003-0002
- **Facility Contact:**  
Thomas Halligan, 664-0998
- **PS-7 Occurrence Investigator:**  
Patricia Vardaro-Charles,  
665- 4644

For more information about "Final Take," please call LANL PS-7 at 665-0033.

**September 11, 2003**  
LANL PS-7, No. 0302



## LESSONS LEARNED

Facility and programmatic personnel should review all work activities involving electrical maintenance or modifications to determine if testing should be performed as a condition of acceptance. This will help assure work is completed in a satisfactory manner and that affected systems or equipment are safe for use.

## Worker Receives Electrical Shock After Contact with Welder Cart

On May 27, 2003, a LANL machinist received an electrical shock when his left upper arm (bicep area) touched the side of a welder cart that had been wired incorrectly during modification by support services subcontractor electricians. The machinist was escorted to Occupational Medicine (HSR-2) for evaluation. The on-call physician determined that there were no abnormal heart rhythms as a result of this incident, however the machinist was suffering from a headache and prolonged numbness in his left arm. The machinist was released back to work with no restrictions, but asked to return for follow-up medical evaluations. A week later, the machinist reported that the headache had dissipated and all feeling in his arm had returned.

### EVENT DISCUSSION:

The mobile welding cart had been moved to the shop from another location but had not been used because it tripped the breaker each time it was turned on, a condition related to an inadequate power supply. The facility coordinator who developed the work package

to modify the power supply from 240 to 480 volts determined the work did not require formal management controls. The subcontractor developed an Activity Hazard Analysis that listed the principal tasks associated with the work order as "skill of craft." The electricians initiated the work on May 3 and the work was 60 percent complete by May 5, when LANL inspectors informed the electricians that the welding receptacle they were installing did not meet Lab standards, and that an interlock circuit disconnect switch also was required. The electricians stopped work, informed their foreman about the new work scope, and

ordered the disconnect switch. The electricians determined that a new pin and sleeve cap were required on the welder to mate with the disconnect switch, and returned to the work site on May 6 to install the cap, run wire to the breaker, and terminate the wire connections to the breaker. One of the electricians was in the process of installing the pin-and-sleeve cap when he was  
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## GUIDANCE: LANL resources at hand

Institutional guidance on LANL electrical work and facility management work control is available at:

- LIR 402-600-01.1 (Electrical Safety)
- LIG 402-600-01.1 (Electrical Safety Implementation Guide)
- LANL HSR Electrical Safety Home Page
- DOE-HDBK-1092-98 (DOE Electrical Safety Handbook)
- LIR 230-03-01 (Facility Management Work Control)
- LIR-230-01-02 (Graded Approach for Facility Work)

## Worker Receives Electrical Shock

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interrupted by his partner with a request for assistance. The electrician believes he made the wiring error when he returned to complete the wiring of the cap. On May 13, the disconnect switch was received and two other electricians were tasked with installing the switch and terminating the wires to the switch. The two electricians were not aware that the cap on the welder had been changed. They completed the work, then tested the voltage from the disconnect switch and receptacle and found that the voltage checked at 480 volts. The electricians did not perform a post-maintenance check of the plug wiring, and neither LANL nor subcontractor procedures required this post-maintenance testing. At this point, the disconnect switch was left in the “on” position, the welder was plugged into the wall-mounted pin-and-sleeve receptacle, and the welder was in the “off” position. The accident happened on May 27 when the machinist came into contact with the welder. A LANL electrical technician subsequently determined that the ground and one of the power leads within the welder plug had been reversed during welder modification.

### EVENT CAUSES

**DIRECT CAUSE:** Investigators determined that the direct cause of the accident was inattention to detail on the part of the electrician who reversed the wiring. However, several factors contributed to this cause: The electrician was assigned too many tasks, he was assisting his co-worker with other job tasks, and he was installing additional components needed to complete the job because the work scope had changed.

**ROOT CAUSE:** Accident investigators cited failure to develop acceptance criteria as the root cause of the accident. In addition, the LANL Facility Management Work Control Laboratory Implementation Requirements (LIR 230-03-01) and Graded Approach for Facility Work (LIR 230-01-02) did not provide clear guidance and expectations for planning purposes with respect to assigning management levels and planning information that should be reflected in the work package.

## ACTIONS:

### SUBCONTRACTOR:

The subcontractor has taken action or is committed to taking action on the following measures:

- **The subcontractor implemented a new procedure for electrical work packages that requires verification and testing by craft employees and independent verification by a qualified person.**

- The subcontractor is developing a “Formality of Operations” procedure that includes guidance on scoping work, adherence to the defined scope, and returning systems and equipment back to service.

- The subcontractor is providing refresher training on work control processes to employees involved in incidents and accidents, and Formality of Operations and pre-job briefing training to all supervisory employees with job oversight responsibilities. In addition, the subcontractor will provide refresher training on the work control process to the craft employees and supervisors involved in the incident.

### LABORATORY

The Laboratory has taken action or is committed to taking action on the following measures:

- **The Laboratory is in the process of re-engineering its work-control and change-control processes, and is developing a post-maintenance/modification procedure. The end product will be a uniform Laboratory work management program that will be incorporated in the LANL Work Management Program Manual.**

- The Facility Management Work Control and Graded Approach for Facility Work LIRs are being reviewed for revision – particularly in the area of requesting work, processing work requests, planning work, and the change control process as it involves post-maintenance testing procedures.

- The facility is training work control personnel on management expectations for developing work requests.

**The complete list of corrective actions and deadlines is listed in Occurrence Report “ALO-LA-LANL-NUCSAFGRDS-2003-0002.”**

**OTHER FACTORS:** Investigators concluded that other errors, communication problems, and management problems were contributory factors, including:

- The subcontractor electrician’s supervisor failed to make an on-site visit to reassess the project after being informed a disconnect switch was needed. The supervisor failed to re-evaluate the hazards, and did not inform the LANL facility coordinator of the new scope.

- Subcontractor supervision did not develop an adequate initial work scope, failing to identify that LANL Engineering Standards required a disconnect switch

and associated hardware for this job.

- The LANL facility coordinator’s work request did not adequately reflect requirements such as codes and standards for oversight, and, consequently, the work request was prepared with an inadequate management level (ML) of involvement. The work request did not include the need for an acceptance requirement, which could have been considered under a higher ML. In addition, the subcontractor foreman did not communicate expectations for self-check to the craft employees during the pre-job briefing.