

Recent Electrical Events Highlight Equipment-Failure Hazards

From January 25, 2007 to February 7, 2007, the Los Alamos National Laboratory experienced four electrical events that were reported to the Department of Energy's Occurrence Reporting and Processing System (ORPS). One case involved the lack of a proper Integrated Work Document (IWD) for the work being performed, and the other three involved failure of electrical equipment.

There were no injuries and none of the events were categorized as serious based on the Department of Energy's ORPS criteria. In all cases electrical work was being performed safely and the concern was properly reported and critiqued. Preliminary indications are the events involved weaknesses in implementation of integrated work management for subcontractors, inadequate inspection of R&D equipment, inadequate inspection of programmatic equipment installation, and a failure of equipment inspection following facility upgrade.

EVENT DISCUSSION:

The events are still under investigation. A summary description of each event and a preliminary analysis follows:

NA-LASO-LANL-ACCCOMPLEX-2007-0001. Harmonic Testing Performed without the Proper IWD (ORPS Significance Category 4): On January 30, 2007, during inspection of a construction job site at TA-53, Building 3P, a KSL supervisor noticed two workers prepar-



Burn marks are evident on the insulators of the 480 volt electrical buss at HRL.

ing to perform energized testing and troubleshooting work on a 480-volt electrical panel. Upon inquiry, the supervisor determined that the workers did not have an Integrated Work Document for the energized work, as required. The supervisor stopped the work, the workers closed the electrical panel, and the area was placed in a safe condition. The event involved a fourth-tier subcontractor, and represented an example of a project in which IWM requirements did not flow down. On a positive note, the subcontract workers were working safely, following all electrical safety requirements, wearing the proper PPE for the job, and demonstrated a good pre-job brief before the work was performed. In addition, the KSL supervisor asked to see the IWD and recognized lack of proper IWM implementation. The implementation of proper IWM principles is being addressed, in part, with the

FOR DETAILS:

- **Occurrence Reports:**
 NA-LASO-LANL-ACCCOMPLEX-2007-01
 NA-LASO-LANL-TA55-2007-06
 NA-LASO-LANL-TA55-2007-07
 NA-LASO-LANL-HRL-2007-01
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- **LANL Chief Electrical Safety Officer:**
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For more information about "1st Take," please call LANL QA-OA at 665-0033.

February 14, 2007
 LANL 2007-0004

expected release of a new subcontractor management Implementation Support Document (ISD).

NA-LASO-LANL-TA55-2007-0006. Management Concern: Failure in Electrical Cord Plug Caused 120 Volt Energizing of Laser Metal Casing (Significance Category 3). On January 25, 2007, an employee observed an electric arc while replacing the deionized water in a laser cooling system at TA-55, Building 4. This task requires the laser to be energized to ensure the proper fill level. The ground wire at the plug connection had become loose and contacted one of the 120 volt hot wires, which caused the laser equipment case to become energized. The arc occurred after the service panel was removed and it came into contact with a grounded piece of equipment. The worker reported the arc, work was stopped, notifications were made, and a critique was held. This event may have occurred because LANL's original Unlisted Electrical Equipment Approval Program allowed older equipment to be left in service without inspection, known as the "grandfather" clause. The LANL Electrical Safety Committee has recommended that the grandfather clause be rescinded, and the recommendation was implemented in the new Electrical ISD, which is due for release in late February 2007.

NA-LASO-LANL-TA55-2007-0007. Management Concern: 208 Volt Lathe Incorrectly Wired Into 480 Volt Service (Significance Category 4). On February 6, 2007, during startup tests of a newly installed lathe in TA-55, Building 3, the lathe spindle motor shorted and tripped

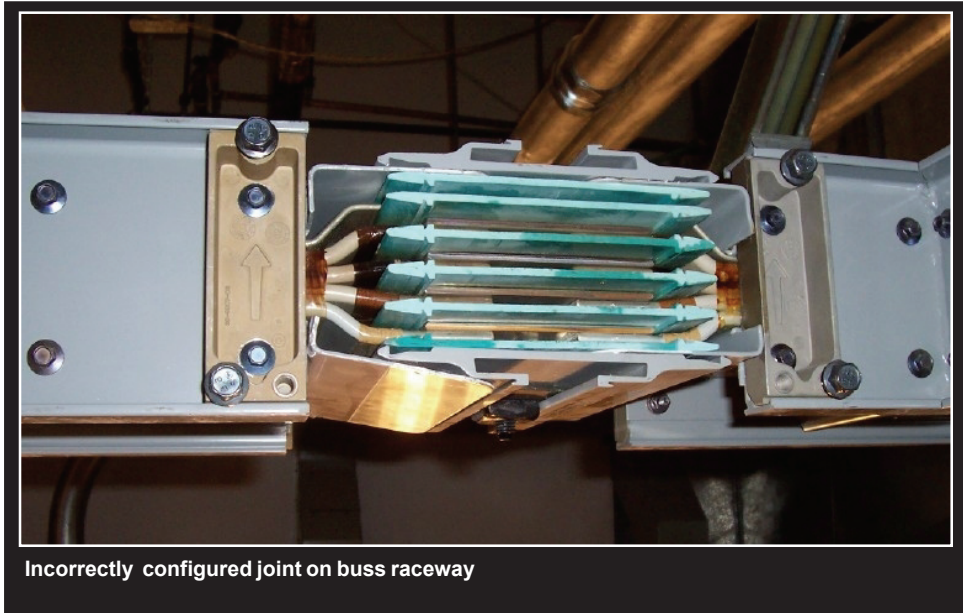
GUIDANCE: Resources at hand

- LIR 402-600-01.3, "Electrical Safety"
- LIG 402-600-01.2, "Electrical Safety Implementation Guide"
- LA-UR-05-7920, "Assessments of Los Alamos Electrical Safety Incidents . . ."
- LANL Electrical ISD: To be posted at <http://int.lanl.gov/safety/esc/index.shtml>
- DOE-HDBK-1092-04, "DOE Electrical Safety Handbook"

the breakers in the lathe and in the electrical panel that provided power to the lathe. It was subsequently discovered that the lathe's 208-volt motor was incorrectly wired to 480-volt service. The circuit breaker was locked/tagged out, the system was re-wired to the correct 208 volts, and a new motor was installed and successfully tested. There was no exposure of workers to an electrical hazard, and the work was performed safely. This event was related to inadequate installation design and inspection. This type of problem is being addressed with full implementation of a new Conduct of Engineering and Design Authority.

NA-LASO-LANL-HRL-2007-0001
Evacuation Due to Electrical Upgrade Installation Flaw (Significance Category 3). On February 7, 2007, at TA-43-0001 (Health Research Laboratory), a facility technician on routine rounds noticed a burning smell in the basement equipment room and notified the operations manager and engineering lead. They detected unusual heat (235 degrees F) coming from an area around an elbow on the 480 V electrical buss entering the building. Portable generators were installed and power to the building was shut down. KSL electricians isolated the buss and found that the affected interface joint adjusting nuts had not been properly torqued and that one of the four stabs was not properly installed when the HRL's 480-V power was upgraded approximately two years ago. There was no exposure to hazards in this event, and all work was performed safely. The overheating of the facility power feed would not have resulted if the errors had been detected during construction upgrade inspection. Such problems can be addressed through full implementation of a new Project Management-Construction Management (PM-CM) process for inspecting and approving new and upgrade construction.

PRELIMINARY ANALYSIS:
In reviewing the four events, Chief



Incorrectly configured joint on buss raceway

Electrical Safety Officer Lloyd Gordon said the common thread was that the events resulted from an installation or project development that occurred 1 to 4 years ago. On the positive side, he noted that work was performed safely in all four cases and the response to discovery was done correctly. In addition, the causes for all four events have already been identified by previous assessments and corrective actions are in final stages of implementation.

ACTIONS IN PROGRESS:

The following corrective actions are in progress of implementation as a result of previous assessments:

- The Electrical ISD, to be released in February 2007, rescinds the grandfather clause and requires inspection of all unlisted electrical equipment, regardless of age.

- The Conduct of Engineering Manual, which is to be employed by Design Authority representatives and engineering managers within each facility operations director (FOD) office, will improve the design and inspection of programmatic equipment installations.

- Better processes for construction inspection through Project Manager Construction Manager and Industrial Hygiene and Safety (IHS) electrical inspectors will improve the inspection

and acceptance of future construction and upgrade projects.

- A new ISD for the management of subcontracts will improve the flow down of IWM requirements.

INITIAL RECOMMENDATIONS:

The following recommendations are particularly relevant to electrical safety officers (ESOs):

- An implementation plan will be developed for the Electrical ISD, requiring all unlisted, unapproved electrical equipment to be inspected over the next few months. In the meantime, ESOs should take any suspect cord and plug, and unlisted, unapproved electrical equipment out of service, until such inspection can be performed.

- After the installation of any programmatic equipment into facility circuits, an electrical inspector or facility ESO should inspect the installation.

- Because of the reorganization of laboratory divisions on June 1, 2006, all divisions performing electrical work and/or using unlisted electrical equipment, should ensure that they still have adequate division and group ESOs to cover electrical safety within their division and group. ESOs should have adequate time to perform their responsibilities.