

Yellow Alert-Potential Shock Hazard from Improperly Grounded Vendor Installed Equipment

(If you have questions on the applicability of this Lessons Learned at Ames Laboratory, please contact Shawn Nelson at 4-9769)

Lesson ID: LSO-2005-0001 (*Source: User Submitted*)

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Classifier: David Aron **Reviewer:** David Aron

Statement: Employees should be aware that even newly installed equipment can pose electrical shock hazards. Improper grounding of vendor supplied electrical equipment, such as the use of sheet metal screws to connect grounding conductors or use of nonconductive coatings, can pose electrical shock hazards to the equipment users. Vendors should be notified of such grounding deficiencies whenever they are encountered.

Discussion: During a review of a newly installed NETZSCH LFA 457 Thermal Diffusivity Analyzer, an Electronics Supervisor discovered electrical potential of 120 volts from the stainless steel cover of the cooling bath to ground. The problem was isolated to the power converter. Upon disassembly of the power converter, it was found that the ground wire from the 120 Volt input was terminated to the converter's metal enclosure by a sheet metal screw. The paint on the surface of the enclosure prevented the input ground wire from making electrical contact to the enclosure. The ground wire from the 230 Volt output of the converter was terminated through a connector welded to a separate piece of the enclosure. The two pieces of enclosure are held together with sheet metal screws. When the two pieces of enclosure are disassembled, the output ground wire no longer has electrical continuity with the output ground wire. The components of the NETZSCH LFA 457 are not UL listed.

Analysis: The National Electric Code (NEC) does not allow sheet metal screws to be used to connect grounding conductors to enclosures. Nonconductive coatings (such as paint, lacquer, and enamel) on equipment to be grounded shall be removed from threads and other contact surfaces to ensure good electrical continuity or be connected by means of fittings designed so as to make

such removal unnecessary. Separable grounding connections shall provide for first-make, last break of the equipment grounding conductor.

The NEC specifies that all electrical installations and equipment are acceptable for use only if approved by an Authority Having Jurisdiction (AHJ). The Department of Energy (DOE) also recommends that DOE contractors establish an AHJ Program for examining and approving electrical equipment that has not been tested by a nationally recognized testing laboratory (e.g., UL). In compliance with these requirements, the Lawrence Livermore National Laboratory has established an internal AHJ Program to ensure that all electrical installations and equipment meet safety codes. The identification of this potential hazard is the direct result of the AHJ Program.

Actions: The vendor was notified of the grounding problem. The paint on the grounding surface of the metal enclosure was removed to provide a positive contact. A hard wire ground has been installed in accordance with NEC requirement.

Savings: N/A

Keywords: electrical, GROUNDING, Shock

Hazard(s): Electrical / NEC

ISM Code(s): Develop / Implement Controls, Perform Work

Work Function(s): Inspection & Testing

References: National Electrical Code

Priority Descriptor: Yellow / Caution