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Subject: Yellow Alert: MCC Failure Affects Exhaust Fan

Title: Motor Control Center Failure Prevents Operation of Radiological Exhaust Fan

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LESSONS LEARNED: During the design review for installation of new motor control centers or electrical switchgear intended to control large amperage loads, the potential need for robust, bolted hardware connections rather than stab connections should be evaluated to ensure reliable and consistent contact between associated breakers and bus bars.

DISCUSSION: An electrical failure in a motor control center prevented operation of a radiological exhaust fan (Fan FE-28). When the fan shifted to high speed for normal operation after being started on low speed, an electrical arc occurred in the fan's motor control center (MCC) and the fan shut down. Personnel subsequently determined that the electrical arcing was caused by poor contact along the stab connectors between the main bus bar in the MCC and the motor circuit protector for the fan.

In 1996 and 1997, electrical subcontractors installed six National Electrical Manufacturers Association (NEMA) size 5 MCCs at a Laboratory facility to control fans that provide exhaust ventilation for radiological laboratory areas. Three other NEMA size 5 MCCs were purchased but they were not installed. These MCCs were kept as spares.

In July 1997, an external power interruption activated protective circuitry in the new MCC for Fan FE-28 and the fan tripped offline. When personnel attempted to restart the fan, it failed. When the MCC for the fan was disassembled to troubleshot the problem, personnel discovered that the manufacturer had incorrectly installed the mounting brackets that supported the main bus bars. Facility personnel decided to replace the back plane on the damaged MCC with a back plane from one of the spare units. However, when the back plane was removed from the spare unit, personnel discovered that the manufacturer had incorrectly installed the bus bar mounting brackets in the spare MCC. Additional bracing was added and the fan was returned to service.

In January 1998, the MCC for Fan FE-28 failed again. A factory representative inspected the failed unit and determined that the stab arrangements and associated back plane supports were not adequate to ensure consistently secure contact in the NEMA size 5 MCCs at the facility.

RECOMMENDATIONS: To correct the problem with the MCCs, the manufacturer replaced the existing vertical bus bar assemblies with new assemblies that had pre-punched holes to accommodate bolted connectors. The original stab connectors were also replaced with Underwriters Laboratory-approved braided connectors that bolted directly to the bus bars and motor circuit protectors to provide positive power connections. The units were then inspected and certified by manufacturer representatives to ensure compliance with their design instructions. Electrical tests of the installed units were also performed and thermographic surveys were conducted. The MCCs were then formally turned over to the facility with completed work packages, recommended spare parts lists, and installation and

maintenance manuals.

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FOLLOW-UP ACTIONS: Information in this report is accurate to the best of our knowledge. As a means of measuring the effectiveness of this report, please contact the originator of significant action(s) taken as a result of this report or of any technical inaccuracies you find. Your feedback is appreciated.