

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, D.C. 20555-0001

March 3, 2006

NRC INFORMATION NOTICE 2006-05: POSSIBLE DEFECT IN BUSSMANN KWN-R AND  
KTN-R FUSES

**ADDRESSEES**

All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

**PURPOSE**

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees of a possible defect in Bussmann KWN-R and KTN-R fuses. Recipients are expected to review the information for applicability to their facilities and consider actions to avoid similar problems. However, the suggestions in this information notice are not NRC requirements; therefore, no specific action or written response is required.

**DESCRIPTION OF CIRCUMSTANCES**

A customer of Wyle Laboratories reported that a KWN-R fuse lost its electrical continuity while in service. The customer cut the fuse open and found the fuse element intact and a lack of electrical continuity across the soldered connection of the element to the rejection ferrule of the fuse. According to the customer, the fuse had been in service from March 31, 2005 to August 4, 2005, carrying 2 to 3 amperes, and there had been no overcurrent events to cause the fuse to open. The customer returned the fuse to Wyle for failure analysis. Wyle forwarded the fuse to Bussmann (the fuse manufacturer) for evaluation. Bussmann found a poor solder connection on the rejection cap. Apparently the cap did not get hot enough to reflow solder during the manufacturing process. Bussmann stated that the issue might extend to other fuses due to a manufacturing process problem.

Wyle Laboratories indicated to the NRC that the only two nuclear power plants that purchased the susceptible KWN-R fuses from Wyle are Hatch Electric Generating Plant and Pilgrim Nuclear Power Station. Wyle has contacted the two customers that have purchased KWN-R fuses from Wyle Laboratories. Since these fuses might have been sold to other nuclear power plants by different vendors, this problem may be generic. Some nuclear power plants have contacted Bussmann and Wyle with inquiries since a Part 21 report was posted on the NRC Web-site.

**DISCUSSION**

The only KWN-R fuses affected are fuses rated less than or equal to 30 amperes. To date, poor solder joints have been found in 3, 6, and 10 ampere KWN-R fuses with date codes L05, M37, and M17. Poor solder connections have also been found in fuses with date codes

**ML060330540**

L11, L19, M07, M20, and M40. KTN-R fuses with ratings less than or equal to 30 amperes were later added to the potentially defective fuse list since these fuses are manufactured using the same process as the KWN-R fuses. Poor solder connections have been found in 3, 4, 5, and 15 amperes KTN-R fuses of 1987-1991 vintage (there are no date codes on these fuses).

On one KWN-R-10 fuse that was in service, Bussmann found no solder connection on the rejection cap. It appeared the cap did not get hot enough to reflow the solder to the tab on the element. There were no signs of solder on the connecting tab of the bridge/element assembly. The lack of solder and corrosion in the cap caused an open circuit condition. Bussmann identified that the manufacturer's personnel have failed to follow process instruction. They are supposed to pull on the bridge assembly of every fuse to determine that a junction has been obtained between the bridge tab and cap. The design of the bridge and cap attachment is common to the KWN-R and KTN-R fuses rated at 1 through 30 amperes.

Bussmann has taken corrective actions to prevent the potential defect in these fuses. It has added a mechanical test to the KWN-R and KTN-R manufacturing process. The test consists of checking the resistance of each fuse and then mechanically impacting it and checking the resistance again. If the resistance readings differ, the fuse is segregated for disposition. The mechanical impact is produced by dropping the fuse at least 3 feet (93 centimeter) onto the plain cap end through a tube with an internal diameter of about 5/8 inch (1.6 centimeters). Bussmann also tests each production lot at 110 percent of the rated current for the KWN-R product.

As a screening test to ensure a good solder connection, the manufacturer recommends performing a current-carrying test for 30 minutes at 110 percent of the rated current after warm up at 100 percent of the rated current. This will avoid blowing the fuse. When performing the mechanical impact test, if the resistance readings differ by more than +/- 10 percent or fall outside the manufacturers' specifications, the fuse should be rejected. Only KWN-R and KTN-R fuses that pass the mechanical impact test and the 110 percent current-carrying capacity test are qualified.

## CONTACT

This information notice requires no specific action or written response. Please direct any questions about this matter to the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

*/RA/*

Christopher I. Grimes, Director  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

Technical Contact: Duc Nguyen, NRR/DE/EEEE  
301-415-3202  
E-mail: [dtn1@nrc.gov](mailto:dtn1@nrc.gov)

Omid Tabatabai, NRR/DIRS/IOEB  
301-415-6616  
E-mail: [oty@nrc.gov](mailto:oty@nrc.gov)

Note: NRC generic communications may be found on the NRC public Web site, <http://www.nrc.gov>, under Electronic Reading Room/Document Collections.