

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

June 3, 1998

NRC INFORMATION NOTICE 98-19: SHAFT BINDING IN GENERAL ELECTRIC TYPE SBM CONTROL SWITCHES

Addressees

All holders of operating licenses for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to alert addressees to the potential for some General Electric (GE) Type SBM control switches with spring return function to fail to return to the normal position because the manufacturer failed to account for shrinkage of the phenolic material as a result of post-mold curing. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

In December 1997, the licensee for LaSalle County Station, Commonwealth Edison Company (ComEd), was replacing the GE Type SBM control switches at both units during a prolonged dual-unit maintenance outage. The licensee was replacing more than 1,100 SBM switches because the switches were reaching the end of service life and because of concerns about cracking of the Lexan cam followers, which was originally described in NRC IN 80-13, "General Electric Type SBM Control Switches Defective Cam Followers" (Accession #8002280650). During the replacement effort, the licensee discovered that some of the new switches that had been installed for about a year would not spring return to the reset (normal) position. The licensee found that 21 out of the 246 installed replacement switches exhibited the binding.

In early January 1998, two of the failed switches were sent to GE-Nuclear Energy (NE) for evaluation to determine the cause of the switch binding. On January 23, 1998, GE-NE issued a transfer of information letter to affected customers in accordance with 10 CFR 21.21(b) to alert them to the possible failure of the SBM switches to return to the normal position after operation (Accession #9801280338). Subsequently, ComEd determined that the reported deviation represented a substantial safety hazard because various equipment important to plant safety could be affected, and submitted a 10 CFR Part 21 notification to the NRC on March, 16, 1998.

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Discussion

The SBM control switch is manufactured as a commercial item by GE-Electrical Distribution and Control (GE-ED&C), Power Management Division, in Malvern, Pennsylvania. GE-NE dedicates the switches for nuclear safety applications. The switches are used extensively throughout the nuclear power industry as control board switches to actuate safety-related pump motors, motor-operated valves, and circuit breakers. Although GE-NE has informed its customers of record about the binding of the SBM switches, some licensees may have procured the switches from third-party dedicating entities that purchased the switches as commercial-grade components. This information notice is intended to alert all licensees to the potential binding issue.

The failure mode has been identified as binding caused by interference between the rear brass bearing and the phenolic rear bearing support. The exploded view of an SBM switch in the attached Figure 1 shows the rear bearing support plate (Item 30, also called the barrier) and the rear bearing (Item 32) on the switch shaft. The interference is caused by post-mold cure shrinkage of the phenolic material, which takes place for up to 2 years after the phenolic material is molded into the bearing support. GE-ED&C found that the mold used to make the bearing support had worn over the years to the point that the diameter of the opening for the brass rear bearing was still within specifications but near the minimum allowable value. The original GE design did not account for the post-mold cure shrinkage of the phenolic material. The second contributing factor to switch failure is a brass rear bearing at its maximum allowable diameter. Only switches with both the undersized hole in the bearing supports and bearings at the maximum tolerance have experienced failures. Testing confirmed that switches with bearings of nominal size functioned properly, even with undersized holes in the phenolic bearing support.

The failed switches were manufactured between November 1996 and February 1997. Although most of the post-mold cure shrinkage occurs within the first 12 to 18 months, GE conservatively assumed that switches manufactured after March 1996 may be susceptible. These switches can be identified by the last two characters on the green quality control acceptance sticker. The affected date codes are PL, RL, SL, TL, UL, VL, WL, XL, YL, ZL, NM, OM, PM, RM, SM, TM, UM, VM, WM, XM, YM, ZM, NN, and ON. The manufacturer has improved the SBM switch manufacturing process to allow for phenolic post-mold cure shrinkage, and switches manufactured as of March 1, 1998, should no longer be susceptible to the failure mode.

There are two safety concerns regarding the switch binding: (1) possible control circuit damage caused by energizing the momentary circuit for a prolonged period and (2) possible prevention of control circuits from performing their function because of the failure of the switch contacts to return to the normal position. GE recommends that licensees with SBM switches manufactured after March 1996 advise operators to return the switch to the normal position after operation to preclude any circuit malfunctions. Licensees should also note that susceptible switches most likely will fail after about 12 to 18 months after the date of manufacture. Switches more than 2 years old are not thought to be susceptible to binding caused by post-mold cure shrinkage.

This IN requires no specific action or written response. However, recipients are reminded that they are required to consider industry-wide operating experience (including NRC INs) where practical, when setting goals and performing periodic evaluations under Section 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," of Part 50 of Title 10 of the Code of Federal Regulations. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

/s/'d
 Jack W. Roe, Acting Director
 Division of Reactor Program Management
 Office of Nuclear Reactor Regulation

Technical contacts: Stephen Alexander, NRR
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Attachment: Figure 1 - Exploded View of Type SBM Switch
 List of Recently Issued NRC Information Notices

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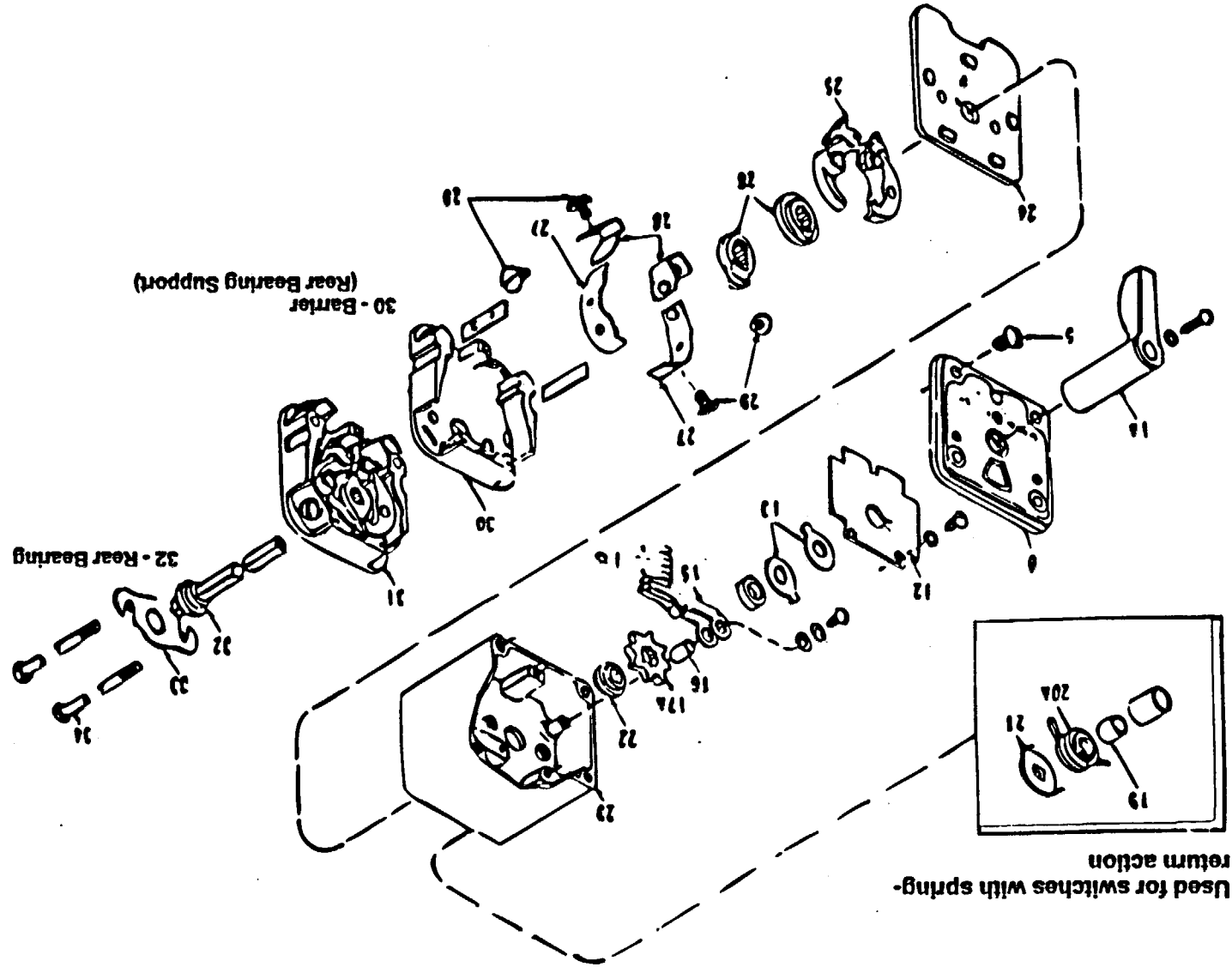


Figure 1 - Exploded View of Type SBM Switch

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OL = Operating License
CP = Construction Permit

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