

IMPROPER FUSE COORDINATION IN BWR STANDBY LIQUID CONTROL SYSTEM CONTROL CIRCUITS

Description of Circumstances:

On October 9, 1976, the Standby Liquid Control System at the Cooper Nuclear Station failed to operate during performance of the required surveillance test of an explosive valve. The system failure resulted from a blown fuse in the main control power circuit. The licensee found that error in selection and coordination of fuses in the Standby Liquid Control System could render the system inoperable.

The firing circuit for the Standby Control System explosive valves receives electrical power from the system pump starter cabinet through a control power transformer. The main control power circuit is fused as is each of the two detonators for each explosive valve. These fuses must be selected so that the fuses for the explosive valves open before the main fuse in the control power circuit when a fault develops. Operating experience has shown that system electrical faults are common to this application because the metal fragments produced by detonation of the explosive valve are likely to short to ground during a firing operation.

Following the event of October 9, 1976, the licensee discovered that the control power fuse rated at 2 amperes did not have sufficient transient current capability to ensure that the 2 ampere rated fuses in series with the explosive valves would open first and protect the firing circuit if the valve wires short circuited upon firing. The fuses found in both Standby Liquid Control starter circuits were sized to protect the 0.25 KVA control power transformer. Corrective action has included the replacement of the control power transformer with one of larger KVA capacity and the replacement of the control power fuse with a 10 ampere rating and MDL 10 characteristics. The firing circuit fuses were changed to 2 ampere FNM2 types (i.e., a fuse having faster slow blow characteristics). Following these modifications a total system operational test was conducted successfully including detonation of both explosive valves.

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Based on the above, licensees of boiling water reactor facilities may wish to review the Standby Liquid Control System drawings and actual installation to ensure proper fuse coordination. Following any modifications to the system consideration may also be given to performing a total system, operational test to verify that the firing circuit fuses blow before the main control power fuse.

No written response to this Circular is required. If you require additional information regarding this matter, contact the Director of this NRC Regional Office.

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STANDBY LIQUID CONTROL SYSTEM CONTROL
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