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IE Bulletin No. 79-11

FAULTY OVERCURRENT TRIP DEVICE IN CIRCUIT BREAKERS FOR ENGINEERED SAFETY SYSTEMS

Discussion:

We have received information from Westinghouse and an NRC licensee relating to the potential failure of a circuit breaker in an engineered safety system of a nuclear power plant. This circuit breaker had a defect in one of its three time delay dashpots which resulted in a reduced time delay for overcurrent protection. The defect was a small hairline crack in the end cap of the dashpot. Further investigation by this licensee disclosed that 7 out of 17 spare dashpot end caps and 2 non-engineered safety feature breakers also had similar defects. The circuit breaker is a Westinghouse type DB-75. Westinghouse type DB-50 breakers also use the same type of dashpot and end cap. DB-50 and -75 breakers are used extensively in PWR's, and some BWR's may also have the same breakers.

Similar make and model circuit breakers, when used for scram purposes, do not require the overcurrent trip feature and thus are not of concern. The end cap crack defect, if severe enough, could result in premature tripping of the circuit breaker because of insufficient time delay in overcurrent protection; i.e., the motor starting (inrush) current could cause the breaker to trip inadvertently and thus prevent the motor start.

The defects reported by the licensee in April 1979, occurred in the replacement end caps which were provided to solve the problem described in IE Bulletin 73-1. The subject of Bulletin 73-1 was end caps made of a black phenolic material. As a result of that Bulletin, the black end caps were replaced with a new type made of fibre-filled polyester material called "navy-gray". Prior to the April 1979 report, there have been no reports of suspect "navy-gray" end caps either from scheduled testing or unusual behavior in service. The manufacturer of the "navy-gray" end caps believes the crack defects may be linked to a raw material batch problem. That is, the molding ingredient materials used may have neared the end of their shelf life before use. It is not believed the end caps, after fabrication, have a significant shelf life limit, due to the low residual stress and low crack propagation probabilities.

Description of Event:

The following information was obtained from the Licensee Event Report dated April 12, 1979 and a subsequent meeting with Westinghouse, the NRC staff and the licensee.

During the 1979 surveillance tests, and a review of the previous refueling surveillance test results on a Westinghouse type DB-75 breaker (used as a 480v ESF bus supply breaker) a drift in the overcurrent trip time from the manufacturer's design minimum value of 6 seconds to 5.50 and 5.12 seconds was observed. The 1979 test results showed a deviation and inconsistency in the delayed trip timings among three consecutive tests.

The overcurrent devices were removed from each of the three phases and a visual inspection indicated a hairline crack in the end cap of one of the devices. That cap was replaced (without checking for a possible crack in the replacement cap), and the breaker was again tested. This test also showed deviations and inconsistency in the delayed trip timings. The subsequent inspection of the devices revealed a hairline crack in the end cap which had just been installed. This prompted an inspection of the in-stock spare caps. Seven out of 17 caps were found to have similar cracks.

Action Required of all Holders of an Operating License or Construction Permit:

1. Determine whether circuit breakers of the above described manufacturer and type with overcurrent trip devices are in safety-related Class IE service or in spares at your facilities.
2. If the subject breakers are in service in safety-related systems: within 30 days, review the existing test data for all overcurrent trip device calibrations since plant startup or since replacement caps were installed and tested in response to Bulletin 73-1, whichever is most recent. Determine if any delay times are: (1) outside of the acceptance band; (2) marginally acceptable - on the low side of the acceptance band; or (3) if any significant change in delay time performance has been observed. These breakers should be retested and end caps replaced as necessary to assure no loss of safety function.
3. Inspect all end caps in spares for cracks using at least a 3x magnifying glass. Caps having visible flaws should be discarded, or prevented from use in Class IE applications.
4. Review test procedures and test schedules for all safety-related circuit breakers to assure that all such breakers are tested at least each refueling outage to confirm overcurrent time delay protection.

For facilities with an operating license, a written report of the above actions, including the date(s) when they will be completed shall be submitted within 45 days of receipt of this Bulletin.

For facilities with a construction permit, a written report of the above actions, including the date(s) when they will be completed shall be submitted within 60 days of receipt of this Bulletin.

Approved by GAO, B180225 (R0072), clearance expires 7/31/80. Approval was given under a blanket clearance specifically for identified generic problems.

LISTING OF IE BULLETINS
ISSUED IN LAST TWELVE MONTHS

Bulletin No.	Subject	Date Issued	Issued To
79-10	Requalification Training Program Statistics	5/11/79	All Power Reactor Facilities with an OL
79-09	Failures of GE Type AK-2 Circuit Breaker in Safety Related Systems	4/17/79	All Power Reactor Facilities with an OL or CP
79-08	Events Relevant to BWR Reactors Identified During Three Mile Island Incident	4/14/79	All BWR Power Reactor Facilities with an OL
79-07	Seismic Stress Analysis of Safety-Related Piping	4/14/79	All Power Reactor Facilities with an OL or CP
79-06B	Review of Operational Errors and System Misalignments Identified During the Three Mile Island Incident	4/14/79	All Combustion Engineering Designed Pressurized Water Power Reactor Facilities with an Operating Licensee
79-06A	Review of Operational Errors and System Misalignments Identified During the Three Mile Island Incident	4/14/79	All Pressurized Water Power Reactor Facilities of Westinghouse Design with an OL
79-06	Review of Operational Errors and System Misalignments Identified During the Three Mile Island Incident	4/11/79	All Pressurized Water Power Reactors with an OL except B&W facilities
79-05A	Nuclear Incident at Three Mile Island	4/5/79	All B&W Power Reactor Facilities with an OL
79-05	Nuclear Incident at Three Mile Island	4/2/79	All Power Reactor Facilities with an OL and CP

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Bulletin No.	Subject	Date Issued	Issued To
79-04	Incorrect Weights for Swing Check Valves Manufactured by Velan Engineering Corporation	3/30/79	All Power Reactor Facilities with an OL or CP
79-03	Longitudinal Welds Defects In ASME SA-312 Type 304 Stainless Steel Pipe Spools Manufactured by Youngstown Welding and Engineering Co.	3/12/79	All Power Reactor Facilities with an OL or CP
79-02	Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts	3/2/79	All Power Reactor Facilities with an OL or CP
79-01	Environmental Qualification of Class IE Equipment	2/8/79	All Power Reactor Facilities with an OL or CP
78-14	Deterioration of Buna-N Component In ASCO Solenoids	12/19/78	All GE BWR facilities with an OL or CP
78-13	Failures in Source Heads of Kay-Ray, Inc., Gauges Models 7050, 7050B, 7051, 7051B, 7060, 7060B, 7061 and 7061B	10/27/78	All general and specific licensees with the subject Kay-Ray, Inc. gauges
78-12B	Atypical Weld Material in Reactor Pressure Vessel Welds	3/19/79	All Power Reactor Facilities with an OL or CP
78-12A	Atypical Weld Material in Reactor Pressure Vessel Welds	11/24/78	All Power Reactor Facilities with an OL or CP
78-12	Atypical Weld Material in Reactor Pressure Vessel Welds	9/29/78	All Power Reactor Facilities with an OL or CP

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Bulletin No.	Subject	Date Issued	Issued To
78-11	Examination of Mark I Containment Torus Welds	7/21/78	BWR Power Reactor Facilities for action: Peach Bottom 2 and 3, Quad Cities 1 and 2, Hatch 1, Monticello and Vermont Yankee
78-10	Bergen-Paterson Hydraulic Shock Suppressor Accumulator Spring Coils	6/27/78	All BWR Power Reactor Facilities with an OL or CP
78-09	BWR Drywell Leakage Paths Associated with Inadequate Drywell Closures	6/14/79	All BWR Power Reactor Facilities with an OL or CP
78-08	Radiation Levels from Fuel Element Transfer Tubes	6/12/78	All Power and Research Reactor Facilities with a Fuel Element transfer tube and an OL
78-07	Protection afforded by Air-Line Respirators and Supplied-Air Hoods	6/12/78	All Power Reactor Facilities with an OL, all class E and F Research Reactors with an OL, all Fuel Cycle Facilities with an OL, and all Priority 1 Material Licensees
78-06	Defective Cutler-Hammer Type M Relays with DC Coils	5/31/78	All Power Reactor Facilities with an OL or CP