

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

December 2, 1988

NRC INFORMATION NOTICE NO. 88-94: POTENTIALLY UNDERSIZED VALVE ACTUATORS

Addressees:

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose:

This information notice is being provided to alert addressees to potential problems concerning valves that may be equipped with undersized actuators incapable of providing sufficient thrust to seat, unseat or properly operate valves during some design conditions. 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

In November 1987, the William B. McGuire Nuclear Station, Unit 1 (McGuire or licensee), experienced problems with feedwater bypass control valve ICF-107 for steam generator 1D. During the startup of the unit, the level on steam generator 1D decreased to approximately 15 percent on the narrow range level instrumentation when flow through valve ICF-107 failed to increase as demanded upon increase of reactor power to above 3 percent. During the licensee's investigation, it was noticed that the valve was not responding as demanded and that in some cases the valve stroke time was slower than required for the control signal. Valve ICF-107 is a Fisher Controls (Fisher) valve, Model Number 667-ET, that was delivered to McGuire in 1975.

During subsequent investigations by the licensee and Fisher, it was determined by Fisher that the actuator for valve ICF-107 had been sized using a calculation that did not explicitly account for any valve packing friction forces. The licensee identified additional valves supplied by Fisher and requested that Fisher recalculate the actuator sizes to include allowances for valve packing friction forces. These evaluations showed that although some valve actuators were appropriately sized, some undersized actuators existed.

The licensee's immediate corrective actions for these undersized actuators included spring adjustments wherever possible. In those cases in which complete closure against design loads could not be assured, the valves were

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declared inoperable and were deactivated in their safe positions. Permanent corrective actions being considered by the licensee include changing control air operating limits, installing different springs, and installing larger actuators. The licensee is also considering methods that could be used to measure actual packing frictional forces for use during actuator resizing calculations.

Discussion:

Fisher Controls contacted the NRC regarding the potential undersized actuator issue, and an NRC inspection was subsequently conducted at Fisher to determine the extent of the problem. On the basis of a review of Fisher documents and discussions with Fisher personnel, the NRC determined that actuators for valves supplied by Fisher may be undersized and incapable of seating, unseating or properly operating their valves during some design conditions.

Fisher indicated that until the mid-1970s it had supplied sliding stem valves with Fisher's standard single arrangement teflon packing, as its actuator sizing technology was principally based on teflon packing. During the sizing of actuators for teflon-packed valves, Fisher did not account for the teflon packing friction forces as, based on their experience, the friction forces were calculated to be small compared to the actuator air pressure forces, actuator spring forces, valve differential pressure forces, and valve seating forces. Around 1975, Fisher began supplying a number of valves with graphite laminate packing as a result of nuclear power industry requests to eliminate teflon material from radiation environments and general personal health and safety concerns resulting in the replacement of asbestos packing material. In April 1976, Fisher began to explicitly account for packing friction forces in sizing all valve actuators when it became apparent that graphite packing friction forces and other non-teflon packing materials contributed significantly to the overall friction forces. The change was fully implemented for all Fisher orders shipped after January 1, 1977.

During the NRC inspection, Fisher also stated that some nuclear power plant licensees may have installed packing different from that provided in the original valve. Such a change would be of concern if the new packing creates higher friction forces than the original packing. For example, data provided by Fisher indicates that increased friction forces can result if teflon packing is replaced with graphite packing or graphite laminate packing is replaced with graphite ribbon packing. If the size of the installed actuator cannot overcome the increased friction forces associated with the packing change, then the valve may be incapable of performing some of its intended functions.

In addition, Fisher informed the NRC of the potential for undersized actuators on Fisher 9200 series butterfly valves. These particular valves employ rotary shafts rather than sliding stems and are not subject to the same packing friction concerns previously discussed; however, some of these butterfly valves may be equipped with undersized actuators for a different reason. Fisher sized butterfly valve actuators ordered before March 1, 1982, using a method that under some circumstances underestimated the torque required to seat or unseat the butterfly disk in the 9200 series valves. Butterfly valves ordered after

March 1, 1982, are not subject to this concern because they are equipped with actuators sized by the current Fisher method that more accurately predicts valve seat/disk frictional forces.

Conclusion:

The NRC has determined, on the basis of the McGuire event and the inspection at Fisher Controls, that the following types of valves may be equipped with undersized actuators that may not provide sufficient thrust to seat, unseat or properly operate their valves during some design conditions:

1. Sliding stem valves supplied by any manufacturer that were repacked using materials or procedures that increased the packing friction forces beyond those accounted for in sizing the actuators.
2. Fisher Controls sliding stem valves shipped before January 1, 1977, supplied with graphite and other non-teflon packing. The actuators for these valves were sized by Fisher without accounting for packing friction forces. Actuators for sliding stem valves supplied by other manufacturers may also be undersized, depending on the actuator sizing methods used by these manufacturers.
3. Fisher Controls 9200 series butterfly valves ordered before March 1, 1982. The method used to size the actuators for these valves may have underestimated the torque needed to seat or unseat the butterfly disk.

Licensees who identify valves with potentially undersized actuators may wish to contact the appropriate valve manufacturer to obtain additional information.

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Charles E. Rossi, Director  
Division of Operational Events Assessment  
Office of Nuclear Reactor Regulation

Technical Contacts: Joseph J. Petrosino, NRR  
(301) 492-0979

Jaime Guillen, NRR  
(301) 492-1170

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-93	Teletherapy Events	12/2/88	All NRC medical licensees.
88-92	Potential for Spent Fuel Pool Draindown	11/22/88	All holders of OLs or CPs for nuclear power reactors.
88-91	Improper Administration and Control of Psychological Tests	11/22/88	All holders of OLs or CPs for nuclear power reactors and all fuel cycle facility licensees who possess, use, import, export, or transport formula quantities of strategic special nuclear material.
88-90	Unauthorized Removal of Industrial Nuclear Gauges	11/22/88	All NRC licensees authorized to possess, use, manufacture, or distribute industrial nuclear gauges.
88-89	Degradation of Kapton Electrical Insulation	11/21/88	All holders of OLs or CPs for nuclear power reactors.
88-88	Degradation of Westinghouse ARD Relays	11/16/88	All holders of OLs or CPs for nuclear power reactors.
88-87	Pump Wear and Foreign Objects in Plant Piping Systems	11/16/88	All holders of OLs or CPs for nuclear power reactors.
86-106, Supp. 3	Feedwater Line Break	11/10/88	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
CP = Construction Permit

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*Bill Brach agreed with changes to final draft on 11/29/88*

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*CE Rossi*

\*SEE PREVIOUS CONCURRENCES

\*OGCB:DOEA:NRR    \*PPMB:ARM    \*VIB:DRIS:NRR  
JGuillen            TechEd            JPetrosino  
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*CE Rossi*  
11/29/88  
\*C/VIB:DRIS:NRR  
WBrach  
11/04/88

\*C/OGCB:DOEA:NRR  
CHBerlinger  
11/28/88  
\*D/DRIS:NRR  
BKGrimes  
11/04/88

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\*Previously concurred by Callum

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CHBerlinger	CERossi
11/ /88	11/ /88

*OK as revised*  
*11/4/88*