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IE Bulletin No. 81-02: FAILURE OF GATE TYPE VALVES TO CLOSE AGAINST DIFFERENTIAL PRESSURE

Description of Circumstances:

As a part of its pressurized water reactor (PWR) Safety and Relief Valve Testing Program, the Electric Power Research Institute (EPRI) conducted limited testing of a number of valves used on PWRs as power-operated relief valve (PORV) isolation or block valves. These tests indicate a number of cases in which certain of these valves failed to fully close under conditions that approximated those of their intended service (i.e., saturated steam at approximately 2,400 psi). The valves that failed to fully close are gate type motor-operated valves that may be used in various safety-related applications in addition to PORV block valves.

Background on EPRI Testing:

The proposed full-scale qualification testing of PORV block valves, with a completion date of July 1, 1982, was first provided to the utilities in a September 5, 1980, draft of NUREG-0737. The item was formally issued, with Commission approval, in NUREG-0737 on October 31, 1980.

The block valve qualification testing was proposed in NUREG-0737 primarily as an additional means of reducing the number of challenges to the emergency core cooling system and the safety valves during plant operation.

In anticipating a request for PWR block valve testing, EPRI decided to make provisions for the installation of block valves between the test steam source and the test PORV in July 1980 at the Marshall test facility. The Marshall test facility is a full-flow steam test facility owned by Duke Power Company. Test PORVs had been carefully selected, with close coordination between EPRI, its consultants and PWR utilities, to assure that PORVs representative of those in service or intended for service would be tested. However, for the block valves that have been tested concurrently, this selection process was not followed because an NRC block valve test program had not been formulated. Therefore, seven readily available valves were obtained and tested by EPRI, primarily to obtain some general baseline information on block valve closure capability.

For the block valves that were tested, EPRI had not established, at least at the time of testing, the population of plants, either operating or under construction, that might have a valve of the type needed for testing. In addition, it should be noted that the test conditions used at Marshall to date were only those that were determined to be applicable for steam testing of PORVs.

These test conditions were selected after review by EPRI, utilities, and PWR NSSS vendors. NRC staff also reviewed and concurred with the test conditions. To date, there has been no similar specific determination by EPRI or the NRC staff as to the relevance of the Marshall block valve test conditions to the conditions in any specific PWR plant under which a block valve should be able to close to isolate a stuck-open PORV.

To date, EPRI has tested a total of seven PORV block valves, all at the Marshall facility. During these tests, the following valves failed to fully close during the EPRI PORV block valve testing:

1. Westinghouse Electro-Mechanical Division (W-EMD) 3-inch Valves - These valves, which are manufactured by W-EMD, can be identified by the yoke-mounted nameplates that are stamped "WESTINGHOUSE" and include "VALVE IDENT." and "VALVE I.D." numbers given in Table 1. Supplemental analyses and water testing, performed by W-EMD, determined that a 4-inch valve also would not close fully and therefore is included in this bulletin. The nameplate data on this valve are given in Table 1. These analyses and tests also determined the threshold differential pressure across the valves above which closure cannot be assured. These values are given in Table 1. A list of power reactor facilities believed to have the affected valves is given in Table 2. It is our understanding that W-EMD has notified these facilities of the failure of these valves to fully close.
2. Borg-Warner Nuclear Valve Division (BW-NVD) 3-inch 1500-pound Motor-Operated Gate Valves - These valves can be identified by BW-NVD part numbers 75460, 77910, and 79190. Supplemental testing to determine threshold differential pressures for less severe service has yet to be completed. A list of power reactor facilities believed to have the affected valves is given in Table 3. BW-NVD has submitted a 10 CFR Part 21 report in which they indicated that they have notified these facilities of the failure of these valves to fully close. (Note: Similar valves with BW-NVD part numbers 74380 and 74380-1 have been modified, retested, and demonstrated to close under test conditions. As a result, they are not included in this bulletin.)
3. Anchor Darling 3-inch 1540-pound Double-Disc Valve - This valve, the first of a series of specially designed valves, has been modified, retested, and demonstrated to close under test conditions. The remaining valves will be similarly modified during manufacture. As a result, they are not included in this bulletin.

It must be cautioned that Tables 2 and 3 may not be complete. For example, the staff is aware of one power reactor facility that obtained affected valves from another inventory. For this reason, this bulletin is applicable to all power reactor facilities with an operating license or construction permit.

The tests and analyses performed to date raise doubts as to the ability of the affected valves to close under less severe service conditions. These valves have also been supplied for utilization in a number of safety-related

applications. In the case of the W-EMD valves, they are also provided as spares or replacements through direct sales from the manufacturer. For this reason, this bulletin is applicable to the affected valves that are required to close with a differential pressure across them in safety-related systems or as PORV block valves.

The responsibility for notification and corrective actions based on adverse test results continues to lie with the utilities and vendors in the industry. NRC will continue to monitor the progress of the qualification program. All adverse test data will continue to be evaluated on a case-by-case basis. NRC staff will take appropriate action, if necessary, to assure that the necessary corrective actions are made in a timely manner.

Actions to be Taken by Licensees:

1. Within 30 days of the issuance date of this bulletin, ascertain whether any of the affected valves have been installed, or are maintained as spares for installation, where they are required to close with a differential pressure across them in safety-related systems or as PORV block valves. The differential pressures of concern include the following:
 - a. For the W-EMD manufactured valves, values in excess of the threshold values in Table 1.
 - b. For the BW-NVD valves, any value.
2. If no affected valves are identified, report this to be the case and ignore the items below.
3. If any affected valves are identified as being installed, take corrective action and evaluate the effect that failure to close under any condition requiring closure would have on system(s) operability pursuant to the facility technical specifications for continued operation.
4. If any affected valves are identified as spares, either modify the valves so that they are qualified for the intended service or obtain qualified replacements prior to installation.
5. Within 45 days of the issuance date of this bulletin, submit a report to NRC listing the affected valves identified, their service or planned service, the maximum differential pressure at which they would be required to close, the safety consequences of the valve's failure to close, the corrective action taken or planned, and the schedule for completing the corrective action.

Actions to be Taken by Construction Permit Holders:

1. Ascertain whether any of the affected valves are or will be installed or maintained as spares for installation where they are required to close

with a differential pressure across them in safety-related systems or as PORV block valves. The differential pressures of concern include the following:

- a. For the W-EMD manufactured valves, values in excess of the threshold values in Table 1.
 - b. For the BW-NVD valves, any value.
2. If no affected valves are identified, report this to be the case and ignore the items below.
 3. If any affected valves are identified, either modify the valves so that they are qualified for the intended service or obtain qualified replacements prior to startup.
 4. Within 90 days of the issuance date of this bulletin, submit a report to NRC listing the affected valves identified, their planned service, the maximum differential pressure at which they would be required to close, the safety consequences of the valve's failure to close, the corrective action taken or planned, and the schedule for completing the corrective action.

For those cases in which reports have already been submitted in accordance with the Technical Specification, 10 CFR Parts 21 and/or 50.55(e), this information need not be resubmitted. Rather, licensees or construction permit holders should reference this earlier report and submit only the additional information requested above.

Reports, signed under oath or affirmation under the provisions of Section 182a of the Atomic Energy Act of 1954, shall be submitted to the Director of the appropriate NRC Regional Office and a copy shall be forwarded to the Director of the NRC Office of Inspection and Enforcement, Washington, D.C. 20555.

If you need additional information regarding this matter, please contact the appropriate NRC Regional Office.

This request for information was approved by GAO under blanket clearance number R0072 that expires November 30, 1983. Comments on burden and duplication should be directed to Office of Management and Budget, Room 3201, New Executive Office Building, Washington, D.C. 20503.

Attachments:

1. Table 1 - Identification of W-EMD Manufactured Valves and Differential Pressure Limits for Operation
2. Table 2 - Partial List of Plants With Affected Valves Manufactured by W-EMD
3. Table 3 - Partial List of Plants With Affected Valves Manufactured by BW-NVD
4. Recently issued IE Bulletins

TABLE 1. IDENTIFICATION OF W-EMD MANUFACTURED VALVES AND DIFFERENTIAL PRESSURE LIMITS FOR VALVE OPERATION

Nominal Valve Size (in.)	W-EMD Model Reference	"VALVE IDENT."**	"VALVE I.D."**	Δ *** (psid)
3	3GM88	03000GM88	3GM58 or 3GM78 or 3GM88	1500
	3GM88	03002GM88	3GM58 or 3GM78 or 3GM88	1500
	3GM99	03001GM99	3GM58 or 3GM78 or 3GM88	750
4	4GM88	04000GM88	4GM78 or 4GM88	750
	4GM88	04002GM88	4GM78 or 4GM88	750
4	4GM87	04000GM87	4GM77	750
	4GM87	04002GM87	4GM77	750

* This number is found on the yoke-mounted nameplate and occupies the first nine positions of a 24-position number. It is used in evaluating the functional ΔP requirements.

** This number is found on the yoke-mounted nameplate and occupies the first three positions of a six-position number. Valves sold as spares or replacements may not contain this number.

*** Pressure below which valve will close (as shipped).

Notes: A "position" may contain more than one character. The three-position "VALVE I.D." number consists of five digits in the three positions; for example, 3 GM 78.

All nameplates have "VALVE IDENT." numbers, but those sold as spares or replacements may not have "VALVE I.D." numbers. The "VALVE IDENT." number includes the manufacturer's model reference, and the "VALVE I.D." number is a reference to the valve system application. The "VALVE I.D." number also appears on Westinghouse valve indexes and system flow diagrams. There is no reference to the "VALVE IDENT." number on these indexes or flow diagrams.

TABLE 2. PARTIAL LIST OF PLANTS WITH
 AFFECTED VALVES MANUFACTURED BY W-EMD

Plant	"VALVE IDENT." Number		
	03000GM88 03002GM88	03001GM99	04000GM88 04002GM88 04000GM87 04002GM87
Operating plants (supplied as spares or replacements except as noted):			
Beaver Valley 1	X		
Connecticut Yankee	X		
Farley 1, 2		X*	
Indian Point 2	X		
Kewaunee	X		
North Anna 1, 2	X		
Oconee 1, 2, 3	X		X
San Onofre 1	X		
Surry 1, 2	X	X	X
Zion 1, 2			X
Nonoperating plants (supplied as original scope of supply except as noted):			
Beaver Valley 2	X		X
Braidwood 1, 2	X		X
Byron 1, 2	X		X
Callaway 1, 2	X		X
Comanche Peak 1, 2	X		X
Harris 1, 2, 3, 4		X	X
Jamesport 1, 2		X	X
Marble Hill 1, 2	X		X
San Onofre 2, 3		X**	
Seabrook 1, 2		X	X
South Texas 1, 2			X
Summer	X		X
Vogtle 1, 2		X	X
Watts Bar 1, 2	X		X
Wolf Creek	X		X

*Transferred from inventory at another plant.

**Spares or replacements.

TABLE 3. PARTIAL LIST OF PLANTS WITH
AFFECTED VALVES MANUFACTURED BY BW-NVD

Plant	NVD-P/N
Arkansas Nuclear One, Unit 2	75460
Bellefonte	79190
Palo Verde	77910

RECENTLY ISSUED
IE BULLETINS

Bulletin No.	Subject	Date Issued	Issued To
81-01 Rev. 1	Surveillance of Mechanical Snubbers	3/5/81	All power reactor facilities with an OL & specified facilities with a CP
80-17, Supplement 5	Failure of Control Rods to Insert During a Scram	2/13/81	All BWR facilities with an OL or CP
81-01	Surveillance of Mechanical Snubbers	1/27/81	All power reactor facilities with an OL & to specified facilities with a CP
80-25	Operating Problems with Target Rock Safety-Relief Valves at BWRs	12/19/80	All BWR facilities with an OL & specified near term OL & all BWR facilities with a CP
Supplement 4 to 80-17	Failure of Control Rods to Insert During a Scram at a BWR	12/18/80	To specified BWRs with an OL & All BWRs with a CP
80-24	Prevention of Damage Due to Water Leakage Inside Containment (October 17, 1980 Indian Point 2 Event)	11/21/80	All power reactor facilities with an OL or CP
80-23	Failures of Solenoid Valves Manufactured by Valcor Engineering Corporation	11/14/80	All power reactor facilities with an OL or CP
80-22	Automation Industries, Model 200-520-008 Sealed-Source Connectors	9/11/80	All radiography licensees
80-21	Valve yokes supplied by Malcolm Foundry Company, Inc.	11/6/80	All light water reactor facilities with an OL or CP

OL = Operating License
CP = Construction Permit