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MURLEY,T.E. Office of Nuclear Reactor Regulation, Director (Post 870411

SUBJECT: Responds to Suppl 3 to Generic Ltr 89-10, "Consideration of Results of NRC-Sponsored Tests of Motor-Operated Valves." Mods performed on HPCI & RCIC valves during Cycle 10/11 refueling outage & two larger motors installed.

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Iowa Electric Light and Power Company

March 11, 1991

NG-91-0438

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Response to NRC Generic Letter 89-10, Supplement 3, "Consideration of the Results of NRC Sponsored Tests of Motor-Operated Valves"
Reference: Letter, D.L. Mineck to Dr. Murley, dated December 10, 1990 (NG-90-2775)
File: A-101b

Dear Dr. Murley:

Supplement 3 to Generic Letter 89-10 requested that BWR licensees assess the applicability of data from the NRC-sponsored testing of motor-operated valves (MOVs) to determine the "as-is" capability of the six High Pressure Coolant Injection (HPCI), Reactor Core Isolation Cooling (RCIC), and Reactor Water Cleanup (RWCU) valves of concern to identify any deficiencies in these MOVs. This letter responds to Supplement 3. The criteria used by Iowa Electric (IE) to assess the as-is capabilities of the six containment isolation valves are shown on Table 1. Table 2 provides valve, motor and operator specifications and the most recent diagnostic test results. The only MOV found to be deficient is MO-2401 which is discussed below. It has been repaired and planned future actions are also described below.

Since the issuance of NRC Bulletin 85-03, "Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings", IE has implemented an aggressive MOV program addressing the concerns of the Bulletin and subsequent industry documents. Through extensive maintenance, testing, analysis and design changes, we have, over the last five years, substantially enhanced MOV operability and reliability. As part of this MOV program, several modifications were performed on the HPCI and RCIC valves of concern during our Cycle 10/11 refueling outage, which included the complete overhaul of one valve and operator and the installation of two larger motors. Due to the concerns raised by the NRC-sponsored testing, all six valves underwent diagnostic testing and four of the six valves had their torque switch settings increased. As stated in the referenced letter, this testing allowed us to conclude that these valves would perform their safety function when subjected to design basis differential pressure and flow conditions.

Subsequent to submittal of the referenced letter, however, the RCIC outboard steam line isolation valve (MO-2401) failed to close on demand during a reactor

shutdown. During the shutdown, MO-2400 and MO-2401 were signaled to close on a RCIC steam line low pressure signal (50 - 100 psig). While MO-2400 isolated as required, the supply breaker to MO-2401 tripped during its attempt to close. As noted in NRC Inspection Report 90-23, inspection of the motor operator revealed a shorted motor, a corroded limit switch and a broken limit switch gear. Although MO-2401 has a history of corrective maintenance actions, its most-recent diagnostic test data indicated good valve performance with no signs of component degradation or failure. Our efforts to determine the cause of the recent failures are incomplete. To help determine the root cause of these failures, the motor has been sent to Wyle Labs and the limit switch gear to Limitorque for analysis. Repairs to MO-2401, including replacement of its motor and limit switch, were completed prior to startup from that shutdown. A complete overhaul of this valve is scheduled for the next refueling outage. Results of the diagnostic test of the repaired valve are shown in Table 2.

Because the root cause analysis of the failure of MO-2401 is incomplete, we are unable to determine if further action is warranted. If the results of the off-site analysis of MO-2401 indicate that corrective actions are necessary, we will inform the staff of any corrective actions and provide a schedule for their completion.

Please contact this office if you have any questions regarding this matter.

Very truly yours,

Daniel L. Mineck
Manager, Nuclear Division

DLM/PMB/pjv+

cc: P. Bessette
L. Liu
L. Root
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A. Bert Davis (Region III)
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Commitment Control

MOV FUNCTIONAL CRITERIA
TABLE 1

FUNCTIONAL CRITERIA	BASIS FOR CRITERIA	VALVES MEETING CRITERIA
Thrust at torque switch trip is less than operator rated maximum thrust, valve rated thrust, and locked rotor thrust under normal conditions	Ensure MOV is not damaged during isolation	All valves
Thrust at contactor drop-out is less than operator rated maximum thrust, valve rated thrust, and locked rotor thrust under normal conditions	Ensure MOV is not damaged during isolation	All Valves
Maximum delivered thrust is less than 110% of operator rated maximum thrust, 100% of valve rated thrust and 100% of locked rotor thrust under normal conditions.	Ensure MOV is not damaged during isolation	All valves (NOTE 1)
Torque at torque switch trip is less than operator rated maximum torque.	Ensure operator is not damaged during isolation	All valves
Torque at torque switch trip is less than locked rotor thrust under degraded conditions.	Ensures sufficient margin exists for operator to close the valve against design basis pressures, and flows under degraded voltage and frequency and elevated temperature conditions.	All valves
Thrust at torque switch trip is greater than required thrust using a .5 valve factor.	Accounts for unpredictable phenomenon identified in INEL blowdown testing	All valves (NOTE 2)
Thrust at torque switch trip is greater than required thrust based on INEL test data.	Compares DAEC valve performance to INEL test valve performance to identify significant differences or deficiencies.	MO-2238 MO-2239 (NOTE 3)
Seating current is less than 80% of locked rotor current.	Protects motor from damage due to locked rotor conditions.	All valves
Running current is less than or equal to motor full load current or 20% of rated load current or Tested running thrust is less than or equal to predicted running thrust.	Ensures normal running load is not excessive to prevent motor temperature increases or thermal overload trips	All valves (NOTE 4)

MOV FUNCTIONAL CRITERIA
TABLE 1

FUNCTIONAL CRITERIA	BASIS FOR CRITERIA	VALVES MEETING CRITERIA
Torque at torque switch trip is within 10% of required torque using a .5 valve factor	Accounts for unpredictable phenomenon identified in INEL blowdown testing	All valves (NOTE 5)
Actual stem factor is less than predicted stem factor	Ensures valve stem is properly lubricated.	All valves except MO-2401 (NOTE 6)

Note:

1. As seen in Table 2, all subject MOVs meet this criteria. While MO-2400 and MO-2700 exceed their maximum operator thrust by 7% and 1% respectively, they are within the 10% allowed design margin.
2. As seen in Table 2, thrust for MO-2401 is 315 lb or 4% less than the required thrust using a .5 valve factor. The 4% difference is not considered significant. It should be noted that the .5 valve factor is used for comparison purposes only. A .4 valve factor was used to calculate the torque switch settings.
3. INEL testing involved 10" and 6" valves only. No thrust data is available for 4" valves. Operators for MO-2238 and MO-2239 are producing 41.6% and 27.2% more thrust respectively than the INEL test based estimates.
4. All valves shown in Table 2 meet this criteria. MO-2238, MO-2239, MO-2401, and MO-2701 meet the first criteria and MO-2239, MO-2400, MO-2401, MO-2700 and MO-2701 meet the second criteria.
5. As seen in Table 2, torque at torque switch trip for MO-2238 and MO-2239 is lower than required by 1.5% and 3.3% respectively which is well within the 10% allowance.
6. As seen in Table 2, all valves meet this criteria except for MO-2401. This criteria, however, addresses maintenance concerns and is not an operability concern. MO-2401 is scheduled for an overhaul during the next refueling outage.

VALVE DESIGN AND PERFORMANCE DATA
(11 March 1991)
TABLE 2

VALVE	MO2238	MO2239	MO2400	MO2401	MO2700	MO2701
MANUFACTURER	ANCNOR DARLING	ANCHOR DARLING	ANCHOR DARLING	ANCHOR DARLING	ANCNOR DARLING	ANCHOR DARLING
VALVE TYPE	FLEX GATE	FLEX GATE	FLEX GATE	FLEX GATE	FLEX GATE	FLEX GATE
VALVE SIZE	10"	10"	4"	4"	4"	4"
ORIFICE SIZE	8.375"	8.375"	3.5"	3.5"	4.0"	4.0"
OPERATOR SIZE	SB-2	SB-3	SMB-00	SMB-00	SMB-00	SMB-00
ACTUATOR RATIO	46.66	37.28	36.20	41.00	36.20	38.60
MOTOR SIZE	80'#	80'#	15'#	10'#	15'#	10'#
MOTOR SPEED	3600 RPM	1900 RPM	1800 RPM	1900 RPM	1800 RPM	1900 RPM
VOLTAGE	480VAC	250VDC	480VAC	125VDC	480VAC	250VDC
DIFFERENTIAL PRESSURE	1110 PSID	1110 PSID	1110 PSID	1110 PSID	1110 PSID	1110 PSID
LINE PRESSURE	1110 PSIG	1110 PSIG	1110 PSIG	1110 PSIG	1110 PSIG	1110 PSIG
TESTED RUNNING THRUST	2,395#	1,293#	949#	931#	338#	422#
PREDICTED RUN THRUST	2,000#	2,000#	1,250#	1,250#	1,250#	1,250#
REQUIRED THRUST LIMITORQUE METHOD 0.4 VALVE FACTOR	29,946#	29,946#	6,884#	6,884#	8,192#	8,192#
REQUIRED THRUST LIMITORQUE METHOD 0.5 VALVE FACTOR	36,062#	36,062#	7,952#	7,952#	9,587#	9,587#
REQUIRED THRUST FROM INEL DATA	30,000#	30,000#	Note A	Note A	Note A	Note A
AVERAGE THRUST FROM BWROG DATA	34,922#	34,922#	7,015#	7,015#	6,349#	6,349#
THRUST AT SWITCH TRIP	42,470#	36,653#	12,303#	7,637#	13,533#	10,930#
THRUST AT DROP OUT	43,345#	37,463#	12,961#	7,938#	13,495#	10,930#
MAXIMUM THRUST	47,042#	38,219#	14,986#	8,356#	14,132#	11,354#
OPERATOR MAX THRUST	70,000#	140,000#	14,000#	14,000#	14,000#	14,000#
VALVE MAX THRUST	92,420#	92,420#	34,810#	34,810#	34,810#	34,810#
LOCKED ROTOR THRUST NORMAL CONDITIONS	71,649#	55,660#	24,359#	22,071#	24,359#	20,779#

Table 2 (Cont.)

LOCKED ROTOR THRUST DEGRADED CONDTIONS	45,855#	44,528#	15,590#	17,657#	15,590#	16,623#
VALVE	MO2238	MO2239	MO2400	MO2401	MO2700	MO2701
MANUFACTURER	ANCHOR DARLING	ANCHOR DARLING	ANCHOR DARLING	ANCHOR DARLING	AHCHOR DARLIHG	ANCHOR DARLING
VALVE TYPE	FLEX GATE	FLEX GATE	FLEX GATE	FLEX GATE	FLEX GATE	FLEX GATE
VALVE SIZE	10"	10"	4"	4"	4"	4"
ORIFICE SIZE	8.375"	8.375"	3.5"	3.5"	4.0"	4.0"
OPERATOR SIZE	SB-2	SB-3	SMB-00	SMB-00	SMB-00	SMB-00
ACTUATOR RATIO	46.66	37.28	36.20	41.00	36.20	38.60
MOTOR SIZE	80'#	80'#	15'#	10'#	15'#	10'#
MOTOR SPEED	3600 RPM	1900 RPM	1800 RPM	1900 RPM	1800 RPM	1900 RPM
VOLTAGE	480VAC	250VDC	480VAC	125VDC	480VAC	250VDC
DIFFERENTIAL PRESSURE	1110 PSID	1110 PSID	1110 PSID	1110 PSID	1110 PSID	1110 PSID
LINE PRESSURE	1110 PSIG	1110 PSIG	1110 PSIG	1110 PSIG	1110 PSIG	1110 PSIG
TEST RUNNING CURRENT	10.4A	15.5A	3.1A	6.1A	2.6A	3.1A
FULL LDAD CURRENT FROM NOTOR CURVE	15.1A	50A	2.55A	11.0A	1.55A	5.2A
SEATING CURRENT	30.0A	59.8A	4.1A	16.4A	2.8A	12.5A
LOCKED ROTOR CURRENT	116A	107A	16A	38A	16A	19.6A
REQUIRED TORQUE 0.4 VALVE FACTOR	632'#	773'#	74'#	74'#	88'#	88'#
REQUIRED TORQUE 0.5 VALVE FACTOR	761'#	930'#	85'#	85'#	103'#	103'#
TDRQUE AT SWITCH TRIP	750'#	900'#	90'#	90'#	115'#	100'#
OPERATOR MAX TORQUE	1,800'#	4,200'#	250'#	250'#	250'#	250'#
PREDICTED STEM FACTDR	0.0211	0.0258	0.0107	0.0107	0.0107	0.0107
ACTUAL STEM FACTOR	0.0177	0.0246	0.0073	0.0144	0.0085	0.0091

Note A: No 4" valves were tested in the INEL test Program.