



Motor-Operated Valve Regulatory Activities

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NRC Regulations

- 10 CFR 50.55a(b)(3)(ii), Motor-Operated Valve Testing
 - Licensees shall comply with the provisions for testing motor-operated valves in OM Code ISTC 4.2, 1995 Edition with the 1996 and 1997 Addenda, or ISTC-3500, 1998 Edition through the latest edition and addenda incorporated by reference in paragraph (a)(1)(iv) of this section, and must establish a program to ensure that motor-operated valves continue to be capable of performing their design basis safety functions. Licensees implementing ASME OM Code, Mandatory Appendix III, “Preservice and Inservice Testing of Active Electric Motor Operated Valve Assemblies in Light-Water Reactor Power Plants,” of the 2009 Edition, 2011 Addenda, and 2012 Edition shall comply with the following conditions:



NRC Regulations (cont'd)

- A. MOV diagnostic test interval. Licensees shall evaluate the adequacy of the diagnostic test intervals established for MOVs within the scope of ASME OM Code, Appendix III, not later than 5 years or three refueling outages (whichever is longer) from initial implementation of ASME OM Code, Appendix III.
- B. MOV testing impact on risk. Licensees shall ensure that the potential increase in core damage frequency and large early release frequency associated with the extension is acceptably small when extending exercise test intervals for high risk MOVs beyond a quarterly frequency. [Regulatory Guide (RG) 1.174]



NRC Regulations (cont'd)

- C. MOV risk categorization. When applying Appendix III to the ASME OM Code, licensees shall categorize MOVs according to their safety significance using the methodology described in ASME OM Code Case OMN-3, "Requirements for Safety Significance Categorization of Components Using Risk Insights for Inservice Testing of LWR Power Plants," subject to the conditions applicable to OMN-3 which are set forth in Regulatory Guide 1.192, or using an MOV risk ranking methodology accepted by the NRC on a plant-specific or industry-wide basis in accordance with the conditions in the applicable safety NRC evaluation.
- D. MOV stroke time. When applying Paragraph III-3600, "MOV Exercising Requirements," of Appendix III to the ASME OM Code, licensees shall verify that the stroke time of MOVs specified in plant technical specifications satisfies the assumptions in the plant's safety analyses.



Current MOV Issues/Activities

- 50.55a Rulemaking
- Regulatory Guide 1.192, Revision 3
- Design Bases Assurance Inspection (Programs) for Power Operated Valves (POVs) Findings Update



50.55a Rulemaking

- Ongoing rulemaking for ASME OM Code (2020 Edition) with conditions.
- Proposed rulemaking was published in the *Federal Register* March 26, 2021 with a 60 day public comment period
- Final rule currently scheduled to be published in the summer of 2022.



50.55a Rulemaking – Items of Interest in Proposed Rulemaking

- Add NRC Inservice Testing (IST) Plan submittal and reporting requirements (replaces ASME requirement).
- Incorporate by reference Subsection ISTE in the ASME OM Code (2020 Edition) without conditions.
- Modify 10 CFR 50.55a(f)(4) to clarify relationship between 50.55a(f)(4) and (g)(4) regarding the inservice testing or inservice inspection programs for snubbers.
- Consideration of proposed relaxation of the interval for position indication testing required in ISTC-3700 for valves that are not susceptible to stem-disk separation.



RG 1.192 Operation and Maintenance Code Case Acceptability, ASME OM Code

- RG 1.192 lists OM Code Cases that are acceptable to the NRC with or without conditions.
- RG 1.192, Revision 3, is applicable to OM Code Cases published up to the 2017 Edition of the ASME OM Code.
- NRC staff has reviewed new Code Cases (OMN-22 through OMN-27) and revised Code Cases up to the 2020 Edition of the ASME OM Code. Proposed rulemaking and RG for these Code Cases was published February 2, 2021 with a 60 day comment period.
- Final rule currently scheduled to be published in the spring of 2022.



Design Bases Assurance Inspection (Programs) for Power Operated Valves (POVs) Findings Update



POV Inspection Program

- On July 26, 2019, NRC issued Inspection Procedure (IP) 71111.21N02, “Design-Basis Capability of Power-Operated Valves Under 10 CFR 50.55a Requirements”
- Inspection objective is to assess the reliability, functional capability, and design-basis of risk-important power-operated valves (POVs) at nuclear power plants.
- Training provided for inspectors in each NRC Region office.
- POV inspections began in January 2020.
- POV inspections focus on sample selection, scope, design, testing, and maintenance and corrective actions.



POV Inspection Status

- POV inspections using IP 71111.21N.02 have been performed at about 59 nuclear power plant units since January 2020.
- Inspections at each site focus on a sample of 8 to 12 POVs including:
 - Motor-Operated Valves (MOVs)
 - Air-Operated Valves (AOVs)
 - Hydraulic-Operated Valves (HOVs)
 - Solenoid-Operated Valves (SOVs)
 - Pyrotechnic-Operated (Squib) Valves
- Many inspections rely on partial remote means due to COVID-19.



POV Inspection Results

- POV inspections have identified several Green Non-Cited Violations (NCVs) and numerous minor and licensee identified violations.
- At a virtual public meeting on December 8, 2020, NRC staff discussed lessons learned from the POV inspections up to that time.
- 14 categories of lessons learned from POV inspections are presented in NRC Information Notice 2021-01 (May 6, 2021), “Lessons Learned from U.S. Nuclear Regulatory Commission Inspections of Design-Basis Capability of Power-Operated Valves at Nuclear Power Plants.”



IN 2021-01 POV Inspection Lessons Learned

1. Ensure IST Programs are fully consistent with ASME OM Code, such as addressing all POV safety functions, and maintaining POV risk rankings up to date.
2. Address ASME OM Code, Appendix III, requirement for mix of static and dynamic testing.
3. Follow NRC-accepted commitment change process (e.g., JOG Program does not include test interval grace periods).
4. Properly determine POV operating requirements and actuator capability, including parameters used in calculations such as friction values, temperature, pressure, and flow.



IN 2021-01 POV Inspection Lessons Learned

5. JOG Program determined potential for degradation of valve friction coefficients, but did not establish valve friction database.
6. Establish methods to periodically demonstrate design-basis capability of JOG Class D valves.
7. Address conditions for EPRI MOV PPM applicability, such as maintaining valve in good internal condition. See NUREG-1482 (Revision 3).
8. Properly justify increasing Limitorque actuator thrust ratings. See IN 92-83.



IN 2021-01 POV Inspection Lessons Learned

9. Properly conduct POV testing and adequately evaluate results to demonstrate POV can perform its safety function.
 - a) Properly translate test acceptance criteria from design calculations to test procedures
 - b) Verify diagnostic equipment installed and operating properly
 - c) Evaluate test data for full valve stroke
 - d) Verify required parameters are within acceptable range
 - e) Determine if test data exceed JOG threshold values
 - f) Address potential variation of data from single test
 - g) Justify reliance on static diagnostic testing
 - h) Periodic evaluation of thermal overload devices
 - i) Prepare monitoring reports in accordance with plant procedures



IN 2021-01 POV Inspection Lessons Learned

10. Provide assurance that MOVs set on limit control under static conditions will fully close under dynamic conditions.
11. Provide assurance of qualified life of POVs if extended.
12. Properly implement guidance provided by Boiling Water Reactor Owners Group for assessing susceptibility of separation of stem-disk connection in Anchor/Darling double-disk gate valves (see IN 2017-03).
13. Implement 10 CFR 50.55a(b)(3)(xi) for supplemental valve position indication when conducting testing for ISTC-3700 in ASME OM Code (2012 or later edition).



IN 2021-01 POV Inspection Lessons Learned

14. Justify POV preventive maintenance schedules based on vendor recommendations and plant experience (e.g., MOVs in high temperature areas might need more frequent stem lubrication, and MOVs in non-normal positions might need additional attention, such as limit switch cover facing down might experience grease intrusion).



Additional POV Inspection Lessons since IN 2021-01

- A. Evaluation of possible consequences of drilling a hole in valve disk when preventing pressure locking
- B. JOG program schedule does not include grace periods so commitment change process needed
- C. Monitoring torque limits when operating a valve by its manual handwheel
- D. Ensuring leak rate requirements met for MOVs with long closing torque switch bypass
- E. Improper reliance on one-time stall torque limits for actuator margin calculations
- F. Determination of stem lube degradation factor for ball-screw stem nut



Additional POV Inspection Lessons since IN 2021-01

- G. Identification and correction of degraded magnesium MOV motor rotors
- H. Consideration of gate valve unwedging force
- I. Modification of JOG program schedule commitments
- J. 10 CFR 50.59 evaluations for valve pressure locking modifications
- K. Evaluation of MOVs with design-basis safety functions to throttle flow
- L. Potential for improper stroke time calculations that rely on computer data
- M. Updating POV surveillance program following PRA update



Additional POV Inspection Lessons since IN 2021-01

- N. Response to EPRI MOV PPM Type 1 warnings
- O. Verification that installed POVs match calculation assumptions
- P. Maintaining EPRI MOV PPM long-term applicability
- Q. Monitoring of industry data for valves that EPRI MOV PPM is best available information
- R. Verification and Validation of POV software
- S. Removal of valves from 10 CFR Part 50, Appendix J Program without adequate technical justification



POV Region Panels

- Draft findings from each POV inspection are presented to an NRC staff panel consisting of representatives from each NRC Region office and headquarters.
- POV Region Panel discusses each POV inspection finding in comparison to findings from previous POV inspections.
- Review by POV Region Panel provides confidence in the consistency of NRC staff technical positions during POV inspections across the NRC Regions.



Summary

- Implementation of IP 71111.21N.02 for POV inspections has been successful in meeting the inspection objectives and maintaining consistency across NRC Region offices.
- POV inspections identified many lessons learned that licensees should address in providing reasonable assurance of the design-basis capability of POVs to perform their safety functions.
- NRC issued IN 2021-01 describing lessons learned from POV inspections up to that date.
- NRC staff plans to complete the POV inspection program using IP 71111.21N.02 in 2022.



QUESTIONS?