U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

3.9.6 FUNCTIONAL DESIGN, QUALIFICATION, AND INSERVICE TESTING PROGRAMS FOR PUMPS, VALVES, AND DYNAMIC RESTRAINTS

REVIEW RESPONSIBILITIES

Primary - Organization responsible for the review of component performance and testing

Secondary - None

I. AREAS OF REVIEW

This standard review plan (SRP) section addresses the areas of the applicant's safety analysis report (SAR) that cover the functional design and qualification provisions and inservice testing (IST) programs for certain safety-related pumps, valves, and dynamic restraints (snubbers) designated as Class 1, 2, or 3 under Section III of the American Society of Mechanical Engineers (ASME) Boiler & Pressure Vessel Code (Code). The review should include any other pumps and valves and dynamic restraints not categorized as ASME Code Class 1, 2, or 3 that are safety related. Conformance with the specific guidance in Subsection II of this SRP section will provide reasonable assurance that the functional design and qualification of pumps, valves, and dynamic restraints within the scope of this SRP section and their associated IST programs satisfy the applicable requirements of 10 CFR 50.55a, particularly the IST program requirements of the ASME Code for Operation and Maintenance of Nuclear Power Plants (OM Code); General Design Criteria (GDC) 1, 2, 4, 14, 15, 37, 40, 43, 46, and 54 in Appendix A to 10 CFR Part 50; Appendix B to 10 CFR Part 50; 10 CFR 52.47(b)(1) and 10 CFR 52.80(a).

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Section XI of the ASME Boiler and Pressure Vessel Code currently specifies requirements for IST programs to be applied to dynamic restraints. However, 10 CFR 50.55a allows applicants to apply Subsection ISTD of the ASME OM Code in lieu of the ASME Code, Section XI, requirements. As discussed in this SRP section, the IST program can involve inservice testing, examination, inspection, and condition monitoring depending on the specific components and regulatory or code provisions and guidance implemented by the applicant or licensee.

The specific areas of review are as follows:

1. Functional Design and Qualification of Pumps, Valves, and Dynamic Restraints

   A. The staff reviews system and component designs and equipment qualification provisions to ensure that pumps, valves, and dynamic restraints (snubbers) are designed, manufactured, tested, and installed to perform their applicable safety functions and to accommodate anticipated inservice examination or inspection and testing.

   B. This SRP section provides guidance for the assessment of the functional design and qualification of pumps and valves. SRP Section 3.10 provides guidance for the assessment of the seismic and dynamic qualification of pumps and valves.

   C. SRP Section 3.9.3 provides guidance for the assessment of the design and installation of safety and relief valves.

   D. Dynamic restraints (snubbers) for plant piping and components do not provide a load path or force transmission during normal plant operations, but function as rigid supports when subjected to dynamic transient loads. SRP Section 3.9.3 provides guidance for staff assessment of the design and qualification of snubbers.

2. Inservice Testing Program for Pumps

   A. The staff will review the descriptive information in the SAR covering the IST program for those ASME Code Class 1, 2, and 3 system pumps whose function is required for safety, as well as pumps not categorized as ASME Code Class 1, 2, or 3 but which the staff considers to be safety related.

   B. The staff will review procedures for testing for speed, fluid pressure, flow rate, and vibration at normal pump operating conditions.

   C. The staff will review test schedules and parameters for pumps that are operated continuously or routinely during operation, cold shutdown, or refueling operations (Group A pumps), and pumps that are not operated routinely except for testing (Group B pumps).

   D. The staff will review the methods described in the SAR for establishing and measuring the reference values and IST values for the pump parameters.

   E. The staff will review the accuracy and range of instruments.

F. The staff will review the duration of testing for Group A tests, Group B tests, and comprehensive tests.

3. Inservice Testing Program for Valves

A. The staff will review the descriptive information in the SAR covering the IST program for those ASME Code Class 1, 2 and 3 valves whose function is required for safety, as well as valves not categorized as ASME Code Class 1, 2, or 3 but which are safety related.

B. The staff will review procedures for testing Category A, B, C, and D valves.

C. The staff will review justifications for the schedules of cold shutdown and refueling outage tests.

D. The staff will review the methods described in the SAR for measuring the reference and inservice parameter values for power-operated valves (POVs), including motor-operated valves (MOVs), air-operated valves, hydraulic-operated valves, and solenoid-operated valves (SOVs).

4. Inservice Testing Program for Dynamic Restraints

A. The staff will review the descriptive information in the SAR covering the IST program (including inservice testing and inspection) for those ASME Code Class 1, 2, and 3 system dynamic restraints whose function is required for safety, as well as dynamic restraints not categorized as ASME Code Class 1, 2, and 3 but which are safety related.

B. The staff will review procedures for IST program activities related to dynamic restraints. Visual examination is required by the OM Code to check for degradation, missing parts, and leakage, and functional testing is necessary to assure operational readiness. The snubbers can be mechanical or hydraulic.

C. The staff will review the duration (frequency) of IST program activities for dynamic restraints.

D. The staff will review functional testing criteria or parameters for dynamic restraints.

E. SRP Section 3.9.3 provides additional guidance for the design and testing of dynamic restraints.

5. Relief Requests and Alternative Authorizations to ASME OM Code

A. Pursuant to 10 CFR 50.55a(a)(3), the Commission may authorize alternatives to OM Code requirements if the alternatives will provide an acceptable level of quality and safety, or compliance will result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The OM Code also provides for alternatives for the code user initiating a request to use a

code case when the need is urgent. Code cases clarify the intent of existing requirements or provide alternative requirements. Acceptable code cases addressed by the staff are in RG 1.192. Plant-specific requests for the application of alternatives are primarily suitable to unique non-recurring applications where a code case is not considered to be appropriate.

B. Pursuant to 10 CFR 50.55a(f)(6)(i) for pumps and valves, and 10 CFR 50.55a(g)(6)(i) for dynamic restraints, the Commission may grant relief from the OM Code requirements if conformance would be impractical for the facility and may impose such alterative requirements as it determines is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest, giving due consideration to the burden upon the license that could result from imposing the requirements. The staff will review any requests for relief to determine if the proposed exceptions to the OM Code will degrade overall plant safety. The staff will give due consideration to the burden upon the applicant that could result if it imposed the IST requirements of the OM Code on the facility.

C. Pursuant to 10 CFR 50.55a(f)(6)(ii) for pumps and valves, and 10 CFR 50.55a(g)(6)(ii) for dynamic restraints, the Commission may require the licensee to follow an augmented IST program for pumps, valves, and dynamic restraints for which the Commission deems that added assurance of operational readiness is necessary.

D. Under 10 CFR 50.55a(f)(4) and 10 CFR 50.55a(g)(4), a nuclear power facility must periodically update its IST program to meet the requirements of future revisions of the OM Code, as specified in 10 CFR 50.55a at the time the IST program is revised. However, if it proves impractical to implement these requirements, the applicant is allowed to submit requests for relief from the OM Code requirements on a case-by-case basis. Accordingly, the staff will review any requests for relief to determine if the proposed exceptions to the OM Code will degrade overall plant safety. The staff will give due consideration to the burden upon the applicant that could result if the staff imposed the updated IST criteria of the OM Code on the facility.

6. Inspection, Test, Analysis, and Acceptance Criteria (ITAAC). For design certification (DC) and combined license (COL) reviews, the applicant's proposed information on the ITAAC associated with the systems, structures, and components (SSCs) related to this SRP Section is reviewed in accordance with SRP Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria - Design Certification." The staff recognizes that the review of ITAAC is performed after review of the rest of this portion of the application against acceptance criteria contained in this SRP section. Furthermore, the ITAAC are reviewed to assure that all SSCs in this area of review are identified and addressed as appropriate in accordance with SRP Section 14.3.

7. COL Action Items and Certification Requirements and Restrictions. For a DC application, the review will also address COL action items and requirements and restrictions (e.g., interface requirements and site parameters).

For a COL application referencing a DC, a COL applicant must address COL action items (referred to as COL license information in certain DCs) included in the referenced DC. Additionally, a COL applicant must address requirements and restrictions (e.g., interface requirements and site parameters) included in the referenced DC.

8. Operational Program Description and Implementation. For a COL application, the staff reviews the preservice testing progam, inservice testing program, inservice inspection progam and the motor-operated valve testing program descriptions and the proposed implementation milestones. The staff also reviews final safety analysis report (FSAR) Table 13.x to ensure that the preservice testing progarm, inservice testing program, inservice inspection program, motor-operated valve test program and associated milestones are included.

Review Interfaces

Other SRP sections interface with this section as follows:

1. SRP Section 3.2.2 addresses the classification system and quality group for pumps and valves.

2. SRP Section 3.10 addresses the seismic and dynamic qualification of safety-related pumps and valves.

3. SRP Section 3.9.2 addresses dynamic testing and analysis of safety-related pumps, valves, and dynamic restraints.

4. SRP Section 3.9.3 addresses the structural design of safety-related pumps, valves, and dynamic restraints.

5. SRP Section 3.11 addresses the environmental qualification of safety-related pumps and valves.

6. SRP Section 9.2.1 addresses surveillance, testing, inspection, and maintenance programs of service water systems.

7. SRP Sections 6.2.4 and 6.2.6 address the containment isolation system and the overall containment leakage testing program, respectively.

8. SRP Section 3.12 addresses the design and leak testing provisions of pressure-retaining systems and components that interface with the reactor coolant system as part of the primary review responsibility for intersystem loss-of-coolant accidents.

9. SRP Section 10.3 addresses the number and size of valves specified for the steam and feedwater systems.

10. SRP Section 5.2.2 addresses the number and size of valves specified for the reactor coolant pressure boundary (RCPB).

11. SRP Sections 5.4.7 and 6.3 address residual heat remove and emergency core cooling systems piping, respectively that is connected to the reactor coolant system and is subject to thermally stratified flow, thermal striping, and/or thermal cyclic effects.

12. SRP Section 6.2.1.2 addresses the applicant's analyses of subcompartment differential pressures resulting from postulated pipe breaks.

13. SRP Section 3.13 addresses programs for ensuring bolting and threaded fastener adequacy and integrity.

14. For COL reviews of operational programs, the review of the applicant's implementation plan is performed under SRP Section 13.4, "Operational Programs."

The specific acceptance criteria and review procedures are contained in the referenced SRP section.

II. ACCEPTANCE CRITERIA

Requirements

Acceptance criteria are based on meeting the relevant requirements of the following Commission regulations:

1. 10 CFR 50.55a and 10 CFR Part 50, Appendix A, GDC 1 as they relate to pumps, valves, and dynamic restraints important to safety being designed, fabricated, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

2. GDC 2, as it relates to pumps, valves, and dynamic restraints important to safety to withstand the effects of natural phenomena combined with the effects of normal and accident conditions.

3. GDC 4, as it relates to designing pumps, valves, and dynamic restraints important to safety to accommodate the effects of and to be compatible with the environment conditions associated with normal operation, maintenance, testing, and postulated accidents.

4. GDC 14, as it relates to designing pumps, valves, and dynamic restraints that form the reactor coolant boundary so as to have an extremely low probability of abnormal leakage, rapidly propagating failure, and gross rupture.

5. GDC 15, as it relates to pumps, valves, and dynamic restraints that form the reactor coolant system being designed with sufficient margin to ensure that the design conditions are not exceeded.

6. GDC 37, as it relates to designing the emergency core cooling to permit periodic functional testing to ensure the leak tight integrity and performance of its active components.

7. GDC 40, as it relates to designing periodic functional testing of the containment heat removal system to ensure the leak tight integrity and performance of its active components.

8. GDC 43, as it relates to designing the containment atmospheric cleanup systems to permit periodic functional testing to ensure the leak tight integrity and the performance of the active components.

9. GDC 46, as it relates to designing the cooling water system to permit periodic functional testing to ensure the leak tight integrity and performance of the active components.

10. GDC 54, as it relates to designing piping systems penetrating containment with the capability to test periodically the operability of the isolation valves and determine valve leakage acceptability.

11. Appendix B to 10 CFR Part 50, as it relates to quality assurance in the design, fabrication, construction, and testing safety-related pumps, valves, and dynamic restraints.

12. 10 CFR 50.55a(c)-(e), in so far as it incorporates the ASME Code, Section III, as it relates to qualification of mechanical equipment and supports.

13. 10 CFR 50.55a(f) for pumps and valves, and 10 CFR 50.55a(g) for dynamic restraints, whose function is required for safety in the IST program, as it relates to assessing operational readiness.

14. 10 CFR 50.55a(b)(3)(ii), as it relates to requirements for an MOV testing program.

15. 10 CFR 52.47(b)(1), which requires that a DC application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations;

16. 10 CFR 52.80(a), which requires that a COL application contain the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the combined license, the provisions of the Atomic Energy Act, and the NRC's regulations.

SRP Acceptance Criteria

Specific SRP acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are as follows for the review described in this SRP section. The SRP is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical

techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide acceptable methods of compliance with the NRC regulations.

Additional guidance regarding the historical and current perspectives on the regulatory requirements for IST programs is available in NUREG-1482, Revision 1, which includes information on the suggested format and content for IST programs and relief requests, examples of relief requests, clarification of issues described in NRC communications on IST, and information regarding current staff positions on IST. Regulatory Guide (RG) 1.192 addresses the acceptability of OM Code cases related to IST programs.

As an alternative to deterministic IST programs, a risk-based approach may be used to prioritize valve test activities, such as the frequency of individual valve tests and selection of valves to be tested. The valve test program should ensure that safety-related valves will remain capable of performing their safety functions until the next scheduled test. The importance of the valve should be considered in determining an appropriate mix of exercising and diagnostic testing. SRP Section 3.9.7 contains the acceptance criteria necessary for the review and their methods of application. In SRP Section 3.9.7, the NRC staff describes procedures and acceptance guidelines for its review of proposed plant-specific, risk-informed changes to a licensee's IST program. The review procedures are consistent with acceptable methods implementing a risk-informed IST program that follow RG 1.174 and RG 1.175. Alternatively, an applicant may use NRC-approved risk-informed ASME Code cases referenced in RG 1.192 to construct a risk-based approach for IST programs.

Subsection ISTD of the ASME OM Code incorporates alternative provisions for determining snubber visual inspection intervals and corrective actions, which the staff recommended in Generic Letter (GL) 90-09

1. Functional Design and Qualification of Pumps, Valves, and Dynamic Restraints

   A. For new plant applications, safety-related pump, valve, and piping designs should include provisions to allow testing of pumps and valves at the maximum flow specified in the plant accident analyses.

   B. Functional design and qualification of each safety-related pump and valve should be accomplished such that each pump and valve is capable of performing its intended function for a full range of system differential pressure and flow, ambient temperatures, and available voltage (as applicable) under all conditions ranging from normal operating to design-basis accident conditions.

   C. Acceptance criteria for the design of dynamic restraints (snubbers) are provided in SRP Section 3.9.3.

   D. Acceptance criteria for the design and installation of safety and relief valves are provided in SRP Section 3.9.3.

   E. Acceptance criteria for the seismic and dynamic qualification of mechanical and electrical equipment are provided in SRP Section 3.10.

F. As required by GDC 14, safety-related valves that are part of the RCPB should be designed and tested such that these valves will not experience any abnormal leakage, or increase in leakage, from their loading, as addressed in SRP Section 3.10.

G. For new plant applications, dynamic restraints in safety-related systems must include provisions to allow access for IST program activities.

2. Inservice Testing Program for Pumps

A. The scope of the applicant's test program is acceptable if it includes all of the ASME Code Class 1, 2, and 3 pumps described in 10 CFR 50.55a(f) and Subsection ISTA-1100 of the OM Code and, in addition, includes pumps not categorized as ASME Code Class 1, 2, or 3 but which the staff considers to be safety-related. Since the pump test program is based on the detection of changes in the hydraulic and mechanical condition of a pump relative to a reference test specified in Subsection ISTB-3000 of the OM Code, the establishment of a set of reference values and a consistent test method are basic criteria of the program.

B. The pump test program is acceptable if it meets the requirements for establishing reference values and the periodic testing schedule described in Subsection ISTB-3000 of the OM Code. Subsections ISTB-3000, ISTB-5000, and ISTB-6000 of the OM Code establish the allowable ranges of IST quantities (e.g., flow rates and pressure differential), corrective actions, and vibration tests. The pump test schedule is required to comply with these rules.

C. The frequency of ISTs and test parameters are acceptable if the provisions of Subsection ISTB-3000 of the OM Code are met.

D. The methods of measurement are acceptable if the test program meets the requirements of Subsection ISTB-5000 of the OM Code with regard to instruments, pressure measurements, rotational speed, vibration measurements, and flow measurements.

E. The instruments are acceptable if they meet the accuracy and range requirements of Subsection ISTB-3500 of the OM Code.

F. The duration of the test is acceptable if the provisions of Subsection ISTB-5000 of the OM Code are met.

3. Inservice Testing Program for Valves

A. To be acceptable, the SAR valve test list must contain all safety-related ASME Code Class 1, 2, and 3 valves required by 10 CFR 50.55a(f) and the OM Code, except those nonsafety-related valves excepted by Subsection ISTC-1200 of the OM Code. It should also include valves not categorized as ASME Code Class 1, 2, or 3 but which are safety related. The SAR valve list must include a valve categorization that complies with the provisions of Subsection ISTC-1300 of the

OM Code. The SAR should list each specific valve to be tested under the rules of Subsection ISTA-1100 of the OM Code by type, valve identification number, code class, and valve category.

B. The valve test procedures, acceptance criteria, and corrective actions are acceptable if the provisions of Subsection ISTC of the OM Code, as incorporated by reference in 10 CFR 50.55a, are met with regard to preservice and periodic inservice valve testing.

C. The following provides additional acceptance criteria for specific valve or actuator types, and leak testing:

i. Inservice Testing Program for Motor-Operated Valves

(1) In addition to the IST program requirements in the ASME OM Code incorporated by reference in 10 CFR 50.55a(f), 10 CFR 50.55(b)(3)(ii) requires establishment of a program to ensure that the safety-related MOVs continue to be capable of performing their design-basis safety functions. GL 96-05 provides additional guidance for the periodic verification of MOV design-basis capability. Furthermore, ASME Code Cases OMN-1 and OMN-11, as accepted by the NRC staff with conditions in RG 1.192, provide an alternative method to MOV stroke-time testing that also satisfies the requirement in 10 CFR 50.55a to supplement the OM Code IST provisions with a program to ensure that safety-related MOVs continue to be capable of performing their safety functions.

(2) Periodic testing should be conducted that objectively demonstrates continuing MOV capability to perform its safety functions to open and close, as applicable, under design-basis conditions. Where testing is not conducted under design-basis conditions (e.g., under environmental conditions), an analysis combined with test results should demonstrate the continued design-basis capability of the MOV.

(3) The interval between testing demonstrating continued design-basis capability should not exceed 5 years or three refueling outages, whichever is longer, unless a longer interval can be justified. Longer design-basis verification intervals may be justified through implementation of ASME Code Case OMN-1, as accepted in RG 1.192.

(4) Acceptance criteria for successful completion of the preservice and inservice testing of MOVs should include the following:

(a) Consistent with the safety function, the valve should fully open and/or the valve fully close or both. Diagnostic equipment should indicate hard seat contact.

(b) The testing should demonstrate adequate margin with respect to the design basis, including consideration of diagnostic equipment inaccuracies, degraded voltage, control switch repeatability, load sensitive MOV behavior, and margin for degradation.

(c) The maximum torque and/or thrust (as applicable) achieved by the MOV, allowing sufficient margin for diagnostic equipment inaccuracies and control switch repeatability, should not exceed the allowable structural and undervoltage motor capability limits for the individual parts of the MOV.

ii. Inservice Testing Program for Power-Operated Valves Other Than Motor-Operated Valves

(1) Safety-related POVs should be qualified to perform their design-basis functions either before installation or as part of preservice tests.

(2) NRC Regulatory Issue Summary 2000-03 provides guidance for the development of IST programs for POVs that incorporate the lessons learned from MOV analysis and tests in response to GL 89-10 .

(3) Class 1E SOVs are to be verified to function as designed. Each SOV should be verified, to the extent practical, to be capable of performing its safety functions for the electrical power supply amperage and voltage at design basis extremes.

iii. Inservice Testing Program for Check Valves

(1) Preservice tests should be conducted on each check valve. Each check valve should be tested in the open and closed direction, consistent with the safety function and under normal operating system conditions. Piping system design features should be able to accommodate all applicable check valve testing equipment and procedures.

(a) Diagnostic equipment or nonintrusive techniques that monitor internal component conditions or measure such parameters as fluid flow, disk position, disk movement, disk impact forces, leak tightness, leak rates, degradation, and disk stability should be used, if practical, for preoperational testing and later during IST. The equipment and its operating principles should be described and the techniques justified. The operation and accuracy

of the diagnostic equipment and techniques should be verified during preoperational testing.

(b) To the extent practical, testing should be performed under temperature and flow conditions that would exist during normal operation as well as cold shutdown. Testing at temperature and flow conditions that may exist in other modes should also be conducted if such conditions are significant.

(c) Test results should identify the minimum flow that will open the valve to the full-open position.

(d) Testing should include the effects of rapid pump starts and stops, as expected for system operating conditions. The testing should include any other reverse flow conditions that may occur during expected system operating conditions.

(2) Nonintrusive (diagnostic) techniques should be used to periodically assess degradation and the performance characteristics of check valves.

(3) Acceptance criteria for the successful completion of the preservice and inservice testing of check valves should include the following:

(a) During all test modes that simulate expected system operating conditions, the valve disk should fully open or fully close as expected based on the direction of the differential pressure across the valve.

(b) Valve disk positions should be determinable without disassembly.

(c) Testing should verify that there is free disk movement to and from the seat.

(d) The valve disk should be stable in the open position under normal and other minimum system operating fluid flow conditions.

(e) For passive plant designs, testing should verify that the valve disk moves freely off the seat under normal and other minimum expected differential pressure conditions.

(4) In 10 CFR 50.55a(b)(3)(iv), the regulations specify conditions for the application of Appendix II to the OM Code. Those requirements must be satisfied when applying Appendix II to the OM Code.

iv. Pressure Isolation Valve Leak Testing

(1) Pressure isolation valves (PIVs) are the two normally closed valves, in series, within the RCPB (defined in 10 CFR Part 50) that isolate the reactor coolant system from an attached low-pressure system. PIVs are classified as A or AC in accordance with the provisions of Subsection ISTC-1300 of the OM Code.

(2) PIV seat leakage rate tests should be conducted on each individual PIV in accordance with Subsection ISTC-3630 of the OM Code. The plant technical specifications or SAR should specify the allowable leak rates and test intervals for each PIV. The maximum allowable leak rate for each PIV at full reactor pressure should be less than 1.9 liters per minute (L/m) (0.5 gallons per minute (gpm)) per nominal inch of valve size, and not to exceed 19 L/m (5 gpm). The test interval should be 18 months or every refueling outage, whichever is longer.

(3) The applicant's SAR should provide a list of PIVs that includes the allowable leak rate for each valve.

v. Containment Isolation Valve Leak Testing

(1) Containment isolation valves (CIVs) should be leak tested in accordance with Appendix J to 10 CFR Part 50.

(2) The plant SAR should provide a list of CIVs that includes the allowable leak rate for each valve or valve combination.

vi. Inservice Testing Program for Safety and Relief Valves

(1) Safety and relief valves, including thermal relief valves and vacuum relief valves, are pressure relief devices that protect systems (or portion of systems) that perform a function in shutting down the reactor to the safe-shutdown condition, maintaining the safe-shutdown condition, or mitigating the consequences of an accident.

(2) Safety and relief valve tests should be conducted in accordance with Appendix I to the OM Code.

(3) Stroke tests should be performed for dual-function safety and relief valves (e.g., boiling-water reactor main steam automatic depressurization system safety/relief valves).

(4) Power-operated relief valves should be tested in accordance with Subsection ISTC-5100 for Category B valves and Subsection ISTC-5240 for Category C valves.

(5) The test equipment, including gages, transducers, load cells, and calibration standards, used to determine valve set-pressure is acceptable if the overall combined accuracy does not exceed ±1 percent of the indicated (measured) set pressure.

(6) The plant SAR should provide a list of safety and relief valves that includes the set pressure and allowable tolerances for each valve.

vii. Inservice Testing Program for Manually Operated Valves

(1) The plant SAR should provide a list of manually operated valves, including their safety-related function.

(2) In 10 CFR 50.55a(b)(3)(vi), the regulations take exception to the 5-year exercise interval for manually operated valves allowed in the OM Code. In accordance with the regulations, manual valves must be exercised on at least a 2-year interval.

(3) The valve should exhibit the full range of obturator position set forth in the design bases.

viii. Inservice Testing Program for Explosively Actuated Valves

(1) At least 20 percent of the charges in explosively actuated valves should be fired and replaced at least every 2 years.

(2) If a charge fails to fire, all charges with the same batch number should be removed and replaced with charges from a different batch.

4. Inservice Testing Program for Dynamic Restraints

A. The IST program for dynamic restraints is acceptable if it meets the requirements of the ASME Code, Section XI, or the ASME OM Code as incorporated by reference in 10 CFR 50.55a. The IST program for dynamic restraints must comply with these provisions.

B. In 10 CFR 50.55a(b)(3)(v), the regulations state that Subsection ISTD of the ASME OM Code, 1995 edition through the latest edition and addenda and incorporated by reference in 10 CFR 50.55a(b)(3), may be applied in place of the requirements for snubbers in the ASME Code, Section XI, IWF-5200(a) and (b) and IWF-5300(a) and (b), by making appropriate changes to technical specifications or licensee-controlled documents. The regulations also state that

preservice and inservice examinations must be performed using the VT-3 visual examination method prescribed in IWA-2213.

C. The FSAR should identify and tabulate all safety-related components that use snubbers in their support systems. The tabulation should include the following information:

i. Identification of the systems and components in those systems that use snubbers

ii. The number of snubbers used in each system and on components in that system

iii. The type(s) of snubber (hydraulic or mechanical) and the corresponding supplier

iv. Specification whether the snubber was constructed in accordance with the ASME Code, Section III, Subsection NF

v. Statement whether the snubber is used as a shock, vibration, or dual purpose snubber

vi. For snubbers identified as either dual purpose or vibration arrestor type, an indication of whether both snubber and component were evaluated for fatigue strength, the evaluation is performed under SRP Section 3.9.3 Appendix A.

D. The applicant should provide assurance that all snubbers are properly installed before preoperational piping vibration and plant startup tests. The applicant may use visual observation of piping systems and measurement of thermal movements during plant startup tests to verify that snubbers are operable (not locked up). The piping preoperational vibration and plant startup test programs should discuss the provisions for such examinations and measurements as described in SRP Section 3.9.2.

E. The applicant should discuss accessibility provisions for maintenance, inservice inspection and testing, and possible repair or replacement of snubbers consistent with the provisions of the applicable NRC standard technical specifications.

5. Relief Requests and Proposed Alternatives

A. The applicant should identify the component identified for which it requests relief:

i. Name and number as given in SAR
ii. Component functions
iii. ASME Code, Section III, Code Class
iv. Valve category as defined in Subsection ISTC-1300 of the OM Code
v. Pump group as defined in Subsection ISTB-2000 of the OM Code

B. The applicant should identify the ASME OM Code requirement(s) from which it is requesting relief.

C. The applicant should specify the basis under which it is requesting relief and then explain why complying with the OM Code is impractical.

D. For alternatives to the OM Code requirements, the applicant should provide sufficient details to demonstrate that (1) the proposed alternative will provide an acceptable level of quality and safety, or (2) compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

E. The applicant should specify a schedule for the implementation of the relief request or alternative.

F. The approval of relief requests or alternatives involves the following:

i. Approval of relief for impractical code requirements

Pursuant to 10 CFR 50.55a(f)(6)(i) for pumps and valves, and 10 CFR 50.55a(g)(6)(i) for dynamic restraints, the Commission may grant relief from impractical code requirements because of design limitations upon application by the applicant. The NRC will consider the burden on the applicant as a factor in its review and evaluation.

ii. Approval of alternatives to the OM Code requirements

Pursuant to 10 CFR 50.55a(a)(3), the staff may authorize alternatives to IST program requirements of the OM Code if the applicant has adequately demonstrated either of the following:

(1) Proposed alternatives to the Code requirements or portions thereof will provide an acceptable level of quality and safety.

(2) Compliance with the Code requirements would result in hardships or unusual difficulties without a compensating increase in the level of quality and safety.

6. Operational Programs. For COL reviews, the description of the operational program and proposed implementation milestones for the preservice testing program, inservice testing program, inservice inspection program, and motor-operated valve testing program are reviewed in accordance with 10 CFR 50.55a(f), 10 CFR 50.55a(g) and 10 CFR 50.55a(b)(3)(ii). The implementation milestones for the specific programs are specified below and included as license conditions for preservice testing and motor-operated valve testing programs:

A. Preservice testing program

Per ASME OM Code, Subsection ISTA-2000, defines the preservice test period as the period of time following the completion of construction activities related to the component and before first electrical generation by nuclear heat.

B. IST program

Per ASME OM Code, Subsection ISTA-2000, prior to first electrical generation by nuclear heat

C. Inservice inspection program related to dynamic restraints

Per ASME Code, Section XI, IWA-2430(b), before placement of the plant into commercial service

D. MOV program

Per ASME OM, Subsection ISTA-2000, prior to first electrical generation by nuclear heat

Technical Rationale

The technical rationale for application of this guidance and/or SRP acceptance criteria to the areas of review addressed by this SRP section is discussed in the following paragraphs:

1. 10 CFR 50.55a and GDC 1 require, in part, that SSCs which include pumps, valves, and dynamic restraints important to safety be designed, fabricated, erected, constructed and inspected to quality standards commensurate with the importance of the safety functions to be performed. The provisions for functional design and IST programs for pumps, valves, and dynamic restraints in this SRP section are based on sound engineering principles as well as operating experience at nuclear power plants. Meeting the requirements of 10 CFR 50.55a and GDC 1 provides assurance that pumps, valves, and dynamic restraints important to safety are capable of performing their intended safety functions.

2. GDC 2 requires, in part, that components important to safety be designed to withstand the effects of severe natural phenomena, combined with appropriate effects of normal and accident conditions, without a loss of capability to perform their safety functions. Meeting the requirements of GDC 2 provides assurance that pumps, valves, and dynamic restraints important to safety are capable of withstanding the effects of severe natural phenomena while performing their safety functions during and after the occurrence of those phenomena, as applicable.

3. GDC 4 requires, in part, that components important to safety be designed to accommodate the effects of, and be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents. Meeting the requirements of GDC 4 provides assurance the components are capable of withstanding those effects and continuing to perform their intended safety functions.

4. GDC 14 requires that the RCPB be designed to have an extremely low probability of abnormal leakage, rapidly propagating failure, and gross rupture. Meeting the requirements of GDC 14 provides assurance that RCPB components will have an extremely low probability of leakage or failure.

5. GDC 15 requires that the reactor coolant system be designed with sufficient margin to ensure that the design conditions of the RCPB are not exceeded during any condition of normal operation, including anticipated operational occurrences.

6. GDC 37 requires that the emergency core cooling system be designed to permit appropriate periodic pressure and functional testing to ensure the structural and leak tight integrity of its components as well as the operability and performance of the active components of the system. The acceptance criteria in SRP Section 3.9.6 cite ISTs required by the OM Code as well as other preservice and inservice tests for pumps and valves to ensure their leak tight integrity and their operability and performance. This testing specifically applies to safety-related pumps and valves in the emergency core cooling system and is intended to meet the requirements of GDC 37. Meeting the requirements of GDC 37 provides assurance that Emergency Core Cooling System pumps and valves important to safety are capable of performing their intended safety function.

7. GDC 40 requires that the containment heat removal system be designed to permit appropriate periodic pressure and functional testing to ensure the structural and leak tight integrity of its components as well as the operability and performance of the active components of the system. The acceptance criteria in SRP Section 3.9.6 cite ISTs required by the OM Code as well as other preservice and inservice tests for pumps and valves to ensure their leak tight integrity and their operability and performance. This testing specifically applies to safety-related pumps and valves in the containment heat removal system and is intended to meet the requirements of GDC 40. Meeting the requirements of GDC 40 provides assurance that containment heat removal system pumps and valves important to safety are capable of performing their intended safety function.

8. GDC 43 requires that the containment atmospheric cleanup system be designed to permit appropriate periodic pressure and functional testing to ensure the structural and leak tight integrity of its components and the operability and performance of the active components of the system, including pumps and valves. The acceptance criteria in SRP Section 3.9.6 cite ISTs required by the OM Code as well as other preservice and inservice tests for pumps and valves to ensure their leak tight integrity and their operability and performance. This testing specifically applies to safety-related pumps and valves in the containment atmospheric cleanup system and is intended to meet the requirements of GDC 43. Meeting the requirements of GDC 43 provides assurance that containment atmospheric cleanup system pumps and valves important to safety will perform their safety intended function.

9. GDC 46 requires that the cooling water system be designed to permit appropriate periodic pressure and functional testing to ensure the structural and leak tight integrity of its components and the operability and performance of the active components of the system. The acceptance criteria in SRP Section 3.9.6 cite ISTs required by the OM Code as well as other preservice and inservice tests for pumps and valves to ensure their leak tight integrity and their operability and performance. This testing specifically applies to safety-related pumps and valves in the cooling water system and is intended to meet the requirements of GDC 46. Meeting the requirements of GDC 46 provides assurance that cooling water system pumps and valves important to safety are capable of performing their intended safety function.

10. GDC 54 requires that piping systems penetrating the primary reactor containment be provided with leak detection and isolation capabilities. Such piping systems should be designed with a capability to test the operability of the isolation valves periodically to determine if valve leakage is within acceptable limits. The acceptance criteria in SRP Section 3.9.6 cite ISTs required by the OM Code as well as other preservice and inservice tests for valves to ensure their leak tight integrity and their operability and performance. This testing specifically applies to safety-related valves in systems that penetrate the primary containment and is intended to meet the requirements of GDC 54. Meeting the requirements of GDC 54 provides assurance that valves in such systems are capable of performing their intended safety function.

11. Appendix B to 10 CFR Part 50 requires that applicants establish and execute an acceptable quality assurance program, including design, testing, and records control. Meeting the requirements of Appendix B to 10 CFR Part 50 provides assurance that designs, tests, IST programs and documentation for pumps, valves, and dynamic restraints will comply with established standards and criteria, thereby ensuring that such equipment will be capable of performing its intended safety functions.

12. 10 CFR 50.55a(f) for pumps and valves, and 10 CFR 50.55a(g) for dynamic restraints, requires that such pumps, valves, and dynamic restraints whose function is required for safety (i.e, in code classes 1, 2, and 3) be assessed for their operational readiness in accordance with the applicable revision of the OM Code, as described therein. In 10 CFR 50.55a(b)(3), the regulations take exception to, or supplement, the OM Code provisions for these components. Meeting the requirements of 10 CFR 50.55a(f) and (g) and 10 CFR 50.55a(b)(3) provides assurance that such pumps, valves, and dynamic restraints are capable of performing their intended safety function. The following provides the applicable OM Codes for IST programs:

    a. Pumps and valves in facilities whose construction permit is issued on or after November 22, 1999 must be designed and provided with access to enable the performance of IST of the pumps and valves for assessing operational readiness as set forth in the editions and addenda of the OM Code incorporated by reference in 10 CFR 50.55a at the time the construction permit is issued.

    b. IST programs implemented during the initial 120-month interval must comply with the requirements in the latest edition and addenda of the OM Code incorporated by reference in 10 CFR 50.55a on the date 12 months before the date of issuance of the operating license under 10 CFR Part 50, or 12 months before the date of the Commission finding that the acceptance criteria have been met pursuant to 10 CFR Part 52 for a COL.

c. IST programs implemented during the successive 120-month intervals must comply with the requirements of the latest edition and addenda of the OM Code incorporated by reference in 10 CFR 50.55a 12 months before the start of the 120-month interval.

13. 10 CFR 52.47(a)(21) requires that applications for DCs contain proposed technical resolutions of the unresolved safety issues and medium- and high-priority generic safety issues identified in the version of NUREG-0933 current on the date 6 months before application identifies as technically relevant to the design.

14. 10 CFR 52.47(b)(1) and 10 CFR 52.80(a) requires that an applicant for a DC and COL, respectively, identify the inspections, tests, and analyses that the licensee shall perform under 10 CFR Part 52, and the acceptance criteria that, if met, are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

15. A license condition for operational program implementation milestones that the FSAR fully describes or references will ensure that such programs, or portions thereof, are implemented before they are needed..

III. REVIEW PROCEDURES

The reviewer will select material from the procedures described below, as may be appropriate for a particular case.

These review procedures are based on the identified SRP acceptance criteria. For deviations from these acceptance criteria, the staff should review the applicant's evaluation of how the proposed alternatives provide an acceptable method of complying with the relevant NRC requirements identified in Subsection II.

The NRC provides additional guidance regarding the review procedures for IST programs for pumps and valves in NUREG-1482, Revision 1. As of November 2005, 10 CFR 50.55a(b)(3) endorses the 2001 Edition through the 2003 Addenda of OM Code. The 2001 Edition through the 2003 Addenda of the OM Code is currently appropriate for the new plant reviews covered by the SRP.

1. Functional Design and Qualification of Pumps, Valves, and Dynamic Restraints

A. The staff will review the functional design of pumps, valves, and dynamic restraints as described in Subsection II.1.

B. GL-96-05 provides additional guidance on the periodic verification of the design-basis capability of safety-related MOVs.

C. Regulatory Issue Summary 2000-03 provides guidance on qualification provisions for POVs other than MOVs.

D. As discussed in the review procedures in SRP Section 3.10, the staff evaluates the program for the design and qualification of plant components during the construction permit or DC stage for the test and analysis to be applied, and again at the operating license stage to confirm the extent to which the equipment meets the SRP provisions. For a COL, this review is performed only once (i.e., at the DC or COL stage). As part of the operating license or COL review, the staff will conduct an audit of the applicant's design files. For example, the staff will review a sampling of functional design specifications for completeness. The reviewer may use the information contained in the following documents in addition to the acceptance criteria cited in this SRP section as part of the evaluation:

i. RG 1.148

ii. American National Standards Institute (ANSI)/ASME N278.1-1975 (R-1992) (endorsed by RG 1.148, as supplemented and modified)

iii. ANSI/ASME N551.1

It is important that the applicant's program be complete in this area so that the staff may be assured that the proper system parameters are specified and appropriate loads defined. The review will screen several key components in the systems to establish the program objectives.

E. The staff will review the test procedures against the criteria set forth in this SRP section. In evaluating an applicant's program for pumps and valves, the reviewer will also use, for guidance purposes, the information contained in the following documents:

i. ANSI B.16.41
ii. ANSI N41.6
iii. ANSI/ASME N551.2
iv. ANSI N45 N551.4

In addition to the above documents, the reviewer will evaluate the functionality assurance programs for purge and vent valves and deep draft pumps.

F. The staff will review the analytical procedures employed by the applicant in conjunction with testing or by themselves to demonstrate functionality by comparing information submitted in the applicant's program with the acceptance criteria delineated in this SRP section. The references cited in this SRP section provide additional guidance for demonstrating functionality by analysis and supplement the staff's review procedures.

G. Reviews of COL applications should include audits of the Equipment Qualification file. The staff should review the results of tests and analyses to accomplish the following:

i. Ensure that the criteria in the certified design were properly implemented

ii. Ensure that adequate design was demonstrated for pumps, valves, and dynamic restraints important to safety

iii. Verify that the testing and analyses that were performed properly defined and accounted for all applicable loads

H. SRP Section 3.9.3 provides additional review guidance for safety and relief valves and dynamic restraints.

I. The reviewer should give particular attention to flow-induced loading in functional design and qualification to account for degraded flow conditions such as those that might be encountered because of the presence of debris, impurities, and contaminants in the fluid system (e.g., containment sump pump recirculating water with debris).

2. Inservice Testing Program for Pumps

A. The staff will review the scope of the applicant's program for conformance to the criteria stated in Subsection II.2. Initial reference values should be determined from the results of preservice testing or from the results of the first IST. The periodic IST program should be used to verify that any deviations from reference values are within acceptable ranges.

B. The pump test program procedures should conform to the criteria stated in Subsection II.2. The program is best presented in tabular form.

C. The staff will review the IST frequencies and test parameters for conformance to the criteria stated in Subsection II.2.

D. The staff will review the test procedures described in the SAR for conformance to the criteria stated in Subsection II.2. The SAR need only provide the necessary information to permit a conclusion that the methods of measurement and the data acquisition system will provide the needed data. The reviewer does not approve or disapprove the instruments or methods proposed or used.

E. The staff will review the accuracy and range of instruments for conformance to the criteria stated in Subsection II.2.

F. The staff will review the test durations for Group A, Group B, and comprehensive tests for conformance to the criteria stated in Subsection II.2.

3. Inservice Testing Program for Valves

A. The staff will review the SAR valve test list and categorization for conformance to the criteria stated in Subsection II.3

B. The staff will review the valve test program for preservice and periodic IST for conformance to the criteria stated in Subsection II.3

C. The staff will review design and qualification tests, preservice tests, ISTs, and acceptance criteria for MOVs, as described in Subsection II.3.C.i. These procedures and ISTs are to be performed in addition to the ISTs described in Subsections II.3.A and II.3.B.

D. The staff will review design and qualification tests, preservice tests, ISTs, and acceptance criteria for POVs, as described in Subsection II.3.C.ii. These procedures and ISTs are to be performed in addition to the ISTs described in Subsections II.3.A and II.3.B

E. The staff will review design and qualification tests, preservice tests, ISTs, and acceptance criteria for check valves, as described in Subsection II.3.C.iii These procedures and ISTs are to be performed in addition to the ISTs described in Subsections II.3.A and II.3.B

F. The staff will review the applicant's list of PIVs to ensure that it is complete and that the allowable leak rates for each PIV are in accordance with the guidance provided in Subsection II.3.

G. The staff will review the applicant's list of CIVs to ensure that it is complete and that the allowable leak rates for each CIV are in accordance with the guidance provided in Subsection II.3.

H. The staff will review the safety/relief valve test program and corrective actions for conformance to the criteria stated in Subsection II.3.

I. The staff will review the testing of manually operated valves for conformance to the criteria stated in Subsection II.3.

J. The staff will review the testing of explosively actuated valves and corrective actions for conformance to the criteria stated in Subsection II.3.

4. Inservice Testing Program for Dynamic Restraints

A. The staff will review the IST program for dynamic restraints described in SRP section 3.9.6.

B. The staff should review and evaluate the applicant's commitments to develop and use a snubber operability assurance program containing the elements specified above.

C. A commitment to provide the snubber classification and identification is sufficient for the construction permit review stage or DC application.

D. During the operating license or COL review, the staff should ensure that the FSAR contain summaries in sufficient detail to confirm commitments.

5. Relief Requests

The staff will review requests for relief from the requirements of the ASME OM Code to determine whether the applicant has provided sufficient information and that the acceptance criteria of Subsection II.5 have been met.

6. For review of a DC application, the reviewer should follow the above procedures to verify that the design, including requirements and restrictions (e.g., interface requirements and site parameters), set forth in the final safety analysis report (FSAR) meets the acceptance criteria. DCs have referred to the FSAR as the design control document (DCD). The reviewer should also consider the appropriateness of identified COL action items. The reviewer may identify additional COL action items; however, to ensure these COL action items are addressed during a COL application, they should be added to the DC FSAR.

For review of a COL application, the scope of the review is dependent on whether the COL applicant references a DC, an early site permit (ESP) or other NRC approvals (e.g., manufacturing license, site suitability report or topical report).

For review of both DC and COL applications, SRP Section 14.3 should be followed for the review of ITAAC. The review of ITAAC cannot be completed until after the completion of this section.

7. Operational Programs. The reviewer verifies that the preservice testing program, inservice testing program, inservice inspection program, and the motor-operated valve testing program are fully described and that implementation milestones have been identified. The reviewer verifies that the program and implementation milestones are included in FSAR Table 13.x and included as license conditions for preservice testing and motor-operated valve testing programs .

Implementation of this program will be inspected in accordance with NRC Inspection Manual Chapter IMC-2504, “Construction Inspection Program - Non-ITAAC Inspections.”

The staff will review the discussion on the specific operational program and its implementation. The implementation description should contain one or more milestones depending on whether the program will be implemented all at once or in a phased approach. The staff will obtain a reasonable assurance finding on each program and its proposed implementation, including the adequacy of the implementation milestones. The evaluation findings section of the staff’s safety evaluation report will document these findings. In addition, the staff will identify this program and its implementation milestones within the license condition on operational programs and implementation described in SRP Section 13.4.

IV. EVALUATION FINDINGS

The reviewer verifies that the applicant has provided sufficient information and that the review and calculations (if applicable) support conclusions of the following type to be included in the staff's safety evaluation report. The reviewer also states the bases for those conclusions.

The staff concludes that the applicant's program for functional design and qualification, and IST programs for pumps, valves, and dynamic restraints are acceptable and meet the requirements of 10 CFR 50.55a; General Design Criteria 1, 2, 4, 14, 15, 37, 40, 43, 46, and 54 of Appendix A to 10 CFR Part 50; Appendix B to 10 CFR Part 50; and 10 CFR 52.47(a)(1)(iv) and 10 CFR 52.80(a). This conclusion is based on the applicant having provided a design, qualification, and test program to ensure that safety-related pumps, valves, and dynamic restraints will be in a state of operational readiness to perform necessary safety functions throughout the life of the plant. This program includes design and qualification testing and analysis, baseline preservice or inservice testing, and periodic inservice testing. The program provides for functional testing of the components in the operating state. The applicant has also formulated the inservice test program to include all safety-related ASME Code Class 1, 2, and 3 pumps, valves, and dynamic restraints, as well as those pumps, valves, and dynamic restraints that are not ASME Code Class 1, 2, and 3 but that are safety related.

For COL reviews, the applicant described the preservice testing program, inservice testing program, inservice inspection program, motor-operated valve testing program and their implementation in conformance with 10 CFR 50.55a(f), 10 CFR 50.55a(g), and 10 CFR 50.55a(b)(ii).

The programs and their implementation milestones are included within the license condition for preservice testing and motor-operated valve testing programs .

For DC and COL reviews, the findings will also summarize the staff's evaluation of requirements and restrictions (e.g., interface requirements and site parameters) and COL action items relevant to this SRP section.

In addition, to the extent that the review is not discussed in other SER sections, the findings will summarize the staff's evaluation of the ITAAC, including design acceptance criteria, as applicable.

V. IMPLEMENTATION

The staff will use this SRP section in performing safety evaluations of DC applications and license applications submitted by applicants pursuant to 10 CFR Part 50 or 10 CFR Part 52. Except when the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the staff will use the method described herein to evaluate conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications submitted six months or more after the date of issuance of this SRP section, unless superseded by a later revision.

VI. REFERENCES

1. ASME Boiler & Pressure Vessel Code, American Society of Mechanical Engineers, 2001 Edition through 2003 Addenda.

2. ASME Code for Operation and Maintenance of Nuclear Power Plants, American Society of Mechanical Engineers, 2001 Edition through 2003 Addenda, and OM Code cases.

3. 10 CFR Part 50, “Domestic Licensing of Production and Uitilization Facilities.”

4. 10 CFR Part 52, “Early Site Permits; Standard Design Certification; And Combined Licenses for Nuclear Power Plants.”

5. NUREG-1482, Revision 1, “Guidelines for Inservice Testing at Nuclear Power Plants,” January 2005.

6. Regulatory Guide 1.192, “Operation and Maintenance Code Case Acceptability, ASME OM Code.”

7. Regulatory Guide 1.174, Revision 1, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” November 2002.

8. Regulatory Guide 1.175, “An Approach for Decisions on Plant-Specific Risk-Informed Decisionmaking: Inservice Testing,” August 1998.

9. Generic Letter 90-09, “Alternative Requirements for Snubbers Visual Inspection Intervals and Corrective Actions,” December 11, 1990.

10. Generic Letter 96-05, “Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves,” September 18, 1996.

11. MPR-2524, Revision 0, “Joint Owners’ Group (JOG) Motor Operated Valve Periodic Verification Program Summary,” February 2004, and JOG responses to NRC staff requests for additional information.

12. NRC Regulatory Issue Summary 2000-03, “Resolution of Generic Safety Issue 158: Performance of Safety-Related Power-Operated Valves Under Design Basis Conditions.”

13. Generic Letter 89-10, “Safety-Related Motor-Operated Valve Testing and Surveillance,” June 1989.

14. Regulatory Guide 1.148, “Functional Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants.”

15. ANSI/ASME N278.1-1975 (R-1992), “Self-Operated and Power-Operated Safety-Related Valves Functional Specification Standard,” American National Standards Institute/American Society of Mechanical Engineers.

16. ANSI/ASME N551.1, “Standard for Qualification of ASME Code Class 2 & 3 Pump Assemblies for Safety Systems Service, General Requirements,” American National Standards Institute/American Society of Mechanical Engineers.

17. ANSI B.16.41, “Functional Qualification Requirements for Power Operated Active Valve Assemblies for Nuclear Power Plants,” American National Standards Institute.

18. ANSI N41.6, “Functional Qualification Requirements for Actuators for Power Operated Valve Assemblies for Nuclear Power Plants,” American National Standards Institute.

19. ANSI/ASME N551.2, “Standard for Qualification of ASME Code Class 2 & 3 Pumps for Safety Systems Service,” American National Standards Institute/American Society of Mechanical Engineers.

20. ANSI N45 N551.4, “Functional Qualification of Motor Drives for Safety Related Code Class 2 and 3 Pumps for Nuclear Power Plants,” American National Standards Institute.

21. NRC Inspection Manual Chapter IMC-2504, “Construction Inspection Program - Non-ITAAC Inspections,” issued April 25, 2006.

22. SECY-05-0197, “Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria.”