



U.S. NUCLEAR REGULATORY COMMISSION
STANDARD REVIEW PLAN
OFFICE OF NUCLEAR REACTOR REGULATION

SECTION 6.6 INSERVICE INSPECTION OF CLASS 2 AND 3 COMPONENTS

REVIEW RESPONSIBILITIES

Primary - Materials Engineering Branch (MTEB)

Secondary - None

I. AREAS OF REVIEW

General Design Criterion 36, "Inspection of Emergency Core Cooling System"; Criterion 39, "Inspection of Containment Heat Removal System"; Criterion 42, "Inspection of Containment Atmosphere Cleanup Systems"; and Criterion 45, "Inspection of Cooling Water System," of Appendix A to 10 CFR Part 50 require that the subject systems be designed to permit appropriate periodic inspection of important component parts to assure system integrity and capability. General Design Criterion 37, "Testing of Emergency Core Cooling System"; Criterion 40, "Testing of Containment Heat Removal System"; Criterion 43, "Testing of Containment Atmosphere Cleanup Systems"; and Criterion 46, "Testing of Cooling Water System," require in part that the subject systems be designed to permit appropriate periodic pressure testing to assure the structural and leaktight integrity of their components.

Inservice inspection programs are based on the general requirements of 10 CFR Part 50, Section 50.55a, as detailed in Section XI of the ASME Code, "Rules for Inservice Inspection of Nuclear Power Plant Components." Inservice inspection includes a preservice inspection prior to initial plant startup.

The following areas relating to the inservice inspection (ISI) program for NRC Quality Group B and C (ASME Boiler and Pressure Vessel Code, Section III, Code Class 2 and 3) components are reviewed:

1. Components Subject to Examination

The descriptive information in the applicant's or licensee's safety analysis report (SAR) is reviewed to establish that all the ASME Boiler and Pressure Vessel Code (hereinafter "the Code"), Section III, Article NA-2000, Class 2 and Class 3 components are included in the ISI program. The Mechanical

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USNRC STANDARD REVIEW PLAN

Standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for the review of applications to construct and operate nuclear power plants. These documents are made available to the public as part of the Commission's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Standard review plans are not substitutes for regulatory guides or the Commission's regulations and compliance with them is not required. The standard review plan sections are keyed to the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. Not all sections of the Standard Format have a corresponding review plan.

Published standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555.

Engineering Branch verifies in SRP Section 3.2.2 that the systems classified as Code Class 2 and 3 agree with Article NA-2000 of Section III and with the definitions of the General Design Criteria. The inservice inspection requirements for ASME Code Class 1 components in the reactor coolant pressure boundary and steam generator tubes are reviewed by MTEB as part of its primary review responsibility for SRP Sections 5.2.4 and 5.4.2.2, respectively.

2. Accessibility

The descriptive information, including drawings, is reviewed by the MTEB to establish that the Code Section XI, Subarticle IWA-1500, provisions for system accessibility are included in the applicant's or licensee's layout and design of these systems.

3. Examination Categories and Methods

The required examination categories and methods included in IWC-2000 and IWD-2000 of Section XI are reviewed.

4. Inspection Intervals

The required examinations and inspections listed in the SAR are reviewed and compared to the requirements in IWC-2000 and IWD-2000 of Section XI to verify that they will be performed within the designated inspection interval.

5. Evaluation of Examination Results

The information concerning repair procedures is reviewed for compliance with Articles IWC-4000 and IWD-4000 of Section XI. The information concerning evaluation of examination results is reviewed for compliance with IWC-3000 and IWD-3000 of the Code. If these requirements are in course of preparation in the applicable Code edition for a program, suitable alternative provisions, such as the requirements in IWB-3000 or those in later approved editions of the Code, should be proposed by the applicant or licensee.

6. System Pressure Tests

The pressure test program is reviewed for compliance with Articles IWC-5000 and IWD-5000 of Section XI to establish that leakage and signs of structural distress are inspected for on a periodic basis.

7. Augmented ISI to Protect Against Postulated Piping Failures

The augmented inservice inspection program as specified in SRP Section 3.6.1 to provide assurance against postulated piping failures of high-energy fluid systems between containment isolation valves is reviewed.

8. Code Exemptions

The ASME Section XI Code exemptions as permitted by IWC-1220 are reviewed.

9. Relief Requests

Requests for relief from the ASME Code Section XI examination requirements which are found to be impractical due to the limitations of design, geometry, or materials of construction of components are evaluated in accordance with Section 50.55a of 10 CFR Part 50.

II. ACCEPTANCE CRITERIA

The requirements for periodic inspection and testing of Class 2 and 3 systems in General Design Criteria 36, 37, 39, 40, 42, 43, 45, and 46 are specified in part in 10 CFR Part 50, Section 50.55a, "Codes and Standards," and detailed in Section XI of the ASME Code. Compliance with the preservice and inservice examinations of 10 CFR Part 50, Section 50.55a, as detailed in Section XI of the Code, constitutes an acceptable basis for satisfying in part the requirements of General Design Criteria 36, 37, 39, 40, 42, 43, 45, and 46. Specific acceptance criteria for meeting the ISI requirements of these General Design Criteria and 10 CFR Part 50, Section 50.55a for the areas of review described in subsection I of this SRP section are as follows:

1. Components Subject to Inspection

The applicant's or licensee's definition of Code Class 2 and 3 components and systems subject to an ISI program is acceptable if it is in agreement with the definitions of Code Section III, Article NA-2000. The interpretation of code classifications by the applicant or licensee is subject to review by the Mechanical Engineering Branch in SRP Section 3.2.2 for compliance with safety criteria pertaining to component classification. (Refer to NA-2000 of Section III.)

2. Accessibility

The design and arrangement of Class 2 and 3 systems are acceptable if the applicant or licensee includes allowances for adequate clearances to conduct the examinations specified in IWC-2000 and IWD-2000 at the frequency specified. Special design considerations are given to those systems that are intended to be examined during normal reactor operation.

3. Examination Categories and Methods

The examination categories and requirements specified in the SAR are acceptable if in agreement with the criteria of IWC-2000 and IWD-2000 of the Code. Every area subject to examination should fall within one or more of the examination categories and must be examined at least to the extent specified. The methods of examination for the components are also listed in the requirements of IWC-2000 and IWD-2000 of the Code.

The applicant's or licensee's examination techniques and procedures used for PSI or ISI are acceptable if in agreement with the following criteria:

- a. The methods, techniques, and procedures for visual, surface, or volumetric examination are in accordance with IWA-2000 of the Code.
- b. Alternative examination methods, combination of methods, or newly developed techniques to those given in a. above are acceptable

provided that the results are equivalent or superior. The acceptance standards for these alternate methods are given in Section XI, IWC-3000 and IWD-3000.

4. Inspection Intervals

The inservice inspection program schedule given in the SAR is acceptable if the required examinations are completed during each ten-year interval, hereinafter designated as the inspection interval, and as required by Articles IWC-2000 and IWD-2000 of Section XI.

5. Evaluation of Examination Results

The methods for evaluation of examination results are reviewed for compliance with Articles IWC-3000 and IWD-3000 in the Code. If the applicable edition of the Code states that these articles are in the course of preparation, the rules of IWB-3000 shall apply.

6. System Pressure Tests

The SAR program for Class 2 and 3 system pressure testing is acceptable if it meets the criteria of IWC-5000 and IWD-5000 of Section XI.

7. Augmented ISI to Protect Against Postulated Piping Failures

High-energy fluid system piping between containment isolation valves should receive an augmented ISI as follows:

- a. Protective measures, structures, and guard pipes should not prevent the access required to conduct the inservice examinations specified in the Code, Section XI, Division 1.
- b. For those portions of high energy fluid system piping between containment isolation valves, the extent of inservice examination completed during each inspection interval should provide 100% volumetric examination of circumferential and longitudinal pipe welds within the boundary of these portions of piping.
- c. For those portions of high-energy fluid system piping enclosed in guard pipes, inspection ports should be provided in the guard pipes to permit the required examination of circumferential pipe welds. Inspection ports should not be located in that portion of the guard pipe passing through the annulus of dual barrier containment structures.
- d. The areas subject to examination should be defined in accordance with Examination Categories C-F and C-G for Class 2 piping welds in Article IWC-2000.

8. Code Exemptions

The applicant or licensee should list the exemptions from Code examination requirements that have been permitted by IWC-1220 of the Code.

9. Relief Requests

Request for relief from the ASME Code Section XI examination requirements which are found to be impractical due to the limitations of design, geometry, or materials of construction of components are evaluated in accordance with Section 50.55a of 10 CFR Part 50.

III. REVIEW PROCEDURES

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

For each area of review the following review procedure is followed:

1. Components Subject to Inspection

The applicant's or licensee's components and system classifications under Class 2 are reviewed for agreement with subsection II.1 of this SRP section. The interpretation of Code classifications is the responsibility of the Mechanical Engineering Branch in the review of SRP Section 3.2.2, should a discrepancy occur between the SAR and subsection II.1 of this SRP section.

The applicant's or licensee's classification of Class 3 systems is reviewed for agreement with subsection II.1 of this SRP section. Any safety-related, fluid-carrying components not included in Class 1 or Class 2 and not a part of the containment structure are included in Class 3.

2. Accessibility

The design and arrangement of Class 2 and 3 systems are reviewed in terms of accessibility for ISI to establish that the design meets the requirements of subsection II.2 of this SRP section. No remote inspection program is required for Code Class 2 or 3 components.

3. Examination Categories and Methods

The reviewer verifies that the examination categories and methods as described by the SAR are the same as those specified in subsection II.3 of this SRP section.

4. Inspection Intervals

The inservice inspection program for Class 2 and 3 components in the plant technical specifications is reviewed to establish that each area and component in the program is inspected on a schedule in agreement with subsection II.4 of this SRP section.

5. Evaluation of Examination Results

The reviewer verifies that the evaluation of examination results described in the SAR is in accordance with subsection II.5 of this SRP section.

6. System Pressure Test

The system pressure test program is acceptable if it meets the criteria of subsection II.6 of this SRP section.

7. Augmented ISI to Protect Against Postulated Piping Failures

The reviewer verifies that the augmented inservice inspection program as described in the SAR meets the acceptance criteria identified in subsection II.7 of this SRP section.

8. Code Exemptions

The reviewer verifies that the exemptions from Code examinations are in accordance with the criteria in IWC-1220.

9. Relief Requests

The reviewer determines if the applicant or licensee has demonstrated that a code requirement is impractical due to the limitations of design, geometry, or materials of construction of components.

IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided in accordance with the requirements of this SRP section and that his evaluation supports conclusions of the following type, to be included in the staff's safety evaluation report:

To ensure that no deleterious defects develop during service in ASME Code Class 2 system components, selected welds and weld heat-affected zones are inspected prior to reactor startup and periodically throughout the life of the plant. In addition, Code Class 2 and 3 systems receive visual inspections while the systems are pressurized in order to detect leakage, signs of mechanical or structural distress, and corrosion.

The applicant (licensee) has stated that his inservice inspection (ISI) program will comply (complies) with the rules published in 10 CFR Part 50, Section 50.55a, and Section XI of the ASME Code, () Edition, including addenda through the () Addenda. The ISI program will consist of a preservice inspection plan and an inservice inspection plan.

Examples of Code Class 2 systems are: residual heat removal systems, portions of chemical and volume control systems (in PWR plants), portions of control rod drive systems (in BWR Plants), and engineered safety features not part of Code Class 1 systems. Examples of Code Class 3 systems are: component cooling water systems and portions of radwaste systems. All of these systems transport fluids.

The staff concludes that the inservice inspection program is acceptable and meets the inspection and pressure testing requirements of General Design Criteria 36, 37, 39, 40, 42, 43, 45, and 46 and 10 CFR Part 50, Section 50.55a. This conclusion is based on the

applicant's or licensee's meeting the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, as reviewed by the staff and determined to be appropriate for this application.

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plan for using this SRP section. Except in those cases in which the applicant or licensee proposes an acceptable alternative method for complying with the specified portions of the Commission's regulations, the methods described herein will be used by the staff in its evaluation of conformance with Commission regulations. Implementation schedules are defined in Section 50.55a of 10 CFR Part 50.

VI. REFERENCES

1. 10 CFR Part 50, Appendix A, General Design Criterion 36, "Inspection of Emergency Core Cooling System"; Criterion 37, "Testing of Emergency Core Cooling System"; Criterion 39, "Inspection of Containment Heat Removal System"; Criterion 40, "Testing of Containment Heat Removal System"; Criterion 42, "Inspection of Containment Atmosphere Cleanup Systems"; Criterion 43, "Testing of Containment Atmosphere Cleanup Systems"; Criterion 45, "Inspection of Cooling Water Systems"; and Criterion 46, "Testing of Cooling Water System."
2. ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components," Article NA-2000 and Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Division 1, "Rules for Inspection and Testing of Components of Light-Water Cooled Plants," American Society of Mechanical Engineers.