



U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

5.2.1.1 COMPLIANCE WITH AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE REQUIREMENTS IN THE CODES AND STANDARDS RULE, 10 CFR 50.55a

REVIEW RESPONSIBILITIES

Primary - Organization responsible for mechanical engineering reviews

Secondary - Organization responsible for materials engineering reviews

I. AREAS OF REVIEW

This Standard Review Plan (SRP) section is used to verify whether acceptable codes and standards (and their edition and addenda) required by Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a, "Codes and Standards," are identified for component construction¹. This SRP section addresses compliance with the requirements related to the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (BPV Code) and *Operation and Maintenance of Nuclear Power Plants* (OM Code). The review under this section is coordinated closely with the review described in SRP Section 3.2.2, "System Quality Group Classification."

More detailed review of conformance with ASME BPV Code requirements for the component code class (e.g., component welds verified to meet requirements applicable for the Code Class), is addressed in other SRP sections. The applicant's framework for compliance with

¹ Constructed, as used herein, is an all inclusive term comprising material certification, design, fabrication, examination, testing, inspection, and certification required in the manufacture and installation of components.

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USNRC STANDARD REVIEW PLAN

This Standard Review Plan (SRP,) NUREG-0800, has been prepared to establish criteria that the U.S. Nuclear Regulatory Commission (NRC) staff responsible for the review of applications to construct and operate nuclear power plants intends to use in evaluating whether an applicant/licensee meets the NRC regulations. The SRP is not a substitute for the NRC 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 an acceptable method of complying with the NRC regulations.

The SRP sections are numbered in accordance with corresponding sections in Regulatory Guide (RG) 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)." Not all sections of RG 1.70 have a corresponding review plan section. The SRP sections applicable to a combined license application for a new light-water reactor (LWR) are based on RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)." These documents are made available to the public as part of the NRC policy to inform the nuclear industry and the general public of regulatory procedures and policies. Individual sections of NUREG-0800 will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience. Comments may be submitted electronically by email to NRO_SRP@nrc.gov.

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10 CFR 50.55a requirements for application of codes and standards during the inservice phase of the component life is also reviewed in other SRP sections (e.g., 3.9.6, 5.2.4, and 6.6).

In addition to providing requirements related to the ASME BPV Code and OM Code, 10 CFR 50.55a also describes requirements for instrumentation and control in reactor protection and safety systems. Specifically, Institute of Electrical and Electronics Engineers (IEEE) Standards IEEE-279, "Criteria for Protection Systems for Nuclear Power Generating Stations," and IEEE-603, "Criteria for Safety Systems for Nuclear Power Generating Stations," are incorporated by reference in 10 CFR 50.55a. Review guidance for the evaluation of protection and safety systems is provided in detail within SRP Chapter 7.

The specific areas of review are as follows:

1. The NRC regulations in 10 CFR 50.55a(c) require that components that are part of the reactor coolant pressure boundary (RCPB) must meet the requirements for Class 1 components in Section III of the ASME BPV Code, Section III, Division 1 and be constructed in accordance with the rules of that Code, except for components that meet the exclusion requirements of 10 CFR 50.55a(c). The regulations in 10 CFR 50.55a(d) and 10 CFR 50.55a(e) require that components classified as Quality Group B and Quality Group C, respectively, meet the requirements for Class 2 and Class 3 components in Section III of the ASME BPV Code. Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," provides guidance for the classification of Quality Group B and Quality Group C components.

Applicants will provide a table in their technical submittal identifying pressure vessels, piping, pumps, and valves, and the component code class and applicable Code edition and addenda for each component.

Components within the scope of 10 CFR 50.55a are subject to inservice inspection (ISI) and inservice testing (IST) in accordance with Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the ASME BPV Code, and the ASME OM Code, respectively, as incorporated by reference in 10 CFR 50.55a.

For construction permit (CP) and operating license (OL) applications under 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," and for design certification (DC) and combined license (COL) applications under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," the staff determines the acceptability of the technical submittal to provide assurance that the applicant complies with 10 CFR 50.55a.

2. The NRC regulations in 10 CFR 50.55a(z) allow alternatives to the requirements of 10 CFR 50.55a to be used if the applicant demonstrates that (1) the proposed alternative would provide an acceptable level of quality and safety, or (2) compliance with the specified requirements of 10 CFR 50.55a would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The technical submittal should identify differences between the specific portions of the code and code addenda to which each component has been constructed and that are required for compliance with 10 CFR 50.55a, and provide justification for proposed alternatives in accordance with 10 CFR 50.55a(z).

3. Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC). For DC and COL reviews, the staff reviews the applicant's proposed ITAAC associated with the structures, systems, and components (SSCs) related to this SRP section in accordance with SRP Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria." The staff recognizes that the review of ITAAC cannot be completed until after the rest of this portion of the application has been reviewed against acceptance criteria contained in this SRP section. Furthermore, the staff reviews the ITAAC to ensure that all SSCs in this area of review are identified and addressed as appropriate in accordance with SRP Section 14.3 and relevant subsections.
4. 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 or information items 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.

Review Interfaces

Other SRP sections interface with this section as follows:

1. The materials engineering staff verifies, upon request from the primary reviewer, the compatibility of the materials of construction with service conditions and, as required, assists in establishing acceptability if an applicant proposes alternatives not in accordance with 10 CFR 50.55a.
2. Technical staff responsible for review of ISI and IST programs verify that the applicant has specified in its submittal that components within the scope of 10 CFR 50.55a are subject to ISI and IST in accordance with Section XI of the ASME BPV Code and the ASME OM Code, respectively.

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

II. ACCEPTANCE CRITERIA

Requirements

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

1. 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion (GDC) 1, "Quality Standards and Records," as to the requirement that SSCs be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed.
2. 10 CFR 50.55a, as to the establishment of minimum quality standards for the design, fabrication, erection, construction, testing, and inspection of components of boiling and pressurized water reactor nuclear power plants by requiring conformance with

appropriate editions and addenda of industry codes and standards incorporated by reference in 10 CFR 50.55a.

3. 10 CFR 52.47(b)(1), which requires that a DC application contain the proposed 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 facility that incorporates the DC has been constructed and will be operated in conformity with the DC, the provisions of the Atomic Energy Act (AEA), and the NRC's regulations.
4. 10 CFR 52.79(a)(11), which requires a COL applicant to provide, in its final safety analysis report (FSAR), a description of the programs and their implementation necessary to ensure that the systems and components meet the requirements of the ASME BPV Code and ASME OM Code in accordance with 10 CFR 50.55a at a level sufficient to enable the NRC to reach a final conclusion on all safety matters that must be resolved before COL issuance.
5. 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 AEA, 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 to ensure compliance with NRC regulations.

1. 10 CFR Part 50, Appendix A, GDC 1 requires that SSCs be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed. For those SSCs defined as safety-related, the NRC regulations specify special treatment requirements to provide reasonable assurance of the capability of those SSCs to perform their safety-related functions. One special treatment requirement is that applicable components meet the requirements in the ASME BPV Code and OM Code as incorporated by reference in 10 CFR 50.55a.
2. The NRC regulations in 10 CFR 50.55a require that components of the RCPB be designed, fabricated, erected, and tested in accordance with the requirements for Class 1 components of Section III of the ASME BPV Code and OM Code as incorporated by reference in 10 CFR 50.55a. This regulation also requires that pressure retaining components of other fluid systems designated as ASME BPV Code Class 2 or Class 3 components meet the applicable requirements of the ASME BPV Code as incorporated by reference in 10 CFR 50.55a. Components within the scope of 10 CFR 50.55a are subject to ISI and IST in accordance with ASME BPV Code, Section XI and ASME OM Code, respectively, as incorporated by reference in 10 CFR 50.55a. The requirements of GDC 1 regarding quality standards are met by

acceptable application of quality group classifications and quality standards. RG 1.26 describes a quality classification system that may be used to determine quality standards acceptable to the NRC staff for satisfying GDC 1 for ASME BPV Code Class 2 and 3 components.

3. 10 CFR 52.47(b)(1), which requires that a DC application contain the proposed 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 facility that incorporates the DC has been constructed and will be operated in conformity with the DC, the provisions of the AEA, and the NRC's regulations. Regulations in 10 CFR 52.80(a) require that the COL identify the ITAAC necessary and sufficient to assure that the facility has been constructed and will be operated in conformity with the license. SRP Section 14.3 provides guidance for reviewing the ITAAC. The requirements of 10 CFR 52.47(b)(1) and 10 CFR 52.80(a), respectively, will be met, in part, by identifying ITAAC for the top-level design features related to compliance with 10 CFR 50.55a.
4. Regulations in 10 CFR 52.79(a)(11) require that a COL applicant provide, in its safety analysis report, a description of the programs and their implementation necessary to ensure that the systems and components meet the requirements of the ASME BPV Code and ASME OM Code in accordance with 10 CFR 50.55a at a level sufficient to enable the NRC to reach a final conclusion on all safety matters that must be resolved before COL issuance. RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," provides guidance for the content of COL applications for a description of the ISI and IST programs to meet 10 CFR 50.55a. The NRC staff reviews the descriptions of these programs and documents its review in the applicable safety evaluation report (SER) sections.

Technical Rationale

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

1. Compliance with GDC 1 requires that SSCs be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed.

The NRC regulations in 10 CFR 50.55a specify application of the ASME BPV Code as incorporated by reference for the construction of ASME BPV Code Class 1, 2, and 3 components. RG 1.26 provides quality group classifications for water-, steam-, and radioactive-waste-containing components (pressure vessels, piping, pumps, valves, and storage tanks) commensurate with the importance of the safety functions they perform. For compliance with these quality group classifications, RCPB and other components within the scope of 10 CFR 50.55a meet the requirements of ASME BPV Code, Section III. These components will perform acceptably, commensurate with their intended safety functions, when designed in accordance with ASME BPV Code requirements as incorporated by reference in 10 CFR 50.55a.

The staff considers the requirements outlined in GDC 1 to be adequate for assurance that these SSCs will perform acceptably, commensurate with the importance of their safety functions.

2. Regulations in 10 CFR 50.55a require that components be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

Regulations in 10 CFR 50.55a specify that ASME Code Class 1, 2 and 3 components must be constructed to meet ASME BPV Code, Section III as incorporated by reference in 10 CFR 50.55a. These components will perform acceptably, commensurate with their intended safety functions, when designed in accordance with ASME Code requirements as incorporated by reference in 10 CFR 50.55a.

Regulations in 10 CFR 50.55a require that components within the scope of the ASME BPV Code and the ASME OM Code are subject to ISI and IST in accordance with Section XI of the ASME BPV Code and the OM Code, respectively, as incorporated by reference in the rule.

The staff considers these requirements adequate for assurance that these components will perform acceptably, commensurate with the importance of their safety functions.

3. Regulations in 10 CFR 52.47(b)(1) require that a DC application contain proposed ITAAC necessary and sufficient to assure the plant is built and will operate in accordance with the design certification. Regulations in 10 CFR 52.80(a) require that the COL identify the ITAAC necessary and sufficient to assure that the facility has been constructed and will be operated in conformity with the license. SRP Section 14.3 provides guidance for reviewing the ITAAC. These requirements in 10 CFR 52.47(b)(1) and 10 CFR 52.80(a) provide confidence in an applicant's compliance with 10 CFR 50.55a.
4. Regulations in 10 CFR 52.79(a)(11) require that a COL applicant provide, in its safety analysis report, a description of the programs and their implementation necessary to ensure that the systems and components meet the requirements of the ASME BPV Code and ASME OM Code in accordance with 10 CFR 50.55a at a level sufficient to enable the NRC to reach a final conclusion on all safety matters that must be resolved before COL issuance. RG 1.206 provides guidance for the content of COL applications for a description of the ISI and IST programs to meet 10 CFR 50.55a. The requirements in 10 CFR 52.79(a)(11) and the guidance in RG 1.206 provide confidence in an applicant's compliance with 10 CFR 50.55a.

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 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.

1. In accordance with 10 CFR 52.47(a)(8), 10 CFR 52.47(a)(21), and 10 CFR 52.47(a)(22), and 10 CFR 52.79(a)(17) and 10 CFR 52.79(a)(20), for new reactor license applications submitted under 10 CFR Part 52, the applicant is required to (1) address the proposed technical resolution of unresolved safety issues and medium and high-priority generic safety issues which are identified in the version of NUREG-0933, "Resolution of Generic

Safety Issues,” current on the date up to 6 months before the docket date of the application and which are technically relevant to the design; (2) demonstrate how the operating experience insights have been incorporated into the plant design; and, (3) provide information necessary to demonstrate compliance with any technically relevant portions of the Three Mile Island requirements set forth in 10 CFR 50.34(f), except paragraphs 10 CFR 50.34(f)(1)(xii), 10 CFR 50.34(f)(2)(ix), and 10 CFR 50.34(f)(3)(v). These cross-cutting review areas should be addressed by the reviewer for each technical subsection and relevant conclusions documented in the corresponding SER section.

2. For reviews of OL and CP applications under 10 CFR Part 50, and DC and COL applications under 10 CFR Part 52, the NRC staff verifies that Section 5.2.1.1 of the applicant’s submitted documentation specifies the use of an acceptable edition and addenda of the ASME BPV Code, Section III and Section XI, and the ASME OM Code incorporated by reference in 10 CFR 50.55a. The staff also checks the applicant’s table identifying pressure vessel components, piping, pumps and valves, and the corresponding component code, code edition, and applicable addenda of each ASME BPV Code, Section III, Class 1, 2, and 3 components for compliance with 10 CFR 50.55a. The ASME BPV Code Class requirements applied for non-RCPB components are based on the acceptable component Quality Group classifications verified under SRP Section 3.2.2.
3. The applicant may propose alternatives to the requirements of 10 CFR 50.55a, as set forth in 10 CFR 50.55a(z). If an alternative is proposed, the staff evaluates whether the applicant demonstrates one of the following:
 - A. The proposed alternatives would provide an acceptable level of quality and safety, or
 - B. Compliance with the specified requirements of 10 CFR 50.55a would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

If its concerns are not resolved satisfactorily, the staff takes a position in conformance with 10 CFR 50.55a.

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 technical submittal meets the acceptance criteria. DCs have referred to the technical submittal as the design control document (DCD) or FSAR. The reviewer should also consider the appropriateness of identified COL action items. The reviewer may identify additional COL action items that should be added to the DC applicant’s DCD or 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 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.

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 SER. The reviewer also states the bases for those conclusions.

The NRC staff concludes that system components are in compliance with 10 CFR 50.55a and meet the requirements of GDC 1. This conclusion is based on the following findings:

1. The staff finds that the applicant has met the requirements of 10 CFR 50.55a and GDC 1 for the construction of SSCs important to safety to acceptable quality standards by ensuring that RCPB components, as defined by 10 CFR 50.55a, are classified properly in the technical submittal as ASME BPV Code, Section III, Class 1 (Quality Group A) components, except for those which meet 10 CFR 50.55a(c) exclusion requirements. The applicant's technical submittal properly identifies the component Code, Code Edition, and Addenda for each ASME BPV Code Class 1 component.
2. The staff finds that the applicant has met the 10 CFR 50.55a requirements by properly classifying components within the scope of the ASME BPV Code (but not ASME Code Class 1) components in its technical submittal as ASME BPV Code, Section III, Class 2 (Quality Group B) or Class 3 (Quality Group C). These remaining components are classified as Quality Group B or C based upon the staff's guidance for component quality group classification described in SRP Section 3.2.2 and are constructed as ASME BPV Code, Section III, Class 2 or 3 components. The applicant's technical submittal identifies the Component Code, Code Edition, and Addenda for each Quality Group B and C components.

The staff reviewed the Component Code, Code Edition, and Addenda as applied to each of these components and finds them to be constructed in accordance with the requirements of the applicable Codes and standards specified by 10 CFR 50.55a. The staff's review of quality group classifications is described in Section 3.2.2 of the SER.

3. The staff finds that the applicant has specified that components within the scope of the ASME BPV Code, Section XI, and the ASME OM Code are subject to ISI and IST in accordance with ASME BPV Code and OM Code, respectively, as incorporated by reference in 10 CFR 50.55a.
4. The staff finds that alternatives to the ASME BPV Code and ASME OM Code, as identified and justified in the DC or COL applicant's technical submittal are authorized in accordance with 10 CFR 50.55a(z).
5. As discussed above, the staff finds that the applicant has met the requirements in 10 CFR 50.55a for establishment of acceptable quality standards for the design, fabrication, erection, construction, testing, and inspection of ASME Code Class 1, 2, and 3 components to be used in the nuclear power plant.

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 or information 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 docketed 6 months or more after the date of issuance of this SRP section, unless superseded by a later revision.

VI. REFERENCES

1. American Society of Mechanical Engineers, *ASME BPV Code*, "Code Cases: Nuclear Components," New York, NY.
2. American Society of Mechanical Engineers, "ASME Operation and Maintenance of Nuclear Power Plants, Division 1, OM Code: Section IST," New York, NY.
3. U.S. Code of Federal Regulations, "Codes and Standards." §50.55a, Title 10, "Energy."
4. U.S. Code of Federal Regulations, "Domestic Licensing of Production and Utilization," Part 50, Chapter 1, Title 10, "Energy," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion 1, "Quality Standards and Records."
5. U.S. Nuclear Regulatory Commission, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," Regulatory Guide 1.26, ADAMS Accession ML14356A249.
6. U.S. Nuclear Regulatory Commission, "Combined License Applications for Nuclear Power Plants (LWR Edition)," Regulatory Guide 1.206, ADAMS Accession No. ML070720184.

PAPERWORK REDUCTION ACT STATEMENT

The information collections contained in the Standard Review Plan are covered by the requirements of 10 CFR Part 50 and 10 CFR Part 52, and were approved by the Office of Management and Budget, approval number 3150-0011 and 3150-0151.

PUBLIC PROTECTION NOTIFICATION

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.
