



U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

SECTION 3.9.4 CONTROL ROD DRIVE SYSTEMS

REVIEW RESPONSIBILITIES

Primary - Mechanical Engineering Branch (MEB)

Primary - Organization responsible for the review of component performance

Secondary - None

I. AREAS OF REVIEW

The control rod drive system (CRDS) consists of the control rods and the related mechanical components which provide the means for mechanical movement. General Design Criteria (GDC) 26 and 27 require that the CRDS provide one of the independent reactivity control systems. The rods and the drive mechanism shall be capable of reliably controlling reactivity changes ~~either~~ under conditions of normal operation, including anticipated ~~normal plant~~ operational occurrences, ~~or~~ and under postulated accident conditions. A positive means for inserting the rods shall always be maintained to ensure appropriate margin for malfunction, such as stuck rods. Since the CRDS is ~~a system~~ important to safety and portions of the CRDS are a part of the reactor coolant pressure boundary (RCPB), ~~General Design Criteria GDC 1, 2, 14, and 29 and 10 CFR Part 50, §50.55a,~~ require that the system ~~shall~~ be designed, fabricated, and tested to quality standards commensurate with the safety functions to be performed; so as to assure an extremely high probability of accomplishing the safety functions ~~either~~ in the event of anticipated operational occurrences ~~or in withstanding the effects of,~~ postulated accidents and natural phenomena such as earthquakes.

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Rev. 3 - ~~xxx~~ 2006

USNRC STANDARD REVIEW PLAN

This Standard Review Plan, NUREG-0800, has been prepared to establish criteria that the Office of Nuclear Reactor Regulation 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's regulations. The Standard Review Plan is not a substitute for the NRC's regulations, and compliance with them is not required. However, applicants are required to identify differences between the design features, analytical techniques, and procedural measures proposed for their 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 standard review plan sections are numbered in accordance with corresponding sections in 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 section. For combined license applications submitted under 10 CFR Part 52, the applicability of standard review plan sections will be based on Regulatory Guide DG-1145, "Combined License Applications for Nuclear Power Plants (LWR Edition)," as superseded by the final guide.

These documents are made available to the public as part of the NRC's 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 NRR_SRP@nrc.gov.

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Information in the areas noted below is provided in the applicant's safety analysis report and is reviewed by the MEB primary review branch in accordance with this standard review plan (SRP) section. This information pertains to the CRDS, which is considered to extend to the coupling interface with the reactivity control elements in the reactor pressure vessel. For electromagnetic systems, the review under this SRP section is limited to just the control rod drive mechanism (CRDM) portion of the CRDS. For hydraulic systems, the review covers the CRDM and also the hydraulic control unit, the condensate supply system, and the scram discharge volume. For both types of systems, the CRDM housing should be treated as part of the RCPB; the relevant mechanical engineering information may be presented either in this SRP section or by reference to the sections on the RCPB.

If other types of CRDS are proposed or if new features that are not specifically mentioned here are incorporated in CRDS of current types, the information ~~should be~~ supplied for the new systems or new features should be similar to ~~that~~ the information described below.

1. The descriptive information, including design criteria, testing programs, drawings, and a summary of the method of operation of the control rod drives, is reviewed to permit an evaluation of the adequacy of the system to perform its mechanical function properly.
2. A review is performed of ~~information pertaining to~~ design codes, standards, specifications, and standard practices, as well as ~~to General Design Criteria~~ GDC, regulatory guides, and branch positions that ~~are applied in~~ apply to the design, fabrication, construction, and operation of the CRDS.
 The various criteria, described in general terms above, should be supplied along with the names of the apparatus to which ~~they~~ the criteria apply. Pressurized portions of the system ~~which that~~ are a part of RCPB are reviewed to determine the extent to which the applicant complies with the Class 1 requirements of Section III of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Reference 14, hereafter "the Code"). Those portions ~~which that~~ are not part of the RCPB are reviewed for compliance with other specified parts of Section III, or other sections of the Code. The ~~MEB reviews the~~ non-pressurized portions of the control rod drive system are reviewed to determine the acceptability of design margins for allowable values of stress, deformation, and fatigue used in the analyses. If an experimental testing program is used in lieu of analysis, the program is reviewed to determine whether it adequately covers ~~the areas of concern in~~ stress, deformation, and fatigue.
3. ~~Information is~~ A reviewed ~~which pertains to the~~ of applicable design loads and their appropriate combinations, ~~to~~ the corresponding design stress limits, and ~~to~~ the it corresponding allowable deformations is performed. The deformations are of interest in the present context only in those instances where a failure of movement ~~could be postulated due to excessive~~ deformation could be postulated due to excessive and such movement would be necessary for a safety-related function.

If the applicant selects an experimental testing option in lieu of establishing a set of stress and deformation allowables, a detailed description of the testing program must be provided for review. ~~In the preliminary safety analysis report (PSAR),~~ the load

combinations, design stress limits and allowable deformations criteria should be provided for review in the preliminary safety analysis report (PSAR).

In the final safety analysis report (FSAR) for an operating license, or the final safety evaluation report (FSER) for design certification (DC) applications, the actual design should be compared with the design criteria and limits to demonstrate that the criteria and limits have not been exceeded.

Loadings imposed during normal plant operation and startup and shutdown transients include but are not limited to pressure, deadweight, temperature effects, and anticipated operational occurrences. Loadings associated with specific seismic and other dynamic events are then combined with the above plant-type loads. For BWRs [boiling-water reactors] only, the CRDS is reviewed to verify that the system is capable of withstanding adverse dynamic loads such as water hammer. The response to each set of combined loads has a selected stress or deformation limit. The selection of a specific limit is influenced by the probability of the postulated event occurring and the need to assure operation during and after the event.

4. TA review of the portion of the SAR is reviewed that describes plans for the conduct of an operability assurance program or that references previous test programs or standard industry procedures for similar apparatus is performed. For example, the life cycle test program for the CRDS is reviewed. The operability assurance program is reviewed to ascertain coverage of the following:

- a. Life cycle test program-
- b. Proper service environment imposed during test, including appropriate conditions for normal operation, anticipated normal operational occurrences, seismic events, and postulated accident conditions-
- c. Mechanism functional tests-
- d. Program results-

~~In addition, the MEB will coordinate other branches' evaluations that~~

5. Inspection, Test, Analysis, and Acceptance Criteria (ITAAC)

For design certification 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. It is recognized 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.

Review Interfaces

~~The listed SRP sections interface with the overall review of the CRDS as follows:~~

~~The Core Performance Branch (CPB) will verify this section as follows:~~

- ~~1. Verification that CRDS pressure-retaining components are acceptably classified and that corresponding appropriate quality standards are applied is performed under SRP Sections 3.2.2 and/or 5.2.1.1.~~
- ~~2. Evaluation of BWR CRDS piping with respect to locations and effects of postulated piping failures is performed under SRP Section 3.6.2.~~
- ~~3. The adequacy of the fuel system design, including effects of the CRDS on fuel behavior in meeting the requirements of the reactor core design under various normal operating and accident operating conditions, is reviewed under SRP Section 4.2. ~~The Materials Engineering Branch (MTEB) will review the~~~~
- ~~4. The functional design of reactivity control systems, including the CRDS and its design for protection against the effects of postulated piping and equipment failures, is reviewed under SRP Section 4.6.~~
- ~~5. The adequacy of programs for assuring the integrity of bolting and threaded fasteners is reviewed under SRP Section 3.13.~~
- ~~6. The material aspects of CRDS are reviewed under SRP Section 4.5.1.-~~

~~For those areas of review identified above as part of the primary review responsibility of other branches, the~~

- ~~7. The adequacy of specified environments and service conditions for equipment qualification and of the overall demonstration that components of the CRDS are qualified to perform their functions is reviewed under SRP Section 3.11.~~
- ~~8. The adequacy of BWR CRDS piping with respect to locations and effects of postulated piping failures is reviewed under SRP Section 3.6.2.~~
- ~~9. The structural integrity of Code Class 1, 2, and 3 components, component supports, and core support structures is reviewed under SRP Section 3.9.3.~~

~~The specific acceptance criteria necessary for the and review and their methods of application procedures are contained in the referenced SRP section of the corresponding primary branch sections. -~~

II. ACCEPTANCE CRITERIA

~~MEB~~The acceptance criteria are based on meeting the relevant requirements of the following Commission regulations:

- 4A. GDC 1~~and~~ and 10 CFR ~~Part 50, §50.55a~~, as ~~its~~ they relates to CRDS, requires that the CRDS be designed to quality standards commensurate with the importance of the safety functions to be performed.
- 2B. GDC 2, as it relates to CRDS, requires that the CRDS be designed to withstand the effects of an earthquake without loss of capability to perform its safety functions.
- 3C. GDC 14, as it relates to CRDS, requires that the RCPB portion of the CRDS be designed, constructed, and tested for the extremely low probability of leakage or gross rupture.
- 4D. GDC 26, as it relates to CRDS, requires that the CRDS be one of the independent reactivity control systems ~~which~~that is designed with appropriate margin to assure its reactivity control function under ~~anticipated~~conditions of normal operation~~condition~~, including anticipated operational occurrences.
- 5E. GDC 27, as it relates to CRDS, requires that the CRDS be designed with appropriate margin, and in conjunction with the emergency core cooling system, be capable of controlling reactivity and cooling the core under postulated accident conditions.
- 6F. GDC 29, as its relates to CRDS, requires that the CRDS, in conjunction with reactor protection systems, be designed to assure an extremely high probability of accomplishing its safety functions in the event of anticipated operational occurrences.
- G. 10 CFR 52.47(a)(1)(vi) which requires ITAAC (for design certification) sufficient to assure that the SSCs in this area of review will operate in accordance with the certification.
- H. 10 CFR 52.97(b)(1) which requires ITAAC (for combined licenses) sufficient to assure that the SSCs in this area of review have been constructed and will be operated in conformity with the license and the Commission's regulations.

Specific criteria ~~necessary~~acceptable to meet⁽¹⁾ the relevant requirements of the Commission's regulations identified above are as follows for each review described in subsection I of this SRP section:

- 1. The descriptive information is determined to be sufficient provided the minimum requirements for such information meet Section 3.9.4 of Reference ~~44~~10.

(1)Note: The SRP is not a substitute for the NRC's regulations, and compliance with it is not required. However, applicants are required to identify differences between the design features, analytical techniques, and procedural measures proposed for their facility and the SRP acceptance criteria and evaluated how the proposed alternatives to the SRP acceptance criteria provide an acceptable method of complying with the NRC regulations.

2. Construction (as defined in NCA-1110 of Section III of the ASME Code, ~~Reference 7~~) should meet the following codes and standards utilized by the nuclear industry which have been reviewed and found acceptable:

a. ~~Pressurized Portions~~ For pressurized portions of ~~Equipment Classified~~ equipment classified as Quality Group A, B, C (Regulatory Guide 1.26):

Section III of the ASME Code, Class 1, 2, or 3 as appropriate ~~(Ref. 7)~~.

b. ~~Pressurized Portions~~ For pressurized portions of ~~Equipment Classified~~ equipment classified as Quality Group D (Regulatory Guide 1.26):

(1) Section VIII, Division 1, of the ASME Code for vessels and pump casings ~~(Ref. 7)~~.

(2) ~~Applicable to Piping Systems~~ For piping systems (American National Standards Institute, ANSI):⁽²⁾

B16.5 Steel Pipe Flanges and Flanged Fittings (~~Ref. 13~~ Reference 15):

B16.9 Steel Butt Welding Fittings (~~Ref. 14~~ Reference 16):

B16.11- Steel Socket Welding Fittings (~~Ref. 15~~ Reference 17):

B16.25 Butt Welding Ends (~~Ref. 16~~):

~~B31.1 Piping (Ref. 17):~~

~~SP-25 Standards (Ref. 18):~~

~~B16.34 Valves (Ref. 19):~~

~~c. Nonpressurized Equipment~~ Reference 18)

B16.34 Steel Valves with Flanged and Butt Welding Ends (Reference 19)

B31.1 Power Piping (Reference 20)

MSS-SP-25 Marking for Valves, Fittings, Flanges, and Unions (Reference 21)

c. For nonpressurized equipment (Non-ASME Code):

Design margins presented for allowable stress, deformation, and fatigue should be equal to or greater than ~~those margins~~ for other plants of similar design ~~having a period of~~ with successful ~~operation~~ operating experience. ~~Justification~~ A justification of any decreases in design margins should be provided.

(2) This list can be extended by a staff review and acceptance of other ANSI and Manufacturers Standardization Society (MSS) standards in the piping system area.

3. For the various design and service conditions defined in NB-3113 of Section III of the ASME Code (~~Ref. 7~~), load combination sets are as given in ~~Standard Review Plan SRP Section 3.9.3 (Ref. 12)~~.

The stress limits applicable to pressurized and nonpressurized portions of the control rod drive systems should be as given in ~~Reference 12~~ SRP Section 3.9.3 for the response to each loading set. ~~The~~ For BWRs, the CRDS design should adequately consider water hammer loads to assure that system safety functions can be achieved.

4. The operability assurance program will be acceptable provided the observed performance as to wear, functioning times, latching, and ~~overcoming~~ ability to overcome a stuck rod meet system design requirements.

Technical Rationale

The technical rationale for application of the above acceptance criteria to the CRDS is discussed in the following paragraphs:

1. GDC 1 and 10 CFR 50.55a establish requirements regarding the quality standards to be applied to the CRDS. Specifically, 10 CFR 50.55a identifies the ASME Code requirements, Code editions, and addenda that must be applied to pressure-retaining portions of the CRDS that are of the highest importance to safety. Regulatory Guide 1.26 identifies acceptable standards to be applied for pressure-retaining portions of the CRDS that are less important to safety but which may contain radioactive material. The CRDS is an independent reactivity control system designed to ensure the capability to control reactivity changes in the reactor under normal operating and accident conditions. The fuel cladding and reactor coolant pressure boundary (RCPB) are protected by CRDS safety functions, including insertion of adequate negative reactivity to preserve these fission product barriers under specified conditions. In addition, the CRDS comprises a portion of the RCPB and provides a barrier to the release of fission products. The application of GDC 1 and 10 CFR 50.55a requirements to the design, fabrication, installation and testing ensures the CRDS meets quality standards that are adequate to provide assurance that these safety functions will be performed.
2. GDC 2 establishes requirements regarding the ability of the CRDS to withstand the effects of an earthquake. The CRDS must satisfy seismic Category I requirements and be capable of controlling reactivity when subjected to a seismic disturbance thereby ensuring that the fission process can be rapidly terminated. Consequently, plant protection and safety is augmented by the capability of the CRDS to perform its safety function under earthquake conditions.
3. GDC 14 establishes requirements regarding the RCPB portion of the CRDS. The CRDM is relied on, in part, to provide a barrier to the release of fission products to the containment through proper design of the control rod drive housing and components that are part of the RCPB. Application of the GDC 14 criteria to the CRDM components

functioning as a RCPB enhances safety by ensuring that the RCPB will have an extremely low probability of failure.

4. GDC 26 establishes requirements regarding the reactivity control systems' redundancy and capability. The CRDS is one of the reactivity control systems relied on during normal operating and anticipated operational occurrences to control reactivity changes and ensure that the fuel design limits are not exceeded. Application of GDC 26 criteria to the CRDS improves safety by providing protection for the fuel rods and cladding, which is the primary barrier to the release of fission products.
5. GDC 27 establishes requirements regarding the combined reactivity control system capability. The CRDS is one of the reactivity control systems relied on to control reactivity changes and ensure that the capability to cool the core is maintained during postulated accident conditions. Requiring compliance with GDC 27 for the CRDS augments the protection provided for the primary fission product barrier by providing one means to ensure that the core will be maintained in a coolable geometry under postulated accident conditions.
6. GDC 29 establishes requirements regarding the capability of the CRDS to accomplish its safety functions in the event of anticipated operational occurrences. In order to provide protection for the fuel rods and cladding, which is the primary barrier to the release of fission products, the CRDS must have a high probability of accomplishing its safety function during anticipated operational occurrences. Application of this requirement augments plant protection and safety by requiring a highly reliable fast-acting control rod drive mechanism capable of operation during anticipated operational occurrences.
7. The specified codes and standards establish requirements for construction of the applicable portions of the CRDS. The individual components of the CRDS must be designed, fabricated, installed, and tested to quality standards commensurate with the importance of the safety function to be performed by that component. The individual codes and standards each provide a set of applicable limits that the design must meet in order to ensure that the applicable component can carry out its designated safety function.

III. REVIEW PROCEDURES

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

1. The objectives of the review are to determine that design, fabrication, and construction of the control rod drive mechanisms provide structural adequacy and that suitable life cycle testing programs have been utilized to prove operability under service conditions.
- In the construction permit (CP) review, it should be determined that the design criteria utilize proper load combinations, stress and deformation limits, and that operability assurance is provided by reference to a previously accepted testing program, ~~or that a~~

commitment is made to perform a testing program ~~which~~that includes the essential elements listed below. In the operating license (OL) review, the results of any testing program not previously reviewed should be evaluated.

2. The design criteria presented should be evaluated for ~~both~~ the internal pressure-containing portions and other portions of the CRDS. ~~These include,~~ including the CRDM housing, the hydraulic control unit, the condensate supply system and scram discharge volume, and portions such as the cylinder, tube, piston, and collect assembly.

Of particular ~~concern~~interest are any new and unique features ~~which~~that have not been used in the past. Pressure-containing components are checked to ensure that they meet the design requirements of the codes and criteria ~~which~~that have been accepted ~~by the Mechanical Engineering Branch,~~ and are identified in ~~Standard Review Plan~~SRP Section 3.2.2. The review of the functional design of reactivity control systems, including control rod drive systems, is ~~the responsibility of the Reactor Systems Branch (RSB) (see SRP Section 4.6)~~performed as part of the review of SRP Section 4.6. The loading combinations for the various plant operating conditions are ~~checked for consistency with Reference 12~~reviewed as part of the review of SRP Section 3.9.3; given these loading combinations, the stress limits of the appropriate code should not be exceeded, or the limits in ~~Reference 12~~SRP Section 3.9.3 should not be exceeded if limits are not specified in the listed design code. ~~Exceptions taken by the applicant to any of the accepted codes, standards, or NRC criteria must be identified and the basis clearly justified so that evaluation is possible. Engineering judgment, experience, comparisons with earlier cases and design margins, and consultation with supervisors permit the reviewer to reach a decision on the acceptability of any exceptions posed by the applicant~~

For BWR control rod drive systems that include a scram discharge volume system, the reviewer verifies that the system piping design meets or exceeds the acceptable owner's group classifications and criteria discussed in the enclosure to Generic Letter 86-01 (Reference 13) to ensure that breaks and through wall cracks in the piping need not be postulated. The reviewer also verifies that acceptable commitments are made regarding associated inspections, periodic visual verification of the scram system piping integrity, and actions in response to detected leakage to adequately address prevention and mitigation of the effects of leakage associated with potential failures of this piping.

For BWR control rod drive systems that include a control rod drive return line, the reviewer verifies acceptable commitments for the return line design and its implementation in accordance with Generic Letter 80-95 (Reference 12) and Part II, Section 8 of NUREG-0619 (Reference 11).

The choice of structural materials of construction for the CRDS is reviewed ~~by the MTEB in SRP~~in SRP Section 4.5.1.

3. Loading combinations are defined as those loadings associated with plant operations ~~which~~that are expected to occur one or more times during the lifetime of the plant and include ₃ but are not limited to ₃ loss of power to all recirculation pumps, tripping of the

turbine generator set, isolation of the main condenser, and loss of all offsite power, combined with loadings caused by natural or accident events including, ~~for BWRs,~~ water hammer loads for BWRs. The load combinations ~~which that~~ are postulated to occur are specified for each of the design and service conditions as defined in Paragraph NB-3113 of the ASME Code ~~(Ref. 7)~~. These load combinations are defined in Reference 12 and are compared by the reviewer with those provided by the applicant. SRP Section 3.9.3 and are part of the review.

- = The design stress limits, including fatigue limits, and deformation limits ~~as~~ appropriate to the components of the control rod drive mechanism, ~~are~~ compared ~~by to~~ the reviewer with those limits of specified codes, previously designed and successfully operating systems, ~~or with~~ the results of scale model and prototype testing programs.
- 4. = The control rod drive mechanisms of a new design or configuration should be subjected to a life cycle test program to determine the ability of the ~~drives~~ drive components to function during and after normal ~~operating operation,~~ anticipated operational occurrences, seismic events, and postulated accident conditions ~~over the full range of temperatures, pressures, loadings, and misalignment expected in service~~ in service. The tests should include functional tests to determine ~~times of rod insertion and withdrawal times,~~ latching operation, scram operation and time, system valve operation and scram accumulator leakage for hydraulic CRODS, ability to overcome a stuck rod condition, and wear. Rod travel and number of operational trips and test trips expected during the mechanism operational life should be duplicated in the tests.
- = The reviewer checks the elements of the test program to be sure all required parameters have been included, ~~and~~ finally reviews the test results to determine acceptability. Excessive wear, malfunction of components, operating times beyond determined limits, scram accumulator leakage, etc., ~~all would be cause for retesting.~~
- 5. For reviews of COL applications under 10 CFR Part 52, the reviewer should follow the above procedures to verify that the design set forth in the safety analysis report and, if applicable, site interface requirements meet the acceptance criteria. For design certification applications, the reviewer should identify necessary combined license action items. Following this review, SRP Section 14.3 should be followed for the review of Tier I information for the design, including the postulated site parameters, interface criteria, and ITAAC. With respect to COL applications, the scope of the review is dependent on whether the COL applicant references a design certification, and ESP or other NRC-approved material.

IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided to satisfy the requirements of this SRP section and that ~~his the~~ evaluation is sufficiently complete and adequate to support conclusions of the following type, to be included in the staff's safety evaluation report:

= In sum:

1. The applicant has met the requirement of GDC 1 and 10 CFR Part 50, §50.55a, with respect to designing components important to safety to quality standards commensurate with the importance of the safety functions to be performed. The design procedures and criteria used for the control rod drive system are in conformance with the requirements of appropriate ANSI and ASME Codes.
2. The applicant has met the requirements of GDC 2, 14, and 26 with respect to designing the control rod drive system to withstand effects of earthquakes and anticipated conditions of normal operation, including anticipated operational occurrences, with adequate margins to assure its the system's reactivity control function and with extremely low probability of leakage or gross rupture of the reactor coolant pressure boundary. ~~The CRDS design capabilities include the ability to accommodate water hammer dynamic loads resulting from rapid opening of the scram insert and withdraw valves and closure of the hydraulic buffer under the worst case loading condition without compromising the safety functions of the system.~~ The specified design transients, design and service loadings, combination of loads, and limiting the resulting stresses and deformations under such loading combinations are ~~in conformance with the requirements of appropriate ANSI and ASME Codes and acceptable regulatory positions specified in~~ reviewed within SRP Section 3.9.3.
3. The applicant has met the requirements of GDC 27 and 29 with respect to designing the control rod drive system to assure its capability of controlling reactivity and cooling the reactor core with appropriate margin in conjunction with either the emergency core cooling system or the reactor protection system. The operability assurance program is acceptable with respect to meeting system design requirements in observed performance as to wear, functioning times, latching, and overcoming a stuck rod.

Accordingly, The staff concludes that the design of the control rod drive system is acceptable and meets the requirements of General Design Criteria 1, 2, 14, 26, 27, and 29, and 10 CFR 50.55a.

For design certification and combined license reviews, the findings will also summarize (to the extent that the review is not discussed in other safety evaluation report sections) the staff's evaluation of the ITAAC, including design acceptance criteria (DAC), as applicable, and interface requirements and combined license action items relevant to this SRP section.

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

The staff will use this SRP section in performing safety evaluations of design certifications and license applications submitted by applicants pursuant to 10 CFR Part 50 or 52. Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission’s regulations, the method described herein will be used by the staff in its evaluation of 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. Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides and implementation of acceptance criterion associated with water hammer loads in BWRs, subsection II.3, is as follows.

- ~~(a) — Operating plants and OL applicants need not comply with the provisions of this revision.~~
- ~~(b) — GP applicants will be required to comply with the provisions of this revision.~~

and in References 1, 11, and 12.

VI. REFERENCES

1. 10 CFR 50.55a, “Codes and Standards.”
2. 10 CFR Part 50, Appendix A, General Design Criterion 1, “Quality Standards and Records.”
23. 10 CFR Part 50, Appendix A, General Design Criterion 2, “Design Bases for Protection Against Natural Phenomena.”
34. 10 CFR Part 50, Appendix A, General Design Criterion 14, “Reactor Coolant Pressure Boundary.”
45. 10 CFR Part 50, Appendix A, General Design Criterion 26, “Reactivity Control System Redundancy and Capability.”
56. 10 CFR Part 50, Appendix A, General Design Criterion 27, “Combined Reactivity Control Systems Capability.”
67. 10 CFR Part 50, Appendix A, General Design Criterion 29, “Protection Against Anticipated Operational Occurrences.”
- ~~7. ASME Boiler and Pressure Vessel Code, Sections III and VIII, American Society of Mechanical Engineers.~~
- 8.8. Regulatory Guide 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants.”
9. Regulatory Guide 1.29, “Seismic Design Classification.”

10. ~~Regulatory Guide 1.48, "Design Limits and Loading Combinations for Seismic Category I Fluid System Components."~~
11. ~~Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear~~ NUREG-0619, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking," November 1980.
11. NRC Letter to BWR Applicants and Licensees, "Final Edition of NUREG-0619, 'BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking' (Generic Letter No. 80-95)," November 13, 1980.
12. NRC Letter to BWR Applicants and Licensees, "Safety Concerns Associated with Pipe Breaks in the BWR Scram System (Generic Letter No. 86-01)," January 3, 1986.
13. ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plants."
- ~~12. Standard Review Plan Section 3.9.3, "ASME Code Class 1, 2, and 3 Components, Component Supports, and Core Support Structures."~~
- ~~13. Plant Components," and Section VIII, Division 1, "Pressure Vessels," American Society of Mechanical Engineers.~~
14. ANSI B 16.5, "Steel Pipe Flanges and Flanged Fittings," American National Standard Institute.
- ~~14~~15. ANSI B 16.9, "Wrought Steel Butt Welding Fittings," American National Standard Institute.
- ~~15~~16. ANSI B 16.11, "Steel Forged Steel Fittings-Steel Welding, Socket-Welding and Threaded," American National Standard Institute.
- ~~16~~17. ANSI B 16.25, "Butt Welding Ends -Pipe- Pipe, Valves, Flanges, and Fittings," American National Standard Institute.-
- ~~17~~18. ANSI B 16.34, "Steel Valves with Flanged and Butt Welding Ends," American Society of Mechanical Engineers.
19. ANSI B 31.1, "Power Piping," American National Standard Institute.
- ~~18~~20. MSS-SP-25, "Marking for Valves, Fittings, Flanges, and Unions," Manufacturers Standardization Society.
- ~~19. ANSI B 16.34, "Steel Valves with Flanged and Butt Welding Ends," American Society of Mechanical Engineers.-~~

PAPERWORK REDUCTION ACT STATEMENT

The information collections contained in the draft Standard Review Plan are covered by the requirements of 10 CFR 50.54, which were approved by the Office of Management and Budget (OMB), approval number 3150 - 0011.

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.

Description of Changes

The following summarizes the changes in Revision 3, dated xxxxxx 2006.

1. General changes included editorial and formatting changes. Note: minor editorial and formatting changes are not identified by side bars.
2. Standard language was added throughout the SRP section to extend the applicability licensing and design certification reviews submitted under 10 CFR Part 52.
3. Specific changes include:
 - a. Identification of Generic Letter 86-01 "Implementation of Fire Protection Controls" and related changes to address review of BWR CRDS scram discharge volume piping.
 - b. Identification of Generic Letter 80-95 to implement NUREG-0619, "BWR Feedwater Nozzle and Contract Rod Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10 (Technical Report)," and related changes for review of the adequacy of BWR control rod drive return lines.

REVIEW RESPONSIBILITIES

Editorial changes to reflect the review responsibilities by functional area. The organizational review responsibilities are maintained in the NRR Office Instruction LIC-200, Standard Review Plan.

I. AREAS OF REVIEW

- A. Editorial changes, consistent with the SRP-UDP specified format, to identify review interfaces with other SRP sections, and to clarify review interface with SRP Section 4.2. Newly identified interfaces include:
 1. review of CRDS classification and quality standards in SRP Section 3.2.2
 2. review of BWR CRDS piping located inside containment with respect to locations and effects of postulated CRDS piping failures in SRP Section 3.6.2
 3. review of the fuel system design, including effects of the CRDS on fuel behavior in SRP Section 4.2
 4. the functional design review of the reactivity control systems, including the CRDS and its design for protection against the effects of postulated piping and equipment failures in SRP Section 4.6

5. review of bolting and threaded fastener programs under new SRP Section 3.13
6. review of material aspects of CRDS under SRP Section 4.5.1
7. review of service conditions and environments under SRP Section 3.11
8. review of postulated piping failures under SRP Section 3.6.2
9. review of the structural integrity of Code Class 1, 2, and 3 components, component supports, and core support structures under SRP Section 3.9.3

II. ACCEPTANCE CRITERIA

- A. Revised ANSI standards titles for consistency with referenced documents
- B. Revised event categorizations and descriptions to be consistent with 10 CFR Part 50 and the General Design Criteria which separate anticipated operational occurrences from normal operation
- C. Technical rationales were developed and added (associated with 10 CFR 50.55a, GDC 1, 2, 14, 26, 27, and 29)

III. REVIEW PROCEDURES

- A. Editorial changes to be consistent with current staff reviews of life cycle testing programs
- B. Added review procedures to address BWR control rod drive systems that include a scram discharge volume system per experience reflected in Generic Letter 86-01
- C. Added review procedures to address BWR control rod drive systems that include a control rod drive return line per experience reflected in Generic Letter 80-95

IV. EVALUATION FINDINGS

None

V. IMPLEMENTATION

- A. Deleted the outdated implementation guidance from Section V of SRP Section 3.9.4, Revision 2 - April 1984, associated with water hammer loads in BWRs

VI. REFERENCES

A. Rearranged references, added or deleted applicable and no longer applicable references