U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

3.2.2 SYSTEM QUALITY GROUP CLASSIFICATION

REVIEW RESPONSIBILITIES

Primary - Organization responsible for the review of the deterministic quality group classification of fluid systems

Secondary - Organizations responsible for the design review of mechanical systems and components.

I. AREAS OF REVIEW

Nuclear power plant systems and components important to safety should be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed. Described herein is an acceptable deterministic approach to classify fluid systems important to safety and identify their applicable construction codes and standards depending on the system or component function and relative importance to safety. An alternative approach identified in 10 CFR 50.69 is a risk-informed categorization process that applies industry guidelines for categorizing Systems, Structures, and Components (SSCs) according to a risk-informed safety class. The risk-informed approach described in Regulatory Guide (RG) 1.176 and RG 1.201 is optional and subject to the limitations of 10 CFR 50.69. Successful application of an acceptable risk-informed categorization approach depends on a high quality PRA and an approved method to assign applicable codes and standards. Considering that RG 1.201 currently is to be used only as interim guidance for trial use and that an acceptable risk-informed method to assign applicable codes and standards to a risk-informed safety class does not exist, this SRP section does not include criteria for reviewing a risk-informed categorization approach.

The specific areas of review are as follows:

1. The applicant's classification system for pressure-retaining components such as pressure vessels, heat exchangers, storage tanks, pumps, piping, and valves in fluid systems important to safety, and the applicant's assignment of quality groups to those portions of systems necessary to perform safety functions. Excluded from this review are: structures; internal parts of mechanical components such as shafts, seals, impellers, packing, and gaskets; fuel, electrical, and instrumentation systems; electrical valve actuation devices; and pump motors.

2. The applicant's data, presented in the safety analysis report (SAR) in the form of a table that identifies the fluid systems important to safety; the system components such as pressure vessels, heat exchangers, storage tanks, pumps, piping, and valves; the associated quality group classification, applicable American Society for Chemical Engineers (ASME) Code and code class (see Reference 15); and the quality assurance criteria. In addition, the review includes the applicant's presentation, on suitable piping and instrumentation diagrams, of the system quality group classifications.

3. 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.

4. COL Action Items and Certification Requirements and Restrictions. COL action items may be identified in the NRC staff's final safety evaluation report (FSER) for each certified design to identify information that COL applicants must address in the application. Additionally, DCs contain requirements and restrictions (e.g., interface requirements) that COL applicants must address in the application. For COL applications referencing a DC, the review performed under this SRP section includes information provided in response to COL action items and certification requirements and restrictions pertaining to this SRP section, as identified in the FSER for the referenced certified design.

Review Interfaces

The listed SRP sections interface with this section as follows:

1. The acceptability of the seismic classification of system components is determined in accordance with SRP Section 3.2.1. The seismic classification information may be combined and/or cross-referenced with the quality group classification information reviewed in this SRP section to minimize repetition of similar information (e.g., tables or lists of components, system drawings, etc.).

2. The systems and components important to safety that are designated as Quality Groups A, B, C, or D items are verified to determine if they are constructed in accordance with the regulatory guides, industry codes, and standards that are referenced in SRP Sections 3.2.1, 3.9.1 through 3.9.3, and 3.11.

3. The adequacy of the qualification and inservice testing program for pumps and valves is determined in accordance with SRP Section 3.9.6.

4. The seismic qualification of equipment is assessed in accordance with SRP 3.10.

5. The quality group classification of systems and components comprising the reactor coolant pressure boundary (RCPB) is reviewed and the adequacy of proposed RCPB construction codes and code cases is determined, as part of the staff's primary review responsibility for SRP Sections 5.2.1.1 and 5.2.1.2.

In addition, the staff will coordinate evaluations that interface with the overall review of system safety and quality group classification as follows:

1. The staff reviews system and component safety and quality group classifications, application of the quality assurance program, and codes and standards applicability in accordance with criteria and methods contained in the SRP sections corresponding to the review of the particular systems.

2. Specific information or assistance may be necessary to review electrical and instrumentation systems needed for functioning of plant features important to safety.

3. The staff determines the adequacy of the inservice inspection programs for the RCPB and for ASME Code Class 2 and 3 components, as part of the primary review responsibilities for SRP Sections 5.2.4 and 6.6.

4. The staff verifies that all items are addressed under the QA program consistent with their importance to safety, as part of the staff's primary review responsibilities for SRP Section 17.5.

For those areas of review identified above as being part of the review conducted under other SRP sections, the acceptance criteria necessary for the review and the methods of their application are contained in the referenced SRP sections.

II. ACCEPTANCE CRITERIA

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

1. 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 1 and 10 CFR Part 50, §50.55a, as they relate to structures, systems, and components important to safety being designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed.

To meet the requirements of GDC 1 and 10 CFR Part 50, §50.55a, the following regulatory guide is used:

1. RG 1.26, "Quality Group Classification and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants." This guide describes an acceptable method for determining quality standards for Quality Group B, C, and D water- and steam-containing components important to safety of water-cooled nuclear power plants.

SRP Acceptance Criteria

Specific SRP acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are as follows for review described in Subsection I of 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.

Technical Rationale

The technical rationale for application of the above acceptance criteria to the review of system quality group classification is discussed in the following paragraph:

GDC 1 and 10 CFR 50.55a require that systems and components be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety function to be performed. 10 CFR 50.55a also incorporates by reference the applicable editions and addenda of the ASME Boiler and Pressure Vessel Code. RG 1.26 establishes an acceptable method for complying with these requirements by classifying fluid systems and components important to safety and applying corresponding quality codes and standards to such systems and components. Fluid systems important to safety may perform any of the following functions: fission product containment, core cooling, reactor shutdown, reactivity control, post-accident containment heat removal, post-accident containment atmosphere cleanup, post-accident fission product removal, residual heat removal from the reactor and/or from the spent fuel storage pool, and containment of radioactive materials. Portions of fluid systems which provide cooling or heating, sealing, lubrication, fuel, motive power, isolation, flood protection, or leakage detection necessary to support accomplishment of any of the above functions are also considered important to safety. Application of 10 CFR 50.55a and GDC 1 provides assurance that established standard practices of proven or demonstrated effectiveness are used to achieve a high likelihood that these safety functions will be performed and that the codes and standards applied are commensurate with the importance to safety of these functions.

III. REVIEW PROCEDURES

The staff assists in reviews of such systems and coordinates the overall review to ensure that all fluid systems and components important to safety are acceptably classified and that appropriate quality assurance measures, including construction codes and standards, are applied with respect to the criteria presented in this SRP section. In Staff Requirements

Memoranda (SRM) dated July 21, 1993, the Commission approved the staff's position that the staff will review new applications using the newest codes and standards that have been endorsed by the NRC. Unapproved editions will be reviewed on a case-by-case basis.

Selection and emphasis of various aspects of the areas covered by this SRP section will be made by the reviewer on each case. The reviewer's judgement with respect to the areas to be given attention during the review is to be based on an inspection of the material presented, on the similarity of the material to that recently reviewed for other plants, and on whether items of special safety significance are involved.

1. Section 50.55a of 10 CFR Part 50 identifies those ASME Section III, Code Class 1 components of light-water-cooled reactors important to safety that are part of the RCPB. The detailed review of these components is conducted by the reviewer under other SRP sections as described in subsection I. These components are designated in RG 1.26 as Quality Group A. In addition, RG 1.26 identifies, on a functional basis, water- and steam-containing components of those systems important to safety that are designated as Quality Groups B and C. Quality Group D applies to water- and steam-containing components of systems that are less important to safety. An applicant may use the NRC Group Classification system identified in RG 1.26 or, alternately, the corresponding ANS classification system of Safety Classes if they are cross-referenced with the classification groups in RG 1.26. There are also systems of light-water-cooled reactors important to safety that are not identified in RG 1.26 for which there are established staff positions regarding quality group classification. These systems, and references establishing their acceptable classifications, are identified in Appendix C.

2. The information supplied in the application identifying fluid systems important to safety is reviewed for completeness, and the quality group classification, ASME Code and code class, and quality assurance criteria of each individual major component are checked for compliance with the above criteria. The various modes of system operation are checked to ensure that the assigned NRC quality groups are acceptable.

3. The piping and instrumentation diagrams are reviewed to ensure that the applicant has delineated in detail the system quality group classification boundaries for systems important to safety. Changes in quality group classification are considered to be acceptable normally only at valve locations, with the valve assigned the higher classification. A change in quality group classification with no valve present is normally considered acceptable only when it can be demonstrated that the safety function of the system is not impaired by a failure on the lower-classification side of the boundary.

The following fluid systems important to safety for pressurized water reactor (PWR) and boiling water reactor (BWR) plants are examples of those that are reviewed by the staff with regard to quality group classification. Typical PWR and BWR system names are provided below, based on historical staff reviews of prior applications. It should be noted that systems whose function is important to safety in accordance with RG 1.26 and that are used in passive system LWR designs or non-LWR designs may not be identified by these names.

FLUID SYSTEMS IMPORTANT TO SAFETY FOR PWR PLANTS

Auxiliary Feedwater System
Boron Thermal Regeneration System[1,2]
Boron Recycle System[1,2]
Chemical and Volume Control System
Combustible Gas Control System[1,6]
Compressed Air System[1,2,6]
Condensate Storage System[1]
Containment Cooling System
Containment Isolation System[6]
Containment Purge System
Containment Spray System
Emergency Core Cooling System
Emergency Diesel Engine Fuel Oil Storage and Transfer System[6]
Emergency Diesel Engine Cooling Water System
Emergency Diesel Engine Starting System
Emergency Diesel Engine Lubrication System
Emergency Diesel Engine Combustion Air Intake and Exhaust System
Equipment and Floor Drainage System[2,6]
Feedwater System[3]
Main Steam System[3]
Pressurizer Power-Operated Relief Valves (PORVs) (including associated components and block valves)[6]
Process and Post-Accident Sampling Systems[3]
Reactor Auxiliary Cooling Water Systems (e.g., Component Cooling Water and Essential Chilled WaterSystems)[2]
Reactor Coolant System
Refueling Water Storage System[2]
Residual Heat Removal System
Spent Fuel Pool Cooling and Cleanup System[2,4]
Station Service Water System[2]
Steam Generator Blowdown System[3]
Ultimate Heat Sink and Supporting Systems[6]
Ventilation Systems for Areas such as Control Room and Engineered Safety Features Rooms[6]

FLUID SYSTEMS IMPORTANT TO SAFETY FOR BWR PLANTS

Combustible Gas Control System[6]
Compressed Air System[1,2,6]
Condensate Storage System[2]
Control Rod Drive Hydraulic System[2]
Containment Cooling System
Containment Isolation System[6]
Emergency Core Cooling Systems
Emergency Diesel Engine Fuel Oil Storage and Transfer System[6]
Emergency Diesel Engine Cooling Water System
Emergency Diesel Engine Starting System
Emergency Diesel Engine Lubrication System
Emergency Diesel Engine Combustion Air Intake and Exhaust System
Equipment and Floor Drainage System[2,6]
Feedwater System (up to outermost containment isolation valve or shutoff valve, as applicable)
Fuel Pool Cooling and Cleanup System[2,4]
Main Steam System (up to but not including the turbine)
Main Steam Isolation Valve Leakage Control System[6]
Nuclear Boiler System
Process and Post-Accident Sampling Systems[3]
Reactor Auxiliary Cooling Water Systems (e.g., Essential Cooling Water and Chilled Water Systems)[2]
Reactor Core Isolation Cooling System
Reactor Recirculation System
Reactor Water Cleanup System
Relief Valve Discharge Piping[5]
Residual Heat Removal (RHR) System
RHR Service Water System
Standby Gas Treatment System[6]
Standby Liquid Control System
Station Service Water System[2]
Ultimate Heat Sink and Supporting Systems[6]
Ventilation Systems for Areas such as Control Room and Engineered Safety Features Rooms[6]

Clarification of the quality group classification provided in RG 1.26 and applicable to those portions of BWR main steam and feedwater systems (other than the reactor coolant pressure boundary) on the turbine side of the containment isolation valves, is provided in Appendices A and B, attached to this SRP section.

Additional guidance on the quality group classification of systems and components important to safety for typical plant designs is provided in Appendix C attached to this SRP section. Appendix C identifies quality group classifications and related references supplemental to the guidance of RG 1.26 for the classification of system components.

Table 3.2.2-1 attached to this SRP section provides a summary of the construction Codes and Standards for components of water-cooled nuclear power plants and is based on the NRC quality group classification system in RG 1.26. Appendix C identifies additional guidance regarding the construction of certain systems and components.

In the event an applicant intends to take exception to RG 1.26 and has not provided adequate justification for the proposed quality group classification, questions are prepared by the staff that may entail additional documentation or an analysis to establish an acceptable basis for the proposed quality group classification. Staff comments may also be prepared requesting clarification, in order to ensure a clear understanding of the quality group classifications assigned to a system by the applicant.

Exceptions and alternatives to the specified quality group classifications of RG 1.26 or the guidance identified in Appendix C are acceptable only if application of an "equivalent quality level" is justified. In such cases, justification can be demonstrated if: the component is classified to meet the criteria of a higher group classification than specified in RG 1.26 or alternative design rules are based on the use of a more conservative design; the extent of component nondestructive examination is equal to or greater than the provisions of the specified code; and the quality assurance requirements of Appendix B, 10 CFR Part 50 are met.

For standard design certification reviews under 10 CFR Part 52, the procedures above should be followed, as modified by the procedures in SRP Section 14.3 (proposed), to verify that the design set forth in the standard safety analysis report, including ITAAC, site interface requirements and combined license action items, meet the acceptance criteria given in subsection II. SRP Section 14.3 (proposed) contains procedures for the review of certified design material (CDM) for the standard design, including the site parameters, interface criteria, and ITAAC.

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1 For some plants this system may be non-safety-related, providing it is quality group classified consistent with the positions of RG 1.26.
2 Portions of the system that perform a safety-related function.
3 Portions of the system to outermost containment isolation valve.
4 Includes makeup water systems as described in SRP Section 9.1.3.
5 Refers to the relief valves providing RCPB overpressure protection.
6 See Appendix C for supplemental classification guidance.

IV. EVALUATION FINDINGS

The staff's review should verify that adequate and sufficient information is contained in the SAR and its revisions to arrive at a conclusion of the following type, which is to be included in the staff's safety evaluation report:

1. Pressure-retaining components of fluid systems important to safety such as pressure vessels, heat exchangers, storage tanks, pumps, piping and valves have been classified Quality Group A, B, C, or D and have been identified in an acceptable manner in Table 3.X.X and on system piping and instrumentation diagrams in the SAR. These components have been constructed to quality standards commensurate with the importance of the safety function to be performed. The review of Quality Group A and B (ASME Section III, Class 1 and 2) reactor coolant pressure boundary components is discussed in Section 5.2.1.1 of the SER. Other Quality Group B components of systems identified in Position C.1.a through C.1.e of RG 1.26 are constructed to ASME Section III, Class 2. Components in systems identified in Position C.2.a through C.2.d of RG 1.26 are constructed to Quality Group C standards, ASME Section III, Class 3. Components in systems identified in Position C.3 of RG 1.26 are constructed to Quality Group D standards such as ASME Section VIII and ANSI B31.1.

2. The staff concludes that pressure-retaining components of fluid systems important to safety have been properly classified as Quality Group A, B, C, or D items and meets the requirements of General Design Criterion 1, "Quality Standards and Records." This conclusion is based on the applicant having met the requirements of General Design Criterion 1 by having properly classified these pressure-retaining components important to safety Quality Group A, B, C, or D in accordance with the positions of RG 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," and by the staff's conclusion that the identified pressure-retaining components are those necessary (1) to prevent or mitigate the consequences of accidents and malfunctions originating within the reactor coolant pressure boundary, (2) to permit shutdown of the reactor and maintain it in a safe shutdown condition, and (3) to contain radioactive materials.

For DC and COL reviews, the findings will also summarize (to the extent that the review is not discussed in other SER sections) the staff's evaluation of the ITAAC, including design acceptance criteria, 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 plan for using this SRP section.

This SRP section will be used by the staff when performing safety evaluations of license applications submitted by applicants pursuant to 10 CFR Part 50 or 10 CFR Part 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 six 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 regulations, Regulatory Guides, Appendices attached to this SRP section, and in documents referenced therein.

VI. REFERENCES

1. 10 CFR Part 50, §50.55a, "Codes and Standards."

2. 10 CFR Part 50, Appendix A, General Design Criterion 1, "Quality Standards and Records."

3. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

4. Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants."

5. Regulatory Guide 1.84, "Design and Fabrication Code Case Acceptability ASME Section III Division 1."

6. Regulatory Guide 1.85, "Materials Code Case Acceptability ASME Section III Division 1."

7. Appendix A, "Classification of Main Steam Components Other Than the Reactor Coolant Pressure Boundary for BWR Plants," attached to this SRP section.

8. Appendix B, "Classification of BWR/6 Main Steam and Feedwater Components Other Than the Reactor Coolant Pressure Boundary," attached to this SRP section.

9. Appendix C, "Additional Guidance for Classification of Systems and Components and Application of Quality Standards," attached to this SRP section.

10. ANSI/ASME B16.34, "Valves - Flanged, Threaded, and Welding End," American National Standards Institute.

11. ANSI/ASME B31.1, "Power Piping," American National Standards Institute.

12. ANSI B96.1, "Specification for Welded Aluminum-Alloy Field-Erected Storage Tanks," American National Standards Institute.

13. API Standard 620, Sixth Edition, "Recommended Rules for Design and Construction of Large, Welded, Low-Pressure Storage Tanks," American Petroleum Institute.

14. API Standard 650, Sixth Edition, Revision 1, "Welded Steel Tanks for Oil Storage," American Petroleum Institute.

15. ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components," American Society of Mechanical Engineers.

16. ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, "Pressure Vessels," American Society of Mechanical Engineers.

17. AWWA D100-79, "AWWA Standard for Steel Tanks-Standpipes, Reservoirs, and Elevated Tanks for Water Storage," American Water Works Association.

18. Regulatory Guide 1.176, “An Approach for Plant-Specific, Risk-Informed Decisionmaking: Graded Quality Assurance.”

19. Regulatory Guide 1.201, “Guidelines for Categorizing Structures, Systems and Components in Nuclear Power Plants, According to their Safety Significance.”

20. 10 CFR 50.69, “Risk-informed categorization and treatment of structures, systems and components for nuclear power reactors.”

21. SRM July 21, 1993, SECY 93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light Water Reactor (ALWR) Designs," April 4, 1993.

TABLE 3.2.2-1

SUMMARY OF CONSTRUCTION[1] CODES AND STANDARDS FOR COMPONENTS OF WATER-COOLED NUCLEAR POWER PLANTS BY NRC QUALITY CLASSIFICATION SYSTEM[2]

	NRC Quality Classification System			
Components	**Quality Group A**	**Quality Group B**	**Quality Group C**	**Quality Group D**
Pressure Vessels	ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NB -Class 1, Nuclear Power Plant Components [3,4]	ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NC -Class 2, Nuclear Power Plant Components[3,4]	ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection ND -Class 3, Nuclear Power Plant Components [3,4]	ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.
Piping	As above	As above	As above	ANSI B31.1 Power Piping
Pumps	As above	As above	As above	Manufacturers standards.
Valves	As above	As above	As above	ANSI B31.1 Power Piping and ANSI B16.34
Atmospheric Storage Tanks	Not applicable	As above	As above	API-650, AWWA D100, or ANSI B96.1
0-15 psig Storage Tanks	Not applicable	As above	As above	API-620
Supports	As above except Subsection NF	As above except Subsection NF	As above except Subsection NF	Manufacturers standards
Metal Containment Components	Not applicable	As above except Subsection NE, Class MC	Not applicable	Not applicable
Core Support Structures	Not applicable	As above except Subsection NG	Not applicable	Not applicable

NOTES:

1 As defined in Sub-subarticle NCA-1110 of Section III, of the ASME Boiler and Pressure Vessel Code, construction is an all-inclusive term comprising materials, design, fabrication, examination, testing, inspection, and certification necessary in the manufacture and installation of components.

2 As defined in Regulatory Guide 1.26, the NRC Quality Classification System identifies, on a functional basis, components of fluid systems by Quality Groups A, B, C, and D.

3 See Section 50.55a, "Codes and Standards," of 10 CFR Part 50 for requirements with regard to the Code Edition and Addenda to be applied.

4 The specific applicability of ASME Code Cases is covered separately in SRP Section 5.2.1.2, Regulatory Guides 1.84 and 1.85, or in Commission regulations, where appropriate. Applicants proposing the use of ASME Code Cases not covered by these SRP and Regulatory Guides should receive approval from the Commission prior to their use and should demonstrate that an acceptable level of quality and safety would be achieved.

APPENDIX A*

CLASSIFICATION OF MAIN STEAM COMPONENTS OTHER THAN THE REACTOR COOLANT PRESSURE BOUNDARY FOR BWR PLANTS

A. BACKGROUND

A pipe classification of "D + QA" for main steam line components of BWR plants was proposed by the General Electric Company in 1971 as an alternative to Quality Group B and has been accepted by the staff in a number of licensing case reviews.

However, a number of potential problems which are applicable to main steam lines of BWR plants have been identified. These problems relate to postulated breaks in high-energy fluid-containing lines outside the containment. The criteria pertaining to protection necessary for structures, systems, and components outside containment from the effects of postulated pipe breaks, as described in Appendix C to Branch Technical Position SPLB 3-1 (attached to SRP Section 3.6.1), reference ASME Section III, Class 2, which corresponds to NRC Quality Group B.

ASME Code Section XI contains in-service inspection criteria for Class 2 components. Steam lines classified as "D + QA" could be interpreted to be exempt from these inspection criteria. Such interpretations would be contrary to the intent of the code and inconsistent with requirements of the NRC Codes and Standards rule, Section 50.55a of 10 CFR Part 50.

Furthermore, the applicability of the following NRC Regulatory Guides, Standard Review Plan section, and Regulations, as they relate to ASME Section III, Class 2 components, is not always clearly identified or implemented in case applications wherever "D + QA" classification is adopted:

1. SRP Section 3.9.3, "ASME Code Class 1, 2, and 3 Components, Component Supports, and Core Support Structures."

2. Regulatory Guide 1.26, "Quality Group Classifications and Standards."

3. 10 CFR Part 50, §50.55a, "Codes and Standards for Nuclear Power Plants."

4. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants."

In view of the foregoing, we find it necessary to clarify the quality group classification criteria for main steam components for BWR plants.

B. BRANCH TECHNICAL POSITION

The main steam line components of BWR plants should conform to the criteria listed in items 1 through 5 of the attached Table A-1. BWRs that do not include a main steam isolation valve leakage control system or main steam line shutoff valves and that credit fission product hold-up and retention in main steam piping and/or the condenser to address main steam isolation valve

* Formerly BTP RSB No. 3-1

leakage in analyses of accident radiological consequences, should also conform to the criteria specified in item 6 of Table A-1 (Reference 5). Figure A-1 illustrates acceptable quality group and seismic classifications for BWR main steam piping and components.

C. REFERENCES

1. 10 CFR Part 50, Section 50.55a, "Codes and Standards."

2. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

3. Regulatory Guide 1.26, "Quality Group Classification and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants."

4. Branch Technical Position SPLB 3-1, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment," attached to SRP Section 3.6.1.

5. SRM July 21, 1993, SECY 93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light Water Reactor (ALWR) Designs," April 4, 1993.

6. Letter of March 22, 1973, J. A. Hinds to J. M. Hendrie.

7. Letters of August 13, 1973 and November 26, 1973, J. M. Hendrie to J. A. Hinds.

8. ANSI/ASME B31.1, "Power Piping," American National Standards Institute (1973).

9. ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components," and Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," American Society of Mechanical Engineers.

10. GEZ-4982A, "General Electric Large Steam Turbine - Generator Quality Control Program."

Table A-1

CLASSIFICATION REQUIREMENTS FOR BWR MAIN STEAM COMPONENTS OTHER THAN THE REACTOR COOLANT PRESSURE BOUNDARY

Item	System or Component	Classification Quality Group
1.	Main Steam Line from 2nd Isolation Valve to Turbine Stop Valve.	B[4.b,c]
2.	Main Steam Line Branch Lines to First Valve.	B[4.a,b,c]
3.	Main Turbine Bypass Line to Bypass Valve.	B[4.c]
4.	First Valve in Branch Lines Connected to Either Main Steam Lines or Turbine Bypass Lines.	B[4.b,c]
5.	a. Turbine Stop Valves, Turbine Control Valves, and Turbine Bypass Valves.[4.c]	D + QA[1] or Certification[2]
	b. Main Steam Leads from Turbine Control Valves to Turbine Casing.[4.c]	D + QA[1,3] or Certification[2]
6.[4]	a. Main Steam drain lines from 2nd containment isolation valve to the first normally closed valve.	B[4.c]
	b. First normally closed valve outside containment and Main Steam drain line piping to condenser hotwell.	D[4.c]
	c. Condenser anchorages and piping inlet nozzles to the condenser.	See Note 4.c
	d. Steam lines from auxiliary steam shutoff valves and power cycle auxiliary equipment.	D[4.d]

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1 The following criteria should be met in addition to the Quality Group D criteria:

a. All cast pressure-retaining parts of a size and configuration for which volumetric examination methods are effective should be examined by radiographic methods by qualified personnel. Ultrasonic examination to equivalent standards may be used as alternate to radiographic methods.

b. Examination procedures and acceptance standards should be at least equivalent to those specified as supplementary types of examination in ANSI B31.1-1973, Par. 136.4.

2 The following qualification shall be met with respect to the certification criteria:

a. The manufacturer of the turbine stop valves, turbine control valves, turbine bypass valves, and main steam leads from turbine control valves to the turbine casing should utilize quality control procedures equivalent to those defined in General Electric Publication GEZ-4982A, "General Electric Large Steam Turbine - Generator Quality Control Program."

Table A-1 (continued)

b. A certification should be obtained from the manufacturer of these valves and steam leads that the quality control program so defined has been accomplished.

[3] The following criteria should be met in addition to the Quality Group D criteria:

a. All longitudinal and circumferential butt weld joints should be radiographed (or ultrasonically tested to equivalent standards). Where size or configuration does not permit effective volumetric examination, magnetic particle or liquid penetrant examination may be substituted. Examination procedures and acceptance standards should be at least equivalent to those specified as supplementary types of examinations, Paragraph 136.4 in ANSI B31.1-1973.

b. All fillet and socket welds should be examined by either magnetic particle or liquid penetrant methods. All structural attachment welds to pressure retaining materials should be examined by either magnetic particle or liquid penetrant methods. Examination procedures and acceptance standards should be at least equivalent to those specified as supplementary types of examinations, Paragraph 136.4 in ANSI B31.1-1973.

c. All inspection records should be maintained for the life of the plant. These records should include data pertaining to qualification of inspection personnel, examination procedures, and examination results.

[4] Acceptable design and classifications for BWR main steam piping and components, including those comprising main steam isolation valve leakage hold-up and retention paths, as illustrated in Figure A-1, are as follows:

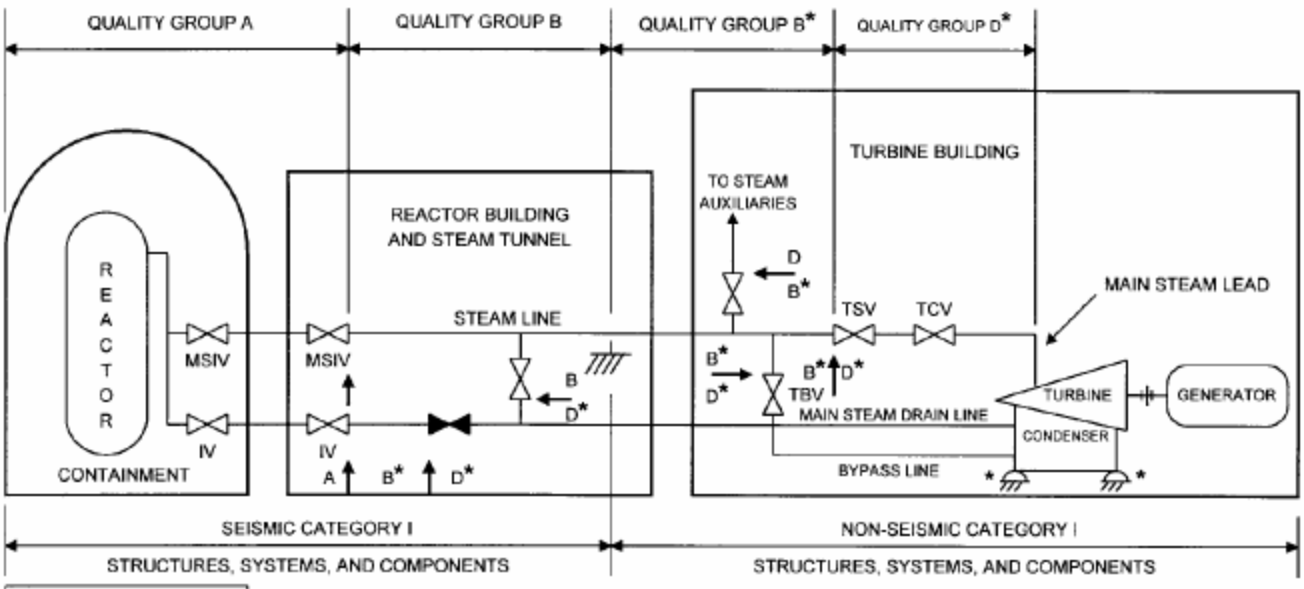
a. The "First Valve" in Table A-1, Item 2 refers to the first normally closed valve.

b. The main steam line piping from the outermost containment isolation valve up to the seismic interface restraint should be classified as seismic Category I, as should connecting branch lines up to the first normally closed valve. The seismic interface restraint should provide a structural barrier between the seismic Category I portions of main steam piping in the reactor building and the non-seismic Category I portions of such piping in the turbine building. The seismic interface restraint should be located inside a seismic Category I building. Main steam line piping from the seismic interface restraint up to, but not including, the turbine stop valve (including branch lines to the first normally closed valve) and steam drain line piping from the outermost containment isolation valve to the condenser hotwell, should be classified and analyzed as described in 4.c below. All pertinent quality assurance requirements of Appendix B to 10 CFR Part 50 apply to the main steam line piping from the seismic interface restraint up to, but not including, the turbine stop valve (including branch lines to the first normally closed valve).

Table A-1 (continued)

c. These components may be classified as nonsafety-related and non-seismic Category I but should be analyzed using a dynamic seismic analysis method to demonstrate structural integrity under safe shutdown earthquake (SSE) loading conditions. The dynamic input for such analyses should be derived from time history analyses of the buildings (e.g., turbine building). Alternate methods, other than a time history approach, used for generating floor response spectra should be submitted for review and approval on a case-by-case basis. The failure of non-seismic Category I components resulting from a seismic event must not cause failure of the main steam piping, main steam drain and bypass lines, or the condenser.

d. These components need not be seismically analyzed as described above.



LEGEND:

	SEISMIC INTERFACE RESTRAINT	TSV	TURBINE STOP VALVE
	CLASSIFICATION BOUNDARY	TCV	TURBINE CONTROL VALVE
	FIRST NORMALLY CLOSED VALVE	TBV	TURBINE BYPASS VALVE
IV	ISOLATION VALVE	*	NON-SEISMIC CATEGORY I, BUT MUST BE DYNAMICALLY ANALYZED FOR SSE
MSIV	MAIN STEAM ISOLATION VALVE	A,B,D	QUALITY GROUP A,B, OR D AS INDICATED

FIGURE A-1

EVOLUTIONARY AND PASSIVE DESIGN BWR MAIN STEAM SYSTEM QUALITY GROUP AND SEISMIC CLASSIFICATION DIAGRAM

Note: (1) The bypass line does not intersect the main steam drain line. The diagram will be revised to reflect this before the issuance of final version of this SRP in March 2007.

APPENDIX B*

CLASSIFICATION OF BWR/6 MAIN STEAM AND FEEDWATER COMPONENTS OTHER THAN THE REACTOR COOLANT PRESSURE BOUNDARY

A. BACKGROUND

At various times, the NRC staff has discussed with the General Electric Company the subject of appropriate classification criteria in boiling water reactor (BWR) plants for main steam system components. These discussions have included consideration of components that are (a) not classified as safety related items but are located downstream of the isolation valves, (b) not specifically designed to seismic Category I standards, and (c) not housed in Seismic Category I structures.

To date, BWR plant reviews have resulted in various approaches for different individual applications. While these different approaches have resulted in acceptable levels of safety in each case, they have necessitated time-consuming case-by-case reviews. The GESSAR (PDA) BWR/6 application, which was reviewed as part of the NRC's standardization program, includes this portion of the BWR plant.

In the course of the GESSAR PDA review, the NRC staff has identified a systematic basis for classification of such components that will result in an acceptable and uniform design basis for the main steam lines (MSL) and feedwater lines (MFL) in BWR/6 plants.

B. BRANCH TECHNICAL POSITION

The main steam and feedwater system components of BWR/6 plants should be classified in accordance with SRP Section 3.2.2, Appendix A, or alternately, in accordance with the attached Table B-1 of SRP Section 3.2.2. The classifications indicated are consistent with the guidelines currently specified in RG 1.26 and RG 1.29.

As an additional criterion, a suitable interface restraint should be provided at the point of departure from the Class I structure where the interface exists between the safety and nonsafety-related portions of the MSL and MFL.

A sketch is attached (Figure B-1) to clarify the specified alternate classification system.

C. REFERENCES

1. Regulatory Guide 1.26, "Quality Group Classification and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants."

2. Regulatory Guide 1.29, "Seismic Design Classification."

3. Letter of April 19, 1974, J. M. Hendrie to J. A. Hinds.

4. ANSI/ASME B31.1, "Power Piping," American National Standards Institute (1973).

5. GEZ-4982A, "General Electric Large Steam Turbine - Generator Quality Control Program."

*Formerly BTP RSB No. 3-2

Table B-1

CLASSIFICATION CRITERIA FOR BWR/6 MAIN STEAM AND FEEDWATER SYSTEM COMPONENTS OTHER THAN THE REACTOR COOLANT PRESSURE BOUNDARY

ITEM	SYSTEM OR COMPONENT	QUALITY GROUP CLASSIFICATION
1.	Main Steam Line (MSL) from second isolation valve to and including shutoff valve.	B
2.	Branch lines of MSL between the second isolation valve and the MSL shutoff valve, from branch point at MSL to and including the first valve in the branch line.	B
3.	Main feedwater line (MFL) from second isolation valve and including shutoff valve.	B
4.	Branch lines of MFL between the second isolation valve and the MFL shutoff valve, from the branch point at MFL to and including the first valve in the branch line.	B
5.	Main steam line piping between the MSL shutoff valve and the turbine main stop valve.	D (1)
6.	Turbine bypass piping.	D
7.	Branch lines of the MSL between the MSL shutoff valve and the turbine main stop valve.	D
8.	Turbine valves, turbine control valves, turbine bypass valves, and main steam leads from the turbine control valves to the turbine casing.	D (1,2) or Certification (3)
9.	Feedwater system components beyond the MFL shutoff valve.	D

(1) All inspection records should be maintained for the life of the plant. These records should include data pertaining to qualification of inspection personnel, examination procedures, and examination results.

(2) All cast pressure-retaining parts of a size and configuration for which volumetric methods are effective should be examined by radiographic methods by qualified personnel. Ultrasonic examination to equivalent standards may be used as an alternate to radiographic methods. Examination procedures and acceptance standards should be at least equivalent to those defined in Paragraph 136.4, "Examination Methods of Welds - Non-Boiler External Piping," ANSI B31.1-1973.

Table B-1 (continued)

(3) The following qualifications should be met with respect to the certification criteria:

a. The manufacturer of the turbine stop valves, turbine control valves, turbine bypass valves, and main steam leads from turbine control valves to the turbine casing should utilize quality control procedures equivalent to those defined in General Electric Publication GEZ-4982A, "General Electric Large Steam Turbine-Generator Quality Control Program."

b. A certification should be obtained from the manufacturer of these valves and steam leads that the quality control program so defined has been accomplished.

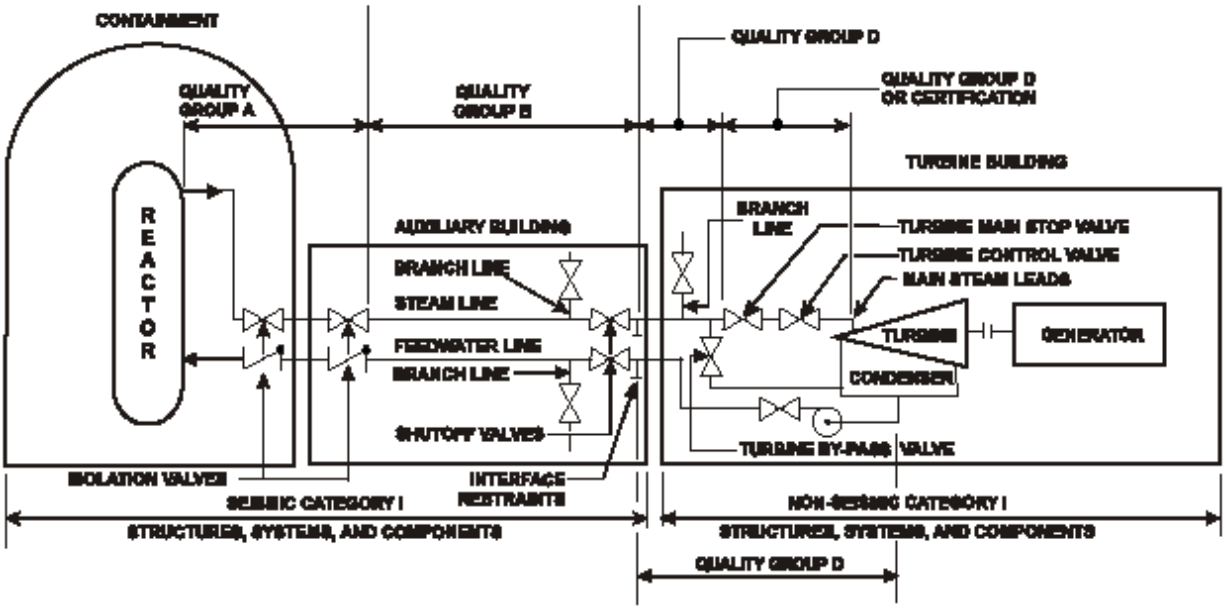


FIGURE B-1 NRC QUALITY GROUP AND SEISMIC CATEGORY CLASSIFICATIONS APPLICABLE LO POWER CONVERSION SYSTEM COMPONENTS IN BWR/6 PLANTS.

APPPENDIX C

Additional Guidance for Classification of Systems and Components and Application of Quality Standards

This appendix summarizes guidance supplemental to the guidance provided in RG 1.26 for the quality group classification of components of fluid systems important to safety.

REFERENCES

1. Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant-Accident."

2. Regulatory Guide 1.11, "Instrument Lines Penetrating Primary Reactor Containment."

3. Regulatory Guide 1.26, "Quality Group Classification and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants."

4. Regulatory Guide 1.72, "Spray Pond Piping Made from Fiberglass- Reinforced Thermosetting Resin."

5. Regulatory Guide 1.96, "Design of Main Steam Isolation Valve Leakage Control Systems for Boiling Water Reactor Nuclear Power Plants."

6. Regulatory Guide 1.137, "Fuel Oil Systems for Standby Diesel Generators."

7. Regulatory Guide 1.141, "Containment Isolation Provisions for Fluid Systems."

8. Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants."

9. Regulatory Guide 1.151, "Instrument Sensing Lines."

10. Branch Technical Position CSB 6-3, "Determination of Bypass Leakage Paths in Dual Containment Plants," attached to SRP Section 6.2.3.

11. NRC Letter to All Pressurized Water Reactor Licensees and Construction Permit Holders, "Resolution of Generic Issue 70, "Power-Operated Relief-Valve and Block Valve Reliability," and Generic Issue 94, "Additional Low-Temperature Overpressure Protection for Light-Water Reactors," (NRC Generic Letter No. 90-06)," June 25, 1990.

12. NRC Memorandum from E. S. Beckjord for F. P. Gillespie, "Resolutions of Generic Issue 70, "Power Operated Relief Valve and Block Valve Reliability," and Generic Issue 94, "Additional Low-Temperature Overpressure Protection for Light Water Reactors,"" November 16, 1989.

13. ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components," and Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," American Society of Mechanical Engineers.

Table C-1

Added Guidance for Classification and Application of Quality Standards

	System or Component	Quality Group	References
1.	Combustible Gas Control System	B (1)	Reg. Guide 1.7
2.	Compressed Air Systems required to perform a safety function	C	SRP 9.3.1
3.	Containment Isolation System:	A/B (2)	SRP 6.2.4
	a. Penetrations including associated piping and isolation valves	A/B (2)	Reg. Guide 1.141
	b. Instrument lines penetrating containment	B (3)	Reg. Guide 1.11
	c. Isolation barriers comprised of closed systems inside containment	B (2)	SRP 6.2.4
	d. Isolation barriers comprised of closed systems outside containment	B (2)	SRP 6.2.4
	e. Closed systems in secondary containment proposed as boundaries to preclude bypass leakage	B (4)	Branch Technical Position CSB 6-3
4.	Emergency Diesel Engine:		
	a. Fuel Oil Storage and Transfer System	C (5)	Reg. Guide 1.137
	b. Cooling Water System	C	
	c. Starting System	C	
	d. Lubrication System	C	
	e. Combustion Air Intake and Exhaust System	C	
5.	Equipment and Floor Drainage System	C (6)	SRP 9.3.3
6.	Gas Treatment Systems which are considered as engineered safeguards systems	B	
7.	BWR Main Steam Isolation Valve Leakage Control System and necessary subsystems	B/A (7)	Reg. Guide 1.96

Table C-1 (continued)

	System or Component	Quality Group	References
8.	Plant Ventilation Systems for areas such as the control room and engineered safety features rooms	C	
9.	PWR Pressurizer PORVs, associated components, and Block Valves	(8)	Generic Letter 90-06
10.	Radioactive Waste Management Systems	(9)	Reg. Guide 1.143
11.	Safety-Related Instrument Sensing Lines	B,C (10)	Reg. Guide 1.151
12.	Ultimate Heat Sink and Supporting Systems	C (11)	SRP 9.2.5, Reg. Guide 1.72

NOTES:

(1) Reg. Guide 1.7 describes acceptable methods for the control of combustible gas in containment, with consideration of 10 CFR 50.44, "Standards for Combustible Gas Control Systems in Light-Water-Cooled Power Reactors."

(2) SRP Section 6.2.4 contains guidance related to classification of containment isolation systems. Containment isolation system components (e.g., isolation barriers) are normally classified as Quality Group B unless their service function dictates that Quality Group A standards be applied. Reg. Guides 1.11 and 1.141 are cited in SRP Section 6.2.4 and describe methods acceptable to the NRC staff for complying with the Commission's requirements with respect to containment isolation of fluid systems.

(3) Reg. Guide 1.11 describes a suitable basis which may be used to implement containment isolation design criteria for instrument lines. Position C.1.c indicates that protection system sensing lines penetrating or connected to primary reactor containment should be provided with an isolation valve capable of automatic operation or remote operation, and should be located in the line outside the containment as close to the containment as practical. Position C.1.d indicates that such lines should be conservatively designed up to and including the isolation valve and of a quality at least equivalent to the containment [generally Group B per NOTE (2) above]. Position C.2 indicates that sensing lines for instruments that are not part of the protection system should meet the above provisions or should be provided with one automatic isolation valve inside and one automatic valve outside containment as close to containment as practical.

(4) Branch Technical Position CSB 6-3, attached to SRP Section 6.2.3, describes methods for determining bypass leakage paths in dual containment plants. Position B.9.b indicates that closed systems proposed as a leakage boundary to preclude bypass leakage should be designed in accordance with Quality Group B standards, as defined by Regulatory Guide 1.26, but that systems designed to Quality Group C or D standards that qualify as closed systems to preclude bypass leakage will be considered on a case-by-case basis.

(5) Reg. Guide 1.137 describes a method acceptable for complying with regulations regarding fuel-oil systems for standby diesel generators. The Reg. Guide describes positions with respect to the design and fabrication of diesel fuel oil systems which are supplemental to those indicated by the Quality Group C classification including the application of additional standards.

(6) SRP Section 9.3.3 provides criteria used to determine the safety-related portions of the equipment and floor drainage system and indicates that the safety-related portions of the system should be verified to be classified Quality Group C or higher.

(7) Reg. Guide 1.96 describes an acceptable basis for evaluating the need for, and design of, leakage control systems for BWR main steam isolation valves. Position C.1 of the Reg. Guide describes the appropriate classification for leakage control systems as Quality Group B, with the exception of the unisolable portion of the system connected to the RCPB, which should be classified as Quality Group A. Appendix A of the Reg. Guide describes measures supplemental to the ASME Code to be applied for Quality Group A portions of the system.

(8) Components of the reactor coolant system, including those comprising the RCPB, should be quality group classified accordingly. PORVs and associated components should be classified as safety-related where necessary to perform a safety-related function (e.g., mitigation of a design-basis steam generator tube rupture accident, low temperature overpressure protection of the reactor vessel, and/or plant cooldown as described in Generic Letter 90-06). As described in Reference 12, the safety-related classification should address redundant and diverse control systems designed to seismic Category I criteria and those improvements that were imposed subsequent to the TMI-2 accident, such as criteria to be powered from Class 1E buses and to provide valve position indication in the control room. The PORVs and block valves should be included within a quality assurance program that is in compliance with 10 CFR Part 50, Appendix B.

For PWR plants licensed prior to the revision date of this SRP section and whose PORVs were not constructed as safety-grade components, these components should be addressed in accordance with the positions specified in Generic Letter 90-06, Enclosure A, Section 3.1.

(9) Reg. Guide 1.143 describes a method acceptable for complying with regulations regarding radwaste management systems, including guidance for classification and quality assurance measures. Position C.1.1 and Table 1 of the Reg. Guide describe codes and industry standards applicable to the design and fabrication of radwaste management systems. In addition, the Reg. Guide describes positions with regard to the design and fabrication of these systems that are supplemental to those established by the codes and standards cited. Reg. Guide 1.143 does not explicitly specify classifications for radwaste management system components in terms of the quality groups (A-D) described in Reg. Guide 1.26.

Table C-1 (continued)

(10) Reg. Guide 1.151 describes an acceptable method for the design and installation of safety-related instrument sensing lines, including the application of another standard in addition to the ASME Code. The Reg. Guide describes an acceptable method for classifying instrument sensing lines by providing classification guidance for instrument sensing lines in terms of the ASME Boiler and Pressure Vessel Code, Section III code classes, which correspond to Reg. Guide 1.26 Quality Groups.

(11) SRP Section 9.2.5 provides review procedures and findings that verify that the ultimate heat sink and its supporting systems meet Quality Group C criteria. Reg. Guide 1.72 describes an acceptable method for the design, fabrication, and testing of fiberglass-reinforced thermosetting resin piping for spray pond applications, which includes the application of a code case as supplemented by the regulatory positions. Reg. Guide 1.72 position C.7.b indicates that ASME Code, Section XI inservice inspection criteria for Class 3 systems should be applied for such piping.

SRP Section 3.2.2
Description of Changes

This SRP section affirms the technical accuracy and adequacy of the guidance previously provided in (Draft) Revision 2, dated April 1996 of this SRP. See ADAMS accession number ML052070297.

In addition this SRP section was administratively updated in accordance with NRR Office Instruction, LIC-200, Revision 1, "Standard Review Plan (SRP) Process." The revision also adds standard paragraphs to extend application of the updated SRP section to prospective submittals by applicants pursuant to 10 CFR Part 52.

The technical changes are incorporated in Revision 2, dated 200X:

Review Responsibilities - Reflects changes in review branches resulting from reorganization and branch consolidation. Change is reflected throughout the SRP.

I. AREAS OF REVIEW

An explanation is included within the Areas of Review section, concerning the application of the deterministic approach for classification compared to the alternative risk-informed categorization process identified in 10 CFR 50.69.

Under Review Interfaces, SRP Sections 3.10 and 3.11 are referenced for qualification of equipment.

References to RG 1.76, RG 1.201 and 10 CFR 50.69 pertaining to risk-informed classification are included.

II. ACCEPTANCE CRITERIA

Revision clarifies interfaces with other branches that have review responsibility in other areas related to classification of SSCs important to safety.

A standard statement is added to clarify that acceptance criteria is contained in other referenced SRPs.

Technical rationale is included for each of the acceptance criteria.

Classification criteria is included for BWRs without MSIV leakage control system that take credit for fission product hold-up in the main steam lines based on staff positions described in SECY 93-087 and SRM dated July 21, 1993. Also included new Figure A-1 at end of Appendix A.

III. REVIEW PROCEDURES

Appendix D for BWR plants is no longer needed and is deleted.

Identification of fluid systems important to safety is included using terminology consistent with SRP Section 9.

To provide for alternative system descriptions used in new advanced reactor designs, a qualifying statement is included under Review Procedures to clarify that the identified systems are examples of systems important to safety based on prior applications and that passive system LWR designs or non-LWR designs with functions important to safety in accordance with RG 1.26 may not be identified by these names.

IV. EVALUATION FINDINGS

Specific Editions of outdated Codes and Standards are deleted.

V. IMPLEMENTATION

None.

VI. REFERENCES

References are added in Appendix A and Appendix B.

Reference to SRM dated July 21, 1993 is included as a reference in Appendix A.

VII Appendix C

Content is added to Appendix C that was previously in course of preparation. Appendix C supplements RG 1.26 guidance by referencing other regulatory guides and SRPs for classifications of specific systems.