



U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

3.11 ENVIRONMENTAL QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT

REVIEW RESPONSIBILITIES

Primary - ~~Equipment Qualification Branch (EQB)~~ Plant Systems Branch (SPLB)¹

Secondary - ~~None~~ Instrumentation and Controls Branch (HICB)²

I. AREAS OF REVIEW

The information presented in Section 3.11 of the applicant's safety analysis report (SAR) should be sufficient to support the conclusion that all items of equipment (mechanical, electrical, includes instrumentation and control) are capable of performing their design safety functions under all normal, ~~abnormal, and accident~~ environmental conditions, anticipated operational occurrences, and accident and postaccident³ environmental conditions. The "normal, ~~abnormal,~~ environmental conditions, anticipated operational occurrences, and⁴ accident and postaccident environmental conditions" ~~are deemed to~~⁵ include all environmental conditions which may result from any normal ~~or abnormal~~ mode of plant operation, anticipated operational occurrences,⁶ design basis events, post-design basis events, and containment tests. The review will be performed to ~~assure~~ ~~ensure~~⁷ conformance with the requirements of 10 CFR Part 50, Appendix A, General Design Criterion 4 Criteria 1, 2, 4, and 23; the requirements of 10 CFR Part 50, Appendix B, Quality Assurance Criteria III, XI, and XVII; and the requirements of 10 CFR 50.49.^{8 9} Section 50.49 of 10 CFR contains specific requirements regarding the qualification of electrical equipment important to safety that is located in a harsh environment. Electrical equipment important to safety is described in 10 CFR 50.49(b). Harsh and mild environmental conditions are discussed in subsection II.^{10 11}

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

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

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

Mechanical and electrical equipment associated with systems described below in this paragraph¹² must be designed to meet the requirements as described under the acceptance criteria of this Standard Review Plan (SRP)¹³ section. Mechanical and electrical equipment covered by this SRP section includes equipment associated with systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or otherwise are essential in preventing significant release of radioactive material to the environment. Also The following items are also covered by this SRP section is:¹⁴

- (1) Equipment that performs the above functions automatically,
- (2) Equipment that is used by the operators to perform these functions manually, and
- (3) Equipment¹⁵ whose failure can prevent the satisfactory accomplishment of one or more of the above safety functions,
- (4) Other electrical equipment important to safety as described in 10 CFR 50.49(b)(1) and (2), and
- (5) Certain postaccident monitoring equipment as described in 10 CFR 50.49(b)(3).¹⁶

~~Seismic qualification is addressed in SRP Section 3.10.~~¹⁷

Section 3.11 of the SAR is reviewed to determine whether the required environmental capability of all equipment, i.e., the capability to perform design safety functions in the event of anticipated operational occurrences and under normal, ~~abnormal~~,¹⁸ accident, and postaccident environments, will be or has been adequately demonstrated. The term "environmental qualification" means verification of design, limited to demonstrating that electrical or mechanical equipment is capable of performing its safety function under significant environmental stresses resulting from design basis accidents in order to avoid common-cause failure.¹⁹

At the construction permit (CP) stage, the staff review will consider the conceptual approach addressing the following areas:

1. Identification of all mechanical and electrical systems required to perform the functions defined in ~~paragraph 1 of subsection I~~ the second paragraph of subsection I.²⁰
2. Identification of the environmental design bases for the equipment identified, including the definition of ~~the anticipated operational occurrences and normal, abnormal~~,²¹ accident, and postaccident environments.
3. Requirements²² for documentation of the qualification tests and analyses that have been or will be performed on the equipment to meet the design bases.
4. Demonstration of the adequacy of the environmental qualification program.

At the operating license (OL) stage, the staff reviews the applicant's environmental qualification program and the submitted results of its implementation. The staff additionally will audit the

applicant's central file. The audit consists of a staff review of the documentation provided in the file to demonstrate tangible evidence of qualification.²³ The staff's review is performed to determine (1) proper implementation of criteria established in the CP review and (2) adequate environmental qualification for all mechanical and electrical equipment.

The staff's review for design certification consists of an evaluation of the applicant's submittal on its approach for selecting and identifying equipment required to be environmentally qualified for the standard design. For combined license (COL) applicants referencing a certified design, the staff will review specific details of the plant's environmental qualification program using the acceptance criteria and review procedures described in this SRP section.²⁴

Seismic and dynamic qualification of mechanical and electrical equipment is addressed in SRP Section 3.10. Protection of mechanical and electrical equipment against other natural phenomena and external events is addressed in other SRP sections as follows and as described under Review Interfaces in this subsection.²⁵

The SPLB reviews SAR Sections 3.4.1, 3.5.1.1, 3.5.2, 3.6.1, 5.4.11, and applicable sections of Chapter 9 using the information obtained in its review of SAR Section 3.11.²⁶

The HICB, in fulfilling its secondary review responsibility, verifies that the postaccident monitoring equipment described in subsection I(5) and the instrumentation and controls for the equipment described in the second paragraph of subsection I are capable of performing their intended functions under anticipated operational occurrences and normal, accident, and postaccident environmental conditions, as appropriate.²⁷

Review Interfaces²⁸

Although the EQBSPLB²⁹ has the primary responsibility for the review of this section SAR Section 3.11,³⁰ the EQBSPLB³¹ reviewer utilizes the information from other SAR sections which are reviewed by other branches in the performance of their review functions. EQBThe SPLB³² will coordinate other branches evaluationbranch evaluations³³ that interface with the overall review of equipment qualification, as follows:

A. The SAR sections reviewed by the branches in performance of their review functions are as follows: ASB reviews Sections 3.4.1, 3.5.1.1, 3.5.2, 3.6.1, 5.4.11, and applicable sections of Chapter 9;³⁴

(1) ~~CSB~~ reviews Section 6.2The Containment Systems and Severe Accident Branch (SCSB) reviews SRP Sections 6.2.1 through 6.2.6;³⁵

(2) ~~RSB~~The Reactor Systems Branch (SRXB)³⁶ reviews Sections 5.4.6, 5.4.7, 6.3, and applicable sections of Chapter 15;

(3) ~~HCSB~~The HICB³⁷ reviews Chapter 7;

(4) ~~PSB~~The Electrical Engineering Branch (EELB)³⁸ reviews Chapter 8; and

- (5) ~~AEB~~The Materials and Chemical Engineering Branch (EMCB)³⁹ reviews Section 6.5.2.
- B. The ~~ASB, ICSB, PSB, and RSB~~SCSB, SRXB, HICB, EELB, and EMCB⁴⁰ confirm that the SAR identifies all equipment as identified in paragraph 1 of subsection I described in the second paragraph of subsection I.⁴¹
- C. The ~~ASB and CSB confirm~~SCSB confirms⁴² the location of each item of equipment, both inside and outside the containment. Inside the containment, the location must be specified, whether inside or outside of the missile shield for pressurized-water-reactor (PWR) plants, or whether inside or outside of⁴³ the drywell for boiling-water-reactor (BWR) plants.
- D. The ~~ASB, CSB, ICSB, PSB, and RSB~~SCSB, SRXB, HICB, EELB, and EMCB⁴⁴ confirm the validity of the descriptions of the anticipated operational occurrences and normal, ~~abnormal~~,⁴⁵ accident, and postaccident environments provided in the SAR. They will also confirm the acceptability of the values provided in the SAR for the length of time that equipment is required to operate in accident environments.
- E. With regard to the environments resulting from loss of environmental control systems (heat tracing,⁴⁶ ventilation, heating, air conditioning), the ~~ASB~~HICB⁴⁷ will confirm the description of these environments as provided in the SAR for those areas which contain equipment, including electrical control and instrumentation equipment and instrument sensing lines which rely on heat tracing for freeze protection.⁴⁸
- F. The ~~QAB~~Quality Assurance and Maintenance Branch (HQMB)⁴⁹ reviews and determines that the applicant's quality assurance (QA)⁵⁰ program described in Chapter 17 of the SAR satisfies the requirements of 10 CFR Part 50, Appendix B, Criteria III, XI, and XVII.
- G. The ~~AEB reviews~~Emergency Preparedness and Radiation Protection Branch (PERB) and the EMCB review⁵¹ the adequacy of the radiation and chemical conditions for qualification for the ~~abnormal~~, accident, and postaccident environments, as well as anticipated operational occurrences.⁵²
- H. Specific information may be requested from the ~~MEB~~Mechanical Engineering Branch (EMEB),⁵³ as needed.
- I. The EMCB reviews the adequacy of programs for assuring the integrity of bolting and threaded fasteners, including provisions for installation and maintenance of mounting and bolting details equivalent to those used for equipment qualification, as part of its primary review responsibility for SRP Section 3.13 (proposed).⁵⁴
- J. For new applications, the Containment Systems and Severe Accident Branch (SCSB) reviews the survivability of equipment used to mitigate severe accidents as part of its primary review responsibilities for SRP Section 19.2.4 (proposed).⁵⁵

For those areas of review identified above as ~~being reviewed as part of the primary responsibility of other branches, the acceptance criteria necessary for the review and their methods of application are contained in the referenced SRP section of the corresponding primary branch.~~⁵⁶

II. ACCEPTANCE CRITERIA

~~The general requirements for environmental design and qualification of all equipment are embodied in General Design Criterion 4 of Appendix A to 10 CFR Part 50. The acceptance criteria for environmental qualification of electrical and mechanical equipment are based on meeting the relevant requirements of the following regulations:~~⁵⁷

- A. 10 CFR Part 50, Appendix A, General Design Criterion 1, "Quality Standards and Records."
- B. 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."
- C. 10 CFR Part 50, Appendix A, General Design Criterion 4, "Environmental and Dynamic Effects Design Bases."
- D. 10 CFR Part 50, Appendix A, General Design Criterion 23, "Protection System Failure Modes."
- E. 10 CFR Part 50, §50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants."
- F. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," Section III, "Design Control," Section XI, "Test Control," and Section XVII, Quality Assurance Records."⁵⁸

Specific criteria, task action plan items, regulatory ~~guide~~guides,⁵⁹ and industry standards that provide information, recommendations, and guidance and, in general, ~~describes~~describe⁶⁰ a basis acceptable to the staff that may be used to implement the requirements of ~~General Design Criterion 4~~10 CFR 50.49; General Design Criteria 1, 2, 4, and 23; and Quality Assurance Criteria III, XI, and XVII⁶¹ are as follows:

1. ⁶²Simply stated, the general requirements for environmental design and qualification are as follows:
 - (1a.)⁶³ The equipment shall be designed to have the capability of performing its design safety functions under all anticipated operational occurrences and normal, ~~abnormal~~,⁶⁴ accident, and postaccident environments and for the length of time for which its function is required.
 - (2b.) The equipment environmental capability shall be demonstrated by appropriate testing and analyses.

- (3c.) A quality assurance program meeting the requirements of 10 CFR Part 50, Appendix B, shall be established and implemented to provide assurance that all requirements have been satisfactorily accomplished.

The environmental design of mechanical and electrical equipment is acceptable when it can be ascertained that all three requirements are met.

2. At the time of the CP and OL application, complete and auditable records must be available (and maintained at a central location)⁶⁵ which describe the environmental qualification method used for all mechanical and electrical equipment in sufficient detail to document the degree of compliance with the requirements discussed herein. Thereafter, such records should be updated and maintained current as equipment is replaced, tested, or otherwise qualified.

3. Harsh Environment

- a.⁶⁶ ~~The specific~~ Specific⁶⁷ criteria for assessing the acceptability of the environmental qualification program of OL applicants⁶⁸ are provided in NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," ~~issued in December 1979~~ Revision 1, July 1981.⁶⁹ NUREG-0588 (endorsed by the Commission Memorandum and Order CLI-80-21, dated May 23, 1980), discusses the staff position and acceptance criteria on the environmental qualification of electrical equipment. These criteria are general in nature and can also be applied to mechanical equipment.⁷⁰ NUREG-0588 includes two sets of qualification requirements, Category I and Category II, ~~which relate to IEEE 323-1974 and 1971 respectively. Category II is for plants whose construction permit SERs were dated before July 1, 1974 unless the licensee made a commitment in the construction permit record to use the 1974 standard, or unless the operating license application indicates the 1974 standard is to be used in which case, Category I will be the applicable criteria to be used. Category I is for plants whose construction permit SERs were dated after July 1, 1974. Category I refers to IEEE Std 323, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," (Reference 6) and is applicable to all future plants. Category II will not be applicable to any future plants.~~⁷¹

~~Subsection VI lists the documents which provide both acceptance criteria and evaluation guidance used in the review. The most important of these documents is IEEE Std 323 (augmented by Regulatory Guide 1.89), "General Guide for Qualifying Class I Electric Equipment for Nuclear Power Generating Stations." This document, although specifically written for Class I electric equipment, IEEE Std 323⁷² contains a clear presentation of the principles and criteria that are generic to the environmental qualification process itself; therefore, IEEE Std 323 is considered applicable to the environmental qualification of other types of equipment. This document IEEE Std 323⁷³ contains detailed criteria applicable to whatever method of qualification is used, i.e., type testing, analyses, operating experience, ongoing qualification, or combined qualification. NUREG-0588~~

~~(endorsed by the Commission Memorandum and Order CLI-80-21 dated May 23, 1980), "Interim Staff Position on Electrical Equipment," discusses the staff position and acceptance criteria on the environmental qualification of electrical equipment. These criteria are general in nature and could also be applied to the mechanical equipment. The environmental design and qualification of equipment is acceptable when it is ascertained that the criteria of NUREG-0588 have been met.~~⁷⁴

- b. Regulatory Guide 1.89 provides guidance for implementing the requirements and criteria of 10 CFR 50.49 for environmental qualification of electrical equipment that is important to safety and located in a harsh environment. Regulatory Guide 1.89 indicates that the provisions of IEEE Std 323 are acceptable to the staff and provides supplementary guidance for satisfying the Commission's regulations regarding the environmental qualification of electrical equipment located in a harsh environment.

The applicant shall prepare a list of electrical equipment important to safety and covered by the qualification requirements. In addition, the applicant shall include the following information in a qualification file for electric equipment important to safety:

- (1) Performance specifications for conditions existing during and after design basis accidents.
- (2) The voltage, frequency, load, and other electrical characteristics for which the performance specified in accordance with (1) above can be ensured.
- (3) The environmental conditions (including temperature, pressure, humidity, radiation, chemicals, and submergence at the location where the equipment must perform) as specified in accordance with (1) and (2) above.

The applicant shall keep the list and information in the file current and retain the file in auditable form for the entire period during which the covered item is installed in the nuclear power plant or is stored for future use to permit verification that each item of electric equipment important to safety meets the requirements.⁷⁵

- c. IEEE Std 334, "IEEE Trial Use⁷⁶ Guide for Type Tests of Continuous-Duty Class 1 Motors Installed Inside the Containment of Nuclear Power Generating Stations" (Reference 7),⁷⁷ ~~(augmented)~~ endorsed⁷⁸ by Regulatory Guide 1.40); IEEE Std 382, "IEEE Trial Use⁷⁹ Guide for Type Test of Class 1E Electric Valve Operators for Nuclear Power Generating Stations" (Reference 9),⁸⁰ ~~(augmented)~~ endorsed⁸¹ by Regulatory Guide 1.73); and IEEE Std 383, "Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations" (Reference 10),⁸² ~~(augmented)~~ endorsed⁸³ by Regulatory Guide 1.131⁸⁴), are specific with regard to type-test qualification of

the equipment identified in their titles. The detailed criteria contained in these documents as they relate to environmental qualification should be used in conjunction with the more comprehensive criteria of NUREG-0588 and Regulatory Guide 1.89, as appropriate,⁸⁵ for evaluating the respective equipment environmental qualifications.

d. IEEE Std 317, "IEEE Standard for⁸⁶ Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations" (Reference 5),⁸⁷ (~~augmented~~ endorsed⁸⁸ by Regulatory Guide 1.63), contains general guidance for qualification of penetration assemblies. Therefore, this document as it relates to environmental qualification should be used in conjunction with NUREG-0588 and Regulatory Guide 1.89, as appropriate,⁸⁹ for evaluating the environmental qualification of this equipment.

e. In addition, ~~IEEE Standards~~ IEEE Std 381, "IEEE Standard Criteria for Type Tests of Class 1E Modules Used in Nuclear Power Generating Stations" (Reference 8);⁹⁰ ~~535~~,⁹¹ IEEE Std 627, "IEEE Standard for Design Qualification of Safety Systems Equipment Used in Nuclear Power Generating Station" (Reference 13);⁹² IEEE Std 649, "IEEE Standard for Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations" (Reference 14);⁹³ and IEEE Std 650, "IEEE Standard for Qualification of Class 1E Static Battery Chargers and Inverters for Nuclear Power Generating Stations," (Reference 15),⁹⁴ can be used for guidance purposes even though NRC has not ~~formerly~~ formally⁹⁵ endorsed these standards through the issuance of a regulatory guide.

f. IEEE Std 535, "IEEE Standard for Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations" (Reference 11), (endorsed by Regulatory Guide 1.158, "Qualification of Safety-Related Lead Storage Batteries for Nuclear Power Plants"), contains guidance acceptable to the staff for environmental qualification of Class 1E lead storage batteries. Therefore, this document as it relates to environmental qualification should be used in conjunction with NUREG-0588 and Regulatory Guide 1.89, as appropriate, for evaluating the environmental qualification of this equipment.⁹⁶

g. The effects of the chemicals should be addressed for the equipment qualification. The concentration of chemicals used for qualification should be equivalent to or more severe than that resulting from the most limiting mode of plant operation (e.g., containment spray, emergency core cooling system ~~ECCS~~⁹⁷ initiation, or recirculation phase). If the chemical composition of the chemical spray can be affected by equipment malfunctions, the most severe chemical environment that results from a single failure in the spray system should be assumed. If only demineralized water spray is used, then the effect of the demineralized water spray should be included in the equipment qualification.

h. Radiation dose and dose rate used to determine the radiation environment for qualification of electrical and mechanical equipment shall be based on an⁹⁸ NRC staff-approved source term and methodology as discussed in NUREG-0588 and

supplemented by Section II.B.2 of NUREG-0737 and NUREG-0718, or NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants."⁹⁹ The radiation environment shall be based on the integrated effects of the normally expected radiation environment over the equipment's installed life, plus that associated with the most severe design basis event during or following which the equipment is required to remain functional. Effects of the beta radiation shall also be considered in the qualification program. Effects of recirculatory fluid shall be considered for the equipment located outside the containment.

The staff's definition of what constitutes a mild radiation environment for electronic components such as semiconductors or electronic components containing organic material differs from that for other equipment. A mild radiation environment for electronic equipment is a total integrated dose less than 10 Gy (10^3 rad). A mild radiation environment for other equipment is less than 100 Gy (10^4 rad).¹⁰⁰

- i. Regulatory Guide 1.156, "Environmental Qualification of Connection Assemblies for Nuclear Power Plants," provides guidance acceptable to the staff for implementing the requirements of IEEE Std 572, "IEEE Standard for Qualification of Class 1E Connection Assemblies for Nuclear Power Generating Stations," (Reference 12). These criteria as supplemented by those of Regulatory Guide 1.89 should be used to evaluate the environmental qualification of the connection assembly.¹⁰¹
- j. The postaccident monitoring equipment described in subsection I(5), as well as instruments and controls for the equipment described in the second paragraph of subsection I, should be environmentally qualified in accordance with the guidance in Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident."¹⁰²
- k. With regard to equipment qualification associated with possible hydrogen generation by a metal-water reaction of the fuel, the equipment needed to achieve and maintain safe shutdown of the plant and to maintain containment integrity should be environmentally qualified in accordance with the provisions of this SRP section and the following criteria. The equipment should be qualified or protected so that it will perform its safety function during and after exposure to environmental conditions resulting from the release of hydrogen generated by the equivalent of a 100% fuel-clad metal-water reaction. The postulated environmental conditions should include those created by activation of the hydrogen control system. If the method chosen for hydrogen control is a postaccident inerting system, inadvertent actuation of the system during plant operation should be considered.¹⁰³

Mechanical components should be designed to be compatible with postulated environmental conditions, including those associated with loss-of-coolant accidents

(LOCAs). A process should be established to determine the suitability of materials, parts, and equipment needed for safety-related functions and to verify that the design of such materials, parts, and equipment is adequate. Equipment qualification records should be maintained and should include the results of tests and materials analyses.

For mechanical equipment, the staff concentrates its review on materials that are sensitive to environmental effects (e.g., seals, gaskets, lubricants, fluids for hydraulic systems, and diaphragms). The reviewer should (1) identify safety-related mechanical equipment located in harsh environment areas, including its required operating time; (2) identify nonmetallic subcomponents of such equipment; (3) identify the environmental conditions for which this equipment must be qualified; (4) identify nonmetallic material capabilities; and (5) evaluate environmental effects.¹⁰⁴

D. MILD ENVIRONMENT

(1) The environmental qualification of all electrical and mechanical equipment located in ~~the~~¹⁰⁵ mild environment is acceptable if the following procedure is followed:

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(a) The ~~documentation~~ documents¹⁰⁷ required to demonstrate qualification of equipment in a mild environment are the "Design/Purchase" specifications. The specifications shall contain a description of the functional requirements for ~~its~~ a specific environmental zone during normal ~~and abnormal~~ environmental conditions and anticipated operational occurrences.¹⁰⁸ A well-supported maintenance/surveillance program in conjunction with a good preventive maintenance program will suffice to ~~assure~~ ensure¹⁰⁹ that equipment that meets the design/purchase specifications is qualified for the designed life.

(b) Furthermore,¹¹⁰ the maintenance/surveillance program data and records shall be reviewed periodically (not more than 18 months) to ensure that the design qualified life has not suffered thermal and cyclic degradation resulting from the accumulated stresses triggered by ~~the abnormal environmental conditions~~ anticipated operational occurrences¹¹¹ and the normal wear due to its service condition. Engineering judgment shall be used to modify the replacement program and/or replace the equipment as deemed necessary.

E. The potentially adverse effects of inadvertent condensate formation in, and/or freezing of, safety related instrument sensing lines which could prevent the affected instrumentation from performing its intended safety function, should be considered as part of the design and arrangement. The reviewer should identify any safety related sensing lines which are relying on heat tracing and/or room heating for prevention of possible freezing and assure that adequate redundancy and other appropriate measures have been implemented, to preclude inadvertent effects caused by adverse conditions. The guidance provided in Regulatory Guide 1.151, "Instrument Sensing Lines," should be followed in this regard.¹¹²

Technical Rationale:

The technical rationale for application of these acceptance criteria to reviewing the environmental qualification of mechanical and electrical equipment is discussed in the following paragraphs:¹¹³

1. Compliance with General Design Criterion 1 (GDC 1), "Quality Standards and Records," requires that components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed.

SRP Section 3.11 describes staff positions related to the environmental qualification of electrical and mechanical equipment important to safety. This section cites a number of regulatory guides and industry standards, including NUREG-0588, Regulatory Guide 1.89, and IEEE Std 323, to establish environmental qualification levels for equipment that are commensurate with the safety functions to be performed.

Meeting the requirements of GDC 1 provides assurance that equipment important to safety will be environmentally qualified and will be capable of performing its intended safety function.¹¹⁴

2. Compliance with General Design Criterion 2 (GDC 2), "Design Bases for Protection Against Natural Phenomena," requires that components important to safety be designed to withstand the effects of natural phenomena without loss of capability to perform their safety function. The design bases for these components must include considering the effects of normal and accident conditions (i.e., environmental qualification) along with the importance of the safety function to be performed and the effects of natural phenomena.

SRP Section 3.11 describes staff positions related to the environmental qualification of electrical and mechanical equipment important to safety. These staff positions require that applicants consider all normal, accident, and postaccident environments (including those resulting from anticipated operational occurrences) in the design, testing, and quality assurance of such equipment. The reviewer also considers information gathered by the staff from reviews conducted by other branches regarding such factors as aging, exposure of equipment to radiation, exposure to chemicals, and exposure to other environmental stressors (e.g., those resulting from severe natural phenomena).

Meeting the requirements of GDC 2 provides assurance that equipment important to safety will be environmentally qualified and will be capable of performing its intended safety function.¹¹⁵

3. Compliance with General Design Criterion 4 (GDC 4), "Environmental and Dynamic Effects Design Bases," requires that components important to safety be designed to accommodate the effects of, and be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including LOCAs. Components must be protected against dynamic effects, including

those of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.

SRP Section 3.11 describes general and specific staff positions on reviewing an applicant's programs for the environmental qualification of electrical and mechanical equipment. These staff positions reference the requirements in IEEE Std 323, NUREG-0588, and Regulatory Guide 1.89. The scope of IEEE Std 323 includes principles, procedures, and methods of qualification applicable to the adequacy of equipment design under normal, design basis, and post-design basis events as well as anticipated operational occurrences. NUREG-0588 provides environmental qualification parameters for equipment located inside or outside containment and references IEEE Std 323. Regulatory Guide 1.89 references the 10 CFR 50.49 and provides additional guidance related to the environmental qualification of electrical equipment that could be subjected to a harsh environment as a result of the conditions addressed in GDC 4.

Meeting the requirements of GDC 4 provides assurance that equipment important to safety will be environmentally qualified and will be capable of performing its intended safety function.¹¹⁶

4. Compliance with General Design Criterion 23 (GDC 23), "Protection System Failure Modes," requires that the protection system be designed to fail in a safe state, or in a state demonstrated to be acceptable on some other defined basis, if conditions such as postulated adverse environments (e.g., extreme heat or cold, pressure, steam, water, or radiation) are experienced.

SRP Section 3.11 describes staff positions related to the environmental qualification of electrical and mechanical equipment important to safety. These staff positions require that applicants consider all normal, accident, and postaccident environments (including anticipated operational events) in the design, testing, and quality assurance of this equipment, which includes the protection system. Electrical equipment exposed to harsh environmental conditions must meet the requirements of 10 CFR 50.49. Regulatory Guide 1.89 provides additional guidance and references the requirements specified in IEEE Std 323. These requirements relate directly to ensuring the acceptable performance of the protection system when its components are exposed to adverse environments, as discussed in GDC 23.

Meeting the requirements of GDC 23 provides assurance that the protection system will be environmentally qualified and will be capable of performing its intended safety function.¹¹⁷

5. Compliance with 10 CFR 50.34(f)(2)(ix) requires that equipment needed to achieve and maintain safe shutdown of the plant and to maintain containment integrity will perform its safety function during and after exposure to the environmental conditions associated with the release of hydrogen generated by the equivalent of a 100% fuel-clad metal-water reaction, including the environmental conditions created by activation of the hydrogen control system. Further, if the method chosen for hydrogen control is a postaccident

inerting system, inadvertent actuation of the system should be safely accommodated during plant operation.

Subsection II.C(11) of SRP Section 3.11 includes criteria for the qualification or protection of equipment needed to achieve and maintain safe shutdown of the plant from hydrogen release or control. These criteria were adapted from 10 CFR 50.34(f)(2)(ix) to address the requirement.

Meeting these requirements provides assurance that equipment subject to hydrogen release or control measures will perform its intended safety functions and will prevent or mitigate the release of radioactive material.¹¹⁸

6. Compliance with 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," requires that the applicant establish a program, as described therein, for qualifying electrical equipment important to safety located in a harsh environment.

SRP Section 3.11 provides staff positions that cite the detailed requirements contained in 10 CFR 50.49 and the supplementary guidance contained in Regulatory Guide 1.89 to meet the qualification requirements of 10 CFR 50.49.

Meeting the requirements of 10 CFR 50.49 provides assurance that such equipment will be environmentally qualified and will be capable of performing its intended safety function.¹¹⁹

7. Compliance with 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires that measures be established to ensure that applicable regulatory requirements and the associated design bases are correctly translated into specifications, drawings, procedures, and instructions. These measures should include provisions to ensure that appropriate quality standards are included in design documents and that deviations from established standards are controlled. A process should also be established to determine the suitability of equipment that is essential to safety-related functions and to identify, control, and coordinate design interfaces between participating design organizations.

SRP Section 3.11 cites staff positions that require complete and auditable records of the applicant's equipment qualification program, including the results of equipment qualification testing. NUREG-0588, Appendix E, and IEEE Std 323, Section 8, include documentation requirements for the methods and results of environmental qualification for equipment important to safety that is located in a harsh environment. Appendix E to Regulatory Guide 1.89 provides guidance for documenting environmental qualification of electrical equipment covered by 10 CFR 50.49. Subsection II.D of this SRP section describes acceptance criteria for documenting the methods and results of environmental qualification for equipment that is located in a mild environment.

Meeting the requirements of Criterion III of Appendix B to 10 CFR Part 50 provides assurance that equipment important to safety will be environmentally qualified and will be capable of performing its intended safety function.¹²⁰

8. Compliance with 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," requires that a test control plan be established to ensure that all tests needed to demonstrate a component's capability to perform satisfactorily in service be identified and performed in accordance with written procedures that incorporate the requirements and acceptance limits contained in applicable design documents.

SRP Section 3.11 cites staff positions for the environmental qualification testing of mechanical and electrical equipment important to safety under appropriate conditions. Appendix E to NUREG-0588 and IEEE Std 323, Section 8, provide environmental qualification procedures for such equipment and contain specific documentation requirements, including those for tests specified under Criterion XI. Appendix E to Regulatory Guide 1.89 provides documentation guidance on meeting the requirements of Criterion XI, including the test methods and results used to establish environmental qualification for electrical equipment covered under 10 CFR 50.49. Section II.D of this SRP section describes acceptance criteria for documenting the methods and results for environmental qualification of equipment located in a mild environment.

Meeting the requirements of Criterion XI of Appendix B to 10 CFR Part 50 provides assurance that equipment important to safety will be environmentally qualified and will be capable of performing its intended safety function.¹²¹

9. Compliance with 10 CFR Part 50, Appendix B, Criterion XVII, "Quality Assurance Records," requires that sufficient records be maintained to furnish evidence of activities affecting quality. The records must include inspections, tests, audits, monitoring of work performance, and materials analysis. Records must be identifiable and retrievable.

SRP Section 3.11 cites staff positions for documenting environmental qualification of mechanical and electrical equipment important to safety under appropriate conditions. Appendix E to NUREG-0588 and IEEE Std 323, Section 8, provide environmental qualification procedures for such equipment and contain specific documentation criteria for meeting the requirements of Criterion XVII. Appendix E to Regulatory Guide 1.89 provides guidance on meeting the documentation requirements of Criterion XVII, including the test methods and results used to establish environmental qualification for electrical equipment covered under 10 CFR 50.49. Section II.D of this SRP section describes acceptance criteria for documentation of the methods and results for environmental qualification of equipment located in a mild environment.

Meeting the requirements of Criterion XVII of Appendix B to 10 CFR Part 50 provides assurance that equipment important to safety will be environmentally qualified and will be capable of performing its intended safety function.¹²²

III. REVIEW PROCEDURES

The reviewer will select and emphasize material from the procedures described below as may be appropriate for a particular case. The reviewer obtains and uses information from SAR Chapters 4, 5, 6, 7, 8, 9, 10, 11, 15, and 17 and consults with other branches as necessary to be assured that the proper environmental parameters are being used for the equipment qualification.

For each area of review, the following procedures are used:

- (1) At the CP stage, the staff reviews the program which the applicant has described in the preliminary safety analysis report (PSAR)¹²³ for the environmental qualification of the mechanical and electrical equipment. The program is measured against the requirements listed in subsection II. Of particular interest to the reviewer ~~are~~¹²⁴ the proper use of test and analytical procedures. Equipment should be tested unless testing of the component is impractical due to size limitations or partial type-test data ~~are~~¹²⁵ provided to support the analytical assumptions and conclusions reached. The qualification is reviewed for the identification of normal, ~~abnormal~~, accident, and postaccident environmental conditions; anticipated operational occurrences; required operating time; and chemical, ~~and~~ submergence, aging, and margin considerations, including the acceptance criteria of the test results.¹²⁵
- (2) At the OL stage, the staff reviews the program again as described by the applicant in the FSAR. In addition, the FSAR is reviewed for documentation of the successful implementation of the environmental qualification program, including test and analytical results. The reviewer verifies that the applicant's list of systems, which includes the list of equipment associated with each such system, is consistent with the definition of the systems and equipment ~~as delineated in paragraph 1 of subsection I~~ described in the second paragraph of subsection I.¹²⁶

To confirm the extent to which the equipment meets the requirements of subsection II, the staff audits the equipment qualification file and conducts a plant site review. For selected equipment, the staff reviews the test procedure and test results, and examines the equipment configuration and mounting, and then determines whether the test or analysis referenced demonstrates compliance with the established criteria.

The staff may require that component evaluation worksheets (CES) for all equipment be submitted to the staff. During its review, the staff will audit the central file and conduct a site visit. After the visit, the applicant may be required to submit certain selected documents and reports for further staff review. If the staff has reviewed an applicant's qualification file for a previous application, they may elect not to require the applicant to submit all the qualification summary data sheets, but instead elect to audit the qualification files at the applicant's central storage location.

For new applications the staff may accept an exemption from the requirement of 10 CFR 50.49(b)(3) to qualify certain types of postaccident monitoring equipment in accordance with Revision 2 to Regulatory Guide 1.97, if the applicant commits to conformance with the latest revision of Regulatory Guide 1.97, which meets the underlying purpose of the 10 CFR 50.49 rule.¹²⁷

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 inspections, tests, analysis, and acceptance criteria (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.¹²⁸

IV. EVALUATION FINDINGS

The review should verify that sufficient information is contained in the SAR to support conclusions of the following type, to be included in the staff's safety evaluation report (SER):¹²⁹
¹³⁰

The staff concludes that the environmental qualification of mechanical and electrical equipment is acceptable and meets the relevant requirements of ~~General Design Criterion 4~~ General Design Criteria 1, 2, 4, and 23; the relevant requirements of 10 CFR Part 50, Appendix B, Quality Assurance Criteria III, XI, and XVII; and the relevant requirements of 10 CFR 50.49¹³¹ with respect to systems and components being designed to withstand the effects of, and being capable of performing their safety function, in the environmental conditions associated with normal operation, maintenance, testing, and accident conditions. This conclusion is based on the following:¹³²

The applicant has implemented an environmental qualification program that provides adequate assurance that mechanical and electrical equipment will function as intended in the event of anticipated operational occurrences as well as in the normal, ~~abnormal~~, accident,¹³³ and postaccident environmental conditions. The applicant's ~~program for equipment has met the guidelines of~~ equipment qualification program is in accordance with the acceptance criteria in this SRP section, including the guidance and requirements described in the following regulations, Regulatory Guide and industry standards:¹³⁴

1. 10 CFR 50.49, Regulatory Guide 1.89, Category I of NUREG-0588, and IEEE Std 323 regarding general requirements and methods for environmental qualification of electrical and mechanical equipment located in a harsh environment;¹³⁵
2. ~~task action plan, Item H.B.2 of NUREGs-0718 and 0737,~~ Subsection II.C(8) of this SRP section regarding establishment of a staff-approved source term for the environmental qualification of equipment;¹³⁶
3. IEEE Std- 323 as ~~supplemented~~ endorsed by Regulatory Guide 1.89 regarding the qualification of electrical equipment important to safety located in a harsh environment;¹³⁷
4. IEEE Std- 334 as ~~supplemented~~ endorsed by Regulatory Guide 1.40 regarding the qualification of motors located inside containment;¹³⁸
5. IEEE Std 382 as ~~supplemented~~ endorsed by Regulatory Guide 1.73 regarding the qualification of electric valve operators located in a harsh environment;¹³⁹

6. IEEE Std 383 as supplemented¹⁴⁰ by Regulatory Guide 1.63¹⁴¹ regarding the qualification of cables located in a harsh environment;¹⁴¹ and NUREG-0588.¹⁴²
7. IEEE Std 317 as endorsed by Regulatory Guide 1.63 regarding qualification of containment penetration assemblies;¹⁴³
8. IEEE Std 535 as endorsed by Regulatory Guide 1.158 regarding the qualification of lead storage batteries located in a harsh environment;¹⁴⁴
9. IEEE Std 572 as endorsed by Regulatory Guide 1.156 regarding the qualification of connection assemblies located in a harsh environment;¹⁴⁵
10. Regulatory Guide 1.97 regarding the qualification of instrumentation and postaccident monitoring equipment located in a harsh environment;¹⁴⁶
11. Regulatory Guide 1.151 related to potential freezing of instrument sensing lines; and¹⁴⁷
12. 10 CFR 50, Appendix B, and the standards and guidance described in this SRP section regarding record keeping for environmental qualification.¹⁴⁸

For design certification 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 inspections, tests, analyses, and acceptance criteria (ITAAC), including design acceptance criteria (DAC), site interface requirements, and combined license action items that are relevant to this SRP section.¹⁴⁹

V. IMPLEMENTATION

This section 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 50 or 10 CFR 52.¹⁵⁰ Except in those cases in which the applicant proposes an acceptable alternative for complying with specific 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.¹⁵¹

~~Implementation schedules to assure conformance to the method discussed herein are contained in the referenced regulatory guides and NUREGs.¹⁵² Each pPlant is required to have a complete equipment qualification file that demonstrates compliance with this review plan (or uses established bases¹⁵³ for alternate requirements) either by June 30, 1982 or prior to submittal of operating license application, whichever comes later.~~ before submittal of an OL

application.¹⁵⁴ For COL applicants referencing a certified design, the staff will review specific details of the plant's environmental qualification program using the acceptance criteria and review procedures described in this SRP section.¹⁵⁵

VI. REFERENCES

1. 10 CFR 50.34(f)(2)(ix).¹⁵⁶
2. 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants."¹⁵⁷
13. 10 CFR Part 50, Appendix A, General Design Criterion 1, "Quality Standards and Records;" General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena;" General Design Criterion 4, "Environmental and ~~Missile Design Bases.~~"Dynamic Effects Design Bases;" and General Design Criterion 23, "Protection System Failure Modes."¹⁵⁹
24. 10 CFR Part 50, Appendix B, Criterion III, "Design Control"; Criterion XI, "Test Control"; and Criterion XVII, "Quality Assurance Records."
3. ~~IEEE Std 279 (ANSI N42.7-1972), "Criteria for Protection Systems for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers.~~¹⁶⁰
45. IEEE Std 317-1983 (reaffirmed 1992), "IEEE Standard for Electric Penetration Assemblies in Containment Structures for Nuclear Power Generation Stations," Institute of Electrical and Electronics Engineers (endorsed by Regulatory Guide 1.63).¹⁶¹
56. IEEE Std 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers (endorsed by Regulatory Guide 1.89 and NUREG-0588).¹⁶²
67. IEEE Std 334-1971¹⁶³, ~~"Standard IEEE Trial-Use Guide for Type Tests of Continuous-Duty Class 1E Motors for Installed Inside the Containment of Nuclear Power Generating Stations,"~~ Institute of Electrical and Electronics Engineers (endorsed by Regulatory Guide 1.40).¹⁶⁴
78. IEEE Std 381-1977 (reaffirmed 1984), "IEEE¹⁶⁵ Standard Criteria for Type Tests of Class 1E Modules Used in Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers.
89. IEEE Std 382-1972¹⁶⁶, ~~"Standard for Qualification of Safety-Related Valve Actuators~~IEEE Trial-Use Guide for Type Test of Class 1 Electric Valve Operators for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers. (as endorsed by Regulatory Guide 1.73.)¹⁶⁷
910. IEEE Std 383-1974 (reaffirmed 1992)¹⁶⁸, "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations,"

Institute of Electrical and Electronics Engineers (endorsed by Regulatory Guide 1.131).¹⁶⁹

- 11. IEEE Std: 535-1986, "IEEE¹⁷⁰ Standard for Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers.
- 12. IEEE Std 572-1985, "IEEE Standard for Qualification of Class 1E Connection Assemblies for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers (endorsed by Regulatory Guide 1.156).¹⁷¹
- 13. IEEE Std: 627-1980 (reaffirmed 1991), "IEEE¹⁷² Standard for Design Qualification of Safety Systems Equipment Used in Nuclear Power Generating Station," Institute of Electrical and Electronics Engineers.
- 14. IEEE Std: 649-1980, "IEEE¹⁷³ Standard for Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations."
- 15. IEEE Std: 650-1979, "IEEE¹⁷⁴ Standard for Qualification of Class 1E Static Battery Chargers and Inverters for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers.
- 16. Regulatory Guide 1.40, "Qualification Tests of Continuous-Duty Motors Installed Inside the Containment of Water-Cooled Nuclear Power Plants" (this guide supplements endorses IEEE Std. 334-1971¹⁷⁵).
- 17. Regulatory Guide 1.63, "Electric Penetration Assemblies in Containment Structures for Water-Cooled Nuclear Plants" (this guide supplements endorses IEEE Std 317-1983¹⁷⁶).
- 18. Regulatory Guide 1.73, "Qualification Tests of Electric Valve Operators Installed Inside the Containment of Nuclear Power Plants" (this guide supplements endorses IEEE Std 382-1972¹⁷⁷).
- 19. Regulatory Guide 1.89, "Qualification of Class 1E Equipment for Environmental Qualification of Certain Electric Equipment Important to Safety for¹⁷⁸ Nuclear Power Plants" (this guide supplements endorses IEEE Std 323-1974¹⁷⁹).
- 20. Regulatory Guide 1.97, "Instrumentation For Light-Water-Cooled Nuclear Power Plants To Assess Plant and Environs Conditions During and Following an Accident."¹⁸⁰
- 21. Regulatory Guide 1.131, "Qualification Tests of Electric Cables, Field Spices, and Connections for Light-Water-Cooled Nuclear Reactors" (this guide supplements endorses IEEE Std 383-1974¹⁸¹).
- 22. Regulatory Guide 1.151, "Instrument Sensing Lines."¹⁸²

23. Regulatory Guide 1.156, "Environmental Qualification of Connection Assemblies for Nuclear Power Plants" (endorses IEEE Std 572-1985).¹⁸³
24. Regulatory Guide 1.158, "Qualification of Safety-Related Lead Storage Batteries for Nuclear Power Plants" (endorses IEEE Std 535-1986).¹⁸⁴
- ~~19~~25. NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment."
- ~~20~~26. NUREG-0737, "Clarification of TMI Action Plan Requirements."
- ~~21~~27. NUREG-0718, "Licensing Requirements for Pending Applications for Construction Permits and Manufacturing License."
28. NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants."¹⁸⁵
29. Commission Memorandum and Order CLI-80-21, "Interim Staff Position on Electrical Equipment," May 23, 1980.¹⁸⁶

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Item numbers in the following table correspond to superscript numbers in the redline/strikeout copy of the draft SRP section.

Item	Source	Description
1.	Current primary review branch and abbreviation	Deleted "Equipment Qualification Branch (EQB)" and substituted "Plant Systems Branch (SPLB)" under REVIEW RESPONSIBILITIES.
2.	Current secondary review branch and abbreviation	Deleted "none" and substituted "Instrumentation and Controls Branch (HICB)" under REVIEW RESPONSIBILITIES.
3.	Editorial/ Generic Issue B-3	Deleted "abnormal, and accident" and substituted "environmental conditions, anticipated operational occurrences, and accident and postaccident" to agree with the sentence that follows and to incorporate revised uniform wording (see Generic Issue B-3).
4.	Editorial/ Generic Issue B-3	Deleted "abnormal" and substituted "environmental conditions, anticipated operational occurrences, and" in the sentence to incorporate revised uniform wording (see Generic Issue B-3).
5.	Editorial	Deleted the redundant phrase, "are deemed to," from the sentence.
6.	Generic Issue B-3	Substituted "anticipated operational occurrences" for "or abnormal" in the sentence to comply with standard nomenclature.
7.	Editorial	Changed "assure" to "ensure."

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Item	Source	Description
8.	10 CFR 50.49; 10 CFR Part 50, Appendices A and B; Regulatory Guide 1.70; Regulatory Guide 1.89; NUREG-0588; and the CE80+, and ABWR FSERs Integrated Impact No. 197	Substituted "General Design Criteria 1, 2, 4, and 23, the requirements of Appendix B to 10 CFR 50, Quality Assurance Criteria III, XI, and XVII, and the requirements of 10 CFR 50.49" for "Criterion 4." This change reflects the NRC staff's position as contained in the Statement of Considerations (SOC) for 10 CFR 50.49 (48 FR 2730, dated 21 January 1983); Subsection 3.11.2 of Regulatory Guide 1.70; Section A of Regulatory Guide 1.89; the CE80+ FSER; NUREG-1462, Subsection 3.11.1; and the ABWR FSER, NUREG-1503, Subsection 3.11. The SOC cites General Design Criteria 1, 2, 4, and 23 and Quality Assurance Criteria III and XI. Subsection 3.11.2 of R.G. 1.70 cites General Design Criteria 1, 4, 23 and 50, and Quality Assurance Criterion III. Regulatory Guide 1.89 cites General Design Criteria 1, 2, 4, and 23 and Quality Assurance Criteria III, XI, and XVII. NUREG-0588 cites General Design Criteria 1, 2, 4, and 23 and Quality Assurance Criteria III and XI. Both the CE80+ and ABWR FSERs cite General Design Criteria 1 and 4 and Quality Assurance Criteria III, XI, and XVII. References 1 and 2 in SRP Section 3.11, Rev. 2, cited GDC 4 as well as Quality Assurance Criteria III, XI, and XVII. In any case, all criteria cited in the revised text are applicable to this SRP section.
9.	Editorial	Moved sentence within this paragraph so that the two sentences above it, which refer to the same topic, would be together.
10.	Integrated Impact No. 197	Added discussion of the requirements of 10 CFR 50.49.
11.	Editorial	Broke first paragraph of AREAS OF REVIEW into 2 paragraphs to cover two different subjects. Further, the second part of the original paragraph is referred to in several places in this SRP section; the citation will be clarified.
12.	Editorial	Deleted "below" and substituted "in this paragraph."
13.	Editorial	Defined "SRP" as Standard Review Plan.
14.	SRP-UDP format item	Listed new and existing numbered items as separate items to improve clarity. Modified lead-in phrase.
15.	Editorial	Added "equipment" to items (2) and (3) and deleted "and" from its previous location to accommodate the added items that follow.
16.	Integrated Impact Nos. 197 and 202	Added direct reference to the electrical equipment covered by 10 CFR 50.49. Added items (4) and (5) to reflect the review scope more accurately.

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Item	Source	Description
17.	Editorial	Deleted sentence at the end of the paragraph ("Seismic qualification is addressed in SRP Section 3.10."), which is incomplete and out of place. Added appropriate text.
18.	Generic Issue B-3	Substituted "in the event of anticipated operational occurrences" for "abnormal" to comply with standard nomenclature.
19.	SRP-UDP format item	Added definition of environmental qualification to the end of the paragraph. This definition was adapted from Regulatory Guide 1.89, Rev. 1, Section B, second paragraph.
20.	Editorial	Corrected citation of location of systems information to agree with updated SRP section. Deleted "paragraph 1 of subsection I" and substituted "the second paragraph of subsection I."
21.	Generic Issue B-3	Substituted "anticipated operational occurrences" for "abnormal" to comply with standard nomenclature. Deleted "the."
22.	Editorial	Corrected usage of the word "Requirements."
23.	Editorial	Combined two paragraphs that refer to the same subject.
24.	10 CFR Part 52	Added paragraph to AREAS OF REVIEW that refers to design certification reviews and subsequent combined license reviews. This addition is needed because the existing text refers only to CP and OL applications. The text of this paragraph was adapted from Subsection 3.11.3 of the CE80+ FSER, NUREG-1462.
25.	Editorial	Added a new paragraph that corrects and expands the sentence deleted from the end of the existing first paragraph of AREAS OF REVIEW, to which it did not apply.
26.	SRP-UDP format item	Added text removed from "Review Interfaces" because these sections were previously under the cognizance of the ASB.
27.	SRP-UDP format item Integrated Impact No. 202	Added a new paragraph to reflect the secondary review branch responsibilities of the HICB. This paragraph was adapted from information contained in Sections 3.10 and 3.11 of NUREG 75-087.
28.	SRP-UDP format item	Added "Review Interfaces" to AREAS OF REVIEW. Added alphabetical designations and numerical designations under "Review Interfaces" and indented text accordingly.
29.	Primary review branch abbreviation	Deleted "EQB" and substituted "SPLB."

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Item	Source	Description
30.	Editorial	Changed "this section" to "SAR Section 3.11" to improve clarity.
31.	Primary review branch abbreviation	Deleted "EQB" and substituted "SPLB."
32.	Primary review branch abbreviation	Deleted "EQB" and substituted "The SPLB."
33.	Editorial	Changed "branches evaluation" to "branch evaluations."
34.	SRP-UDP format item/ Primary review branch responsibility	Deleted "ASB reviews Sections 3.4.1, 3.5.1.1, 3.5.2, 3.6.1, 5.4.11, and applicable sections of Chapter 9" because SPLB now has primary review responsibility for these SRP sections. This text was inserted, essentially verbatim, as a new paragraph in the description of SPLB responsibility that precedes "Review Interfaces."
35.	SRP-UDP format item/ Current review branch responsibility	Deleted "the CSB reviews Section 6.2" and substituted "Containment Systems and Severe Accident Branch (SCSB) reviews SRP Sections 6.2.1 through 6.2.6."
36.	SRP-UDP format item/ Current review branch abbreviation	Deleted "RSB" and substituted "the Reactor Systems Branch (SRXB)."
37.	SRP-UDP format item/ Secondary review branch abbreviation	Deleted "ICSB" and substituted "the HICB."
38.	SRP-UDP format item/ Current review branch designation and abbreviation	Deleted "PSB" and substituted "the Electrical Engineering Branch (EELB)."
39.	SRP-UDP format item/ Current review branch designation and abbreviation	Deleted "AEB" and substituted "the Materials and Chemical Engineering Branch (EMCB)."
40.	SRP-UDP format item/ Current review branch abbreviation	Deleted "ASB, ICSB, PSB, and RSB" and substituted "SCSB, SRXB, HICB, EELB, and EMCB."
41.	Editorial	Corrected citation for location of systems information to agree with updated SRP section. Deleted "as identified in paragraph 1 of subsection I" and substituted "described in the second paragraph of Subsection I."
42.	SRP-UDP format item/ Current review branch abbreviation	Substituted "SCSB" for "ASB and CSB."
43.	Editorial	Corrected use of double prepositions by deleting "of" (two occurrences).
44.	SRP-UDP format item/ Current review branch abbreviation	Deleted "ASB, CSB, ICSB, PSB, and RSB" and substituted "SCSB, SRXB, HICB, EELB, and EMCB."

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Item	Source	Description
45.	Generic Issue B-3	Substituted "anticipated operational occurrences" for "abnormal" to comply with standard nomenclature. Deleted the word "the." Corrected punctuation.
46.	Integrated Impact 1491	Added discussion of items addressed in Regulatory Guide 1.151 to the Review Interfaces subsection of the Areas of Review.
47.	SRP-UDP format item/ Current review branch abbreviation	Substituted "HICB" for "ASB."
48.	Integrated Impact 1491	Added discussion of items addressed in Regulatory Guide 1.151 to the Review Interfaces subsection of the Areas of Review.
49.	SRP-UDP format item/ Current review branch designation and abbreviation	Substituted "Quality Assurance and Maintenance Branch (HQMB)" for "QAB."
50.	Editorial	Defined "QA" as "quality assurance."
51.	SRP-UDP format item/ Current review branch designation and abbreviation	Deleted "AEB reviews" and substituted "Emergency Preparedness and Radiation Protection Branch and the EMCB review."
52.	Generic Issue B-3	Substituted the phrase "as well as anticipated operational occurrences" for "the abnormal" to conform to standard nomenclature. Corrected punctuation.
53.	SRP-UDP format item/ Current review branch designation and abbreviation	Deleted "MEB" and substituted "the Mechanical Engineering Branch (EMEB)."
54.	SRP-UDP Integration of Bolting Issues, Potential Impact 986	Added a review interface reflecting reviews of bolting and threaded fastener programs under proposed new SRP Section 3.13.
55.	SRP-UDP format item, Review Interfaces	Added a Review Interface to SRP Section 19.2.4, "Severe Accident Containment Performance." (See PIs 23074, 23075 and 23043).
56.	Editorial	Simplified general review responsibility statement to improve clarity and readability.
57.	Editorial	Added a lead-in sentence to the Acceptance Criteria subsection that is typical of other SRP sections.

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Item	Source	Description
58.	Integrated Impact No. 197 and 205	The ACCEPTANCE CRITERIA subsection of the SRP was revised and restructured to list the applicable acceptance criteria for environmental qualification of equipment. The revised structure is typical of other SRP sections and clearly identifies the criteria to the reviewer. GDCs 1, 2, and 23, the EQ rule 10 CFR 50.49, and applicable portions of 10 CFR 50, Appendix B were added to the criteria, based primarily on Regulatory Guide 1.89, but are also reflected in the staffs SERs for the evolutionary designs.
59.	Editorial	Corrected tense of "guides."
60.	Editorial	Corrected tense of "describe."
61.	10 CFR 50.49; 10 CFR Part 50, Appendices A and B; Regulatory Guide 1.70; Regulatory Guide 1.89; NUREG-0588; and the CE80+ and ABWR FSERs Integrated Impact No. 197	Deleted "General Design Criterion 4" and substituted "10 CFR 50.49; General Design Criteria 1, 2, 4, and 23 and Quality Assurance Criteria III, XI, and XVII" to reflect the staff's position as contained in the Statement of Considerations (SOC) for 10 CFR 50.49 (48 FR 2730, dated 21 January 1983); Subsection 3.11.2 of Regulatory Guide 1.70; Section A of Regulatory Guide 1.89; the CE80+ FSER, NUREG-1462, Subsection 3.11.1; and the ABWR FSER, NUREG-1503, Subsection 3.11.
62.	SRP-UDP format item	Indented paragraph and the ones that follow; provided letter designations for each paragraph to improve clarity.
63.	SRP-UDP format item	Separated existing numbered portions of the sentence and indented them to improve clarity.
64.	Generic Issue B-3	Substituted the phrase "anticipated operational occurrences" for "abnormal" to comply with standard nomenclature and corrected punctuation.
65.	Editorial	Set phrase aside in parentheses to avoid potential misunderstanding caused by a misplaced modifier.
66.	SRP-UDP format item	Indented paragraph and the ones that follow; provided number designations for each paragraph to improve clarity.
67.	Editorial	Deleted the article "The" at the beginning of the sentence to avoid the implication that this sentence describes the only criteria for assessing acceptability of an environmental qualification program.
68.	Editorial	Deleted the phrase "of OL applicants." The sentence now applies to all licensees.
69.	SRP-UDP format item	Cited latest date of publication of NUREG-0588.

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Item	Source	Description
70.	Editorial	Moved two sentences that refer to NUREG-0588 from the paragraph that follows to this location so that the discussion will be consistent. Deleted redundant title in text that was moved.
71.	Integrated Impact No. 197	Deleted reference to Category II of NUREG-0588 which is no longer applicable and added appropriate references. Added reference to Category I requirements as per IEEE Std 323-1974 for future plants.
72.	Editorial	Cite IEEE 323 for clarification.
73.	Editorial	Refer to "IEEE 323" rather than "This document."
74.	Editorial	Deleted three sentences in this paragraph and moved the first two to the previous paragraph so that the discussion of NUREG-0588 will be consistent. The text moved or deleted is as follows: "NUREG-0588 (endorsed by the Commission Memorandum and Order CLI-80-21 dated May 23, 1980), 'Interim Staff Position on Electrical Equipment,' discusses the staff position and acceptance criteria on the environmental qualification of electrical equipment. These criteria are general in nature and could also be applied to the mechanical equipment. The environmental design and qualification of equipment is acceptable when it is ascertained that the criteria of NUREG-0588 have been met." The last sentence was deleted because its too broad. (See item 64)
75.	Integrated Impact No. 197	Added discussion of Regulatory Guide 1.89 and 10 CFR 50.49 to ACCEPTANCE CRITERIA. All but the first paragraph of the added text was taken from the CE 80+ FSER, NUREG-1462, Section 3.11.2. The first paragraph is a general description and introductory statement.
76.	SRP-UDP format item	Corrected citation of IEEE Std 334 to reflect endorsement as cited in RG 1.40. IEEE Std 334 is listed as withdrawn in 1993 by NUREG/CR-5973, "Codes and Standards and Other Guidance Cited in Regulatory Documents." Note that the ABWR FSAR cites RG 1.40 but also cites IEEE Std 334. The staff did not comment on this discrepancy in Sections 1.8 or 3.11 of the ABWR FSER, NUREG-1503.
77.	SRP-UDP Format Item	Added parenthetical reference identification in accordance with SRP-UDP guidance. This approach allows the specific version of the standard to be cited in the Reference subsection only, which will simplify future updates of the SRP.

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Item	Source	Description
78.	Editorial	Deleted "augmented" and substituted "endorsed" to provide an accurate reflection of the relationship between the regulatory guide and the standard.
79.	SRP-UDP format item	Corrected citation of IEEE Std 382 to reflect endorsement as cited in RG 1.73. Note that the ABWR FSAR cites R. G. 1.73 but also cites IEEE Std 382-1985. The staff did not comment on this discrepancy in Sections 1.8 or 3.11 of the ABWR FSER, NUREG-1503.
80.	SRP-UDP Format Item	Added parenthetical reference identification in accordance with SRP-UDP guidance. This approach allows the specific version of the standard to be cited in the Reference subsection only, which will simplify future updates of the SRP.
81.	Editorial	Deleted "augmented" and substituted "endorsed" to provide an accurate reflection of the relationship between the regulatory guide and the standard.
82.	SRP-UDP Format Item	Added parenthetical reference identification in accordance with SRP-UDP guidance. This approach allows the specific version of the standard to be cited in the Reference subsection only, which will simplify future updates of the SRP.
83.	Editorial	Deleted "augmented" and substituted "endorsed" to provide an accurate reflection of the relationship between the regulatory guide and the standard.
84.	Integrated Impact No. 691	No change was made to the text of the SRP section. Integrated Impact No. 691 recommends that Regulatory Guide 1.131 be updated to cite the 1993 edition of ASTM D2220 regarding PVC insulation. (IPD-7.0 Form 3.11-3)
85.	Integrated Impact Nos. 197	Added "and Regulatory Guide 1.89, as appropriate."
86.	SRP-UDP format item	Corrected citation of IEEE Std 317 to reflect endorsement as cited in RG 1.63.
87.	SRP-UDP Format Item	Added parenthetical reference identification in accordance with SRP-UDP guidance. This approach allows the specific version of the standard to be cited in the Reference subsection only, which will simplify future updates of the SRP.
88.	Editorial	Deleted "augmented" and substituted "endorsed" to provide an accurate reflection of the relationship between the regulatory guide and the standard.
89.	Integrated Impact Nos. 197	Added "and Regulatory Guide 1.89, as appropriate."

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Item	Source	Description
90.	SRP-UDP Format Item	Added parenthetical reference identification in accordance with SRP-UDP guidance. This approach allows the specific version of the standard to be cited in the Reference subsection only, which will simplify future updates of the SRP. Also added the title for IEEE Std 381 to be consistent with other standard citations in the SRP section.
91.	Integrated Impact No. 198	Deleted citation of IEEE Std 535 in the paragraph. This standard was reviewed and accepted by the staff as described in Regulatory Guide 1.158, February 1989.
92.	SRP-UDP Format Item	Added parenthetical reference identification in accordance with SRP-UDP guidance. This approach allows the specific version of the standard to be cited in the Reference subsection only, which will simplify future updates of the SRP. Also added the title for IEEE Std 627 to be consistent with other standard citations in the SRP section.
93.	SRP-UDP Format Item	Added parenthetical reference identification in accordance with SRP-UDP guidance. This approach allows the specific version of the standard to be cited in the Reference subsection only, which will simplify future updates of the SRP. Also added the title for IEEE Std 649 to be consistent with other standard citations in the SRP section.
94.	SRP-UDP Format Item	Added parenthetical reference identification in accordance with SRP-UDP guidance. This approach allows the specific version of the standard to be cited in the Reference subsection only, which will simplify future updates of the SRP. Also added the title for IEEE Std 650 to be consistent with other standard citations in the SRP section.
95.	Editorial	Corrected "formerly" to "formally."
96.	Integrated Impact No. 198	Added paragraph to cover review of lead storage batteries.
97.	Editorial	Added "emergency core cooling system" and deleted the acronym "ECCS" for clarification.
98.	Editorial	Added "an" for readability.

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Item	Source	Description
99.	Integrated Impact No. 206	Added "NUREG-1465 'Accident Source Terms for Light-Water Nuclear Power Plants.'" The existing references to NUREGs-0588, -0737 and -0718, are based on the definition of the source term as described in TID 14844, "Calculation of Distance Factors for Power and Test Reactors." The source term was revised by the staff in NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants." The draft of this document is the basis for the CE System 80+ source term as indicated in NUREG-1462, the CE 80+ FSER.
100.	Integrated Impact Nos. 204 and 205	Added a paragraph to Subsection II.C(8) taken from subsection 3.11.3.2.1 of the CE System 80+ FSER (NUREG-1462) regarding the criterion for the radiation environment for electronic and other equipment.
101.	Integrated Impact No. 199	Added reference to RG 1.156 and IEEE Std 572.
102.	Integrated Impact No. 202	Added Subsection II.C(10) regarding postaccident monitoring equipment.
103.	Integrated Impact No. 1349	Added Subsection II.C(11) regarding equipment qualification associated with possible hydrogen generation by a metal-water reaction of the fuel. The text of the above paragraph was closely adapted from 10 CFR 50.34(f)(2)(ix)(C) and (D).
104.	Integrated Impact No. 204	Added passage to focus the staff's review of mechanical equipment. The added text was taken directly from Subsection 3.11.3.2.2 of the CE System 80+ FSER, NUREG-1462. As stated in the FSER, GDCs 1 and 4, and 10 CFR 50, Appendix B, Sections III, and XVII, provide the basis for the review of mechanical components.
105.	Editorial	Changed "the" to "a."
106.	SRP-UDP format item	Indented paragraph and the one that follows and provided letter designations to improve clarity.
107.	Editorial	Changed "documentation" to "documents" to correct grammar.
108.	Generic Issue B-3	Substituted "and anticipated operational occurrences" for "and abnormal" for consistency.
109.	Editorial	Changed "assure" to "ensure."
110.	Editorial	Added comma.
111.	Generic Issue B-3	Substituted "anticipated operational occurrences" for "the abnormal environmental conditions" for consistency.

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Item	Source	Description
112.	Integrated Impact 1491	Added discussion of items addressed in Regulatory Guide 1.151 to the specific Acceptance Criteria subsection.
113.	SRP-UDP format item	Added "Technical Rationale" and lead-in statement to ACCEPTANCE CRITERIA.
114.	SRP-UDP format item	Added technical rationale for GDC 1.
115.	SRP-UDP format item	Added technical rationale for GDC 2.
116.	SRP-UDP format item	Added technical rationale for GDC 4.
117.	SRP-UDP format item	Added technical rationale for GDC 23.
118.	SRP-UDP format item	Added technical rationale for 10 CFR 50.34(f)(2)(ix).
119.	SRP-UDP format item	Added technical rationale for 10 CFR 50.49.
120.	SRP-UDP format item	Added technical rationale for 10 CFR 50, Appendix B, Criterion III.
121.	SRP-UDP format item	Added technical rationale for 10 CFR 50, Appendix B, Criterion XI.
122.	SRP-UDP format item	Added technical rationale for 10 CFR 50, Appendix B, Criterion XVII.
123.	Editorial	Defined "PSAR" as "preliminary safety analysis report."
124.	Editorial	Changed "is" to "are" to provide noun/verb agreement.
125.	Generic Issue B-3	Substituted "anticipated operational occurrences" for "abnormal" for consistency. Corrected punctuation.
126.	Editorial	Corrected citation of location of systems information to agree with updated SRP section. Deleted "as delineated in paragraph 1 of subsection I" and substituted "described in the second paragraph of subsection I."
127.	Integrated Impact 202	Added a discussion of the exemption granted in both the ABWR and System 80+ design certifications regarding use of Revision 3 to RG 1.97.
128.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard paragraph to address application of Review Procedures in design certification reviews.
129.	Editorial	Provided "SER" as initialism for "safety evaluation report."
130.	Editorial	Indented paragraphs that follow.

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Item	Source	Description
131.	SRP-UDP format item Integrated Impact No. 197 10 CFR 50.49; 10 CFR Part 50, Appendices A and B; Regulatory Guide 1.70; Regulatory Guide 1.89; NUREG-0588; and the CE80+ and ABWR FSERs.	Substituted "General Design Criteria 1, 2, 4, and 23; the relevant requirements of 10 CFR 50, Appendix B, Quality Assurance Criteria III, XI, and XVII and the relevant requirements of 10 CFR 50.49" for the phrase "General Design Criterion 4." (See item 8 above.)
132.	Editorial	Indented paragraphs that follow.
133.	Generic Issue B-3	Substituted the phrase "in the event of anticipated operational occurrences as well as" for "abnormal." Added "accident" to correct an omission.
134.	SRP-UDP format item	Clarified introductory phrase. Deleted "program for equipment has met the guidelines of" and added "equipment qualification program is in accordance with the guidance and requirements of:" as lead-in to a list of guidance and requirements documents.
135.	SRP-UDP format item/ Integrated Impact No. 197	Added subsection IV.1 to EVALUATION FINDINGS for 10 CFR 50.49, Regulatory Guide 1.89, Category I of NUREG-0588, and IEEE Std 323-1974 regarding general requirements and methods for environmental qualification of electrical and mechanical equipment located in a harsh environment.
136.	SRP-UDP format item	Deleted the phrase, "task action plan, Item II.B.2 of NUREGs-0718 and 0737," and substituted, "Subsection II.C.(8) of this SRP Section regarding establishment of an NRC staff approved source term for environmental qualification of equipment," to reflect the staff's current position to examine the source term for each application on a case-by-case basis.
137.	SRP-UDP format item	Corrected citation of IEEE Std 323 and added the phrase "regarding qualification of electrical equipment important to safety in a harsh environment" in subsection IV.3 to clarify the application of the standard.
138.	SRP-UDP format item	Corrected citation of IEEE Std 334 and added the phrase "regarding qualification of motors located inside containment" in subsection IV.4 to clarify the application of the standard.
139.	SRP-UDP format item	Corrected citation of ANSI/IEEE Std 382 and added the phrase "regarding qualification of electric valve operators located in a harsh environment" in subsection IV.5 to clarify the application of the standard.
140.	Editorial	Deleted the word "supplemented" and substituted "endorsed" in subsections IV.3, IV.4, IV.5, and IV.6, to provide an accurate reflection of the relationship between the standards and the regulatory guides.

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Item	Source	Description
141.	Editorial	Regulatory Guide 1.63 was incorrectly cited as invoking IEEE Std 383. The correct RG is 1.131. Added the phrase "regarding qualification of cables located in a harsh environment" in subsection IV.6 to clarify the application of the standard.
142.	Editorial	Deleted "and NUREG-0588." This requirement is now covered in subsection IV.1.
143.	SRP-UDP format item	Added subsection IV.7 to reference IEEE Std 317 as endorsed by Regulatory Guide 1.63 regarding qualification of containment penetration assemblies.
144.	SRP-UDP format item	Added subsection IV.8 to reference IEEE Std 535 as endorsed by Regulatory Guide 1.158 regarding qualification of lead storage batteries located in a harsh environment.
145.	SRP-UDP format item	Added subsection IV.9 to reference IEEE Std 572 as endorsed by Regulatory Guide 1.156 regarding qualification of connection assemblies located in a harsh environment.
146.	SRP-UDP format item/ Integrated Impact No. 202	Added subsection IV.10. to reference Regulatory Guide 1.97 regarding qualification of instrumentation and postaccident monitoring equipment located in a harsh environment.
147.	Integrated Impact 1491	Added discussion of items addressed in Regulatory Guide 1.151 to the Evaluation Findings subsection.
148.	SRP-UDP format item	Added Subsection IV.12 to reference 10 CFR 50, Appendix B, and the pertinent portions of the standards and guidance described in this SRP section regarding records of environmental qualification. This text was added to cover recordkeeping.
149.	SRP-UDP Format Item, Implement 10 CFR 52 Related Changes	To address design certification reviews a new paragraph was added to the end of the Evaluation Findings. This paragraph addresses design certification specific items including ITAAC, DAC, site interface requirements, and combined license action items.
150.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard sentence to address application of the SRP section to reviews of applications filed under 10 CFR Part 52, as well as Part 50.
151.	SRP-UDP Guidance	Added standard paragraph to indicate applicability of this section to reviews of future applications.
152.	Editorial	Deleted obsolete information.
153.	Editorial	Changed "Plants are" to "Each plant is" and "basis" to "bases" for clarity.

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Item	Source	Description
154.	Integrated Impact No. 197	Deleted the phrase "either by June 30, 1982 or prior to submittal of operating license application, whichever comes later" and replaced it with "before submittal of operating license application" to update obsolete information (see 10 CFR 50.49(h)(i)). It is not necessary to refer to a date because all future plants must comply fully with the regulations.
155.	10 CFR Part 52, Subpart C, "Combined Licenses"	Added "For combined license (COL) applicants referencing a certified design...described in this SRP section." The existing paragraph only covered the case of OL applications.
156.	Integrated Impact No. 1349	Added 10 CFR 50.34(f)(2)(ix) as new Reference 1.
157.	Integrated Impact No. 197 SRP-UDP format item	Added 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," as new Reference 2.
158.	Editorial	Renumbered REFERENCES to accommodate added citations.
159.	10 CFR 50.49; 10 CFR Part 50, Appendices A and B; Regulatory Guide 1.70; Regulatory Guide 1.89; NUREG-0588; and the CE80+ and ABWR FSERs.	Added General Design Criteria 1, 2, and 23 to REFERENCES.
160.	SRP-UDP Format Item, Reference Verification	Deleted IEEE Std 279 (ANSI N42.7-1972) as a reference. IEEE Std 279 is not cited as a reference in the text of SRP Section 3.11 and it is assumed that this reference was included for information only.
161.	Integrated Impact 655, Editorial	Added the applicable version date to the standard reference for IEEE Std. 317. Also revised the title and identified the endorsing Regulatory Guide.
162.	Editorial	Corrected citation of IEEE Std 323-1974 to agree with NUREG-0588 and RG 1.89. Added parenthetical statement to indicate that the standard is endorsed by RG 1.89 and NUREG-0588.
163.	Integrated Impact 1494	Added applicable version date to IEEE Std. 334.
164.	Integrated Impact No. 197	Corrected citation of IEEE Std 334-1971 to agree with RG 1.40. Added parenthetical statement that the standard is endorsed by RG 1.40.
165.	Integrated Impact 655, Editorial	Added the applicable version date to the standard reference for IEEE Std. 381 and also revised the title.
166.	Integrated Impact 1495	Added applicable version date to IEEE Std. 382.
167.	Editorial	Corrected citation of ANSI/IEEE Std 382-1972 to agree with RG 1.73. Added parenthetical statement that the standard is endorsed by RG 1.73.

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Item	Source	Description
168.	Integrated Impact 655, Editorial	Added the applicable version date to the standard reference for IEEE Std. 383 and also revised the title.
169.	Editorial	Corrected citation of IEEE Std 383-1974 to agree with RG 1.131 and incorporated reaffirmation information. Added parenthetical statement to indicate that the standard is endorsed by RG 1.131.
170.	Integrated Impact No. 198	Corrected citation of IEEE Std 535-1986 to agree with RG 1.158
171.	Integrated Impact No. 199	Cited IEEE Std 572-1985 as a reference.
172.	Integrated Impact No. 655/ Editorial	Cited IEEE Std 627-1980 and corrected title to describe the reference more accurately.
173.	Integrated Impact 1496, Editorial	Cited ANSI/IEEE Std 649-1980 and corrected title to describe the reference more accurately.
174.	Integrated Impact 1497, Editorial	Cited IEEE Std 650-1979 and corrected title to describe the reference more accurately.
175.	Editorial	Substituted the word "endorses" for "supplements" in the parenthetical statement to provide an accurate reflection of the relationship between the standard and the regulatory guide. Corrected the citation of IEEE Std 334-1971 to reflect the standard as endorsed in RG 1.40.
176.	Editorial	Deleted the word "supplements" and substituted "endorses" in the parenthetical phrase to provide an accurate reflection of the relationship between the regulatory guide and the standard. Corrected citation of IEEE Std 317-1983 to reflect endorsement in RG 1.63.
177.	Editorial	Deleted the word "supplements" and substituted "endorses" in the parenthetical phrase to provide an accurate reflection of the relationship between the regulatory guide and the standard. Corrected citation of IEEE Std 382-1972 to reflect endorsement in RG 1.73.
178.	Editorial	Corrected title of standard.
179.	Editorial	Deleted the word "supplements" and substituted "endorses" in the parenthetical phrase to provide an accurate reflection of the relationship between the regulatory guide and the standard. Indicated that RG 1.89 endorses IEEE Std 323-1974.
180.	Integrated Impact No. 202	Added reference to cite Regulatory Guide 1.97 regarding environmental qualification of instrumentation.

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Item	Source	Description
181.	Editorial	Deleted the word "supplements" and substituted "endorses" in the parenthetical phrase to provide an accurate reflection of the relationship between the regulatory guide and the standard. Indicated that RG 1.131 endorses ANSI/IEEE Std 383-1974.
182.	Integrated Impact 1491	Added Regulatory Guide 1.151 to the list of references in the References subsection.
183.	Integrated Impact No. 199	Added RG 1.156 to REFERENCES.
184.	Integrated Impact No. 198	Added RG 1.158 to REFERENCES.
185.	Integrated Impact No. 206	Added NUREG-1465 to REFERENCES.
186.	SRP-UDP format item	Added Commission Memo, which was omitted in the previous revision of SRP Section 3.11 and should have been included.

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Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
197	Add a discussion of 10 CFR 50.49, the "EQ Rule," and Regulatory Guide 1.89 as it endorses IEEE Std 323-1974.	AREAS OF REVIEW, 1st and 2nd paragraph ACCEPTANCE CRITERIA, numerous additions and deletions EVALUATION FINDINGS, 2nd paragraph, subsection IV.1 IMPLEMENTATION, 3rd paragraph REFERENCES, new References 1 and 20
198	Add a discussion of RG 1.158's endorsement of IEEE Std 535-1986.	ACCEPTANCE CRITERIA, subsections II.C(5) and II.C(6) REFERENCES, References 11 and 24
199	Add a discussion of RG 1.156's endorsement of IEEE Std 572-1985.	ACCEPTANCE CRITERIA, subsection II.C(9) REFERENCES, new References 12 and 23
200	Endorse the 1974 version of IEEE Std 334 rather than the 1971 version in SRP Section 3.11.	No change was made to the text of SRP Section 3.11 based on Integrated Impact No. 200.
201	Endorse the 1985 version of IEEE Std 382 rather than the 1972 version in SRP Section 3.11	No change was made to the text of SRP Section 3.11 based on Integrated Impact No. 201.
202	Add a discussion of environmental qualification of instrumentation, in accordance with Regulatory Guide 1.97 to SRP Section 3.11.	AREAS OF REVIEW, subsection I(5). Added new paragraph just before "Review Interfaces." ACCEPTANCE CRITERIA, subsection II.C(10) EVALUATION FINDINGS, subsection IV.10 REFERENCES, Reference 21
203	Add a discussion of a number of NRC Bulletins as they relate to environmental qualification of equipment.	No change was made to the text of SRP Section 3.11 based on Integrated Impact No. 203.
204	Add a discussion to SRP Section 3.11 covering nonmetallic mechanical equipment that is sensitive to environmental conditions. Add a discussion of the NRC position on radiation levels that constitute a mild environment.	ACCEPTANCE CRITERIA, last 2 paragraphs under subheading, "Harsh Environment."

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Integrated Impact No.	Issue	SRP Subsections Affected
205	Add a discussion to SRP Section 3.11 covering non-metallic mechanical equipment that is sensitive to environmental conditions. Address GE Topical Report NEDE-24326-1 (proprietary) and GESSAR II design. Add a discussion of the staff position on radiation levels that constitute a mild environment for electronics equipment. Add a discussion of flooding above the flood level that might compromise equipment qualification. Add a discussion of design life as it relates to equipment qualification.	ACCEPTANCE CRITERIA, new 1st paragraph, subsections II.3.h.
206	Add a discussion of the NRC staff's approval of the new EPRI-proposed source term. Add a discussion of design life as it relates to equipment qualification.	ACCEPTANCE CRITERIA, first paragraph of subsection II.h.3. Qualified life is addressed in Integrated Impact No. 205.
207	Add a discussion of new testing requirements related to large-bore hydraulic snubbers to acceptance criteria.	No change was made to the text of SRP Section 3.11 based on Integrated Impact No. 207.
208	Add review procedures to address equipment survivability under severe accident conditions.	No change was made to the text of SRP Section 3.11 based on Integrated Impact No. 208. Equipment survivability under severe accident conditions is not covered under SRP Section 3.11.
654	Address updated versions of various IEEE standards in SRP Section 3.11.	This is a placeholder integrated impact and will not be processed further.
655	Cite the reaffirmed versions of IEEE Std 317, 381, 383, and 627 in SRP Section 3.11.	REFERENCES
691	Revise Regulatory Guide 1.131 to cite ASTM D2220-1993 rather than ASTM D2220-1968.	No change was made to the text of SRP Section 3.11 based on Integrated Impact No. 691.
692	Cite IEEE Std 323-1983(R90) rather than IEEE Std 323-1974 in SRP Section 3.11.	No change was made to the text of SRP Section 3.11 based on Integrated Impact No. 692.
742	Update Regulatory Guide 1.131 to cite the latest versions of IEEE 323 and 383.	No change was made to the text of SRP Section 3.11 based on Integrated Impact No. 742.

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Integrated Impact No.	Issue	SRP Subsections Affected
1349	Add a discussion regarding equipment qualification or protection to accommodate hydrogen burning or post-accident inerting.	ACCEPTANCE CRITERIA, subsection II.C(11); "Technical Rationale," subsection 5 EVALUATION FINDINGS, subsection IV(14) REFERENCES, Reference 1
1365	Change Regulatory Guide 1.73 to endorse the latest version of IEEE 382. The latest version is IEEE Std 382-1985, "IEEE Standard for Qualification of Actuators for Power Operated Valve Assemblies with Safety Related Functions for Nuclear Power Plants."	No change was made to the text of SRP Section 3.11 based on Integrated Impact No. 1365.
1491	Incorporate Regulatory Guide 1.151 as guidance in Acceptance Criteria of this SRP section.	AREAS OF REVIEW, I.E; ACCEPTANCE CRITERIA, II.E; EVALUATION FINDINGS, IV.11 REFERENCES, Reference 23
1494	Update the citation of IEEE 334 to cite the 1971 version.	REFERENCES
1495	Update the citation of IEEE 382 to cite the 1972 version.	REFERENCES
1496	Update the citation of IEEE 649 to cite the 1980 version.	REFERENCES
1497	Update the citation of IEEE 650 to cite the 1979 version.	REFERENCES