



U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

14.3.7¹ PLANT SYSTEMS (Tier 1)

REVIEW RESPONSIBILITIES

Primary - Plant Systems Branch (SPLB)

Secondary - None

I. AREAS OF REVIEW

SPLB reviews the Design Control document (DCD) submitted by the applicant. SPLB has primary review responsibility for most of the fluid systems in Tier 1 that are not part of the core reactor systems. Review responsibilities may be consistent with those in Appendix A to SRP Section 14.3. The scope of the plant systems review includes new and spent fuel handling systems, power generation systems, air systems, cooling water systems, radioactive waste systems and heating, ventilation and air conditioning systems. SPLB reviews issues which affect multiple SSCs such as equipment qualification and protection from fires, floods and tornado missiles, and, therefore, has secondary review responsibilities for most of the fluid systems and the structures of the design. In addition, SPLB has responsibility for the review of selected definitions, interface requirements of the standard design with the site, and site parameters for the design, that pertain to plant systems issues.

Review Interfaces

SRP Section 14.3 provides general guidance on review interfaces. SPLB performs related reviews and coordination activities, as requested by other branches, for issues in Tier 1 related to plant systems. In addition, SPLB will coordinate other branches' evaluations that interface with the overall review of the systems as follows:

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USNRC STANDARD REVIEW PLAN

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

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

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

1. The Electrical Engineering Branch (EELB) determines the acceptability of Tier 1 information regarding electrical SSCs in SRP Section 14.3.6.
2. The Civil Engineering and Geosciences Branch (ECGB) determines the acceptability of Tier 1 information regarding the ability of SSCs to withstand various natural phenomena in SRP Sections 14.3.1 and 14.3.2, and regarding piping design in SRP Section 14.3.3.
3. The Instrumentation and Controls Branch (HICB) determines the acceptability of Tier 1 information regarding the instrumentation and controls aspects of the design in SRP Section 14.3.5.

II. ACCEPTANCE CRITERIA

The acceptance criteria for ITAAC are based on meeting 10 CFR 52.97(b)(1), which sets forth the comprehensive requirements for ITAAC. For design certification reviews, the scope of ITAAC is limited to the scope of the certified design as required by 10 CFR 52.47(b). In addition, acceptability is based on meeting the relevant requirements of the following regulations:

1. 10 CFR 50.49 as it relates to environmental qualification of electrical equipment important to safety for nuclear power plants. Applicants must ensure that safety-related, some nonsafety-related, and some post-accident monitoring equipment can perform their intended functions in various anticipated environments.
2. 10 CFR 50.48 as it relates to fire protection for the design.

The reviewer should utilize the SRP in its review of Tier 1 to determine the safety significance of SSCs. Other sources include applicable rules and regulations, GDCs, RGs, USIs and GSIs, NRC generic correspondence, PRA, insights from the standard design's safety and severe accident analyses, and operating experience. Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2. The reviewer should also use the review checklists provided in Appendix C to SRP Section 14.3 as an aid for establishing consistency and comprehensiveness in his review of the systems. If applicable, the reviewer should utilize regulatory guidance from the Commission for selected policy and technical issues related to particular design. Examples of these are contained in SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor Designs." The SRM related to this is dated July 21, 1993.

Tier 1 should be reviewed for treatment of design information proportional to the safety significance of the SSC for that system. Many items may be judged to be important to safety, and thus should be included in Tier 1. The following issues are identified to ensure comprehensive and consistent treatment in Tier 1 based on the safety significance of the system being reviewed:

- (1) System purpose and functions
- (2) Location of system
- (3) Key design features of the system

- (4) Seismic and ASME code classifications
- (5) System operation in various modes
- (6) Controls, alarms, and displays
- (7) Logic
- (8) Interlocks
- (9) Class 1E electrical power sources and divisions
- (10) Equipment to be qualified for harsh environments
- (11) Interface requirements
- (12) Numeric performance values
- (13) Accuracy and quality of figures

Additionally, standard ITAAC entries should be utilized to verify selected issues, where appropriate. The reviewer should ensure consistent application and treatment of the standard ITAAC entries for basic configuration ITAAC, net positive suction head, and physical separation for appropriate systems in Tier 1. In particular, the general provision for environmental qualification aspects of SSCs invoked by the basic configuration ITAAC should be reviewed to ensure appropriate treatment in Tier 1.

Environmental qualification (EQ) of safe-shutdown equipment may be verified as part of the basic configuration ITAAC for safety-related systems. EQ treatment in the ITAAC would then be discussed in the General Provisions section of Tier 1. Verification may include type tests or a combination of type tests and analyses of Class 1E electrical equipment identified in the Design Description or accompanying figures to show that the equipment can withstand the conditions associated with a design basis accident without loss of safety function for the time that the function is needed.

The design features in Tier 1 should be selected to ensure that the integrity of the analyses are preserved in an as-built facility. For example, 3-hour fire boundaries and divisional separation may be shown in the building figures. Also, flooding features such as structure elevations should be specified in the site parameters, flood doors may be shown on the building figures, and elevations are shown on the buildings to verify that the approximate physical location of components and relative elevations of buildings minimize the effects of flooding. As-built reconciliation reports for fires and floods to ensure consistency with Tier 2 analyses should be required by the appropriate system ITAAC (e.g., fire protection system) and selected building ITAAC, respectively.

Other specific issues that should be addressed include heat removal capabilities for design-basis accidents and tornado and missile protection. Heat removal capabilities may be verified through heat removal requirements for core cooling system heat exchangers and interface requirements for site-specific systems. Tornado and missile protection may be provided by inlet and outlet dampers in ventilation systems, and through the structural design of buildings.

The reviewer should receive inputs on the treatment of issues identified above from other branches such as the structural, electrical and I&C branches. In addition, the secondary review branches specified in SRP Section 14.3 should provide inputs on selected issues. These issues include key insights and assumptions from PRA and severe accident analyses, as well as inputs for issues such as treatment of alarms, displays and controls, and functionality of MOVs. Cross-

references from Tier 2 to Tier 1 for key insights and assumptions from PRA and severe accidents should be provided by applicants in Tier 2 together with these analyses.

Tier 1 should address and verify at least the minimum inventory of alarms, controls, and indications as derived from the Emergency Procedure Guidelines, the requirements of RG 1.97, and probabilistic risk assessment insights. These may be specified in the MCR and the Remote Shutdown System (RSS) ITAAC, or addressed in the appropriate ITAAC, and verified to exist. Other controls, indications and alarms should be identified in the system ITAAC based on their safety significance. Locations for these should be shown on system figures if important to system design and function. The ability of these controls, indications, and alarms to function should be checked during operation of the system for the functional tests required by the system ITAAC. Because the intent of the ITAAC is to verify the final as-built condition of the plant, the operation of the system during the completion of the functional tests required in the system ITAAC should be conducted from the MCR. Therefore, the verification that the system can be operated from the MCR need not be a separate ITAAC. Also, because the operation of the equipment from the control room demonstrates the control function, continuity checks between the RSS and the equipment demonstrates that the control signal will be received by the component and provides adequate assurance that the equipment can be operated by the RSS. The results of the pre-operational test program may be utilized to demonstrate the ability to operate plant equipment by the RSS.

Technical Rationale

In addition to meeting the requirements for ITAAC in 10 CFR Part 52, the technical rationale for application of the above acceptance criteria to Tier 1 is discussed in the following paragraphs.

1. Compliance with 10 CFR 50.49 requires that certain electrical equipment be qualified for accident (referred to as harsh) environments. This provides a reasonable assurance that various equipment will perform its intended function in anticipated environments.
2. Compliance with 10 CFR 50.48 requires that fire protection aspects be considered in the design. This provides a reasonable assurance that the design will prevent fires and function safely in the event of a fire.

III. REVIEW PROCEDURES

1. Follow the general procedures for review of Tier 1 contained in the Review Procedures section of SRP Section 14.3. Ensure that the DCD is consistent with Appendix A to SRP Section 14.3. Review responsibilities may be consistent with those in Appendix B to SRP Section 14.3.
2. Ensure that all Tier 1 information is consistent with Tier 2 information. Figures and diagrams should be reviewed to ensure that they accurately depict the functional arrangement and requirements of the systems. Reviewers should use the Review Checklists in Appendix C to SRP Section 14.3 as an aid in establishing consistent and comprehensive treatment of issues.

3. Ensure that the plant systems are clearly described in Tier 1, including the key performance characteristics and safety functions of SSCs based on their safety significance.
4. The reviewer should ensure that appropriate guidance is provided to other branches such that plant systems issues in Tier 1 are treated in a consistent manner among branches.
5. Ensure that the standard ITAAC entries related to plant systems items are included in the appropriate systems of the standard design. In particular, the reviewer should review the basic configuration ITAAC for verification of environmental qualification. The reviewer should ensure consistent application and treatment of the standard ITAAC entries for basic configuration ITAAC, net positive suction head, and physical separation for appropriate systems in Tier 1.
6. Ensure that design features from the resolutions of selected policy and technical issues are adequately addressed in Tier 1, based on safety significance. Ensure that the appropriate Commission guidance, requirements, bases and resolutions for these items are documented clearly in the SER.
7. Ensure that definitions, legends, interface requirements, and site parameters that pertain to plant systems issues are treated consistently and appropriately in Tier 1.

IV. EVALUATION FINDINGS

Each review branch verifies that sufficient information has been provided to satisfy the requirements of this SRP section, and concludes that Tier 1 is acceptable. A finding similar to that discussed in the Evaluation Findings section of SRP Section 14.3 should be included in a separate section of the SER.

In addition, if interface requirements or site parameters are reviewed, a finding similar to the following should be included in the SER.

"The staff also concludes that the interface requirements (and site parameters, if applicable) in Tier 1 meet the requirements for design certification applications in 10 CFR 52.47, and are acceptable."

V. IMPLEMENTATION

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

This SRP section will be used by the staff when performing safety evaluations of design certification and combined license applications submitted by applicants pursuant to 10 CFR 52. Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications docketed six months or more after the date of issuance of this SRP section.

VI. REFERENCES

1. 10 CFR Part 52, §52.47 "Contents of Applications."
2. 10 CFR Part 52, §52.97 "Issuance of Combined Licenses."
3. 10 CFR Part 50, §50.48, "Fire Protection."
4. 10 CFR Part 50, §50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants."
5. Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident."
6. NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor", Volumes 1 and 2, July 1994.
7. NUREG-1462, "Final Safety Evaluation Report Related to the Certification of the System 80+ Design," Volumes 1 and 2, August 1994.

SRP Draft Section 14.3.71
Attachment A - Proposed Changes in Order of Occurrence

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

Item	Source	Description
1.	Integrated Impact 1540	The scope and content of this proposed SRP section is derived from the requirements of 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," as well as the guidance in staff SECY papers related to design certification and combined license reviews, and the staff positions established in the Final Safety Evaluation Reports (FSERs) for the evolutionary reactor designs. SRP Section 14.3.7 provides guidance specific to the review of plant systems design information and related inspections, tests, analyses, and acceptance criteria (ITAAC) provided in applications submitted in accordance with the requirements of 10 CFR 52.

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SRP Draft Section 14.3.71
Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
1540	Develop Acceptance Criteria and Review Procedures for review of Certified Design Material (CDM) including associated inspections, tests, analyses and acceptance criteria (ITAAC) for plant systems.	All