



U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

2.4.14 TECHNICAL SPECIFICATIONS AND EMERGENCY OPERATION REQUIREMENTS

REVIEW RESPONSIBILITIES

Primary - ~~Hydrologic and Geotechnical Engineering Branch (HGEB)~~ Civil Engineering and Geosciences Branch (ECGB)¹

Secondary - None

I. AREAS OF REVIEW

The purpose of this section of the applicant's safety analysis report (SAR) is to identify the technical specifications and emergency procedures required to implement flood protection for safety-related facilities and to ~~assure~~ ensure² an adequate water supply for shutdown and cooldown purposes.

If there is evidence of potential structural effects, ~~the Structural Engineering Branch (SEB)~~ the ECGB³ will be requested by ~~HGEB~~ to⁴ ascertain whether these effects are properly considered in the structural design bases for the plant. Guidance for determining whether these potential effects are considered properly is outlined in the appropriate ~~SEB~~ECGB⁵ SRP sections.

Review Interfaces

The ECGB will coordinate other branches to evaluate the overall review of technical specifications and emergency operation requirements, as follows:⁶

- 1.⁷ ~~Auxiliary Systems Branch (ASB)~~ Plant Systems Branch (SPLB)⁸ will be requested by ~~HGEB~~ECGB⁹ to ascertain whether potential structural effects are properly considered in

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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.

the systems design bases for the plant. Guidance for determining whether these potential effects are considered properly is outlined in the appropriate ~~ASB~~¹⁰ SRP sections.

2. Issues involving shutdown water supplies should be coordinated with the Plant Systems Branch.¹¹

For areas of review identified as part of the primary responsibility of other branches, acceptance criteria and methodologies necessary for these reviews are contained in the referenced SRP section of the corresponding primary review branch.¹²

II. ACCEPTANCE CRITERIA

~~HGEBECGB~~¹³ acceptance criteria for this SRP section ~~is~~ ^{are}¹⁴ based on meeting the relevant requirements of the following regulations:

1. 10 CFR ~~Part 50, §~~¹⁵ 50.36 as it relates to requiring technical specifications to be derived from safety evaluations.
2. General Design Criterion 2 (GDC 2) as it relates to structures, systems, and components important to safety being designed to withstand the effects of hurricanes, floods, tsunamis, and seiches.

To meet the requirements of the hydrologic aspects of 10 CFR ~~Part 50, §~~ 50.36, and General Design Criterion 2 with respect to technical specifications and emergency operation requirements, the following specific criteria are used:

If the hydrologic design bases developed in preceding sections do not necessitate technical specifications or emergency procedures to ensure safety-related plant functions (i.e., position 1 of Regulatory Guide 1.59 is met), this section should so state. If technical specifications or emergency procedures in compliance with position 2 of Regulatory Guide 1.59 are necessary this section will be acceptable if the following are identified.

1. The controlling hydrologic events, as developed in the preceding sections of SAR Chapter 2.
2. The actions to be taken, and the effect of such actions on the protection of safety-related facilities and water supplies.
3. The appropriate water levels and conditions at which action is to be initiated.
4. The appropriate emergency procedures, and the amount of time required to implement each procedure. Regulatory Guide 1.102, position 2, provides guidance in establishing appropriate procedures.

Technical Rationale

The technical rationale for application of acceptance criteria for technical specifications and emergency operation requirements is discussed in the following paragraphs:¹⁶

1. Compliance with 10 CFR 50.36 requires establishing appropriate limiting conditions for operation (LOCs) based on analyses and evaluations included in the SAR. LOCs define the lowest functional capability or performance levels of equipment required for safe operation of a facility.

As applied to SRP Section 2.4.14, technical specifications and emergency operation requirements need to be established if the design basis flood would have an impact on safety-related structures, systems, or components (i.e., if the design of the plant is such that Regulatory Position 2 of Regulatory Guide 1.59 applies). In this case, the plant would be shut down before floodwaters reach an unsafe level and appropriate emergency procedures would be implemented by the licensee.

Meeting the requirements of 10 CFR 50.36 provides a level of assurance that the nuclear power plant will be shut down and any necessary emergency measures taken before floodwaters reach an unacceptable level.¹⁷

2. Compliance with GDC 2 requires that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions.

GDC 2 applies to SRP Section 2.4.14 because this section deals with actions specified in the technical specifications to shut down the plant and take appropriate emergency measures when the site is susceptible to flooding. This criterion also applies to measures needed to protect safety-related equipment. Regulatory Guide 1.59 discusses the design basis floods that nuclear power plants should be able to withstand without loss of capability to achieve and maintain cold shutdown. Regulatory Guide 1.102 describes types of flood protection acceptable to the NRC staff and acceptable methods for protecting plants from the effects of probable maximum precipitation falling directly on the site.

Meeting the requirements of this criterion provides a level of assurance that those structures, systems, and components important to safety are protected from the most severe floods likely to occur.¹⁸

III. REVIEW PROCEDURES

The review procedures consist of proposed specifications and procedures with the flood protection and water supply design bases derived in the preceding sections or considered necessary by the staff. Data in, or derived from, the preceding sections are used to estimate the

time available to complete any required emergency action (e.g., sandbagging, shutdown, installing flood gates and stop logs). This information will also serve to substantiate the water levels and other conditions used to initiate the action. Specific questions on the structural adequacy of protective measures are referred to Structural Engineering Branch reviewed by the ECGB,¹⁹ which should refer to and the general experience of the Corps of Engineers in such situations, as reflected in reports and manuals, is the principal basis for comparison.²⁰ Issues involving shutdown water supplies should be coordinated with the Auxiliary Plant²¹ Systems Branch.

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.²²

IV. EVALUATION FINDINGS

For both construction permit and operating license reviews the findings will consist of a brief statement of technical specifications and emergency procedures and the time required to implement flood protection of facilities and assure ensure an adequate water supply for safety-related equipment. The flood or water levels and other conditions at which action is to be initiated will also be stated. If none are required, the findings will so state.

A sample operating license statement follows:

The staff concludes that the applicant's proposed emergency flood protection plan and corresponding plant shutdown technical specifications are acceptable and meet the requirements of 10 CFR Part 50, 50.36 and General Design Criteria 2. This conclusion is based on the following:

The applicant has provided an emergency flood protection plan designed to minimize the impact of floods exceeding plant grade on safety-related facilities, and a corresponding proposed technical specification outlining the action to be taken to prevent any flood-caused accidents.

The applicant's flood protection plan is designed to meet the criteria of Regulatory Guide 1.59, position 2, and Regulatory Guide 1.102, position 2. It includes procedures for predicting rainfall floods, arrangements to warn of upstream seismically induced dam failure floods, and lead times available and types of action to be taken to meet safety-related requirements for both sources of flooding. The applicant's warning scheme for both types of floods is to be divided into two stages. Stage I will allow preparation steps and some damage, but will withhold major economic damage until Stage II warning assures ensures a flood above plant grade.

Reservoir levels for large rainfall floods can be predicted well in advance by the applicant. The applicant estimates that a minimum of 27 hours, divided into the two warning stages, will be available between the time a pre-flood preparation order is issued and the time the flood water could exceed plant grade. A minimum 10-hour Stage I will begin upon prediction that flood-producing conditions might develop. A minimum 17-hour Stage II will be based on a confirmed estimate that conditions will produce a flood above plant grade.

Seismically induced failure of upstream dams can result in flood surges that exceed plant grade. However, such surges do not have a water level potential as great as the rainfall-induced probable maximum flood water level. A minimum of 27 hours, divided into the warning stages, is estimated by the applicant to be available to prepare the plant for such flooding.

The applicant defines "flood mode" operation as the means by which the plant will be safely maintained during the time when flood waters exceed plant grade, elevation 215 meters²³ (705 feet) above mean sea level, and are allowed ingress into plant structures, and during the succeeding time period until recovery is accomplished.

Plant cooling requirements during flood mode operation will be met by the essential raw cooling water system, unless flood mode operation is necessary prior to operation of the permanent essential raw cooling water pumping station. If the latter is necessary, the auxiliary essential raw cooling water system will provide closed-cycle water circulation to meet plant cooling requirements. Water supplied by both these systems is discussed in greater detail above in Sections 2.4.1 and 2.4.11.

The applicant proposes one kind of warning scheme for rainfall floods and another type of warning scheme for seismically induced dam failure floods. For rainfall floods, the first stage (Stage I) of shutdown will begin when sufficient rainfall occurs to yield a projected plant site water level of 212.4 meters²⁴ (697.0 feet) above mean sea level in the winter months (October 1 through April 15) and 214 meters²⁵ (703 feet) above mean sea level in the summer months (April 16 through September 30). These water levels ~~assure~~ ensure that any additional rain will not produce water levels in excess of 214 meters²⁶ (703 feet) mean sea level in less than 27 hours. This level provides a 0.6-meter²⁷ (2-foot) margin (requested by us) so that waves resulting from high winds cannot disrupt flood protection preparation, i.e., cannot exceed plant grade of 215 meters²⁸ (705 feet) above mean sea level.

Stage I will be maintained until either Stage II begins, or until the applicant determines that floodwaters will not exceed elevation 214 meters²⁹ (703 feet) above mean sea level at the plant. Stage II shutdown will begin only when enough additional rain has fallen to yield water levels in excess of 214.3 meters³⁰ (703.0 feet) above mean sea level. The applicant estimates that required shutdown procedures will take no longer than 24 hours, which allows a 3-hour contingency margin.

As stated in Section 2.4.4 above, the failure of nine upstream dams either singly or in varying combinations can produce floods over plant grade. Stage I shutdown will be

started upon notification that any one of these dams has failed, and will continue until it has been determined that critical combinations do not exist. At our request, the applicant committed to initiating Stage II shutdown if communications are lost, or if there is no certainty that critical combinations do not exist in such situations.

Three communication networks are available to the applicant:

- (1) the applicant's own microwave network,
- (2) the applicant's own power line carrier system, and
- (3) the commercial Bell³¹ telephone system.

The staff finds that both the applicant's proposed emergency flood protection plan and corresponding plant shutdown technical specification meet the criteria of Regulatory Guides 1.59 and 1.102 and are acceptable from a hydrologic engineering standpoint. Technical specifications for plant shutdown to minimize the possibility of an accident resulting from hydrologically associated phenomena other than floods are not necessary, since such phenomena should have inconsequential effects upon safety-related facilities.

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.³²

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 license applications submitted by applicants pursuant to 10 CFR 50 or 10 CFR 52.³³ 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.³⁴

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides.

VI. REFERENCES

Data and information presented in, or derived from, previous SRP sections in the 2.4 series provide the basic reference material for this section.

1. 10 CFR ~~Part 50~~, 50.36, "Technical Specifications."
2. 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."
3. Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants."
4. ~~ANSI N170, "Standards for Determining Design Basis Flooding at Power Reactor Sites" (1976).~~³⁵
- 54.³⁶ Regulatory Guide 1.102, "Flood Protection for Nuclear Power Plants."

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SRP Draft Section 2.4.14
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.	Current primary review branch name and designation	Changed PRB to Civil Engineering and Geosciences Branch (ECGB).
2.	Editorial modification	Changed "assure" to "ensure" (global change for this section).
3.	Current primary review branch designation	Changed PRB to ECGB.
4.	Editorial modification	Deleted reference to a review interface branch since SRP Section 2.4.14 and structural matters are now the responsibility of ECGB.
5.	Current primary review branch designation	Changed PRB to ECGB.
6.	SRP-UDP format item	Added "Review Interfaces" and lead-in sentence under AREAS OF REVIEW. The old paragraph has been divided into two paragraphs to accommodate the review interface SRP-UDP format item. The text has been preserved, except for necessary branch designation changes and some minor editing to accommodate the division into two paragraphs.
7.	SRP-UDP format item	Created paragraphs 1 and 2 under "Review Interfaces."
8.	Current review branch name and designation	Changed review interface branch name and designation to Plant Systems Branch (SPLB).
9.	Current primary review branch designation	Changed PRB to ECGB.
10.	Current review branch designation	Changed review interface branch to SPLB.
11.	SRP-UDP format item	Added a review interface review responsibility that appears under REVIEW PROCEDURES (but was not listed) to "Review Interfaces."
12.	SRP-UDP format item	Added standard paragraph under "Review Interfaces," tying review responsibilities to pertinent SRP sections.
13.	Current primary review branch designation	Changed PRB to ECGB.
14.	Editorial modification	Changed "is" to "are" to provide noun/verb agreement.
15.	Editorial	Provided correct citation format for the Code of Federal Regulations (global change for this section).
16.	SRP-UDP format item	Added "Technical Rationale" and lead-in paragraph for ACCEPTANCE CRITERIA.

SRP Draft Section 2.4.14
Attachment A - Proposed Changes in Order of Occurrence

Item	Source	Description
17.	SRP-UDP format item	Added technical rationale for 10 CFR 50.36.
18.	SRP-UDP format item	Added technical rationale for GDC 2.
19.	Current primary review branch designation	Changed PRB to ECGB, and changed "referred" to "reviewed" since ECGB is now the primary review branch for both review aspects. No referral is now needed.
20.	Editorial revision	Deleted the phrase "is the principal basis for comparison" because the text does not discuss any comparison. Also changed the words to indicate that ECGB should refer to the experience of the Corps of Engineers.
21.	Current review branch name	Changed review interface branch to Plant Systems Branch.
22.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard paragraph to address application of Review Procedures in design certification reviews.
23.	SRP-UDP format item	Converted the elevation units to meters and retained the units in feet in parenthesis, 705 feet.
24.	SRP-UDP format item	Converted the elevation units to meters and retained the units in feet in parenthesis, 697.0 feet.
25.	SRP-UDP format item	Converted the elevation units to meters and retained the units in feet in parenthesis, 703 feet.
26.	SRP-UDP format item	Converted the elevation units to meters and retained the units in feet in parenthesis, 703 feet.
27.	SRP-UDP format item	Converted the elevation units to meters and retained the units in feet in parenthesis, 2 feet.
28.	SRP-UDP format item	Converted the elevation units to meters and retained the units in feet in parenthesis, 705 feet.
29.	SRP-UDP format item	Converted the elevation units to meters and retained the units in feet in parenthesis, 703 feet.
30.	SRP-UDP format item	Converted the elevation units to meters and retained the units in feet in parenthesis, 703.0 feet.
31.	Editorial deletion	Deleted "Bell" because the name of the commercial telephone company is not necessary or correct.
32.	SRP-UDP format item	Added a paragraph at the end of EVALUATION FINDINGS that refers to design certification reviews, 10 CFR Part 52.
33.	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.

Item	Source	Description
34.	SRP-UDP Guidance	Added standard paragraph to indicate applicability of this section to reviews of future applications.
35.	Integrated Impact No. 711	Deleted the reference to ANSI N170-1976 because this standard is out-of-date and is not cited in SRP Section 2.4.14, as explained in Integrated Impact No. 711, Part D.
36.	Editorial change	Renumbered the paragraph 4 because the previous paragraph was deleted.

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SRP Draft Section 2.4.14
Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
711	ANSI N170 is cited in SRP Section 2.4.14 (in the References and is out-of-date.	VI. (reference to ANSI N170 was deleted)