



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)

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 an adequate water supply for shutdown and cooldown purposes.

If there is evidence of potential structural effects, the Structural Engineering Branch (SEB) will be requested by HGEB to ascertain whether these effects are properly considered in the structural design bases for the plant; similarly, Auxiliary Systems Branch (ASB) will be requested by HGEB to ascertain whether these effects are properly considered in the systems design bases for the plant. Guidance for determining whether these potential effects are considered properly is outlined in the appropriate SEB and ASB SRP sections.

II. ACCEPTANCE CRITERIA

HGEB acceptance criteria for this SRP section is based on meeting the relevant requirements of the following regulations:

1. 10 CFR Part 50, §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:

Rev. 2 - July 1981

**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.

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.

### 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 and the general experience of the Corps of Engineers in such situations, as reflected in reports and manuals, is the principal basis for comparison. Issues involving shutdown water supplies should be coordinated with Auxiliary Systems Branch.

### 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 time required to implement flood protection of safety-related facilities and assure 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 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 preflood 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 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 697.0 feet above mean sea level in the winter months (October 1 through April 15) and 703 feet above mean sea level in the summer months (April 16 through September 30). These water levels assure that any additional rain will not produce water levels in excess of 703 feet mean sea level in less than 27 hours. This level provides a two-foot margin (requested by us) so that waves resulting from high winds cannot disrupt flood protection preparation, i.e., cannot exceed plant grade of 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 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 703.0 feet above mean sea level. The applicant estimates that required shutdown procedures will take no longer than 24 hours, which allows a three-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 powerline carrier system; and
- (3) the commercial Bell 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.

## V. IMPLEMENTATION

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

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.

Implementation schedules for conformance to parts of the method discussed herein are contained in the reference 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).
5. Regulatory Guide 1.102, "Flood Protection for Nuclear Power Plants."