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U.S. NUCLEAR REGULATORY COMMISSION
STANDARD REVIEW PLAN
OFFICE OF NUCLEAR REACTOR REGULATION

SECTION 2.4.10 FLOODING PROTECTION REQUIREMENTS

REVIEW RESPONSIBILITY

Primary - Site Analysis Branch (SAB)

Secondary - Structural Engineering Branch (SEB)
Auxiliary and Power Conversion Systems Branch (APCSB)
Electrical, Instrumentation, and Control Systems Branch (EICSB)

I. AREAS OF REVIEW

The locations and elevations of safety-related facilities and of structures and components required for protection of safety-related facilities are compared with the estimated static and dynamic effects of design basis flood conditions identified in safety analysis report (SAR) Section 2.4.2.2, to determine whether flood effects need be considered in plant design or emergency procedures.

If flood protection is required, the type of flood protection ("hardened facilities," sandbags, flood doors, bulkheads, etc.) is reviewed. Any emergency procedures required to implement flood protection and warning times available for implementation thereof are reviewed, based on the flood conditions identified in other sections.

II. ACCEPTANCE CRITERIA

The flood design basis for each facility must be comparable with the positions in Regulatory Guide 1.59. For construction permit (CP) reviews, the types of flood protection proposed must be capable of protecting those safety-related structures, systems, and components identified in Regulatory Guides 1.59 and 1.29.

For operating license (OL) reviews, the specific designs of flood protection measures are reviewed to assure the protection levels are adequate (including static and dynamic effects) for the controlling flood conditions and that any necessary technical specifications are considered.

Standard engineering practice in positive flood control and shore protection, such as that developed by the Corps of Engineers, provides the basis for acceptance of methods to be employed for protection. Where sites are not "hardened," that is, where emergency action is required, the time available to implement emergency procedures must be estimated by analysis

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 Revision 2 of 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.

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of the hydrologic design event. The environmental conditions likely to prevail during all potential flooding events up to and including events of the severity of the controlling event are compared with the requirements for implementing flood emergency procedures. If the environmental conditions likely are such that the procedures can be carried out, they will be considered acceptable. An appropriate item in the plant Technical Specifications will be required in cases where emergency procedures are required to assure adequate flood protection.

"Hardened" flood protection (as discussed in Regulatory Guide 1.59, for facilities identified in Regulatory Guide 1.29) will be interpreted to mean "almost always in place".

III. REVIEW PROCEDURES

The estimated design basis flood level is compared with the locations and elevations of safety-related components. The staff will independently determine from analyses of postulated individual hydrologic events whether flood protection is required, and if so, what protective levels (including static and dynamic effects) are applicable. These data are transmitted to Structural Engineering Branch for determination of structural competence and to Auxiliary and Power Conversion Systems Branch (APCSB) and Electrical, Instrumentation, and Control Systems Branch (EICSB) for determination of safety system adequacy. For flood protection requiring emergency action, the design basis flood conditions, and other, less severe events, are reviewed to establish the minimum time available for implementation of emergency procedures. Physical parameters such as rate-of-rise (of river or lake levels), as well as evaluation (based on experience and engineering judgment) of flood warning networks provide the staff with an independent estimate of available time. These data are provided APCSB and EISCB for their independent evaluation of the time required to implement shutdown and flood protective measures.

For OL reviews, the design of flood protection measures is reviewed to assure compatability with the original design basis. For those plants for which shutdown (if required under Regulatory Guide 1.59, position 2) and installation of protective measures is required in the event of a major flood, the procedures for carrying out these measures are reviewed for compatibility of available and required times as established above. The Technical Specifications must reference an emergency plan which allows for the orderly installation of required flood protection.

The above reviews are performed only when applicable to the site or site region. Some items of review may be done on a generic basis.

IV. EVALUATION FINDINGS

For CP reviews, the findings will consist of statements of flood design bases for safety-related facilities. If emergency procedures are required, the findings will indicate staff conclusions that time for implementation and methods of providing flood protection provide the necessary protection.

For OL reviews the findings will indicate the flood protection measures provided for safety-related facilities, and will indicate the type of technical specifications required to assure that the protection will be in place.

If Regulatory Guide 1.59, position 2, is elected by the applicant, a statement describing lesser design bases will be included in the findings with the staff's conclusion of adequacy.

A sample CP-stage statement follows:

> "The applicant states, and we concur, that the station is above the flood level of a Probable Maximum Flood (PMF), either on the A River or the two intermittent streams crossing the site.
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> "Further, the applicant has stated that the roofs of safety-related buildings will be constructed to safely dispose of, or store, local precipitation as severe as the Probable Maximum Precipitation (PMP). Further, we conclude that the bases for plant grading and drainage will be sufficient to prevent a threat to safety-related facilities by a localized PMP."

V. REFERENCES

Other sections of 2.4 provide hydrologic design basis flood levels and environmental condition descriptions. Reports of the Corps of Engineers, United States Geologic Survey, Bureau of Reclamation, National Oceanic and Atmospheric Administration, and others will be used on an "as available" basis to evaluate flood warning systems, if applicable. The references for acceptability of protection will be completed projects of the Corps of Engineers and other federal, state, and local agencies, and similar types of protection previously reviewed and found acceptable for other nuclear plants.

1. Regulatory Guide 1.70, "Standard Format and Contents of Safety Analysis Reports for Nuclear Power Plants," Revision 2.

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