



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

SECTION 9.2.3

DEMINERALIZED WATER MAKEUP SYSTEM

REVIEW RESPONSIBILITIES

Primary - Auxiliary and Power Conversion Systems Branch (APCSB)

Secondary - Reactor Systems Branch (RSB)
 Structural Engineering Branch (SEB)
 Mechanical Engineering Branch (MEB)
 Materials Engineering Branch (MTEB)
 Effluent Treatment Systems Branch (ETSB)
 Electrical, Instrumentation and Control Systems Branch (EICSB)

I. AREAS OF REVIEW

The APCSB reviews the demineralized water makeup system (DWMS) from the supply connection of the service or municipal water source to the points of discharge. The capability to provide an adequate supply of treated water of reactor coolant purity to other systems as makeup, and other plant demineralized water requirements is reviewed.

1. The APCSB review of the DWMS system includes the following considerations:
 - a. Capability of the system to effectively store, handle, and dispense all chemicals utilized in the demineralizing and regeneration process.
 - b. Capability of the DWMS to operate within the environment to which it is exposed.
 - c. Provisions for the regeneration wastes to be directed to a suitable point in the radwaste system or other specified areas for subsequent processing prior to discharge to the environment and instrumentation and isolation capabilities provided, including the ability to detect corrosive solutions and the valving necessary to isolate the system.
2. The APCSB reviews the system function to determine whether portions of the system are safety-related.
3. The DWMS is also reviewed to assure that a malfunction or failure of a component will not have an adverse effect on any safety-related system or components.
4. The applicant's proposed technical specifications are reviewed at the operating license (OL) stage, as they relate to areas covered in this review plan.

Secondary reviews are performed by other branches and the results used by the APCSB to complete the overall evaluation of the system. The secondary reviews are as follows.

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.

11/24/75

9511010401 751124
 PDR NUREG
 75/087 R PDR

The SEB determines the acceptability of the design analyses, procedures, and criteria used to establish the ability of seismic Category I structures housing the system and supporting systems to withstand the effects of natural phenomena such as the safe shutdown earthquake (SSE), the probable maximum flood (PMF), and tornado missiles. The MEB reviews the seismic qualification of components and confirms that the components, piping, and structures are designed in accordance with applicable codes and standards. The RSB determines that the assigned seismic and quality group classifications for system components are acceptable. The MTEB verifies that inservice inspection requirements are met for system components and, upon request, verifies the compatibility of the materials of construction with service conditions. The EICB determines the adequacy of the design, installation, inspection, and testing of all essential electrical components (sensing, control, and power) required for proper operation. The ETSB verifies that the limits for radioactivity concentrations are met.

II. ACCEPTANCE CRITERIA

Acceptability of the design of the DWMS, as described in the applicant's safety analysis report (SAR) is based on the degree of similarity of the design with that of previously reviewed plants with satisfactory operating experience. There are no general design criteria or regulatory guides that apply directly to the safety-related functional performance requirements for the DWMS. The APCSB assures that the system is capable of providing the required supply of reactor coolant purity water to all systems.

Several general design criteria and regulatory guides are used to evaluate the system design for those cases when a failure or malfunction of the DWMS could adversely effect essential systems or components (i.e., those necessary for safe shutdown or accident prevention or mitigation). These are as follows:

1. General Design Criterion 2, as related to the safety-related portions of the system being capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, or floods as established in Chapters 2 and 3 of the SAR.
2. General Design Criterion 4, with respect to the system being capable of withstanding the effects of internally generated missiles.
3. General Design Criterion 5, in regards to the effect of sharing in multiple unit facilities.
4. Regulatory Guide 1.29, Position C-1, if any portion of the system is deemed to be safety-related, and Position C-2 for non-safety-related functions.
5. Appendix 1 of Regulatory Guide 1.56, for an acceptable standard for purity of the demineralized water produced by the DWMS.
6. Branch Technical Position APCSB 3-1, as it relates to high and moderate energy breaks or cracks in piping systems outside containment.

III. REVIEW PROCEDURES

The procedures set forth below are used during the construction permit (CP) application review to determine that the design criteria and bases and the preliminary design as set forth in the preliminary safety analysis report meet the acceptance criteria given in Section II of this review plan. For the review of operating license applications, the review procedures and acceptance criteria are utilized to verify that the initial design criteria and bases have been appropriately implemented in the final design as set forth in the final safety analysis report.

The procedures for OL reviews include a determination that the content and intent of the technical specifications prepared by the applicant are in agreement with the requirements for system testing, minimum performance, and surveillance developed as a result of the staff's review.

The reviewer selects and emphasizes material from this review plan, as may be appropriate for a particular case. A determination will be made as to whether the DWMS or portions thereof are safety-related. In confirming this design aspect, an analysis is made in which it is assumed that any DWMS pipe fails or component malfunctions or fails in such a manner as to cause maximum damage to other equipment located nearby. The system will be considered non-safety-related if its failure does not affect the ability of the reactor facility to achieve and maintain safe shutdown conditions.

1. The APCSB evaluates the system design information and drawings and, utilizing engineering judgment, operational experience, and performance characteristics of similar, previously approved systems, verifies that:
 - a. The system is capable of fulfilling the requirements of the facility for makeup water on a day-to-day basis.
 - b. The component redundancy necessary for the system to perform its design function is provided.
 - c. Precautions are taken or incorporated into the system design to properly store, handle, and dispense corrosive and toxic chemicals effectively and safely so that a hazardous condition does not result from mishandling or leakage.
 - d. The components utilized are compatible with the associated chemicals.
 - e. The potential for leakage and accidental spills has been minimized.
 - f. In the event of a leak or spill, there would not be an adverse effect on safety-related systems or components.
 - g. Instrumentation (e.g., a conductivity monitor) has been provided together with the capability to isolate the system should planned operating conditions be exceeded.
 - h. Piping has been provided as necessary to direct solutions and regenerative wastes to the radwaste system or other specified areas for processing and disposal.

IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided and that his review supports conclusions of the following type, to be included in the staff's safety evaluation report:

"The demineralized water makeup system includes all components and piping associated with the system from the service or municipal water source to the points of discharge to other systems or to a discharge canal. The scope of review of the demineralized water makeup system for the _____ plant included layout drawings, process flow diagrams, piping and instrumentation diagrams, and descriptive information for the system and for the auxiliary supporting systems that are essential to its operation. [The review has determined the adequacy of the applicant's proposed design criteria and design bases for the demineralized water makeup system, regarding safety related requirements (if any) for an adequate supply of reactor coolant purity water during all conditions of plant operation. (CP)] [The review has determined that the applicant's analysis of the designs of the demineralized water makeup system and auxiliary supporting systems is in conformance with the design criteria and bases. (OL)]

"The basis for acceptance in the staff review has been conformance of the applicant's designs and design criteria for the demineralized water makeup system and necessary auxiliary supporting systems to the commission's regulations as set forth in the general design criteria, and to applicable regulatory guides, staff technical positions, and industry standards and is acceptable."

V. REFERENCES

1. General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."
2. General Design Criterion 4, "Environmental and Missile Design Bases."
3. General Design Criterion 5, "Sharing of Structures, Systems, and Components."
4. Regulatory Guide 1.29, "Seismic Design Classification," Revision 1.
5. Regulatory Guide 1.56, Appendix, "Maintenance of Water Purity in Boiling Water Reactors."
6. Branch Technical Position APCSB 3-1, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment, attached to Standard Review Plan 3.6.1.

SRP 9.2.4