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

SECTION 6.1.3 POST-ACCIDENT CHEMISTRY

REVIEW RESPONSIBILITIES

Primary - Accident Analysis Branch (AAB)

Secondary - Materials Engineering Branch (MTEB)

I. AREAS OF REVIEW

The methods and procedures used to control the chemical composition of solutions recirculated within containment after design basis accidents (DBA) are reviewed to assure that adverse chemical reactions or inadequate solution mixing will not occur.

II. ACCEPTANCE CRITERIA

The procedures and methods which the applicant proposes to use to raise or maintain the pH of the solutions expected to be recirculated within containment after a DBA should be straightforward and reliable. The chemistry of the post-accident environment in the containment should not result in significant deterioration of engineered safety features.

III. REVIEW PROCEDURES

The purpose of controlling the pH is to reduce the probability of chloride stress corrosion cracking leading to equipment failure or loss of containment integrity, and to ensure low volatility of dissolved radioiodines. These purposes are met by maintaining a high pH, at least 7 (Ref. 1 and 2), but not high enough to cause any substantial attack on aluminum fittings. A number of plants have used NaOH added to the containment spray solution, or solid trisodium phosphate placed in baskets on the containment lower level where it can dissolve in the recirculated water in the event of a DBA.

Guidance as to allowable pH histories should be obtained from the Materials Engineering Branch. At present, available information indicates optimum pH control consists of stabilizing pH between 7 and 8 within four hours (Ref. 3).

The reviewer examines the paths which solutions would follow in the containment from sprays and emergency core cooling systems to the sump, for both injection and recirculation phases, to verify that no areas accumulate very high or low pH solutions and that any assumptions regarding pH in the modeling of containment spray fission product removal are valid (see Standard Review Plan 6.5.2).

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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IV. EVALUATION FINDINGS

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

"The methods and procedures for controlling the pH of solutions expected to be recirculated in containment following design basis accidents have been found adequate. The proposed control provides assurance that the pH will be maintained at a level which minimizes the possibility of stress corrosion cracking of mechanical systems and components."

V. REFERENCES

1. D. D. Whyte and L. F. Picone, "Behavior of Austenitic Stainless Steel in Post Hypothetical Loss of Coolant Environments," WCAP-7798-L (proprietary), Westinghouse Electric Corporation, November 1971.

2. J. C. Greiss and G. E. Creek, "Design Considerations of Reactor Containment Spray Systems - Part X, The Stress Corrosion Cracking of Types 304 and 316 Stainless Steel in Boric Acid Solutions," ORNL-TM-2412, Oak Ridge National Laboratory, May 1971.

3. R. Zavadoski, "Stress Corrosion Cracking and pH for the Fort Calhoun Station," regulatory staff memorandum to K. Goller, April 7, 1972.

SRP 6.2.1