



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

SECTION 15.7.3

POSTULATED RADIOACTIVE RELEASES DUE TO  
 LIQUID-CONTAINING TANK FAILURES

REVIEW RESPONSIBILITIES

Primary - Effluent Treatment Systems Branch (ETSB)

Secondary - Site Analysis Branch (SAB)

I. AREAS OF REVIEW

1. The ETSB reviews the consequences of single failures involving tanks and associated components containing radioactive liquids.
2. The SAB provides information on the site geology, hydrology, and the parameters governing liquid waste movement through the soil, i.e., dilution by groundwater, lateral dispersion, transit time, hydraulic gradient, permeability, and effective porosity, based on single failure assumptions.

II. ACCEPTANCE CRITERIA

Tanks and associated components containing radioactive liquids are acceptable if failure does not result in radionuclide concentrations in excess of the limits in 10 CFR Part 20, Appendix B, Table II, Column 2, at (1) the nearest potable water supply, and (2) the nearest surface water supply in a unrestricted area, or special design features are provided to mitigate the effects of postulated failures for systems not meeting these limits.

III. REVIEW PROCEDURES

The reviewer will select and emphasize material from this plan as may be appropriate for a particular case.

1. The reviewer will evaluate the consequences of postulated single failures for tanks and associated components that contain contaminated liquids, where the leaked fluid is capable of affecting the nearest potable water supply or the nearest surface water in an unrestricted area. The reviewer will select tanks or components for which a failure is assumed for evaluation purposes based on the radionuclide inventory in the components, and the potential for the contaminated liquids entering the groundwater or a potable water supply.
  - a. The radionuclide inventory in failed components is based on assuming 80% of the liquid volume in each component and the design basis failed fuel fraction, i.e., 1% of the fuel producing power in a pressurized water reactor (PWR), or, consistent

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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 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. 20550.

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with an offgas release rate of 100  $\mu$ Ci/sec-MWt after 30 minutes delay for a boiling water reactor (BWR). The radionuclide inventory is calculated by the GALE Code using values of parameters for radionuclide removal by processing components given in Regulatory Guides 1.BB or 1.CC (Refs. 1, 2).

- b. The reviewer will consider the design features incorporated to mitigate the effect of a postulated failure, e.g., steel liners in building areas housing components. Normally, because of the potential radionuclide inventory, the failed components that are considered are (1) waste collector tanks, (2) evaporator concentrate tanks, (3) phase separator tanks, and (4) spent resin storage tanks. The components selected for evaluation are based on the individual plant design.
2. The radionuclide concentrations at the nearest potable water supply and nearest surface water supply are calculated by the GALE Code using the values of hydrological parameters provided by SAB. Credit for liquid retention by unlined building foundations will not be given regardless of the building seismic category because of the potential for cracks. Credit is not allowed for retention by coatings or leakage barriers outside the building foundation.
3. The calculated radionuclide concentrations at the nearest potable water supply and nearest surface water in an unrestricted area are compared to the concentration limits in 10 CFR Part 20, Appendix B, Table II, Column 2.
4. The reviewer may elect to use the applicant's evaluation in lieu of an independent calculation. In this case, the applicant's parameters are verified by ETSB and SAB, as appropriate, and the calculated concentrations are adjusted for inconsistencies between the respective models.

#### IV. EVALUATION FINDINGS

If the review confirms that the consequences of liquid-containing tank failures would be acceptable according to the criteria stated in Section II, conclusions of the following type are provided for the staff's safety evaluation report:

"The consequences of tank and associated component failures which could result in contaminated liquid releases to the environs were evaluated for tanks and components containing radioactive materials located outside reactor containment. The scope of the review included the calculation of radionuclide inventories in station components at design basis fission product levels, the mitigating effects of the plant design, and the effect of site geology and hydrology. Radionuclide concentrations were calculated at the nearest potable water supply and at the nearest surface water in an unrestricted area.

"The basis for acceptance in our review has been that the postulated failures would not result in radionuclide concentrations in excess of 10 CFR Part 20 limits at the water sources considered above.

"Based on the foregoing evaluation we conclude that the provisions incorporated in the applicant's design to mitigate the effects of tank and component failures involving contaminated liquids are acceptable."

V. REFERENCES

1. Regulatory Guide 1.88, "Calculation of Releases of Radioactive Materials in Liquid and Gaseous Effluents from Pressurized Water Reactors"
2. Regulatory Guide 1.89, "Calculation of Releases of Radioactive Materials in Liquid and Gaseous Effluents from Boiling Water Reactors"

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