



Structural Performance Criteria (Deterministic)

**NRC/NEI Technical Issues Meeting
May 6, 1999**

908/5

23-4

DG-1074

All tubes should retain margins of safety against burst consistent with the safety factor margins implicit in the stress limit criteria of the ASME Code, Section III, as referenced in 10 CFR 50.55a, for all service level loadings. Satisfaction of this criteria means that all tubes have been determined to retain a margin of 3.0 against gross failure or burst under normal plant operating conditions, including startup, operation in the power range, hot standby, and cooldown, and all anticipated transients that are included in the plant design specification. In addition, all tubes have been determined to retain a margin of safety against gross failure or burst consistent with the margin of safety determined by the stress limits in NB-3225 of Section III of the ASME Code under postulated accidents concurrent with a safe shutdown earthquake.

Industry Comments

- EPRI Tube Integrity Assessment Guidelines include safety margins consistent with ASME Code.
- Inappropriate to reference ASME Section III in performance criteria. Section XI applies and identifies safety factors for all service level loadings.
- Factor of three criterion should apply to normal full power dP rather than normal operating conditions defined to include startup and shutdown, operation in the power range, and anticipated transients.

Revised Staff Proposals

Technical Specifications:

- Structural criteria: All tubes shall retain a margin of 3.0 against burst under loads associated with normal steady state, full power operating conditions and a margin of 1.4 against burst under loads associated with postulated accidents concurrent with a safe shutdown earthquake.

Revised Staff Proposals

Top-Tier Industry Guideline Document:

- Structural criteria: All tubes shall retain a margin of 3.0 against burst under loads associated with normal steady state, full power operating conditions and a margin of 1.4 against burst under loads associated with postulated accidents concurrent with a safe shutdown earthquake. “Loads” in this context refers to applied loads causing primary stress in the tubing.
- These criteria should be supplemented as necessary to ensure that loadings contributing to combined primary plus secondary stress will not lead to burst (e.g., as consequence of tensile overload, stress ratcheting, or fatigue) for the full range of normal operating conditions, including ..., and postulated accidents.

Revised Staff Proposals

DG-1074:

Same words as industry top-tier document, plus:

- It is acceptable to develop these supplemental criteria consistent with design criteria in the ASME Code, Section III, from the standpoint of avoiding stress ratcheting and fatigue. For tubes with cracks, it is also acceptable to address fatigue by demonstrating that expected crack growth under cyclic loading is addressed by assumed crack growth rates in the operational assessment. Note, the ASME Code, Section III, assumes that a single application of secondary stress will not cause component failure. For flawed tubing, however, licensees should be alert to extreme situations where this assumption may not be valid.