

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF ENGINEERING
SAFETY EVALUATION OF EPRI TOPICAL REPORT TR-108695
"BWR VESSEL AND INTERNALS PROJECT,
INSTRUMENT PENETRATION INSPECTION AND FLAW EVALUATION GUIDELINES
(BWRVIP-49)"

1.0 INTRODUCTION

1.1 Background

By letter dated March 13, 1998, the Boiling Water Reactor Vessel and Internals Project (BWRVIP) submitted the Electric Power Research Institute (EPRI) Topical Report TR-108695, "BWR Vessel and Internals Project, Instrument Penetration Inspection and Flaw Evaluation Guidelines (Ref. 1), for staff review and approval. The BWRVIP intended, in submitting the BWRVIP-49 report, to provide proper inspection and evaluation procedures to ensure the long term integrity of instrument penetrations.

Instrument penetrations, consisting of penetrations, nozzles, and safe ends/extensions in a variety of configurations and materials, are used to allow measurement of reactor water level and maintain the reactor pressure boundary. The materials used are stainless steel, Alloy 600, Alloy 182 or 82, and low alloy steel (nozzles). The size of the instrument lines is under NPS 4 (4-inch pipe size).

1.2 Purpose

The staff reviewed the BWRVIP-49 report to determine whether its guidance would ensure the long term integrity of instrument penetrations.

1.3 Organization of this Report

Because the BWRVIP-49 report is proprietary, this SE was written so as not to repeat information contained in the report. The staff does not discuss in any detail the provisions of the guidelines nor the parts of the guidelines it finds acceptable.

2.0 SUMMARY OF TOPICAL REPORT

The BWRVIP-49 report addresses the following topics:

Instrument Penetration Assessment: Penetration function and configuration, susceptibility factors, consequences of cracking.

3.0 STAFF EVALUATION

The staff finds the BWRVIP-49 report and its guidance acceptable. The report addressed the degradation mechanisms of potential significance. It discussed the causes of crack initiation and growth, the susceptibility factors of environment, materials, and stress state, and the history of materials performance in this application. It discussed the consequences of failure, the monitoring used to detect failures, and measures prescribed to deal with the consequences. Ref. 2 covered the safety consequences of failures.

One of the mechanisms which can cause degradation of the instrument penetrations is fatigue. During the initial design process, the influence of fatigue on the penetrations was considered. In a majority of instances, the penetrations were determined to be exempt from the requirements of a detailed ASME Code Section III fatigue analysis. In those instances where a fatigue analysis was required, the fatigue usage factors were determined to be very low.

In addition, operational experience indicates that no unanticipated mechanisms exist which may accelerate degradation due to fatigue. Therefore, no additional guidance has been provided in this area.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The staff finds that the guidance presented should ensure the long term integrity of the instrument penetrations and thus provide an adequate level of quality and safety.

5.0 REFERENCES

1. Electric Power Research Institute (EPRI) Topical Report TR-108695, "BWR Vessel and Internals Project, Instrument Penetration Inspection and Flaw Evaluation Guidelines, March 13, 1998.
2. Electric Power Research Institute (EPRI) Topical Report TR-105707, "BWR Vessel and Internals Project, "Safety Assessment of BWR Reactor Internals," October 1995.
3. NUREG-1557, Summary of Technical Information and Agreements from Nuclear Management and Resources Council Industry Reports Addressing License Renewal, October 1996.