

Materials Reliability Program: Inspection Standard for Pressurized Water Reactor Internals—2018 Update (MRP-228, Rev. 3)

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Abstract

This report—a work product of the Electric Power Research Institute (EPRI) Materials Reliability Program (MRP)—was developed to implement the applicable reactor internals inspection program described in the EPRI report *Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)* (1022863) and its revisions. It contains requirements specific to the examination methodologies involved, as well as requirements for qualification of the nondestructive evaluation (NDE) systems used to perform those inspections. This report is intended for use by owners of pressurized water reactor (PWR) plants in preparing examination procedures and qualifying NDE systems, that is, the combinations of equipment, procedures, and personnel used to perform examinations needed for plants' internals aging management programs. The implementation requirements for MRP-228 are summarized in Section 4 of this report. As a companion to the PWR internals inspection and evaluation guidelines, this report should be used to support compliance with the requirements of Nuclear Energy Institute (NEI) 03-08, as explained in MRP-227.

Keywords

Internals
Inspection
Nondestructive evaluation (NDE)
Ultrasound
Visual examination

Product Description

Demonstration that the effects of aging degradation in pressurized water reactor (PWR) internals are being adequately managed is essential in maintaining a healthy fleet and ensuring continued functionality of the internal components of a reactor. This report is a revision based on the experience of the first utilities that have implemented the Electric Power Research Institute (EPRI) Materials Reliability Program (MRP) 228, which was originally published in 2009 and last revised in 2015 as EPRI report *Materials Reliability Program: Inspection Standard for Pressurized Water Reactor Internals—2015 Update (MRP-228, Rev. 2)* (3002005386). As a work product of the EPRI MRP Inspection Technical Advisory Committee and in cooperation with the Internals Focus Group, this inspection standard is intended to support the guidance in *Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)* (1022863) [1] and its revisions [2] to detect the effects of aging degradation. (The “A” designation was assigned after the U.S. Nuclear Regulatory Commission approved a safety evaluation of MRP-227, Rev 0.) The requirements contained in this report are applicable to Babcock & Wilcox, Combustion Engineering, and Westinghouse nuclear steam supply system PWR designs. This report defines inspection standards and documented examination techniques for PWR vessel internals components.

Background

The program to develop the guidelines and this inspection standard has been under way for more than a decade, organized around a framework and strategy for managing the effects of aging in PWR internals, dependent on a substantial database of material data and supporting examination techniques.

Objectives

PWR licensees must use this report with the revision of MRP-227 that is applicable to their vessel internals to ensure that their components are inspected in compliance with MRP guidance. The guidance in MRP-227 and MRP-228 will be updated as additional information is obtained from these inspections during the life of the plants.

Approach

The MRP strives to make effective examination techniques available by developing inspection standards that can ensure the structural integrity of the components and by providing demonstrated, documented techniques for effectively examining the susceptible components.

Results

Procedure standards have been developed for ultrasonic and visual examination. The ultrasonic procedures and personnel are qualified by performance demonstration. The visual examinations refer to the requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code or the requirements of this report. A few mockups for visual examinations have been manufactured by EPRI and are described in this report. PWR owners can use these mockups and documented techniques to inspect their vessel internals components in compliance with MRP guidance.

Applications, Value, and Use

The information contained in this report can be applied by PWR owners in preparation for managing aging degradation of vessel internals components during refueling outages.

This report provides the PWR fleet with requirements for examination systems for all of the primary and expansion vessel internals components included in the inspection and evaluation guidelines, and it provides a stable mechanism for documenting the capability of the evolving examination technology.

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