STP-NU-069

ANALYSIS OF SELECTED NONDESTRUCTIVE EXAMINATION (NDE) METHODOLOGIES FOR THE ASSESSMENT OF CRACKING IN CONCRETE CONTAINMENTS

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Prepared by:

Maria Guimaraes
David B. Scott
Paul Weeks
Randall Manley
James Wall

Electric Power Research Institute (EPRI)

ASME STANDARDS TECHNOLOGY, LLC

Date of Issuance: March 14, 2014

ASME Standards Technology, LLC
Two Park Avenue, New York, NY 10016-5990

ISBN No. 978-0-7918-6937-6

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FOREWORD

This report provides exploratory research into the reliability of available NDE technology to detect delaminations and cracking. It also provides the foundation for further interactions with the industry and ASME code to develop appropriate in-service inspection methodologies to perform detailed assessments of the integrity of aging concrete containment structures. This project is part of a larger initiative at EPRI to research aging of concrete and reliability of inspection techniques for nuclear structures.

The authors acknowledge, with deep appreciation, the activities of ASME ST-LLC and ASME staff and volunteers who have provided valuable technical input, advice and assistance with review of, commenting on, and editing of, this document.

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1 INTRODUCTION

As the current nuclear fleet enters into long term operation (LTO), challenges are occurring due to the degradation of concrete structures. ASME Section XI, Subsection IWL currently provides in-service inspection requirements to assess the structural condition of concrete containments, through visual examination of the accessible surfaces. However, no specific guidance is provided for assessment of the internal condition of concrete.

To ensure long term safe operation and sustainability of the nuclear fleet, research is needed to determine if nondestructive examination (NDE) tools can provide the level of reliability required to assess existing and emerging degradation issues in concrete containments.

EPRI, through its concrete inspection and aging initiative is performing and directing some of the needed research in this area. It seemed natural that this effort is leveraged with this ASME research grant and, in that way, benefit ASME and EPRI by exploiting synergies in this area.

1.1 Objective

This project supports an action item within ASME Section XI Working Group Containment to evaluate examination requirements for determining concrete internal condition.

The objective of this project is to test nondestructive examination techniques and tools to perform detailed assessments on the structural integrity of concrete containment structures. Specifically, three parameters are tested: the depth of flaw detection, the operator dependence and the ease of deployment of each technique. The primary defects of interest include delaminations and cracking. Note that due to the limited scope of this project only three techniques were evaluated. Further work can focus on additional techniques.