

March 13, 2013

MEMORANDUM TO: Anthony J. Mendiola, Chief
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Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

FROM: Sheldon D. Stuchell, Sr. Project Manager /RA/
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SUBJECT: SUMMARY OF MARCH 5, 2013, PUBLIC MEETING REGARDING
THE POTENTIAL FOR QUASI-LAMINAR INDICATIONS IN REACTOR
PRESSURE VESSEL FORGINGS

On March 5, 2013, a Category 2 public meeting was held by the U.S. Nuclear Regulatory Commission (NRC) staff to allow an exchange of information concerning the possibility of NRC licensees discovering quasi-laminar indications (planar-type indications oriented nearly parallel to the inner and outer surfaces of the reactor vessel) in reactor pressure vessel (RPV) ring forgings. A large number of quasi-laminar indications were found in 2012 during ultrasonic inspections of two RPVs in Europe.

The probable cause analysis of the quasi-laminar indications in the European RPVs concluded the likely cause of the indications is hydrogen flaking, which occurs during the forging process, and is not an in-service degradation mechanism. The NRC is working with U.S. licensees to assess the potential existence and impact of quasi-laminar indications in RPV forgings in domestic plants. The NRC staff presented technical information defining the issue and announced plans to issue an Information Notice. Industry representatives also presented technical information and indicated that they plan to perform probabilistic fracture mechanics and complementary continuum damage mechanics analyses. Additionally, the industry is facilitating the collection of RPV forging fabrication inspection records to determine whether any forgings in domestic plants had evidence of hydrogen flaking. Industry is also reviewing the type of non-destructive testing equipment and procedures that were used during construction in an effort to document that construction inspections would have been capable of identifying hydrogen flaking. The industry is also evaluating current technology for forging inspection.

The NRC staff solicited input with regard to the material presented and discussed at the meeting, as well as any lessons learned on quasi-laminar flaws, that might lead to suggested improvements in Sections III and XI of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code*. Sections III and XI differ in the examinations that are required and the acceptance criteria that apply and Section XI allows for evaluation for acceptance of any flaws detected during examinations. Discussion topics included clarification of the definitions of "reportable" and "recordable" indications, as defined by ASME. There was also discussion on when nondestructive examination examiners were required to document their findings, and whether those written findings became part of the permanent documentation record.

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It was identified that the documentation requirements vary based on vendor or plant-specific procedures. The industry representatives stated that they will advise the NRC of their recommendations for improvements to the ASME Code, if any, as they progress through their activities on this topic.

A list of attendees is enclosed. The slide presentations presented by the NRC staff and the industry representatives can be found in the Agencywide Documents Access and Management System at Accession Numbers ML13059A225, ML13 067A407, and ML13 067A391.

Project No. 669

Enclosure:
List of Attendees

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List of Attendees

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Potential Quasi-Laminar Indications in Reactor Pressure Vessel Forgings**

March 5, 2013

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