

Preservice Inspection (PSI) of Nuclear Power Plant Components

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Preservice Inspection (PSI) versus Inservice Inspection (ISI)



Preservice Inspection (PSI)

- ❖ What is PSI and why is it required?
- ❖ PSI was originally intended only as baseline examination



Why Require PSI?

- ❖ "The most appropriate approach to establish a base line is to conduct preoperational examinations prior to the initial operation of the facility. The results of subsequent examinations can then be compared to the original condition to determine if changes have occurred. If the examination shows no changes on specific components, then no action would be required; however, if changes have occurred then an evaluation of the indications would be required to determine necessary action."
(1968 Section XI)



Inservice Inspection (ISI)

- ❖ Why is ISI required?
- ❖ Identify changes from baseline
 - Flaw growth



Purpose of ISI

- ❖ "The intent of the Code is to provide for, on a case by case basis, a review of the indications that show potential signs of distress and relate the condition to the service requirements to which the component is subjected. For the case where the review shows that no changes have occurred, disposition would require nothing further. For the case where the evaluation shows potential signs of distress, but the condition meets (is within) the original acceptance standards, disposition may require nothing more than the examination of an additional number of components or like areas." (1968 Section XI)



❖ Why require PSI prior to Code Symbol Stamping?



Why Require PSI prior to Code Symbol Stamping?

- ❖ During 1st generation NPP construction, flaws were found in field PSI required by ASME Section XI of completed welds already accepted in accordance with Section III



Why Require PSI prior to Code Symbol Stamping?

- ❖ Flaws were acceptable, based on acceptance of examinations required by ASME Section III
- ❖ Additional examinations not required by Section III do not have to meet Section III acceptance criteria



Why Require PSI prior to Code Symbol Stamping?

- ❖ Not all flaws are defects
 - Flaw = Unintentional Imperfection
 - Defect = Flaw Not Meeting Specified Acceptance Criteria



Why Require PSI prior to Code Symbol Stamping?

- ❖ Different NDE methodologies were used for Section III construction acceptance and Section XI PSI
 - RT versus UT
- ❖ Owners were not comfortable defending these flaws to regulator
 - Lack of service experience



Why Require PSI prior to Code Symbol Stamping?

- ❖ Result?
- ❖ Flaws found by UT were repaired, even if acceptable by RT
- ❖ Repair required additional PWHT and hydrostatic testing in the field



Why Require PSI prior to Code Symbol Stamping?

- ❖ Repair often impractical or detrimental
 - Additional PWHT can exceed prequalified time on test coupons
 - PWHT in field can produce significant thermal expansion strains
 - Fatigue cycles are added by repeated hydrostatic testing
 - Can be more expensive in field than in shop



Why Require PSI prior to Code Symbol Stamping?

- ❖ In 1997 Addenda, PSI was added to Section III, Division 1
- ❖ Owner option



Why Require PSI prior to Code Symbol Stamping?

- ❖ Owner must specify requirements in Design Specification for Division 1 components or Division 2 containments (Subsection NCA)
 - Edition and Addenda of Section XI
 - Examination Category and examination method
 - Procedure, personnel, and equipment qualification requirements
 - Surface conditioning requirements
 - Marking system for reproducibility of results
 - Monitoring by ANII (Inservice Inspector)



PSI prior to Code Symbol Stamping

- ❖ PSI must be same as ISI
- ❖ Same method
 - UT before service if UT will be used in service
- ❖ Same methodology
 - Performance demonstration, rather than standard procedures
- ❖ Same personnel qualifications
 - Performance demonstration is required



PSI prior to Code Symbol Stamping

- “The intent of the Code is that preoperational examinations be as closely representative of the examinations to be performed later as is practicable.” (1968 Section XI)
- “Components shall be examined as specified in Section XI, Table IWB-2500-1. The method of examination for the components and parts of the pressure-retaining boundaries shall comply with those tabulated in Table IWB-2500-1. Only the volumetric and surface examinations are required to be performed.” (2008 Section III)



PSI prior to Code Symbol Stamping

- ❖ PSI acceptance in accordance with Section XI
 - “Components whose volumetric examination reveals flaws that meet the acceptance standards of Section XI, IWB-3000 shall be acceptable. The flaws will be dimensioned and recorded in accordance with Section V, Article 4 and this Subsection.” (2008 Section III)
 - “Components whose volumetric examination reveals flaws that exceed the standards of IWB-3000 are not acceptable for service and shall be repaired.” (2008 Section III)
 - Some Section XI PSI and ISI acceptance criteria slightly different



PSI prior to Code Symbol Stamping

- ❖ Owner must play active role in specifying requirements and verifying procedure and performance demonstration qualifications



Questions?



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