

# **NRC Position on Code Issues**

**Annual Industry NRC Materials Issue Program Information Exchange Meeting  
U.S. Nuclear Regulatory Commission**

**June 5, 2014**

# **Inspection of Nickel-Base Alloy Branch Connection Butt Welds**

# N-770-1 and N-722-2

- Code Case N-770
  - Developed to enhance the inspection
  - Dissimilar metal welds
  - Nickel-based alloys, Alloy 82/182
  - Apply to butt welds in ASME Class 1 systems
  
- Code Case N-722
  - visual examination of partial and full penetration weld locations
  - Rev 2 removed full penetration welds as redundant to N-770, which included ASME Code B-J Class branch connection butt welds

# ASME Code Inquiry

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- ASME Code position
  - Examination Category B-J branch connection welds in piping are not required to be examined in accordance with N-770 or its revisions
  - Only circumferential butt welds are required to be examined
- NRC disagrees with overall intent of this position

# NRC Position

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- Branch connection butt welds are to be volumetrically examined
- NRC's full intent when incorporating by reference Case N-770-1 into the Code of Federal Regulations was that all butt welds in systems designated as ASME Class 1 utilizing Alloy 82/182 materials for structural integrity be volumetrically examined
  - See 10 CFR 50.55a(g)(6)(ii)(F)(2)

## NRC Position (Con't)

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- Figure 1 of Case N-770-1 provides sufficient information to define the inspection volume of a branch connection butt weld
  - If licensees think otherwise, an alternative examination volume may be submitted to the NRC for review.
- Sufficient information in ASME Section XI, Appendix VIII exists to develop and qualify inspection procedures, equipment, and personnel

# Going Forward

- If ASME Committee believes that additional information is necessary to establish inspection volumes or inspection requirements, the NRC will ask ASME to develop revisions to Case N-770
- The NRC will be developing generic communication providing this information to licensees. The timeline for issuing such generic communication is around the end of this year.

# **Improvement and Clarification of Eddy Current Acceptance Criteria and Application**



# Eddy Current Examination Regulatory Needs

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- Dissimilar metal butt welds
  - ASME Code Case N-770-1 surface examinations
  - ASME Code Case N-766 Inlay/Onlay mitigation
- Partial penetration welds
  - Upper head penetration nozzle welds
  - Vent line welds and other penetrations with no interference fit
- Peening non-destructive examination technique

# Value of Eddy Current Examination

- NUREG/CR-6996 (ADAMS #ML092170311)
  - Demonstrated value of eddy current versus dye penetrant for stress corrosion cracking surface detection in partial penetration welds
- “Shallow” subsurface flaw detection capability
  - Operational Experience from embedded flaw repairs
    - Pre-service PT passed
    - Operated for one or more cycles
    - Subsurface defects of size  $\geq 0.14$ -inch deep exposed
    - Thin ligaments of metal found to mask indications from PT

# Current Code Limitations

- ASME Code Case N-770-1 surface examination acceptance criteria
  - Note 15(d) applies a 1/16” bleedout sizing acceptance criteria for the surface examination
  - Supplement 2 of Appendix IV of Section XI limits the eddy current qualification
    - size of 1/16” linear indication or
    - less than or equal to the allowable length specified in IWB-3514 and IWC-3514 for inservice surface flaws for piping or Table IWB-3510-3 and Table IWC-3510-3 for vessels.
  - Liquid dye penetrant acceptance criteria are not directly comparable for eddy current testing

# Need for “Shallow” Flaw Detection

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- Inlay/Onlay to ensure effective 2 layer boundary
- Ensure no shallow near surface flaws in pre and post peening surfaces
- Demonstration program not developed

# Going Forward

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- Eddy current examination technology appears adequate to address these issues
- Need for a program to ensure full capabilities of eddy current examinations are realized
  - NRC Office of Regulatory Research program beginning
- Need to establish consistency in surface examination acceptance criteria between PT and ECT