

NRC Position on Code Issues

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

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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

- 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

- 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)

- 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

- 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 ≥ 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

- 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

- 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