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Performance Demonstration for Eddy Current Testing of J-Welds and Butt Welds

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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

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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

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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” 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

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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

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Performance Demonstration Using N-773

- Qualification program extension for wetted surface exams of dissimilar metal welds
  - Provides a blind and open qualification program
  - Provides detection criteria for 0.4” surface flaws
- Need to expand
  - Make detection criteria have a similar flaw size to dye penetrant bleed out acceptance criteria in N-770
  - Provide a “shallow” volumetric detection program
  - Generalize program to include wetted surface exams of partial penetration welds

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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
- Need to establish consistency in surface examination acceptance criteria and qualification requirements for eddy current examinations