ELECTRIC POWER RESEARCH INSTITUTE

Codification of UT Examinations on Welds Containing Corrosion Resistant Cladding (CRC)

PDI Meeting

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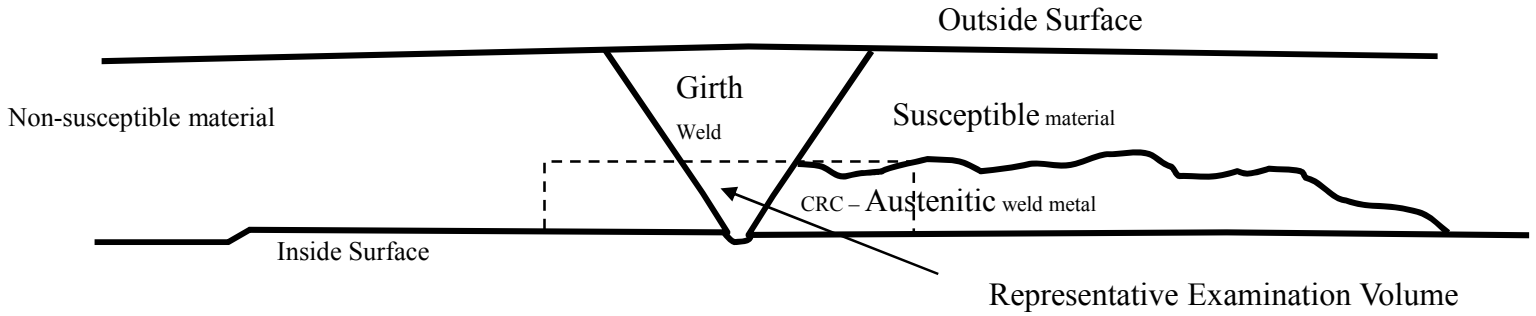
Objectives

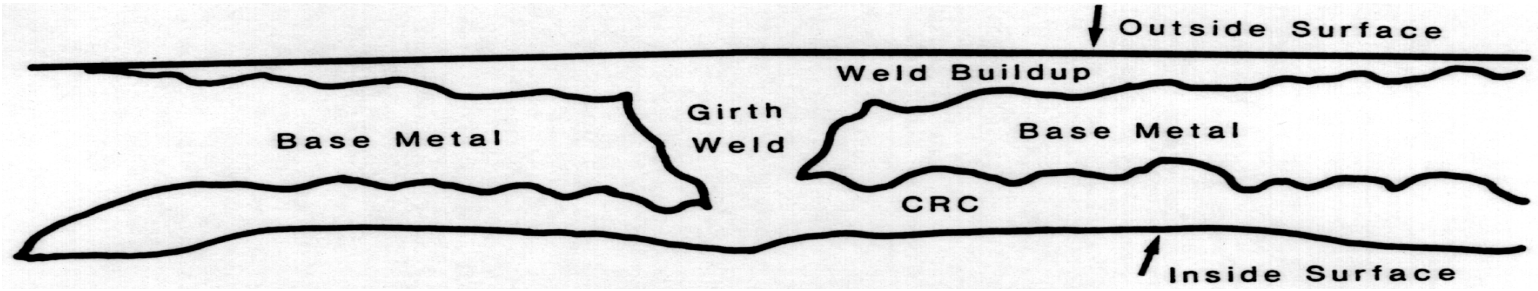
- Review Use of CRC in BWR plants
- Review Current Guidance for UT of CRC Welds
- Discuss Proposed Solution
- Summary

What is CRC?

- Corrosion Resistant Cladding is a stainless steel weld boundary applied on the inside surface of some stainless steel piping welds to mitigate IGSCC in BWRs (a potential PWR issue also)
  - Part of the design pressure boundary
  - Subject to examination as Cat. B-J or B-F in Code space
  - Configurations can vary based on components being joined – including outside surface weld build-up, in some cases

Example CRC Configurations





Current Rules for UT of CRC

- In response to a February 2003 Code Inquiry, ASME stated that Appendix III examination requirements should be followed for CRC *" . . until performance demonstration requirements are specified"*
- Appendix VIII, Table VIII-3110-1, which indicates which App. VIII Supplement applies to which component, was later modified to show structural weld inlay (corrosion-resistant clad) as being *"in course of preparation"*
- Also in 2003, PDI created the "Guideline for Ultrasonic Examination of Corrosion Resistant Cladding (CRC)" – PDI-GL-002
  - Requires examiner to possess a Suppl. 2 qualification (w/ IGSCC) or a Suppl. 10 qualification
  - Requires personnel, procedures and equipment to be demonstrated on a site-specific mockup

Additional EPRI Studies

- EPRI has been involved in several related studies involving UT through resistant austenitic materials in the years since the CRC rules were established
  - Weld Overlay Repairs for PWRs has increased the industry's sample library and required major revision to the examination procedures
    - Small bore piping overlays
    - Complicated geometries
    - Optimized weld overlays for very large bore piping
  - Weld Inlay and Onlay studies for piping ID surfaces, measuring the effect on previously qualified Suppl. 10 procedures

Proposed Approach to Close this Gap

- Proposed Project (to be performed by or supported by EPRI PD Program staff):
  - Step 1: Gather the CRC mockups from plants that have them
  - Step 2: Perform capability study using Supplement 10 techniques on these available mockups
  - Step 3: Pull in results from previous PDI studies performed on inlay and onlay mockups and WOL mockups to bolster this study
  - Step 4: (optional) Build one additional mockup representative of worst case CRC configuration, to test Supplement 10 techniques
  - Step 5: Document results in EPRI Technical Report
  - Step 6: If Supplement 10 techniques prove effective, use EPRI TR as the basis for Code Case/Code Change to add one paragraph to Appendix VIII, Supplement 10 which states that personnel, procedures and equipment qualified to Supplement 10 are also considered qualified to examine CRC welds
    - Hopefully address ID and OD exams
    - Possibly address both Supplement 2 and 10 welds

Summary

- CRC is a configuration primarily found in BWR plants which was used to mitigate SCC and in some PWR units
- The current examination guidelines are to use qualified App. VIII UT personnel and to demonstrate the whole process on a site specific mockup
- All available guidance has been written in a way that suggests that eventually the rules will be codified
- Proposed industry groups consider the merit of a project whereby we would collect the available CRC mockups and previous study results and formulate a report which would be the basis for codifying these exams into Supplement 10 of Appendix VIII
- If this idea is favorable to various advisors, a formal project outline will be developed for presentation during the next funding period

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