

Proposed Changes to Code Cases N-740 and N-754

ASME/USNRC Meeting

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EPRI



H & A Inc.

Proposed Changes to N-740

- **Inquiry/Reply Changed to Permit a Full Structural Overlay for Mitigation of PWSCC**
- **Overlay Uses on Austenitic Nickel Filler Wire (28% Cr min., ERNiCrFe-7 or ERNiCrFe-7A)**
- **Crack Growth for Mitigative Overlays - the initial flaw size for crack growth shall be assumed consistent with the inspections performed, either pre- or post overlay**
 - ♦ **If a qualified inspection is performed prior to application of the overlay and no indications are discovered, initial flaws equal to 10% of the original wall thickness shall be assumed in both the axial and circumferential directions**
 - ♦ **If no inspection is performed prior to application of the overlay, initial flaws equal to 75% through the original wall thickness shall be assumed, in both the axial and circumferential directions**
 - ♦ **There may be circumstances in which an overlay inspection is performed using a qualified ultrasonic inspection procedure below for depths greater than the outer 25% of the original wall thickness . For such cases, initial flaw sizes may be assumed consistent with the depth to which the inspection procedure is qualified**

Proposed Changes to N-740 (Con't)

- ◆ Any flaw indications found by the final overlay inspection, which exceed the depth above, shall be used as the initial flaw depth in determining the service life of the overlay
- The axial flaw length shall be set at 1.5 inches (38 mm) or the combined width of the weld plus buttering, whichever is greater
- The circumferential flaw length shall be assumed to be 360 degrees

Proposed Changes to N-740 (Con't)

- **Structural Design and Sizing of the Overlay**
 - ◆ For mitigative full structural overlays, the assumed flaw in the underlying base material or weld is to be based on the limiting case of the two below:
 - 100% through wall for the entire circumference
 - 100% through wall for 1.5 inches (38 mm) or the combined width of the weld plus buttering, whichever is greater, in the axial direction.
- The overlay design thickness shall be based on the measured circumference, using only the weld overlay thickness meeting the deposit analysis requirements

Proposed Changes to N-740 (Con't)

- **Examination and Inspection**
 - ◆ **Planar flaws shall meet the preservice examination standards of Table IWB-3514-2**
 - In applying the acceptance standards to planar indications within the inservice inspection examination volume (A-B-C-D in Figure 2), wall thickness “tw” shall be the thickness of the weld overlay
 - For planar indications outside of that examination volume, wall thickness may be defined as the total thickness of the weld overlay plus the underlying base metal.

Proposed Changes to N-740 (Con't)

- **Examination and Inspection**
 - ◆ **Laminar flaws shall meet the following:**
 - Laminar flaws shall meet the acceptance standards of Table IWB-3514-3 with the additional limitation that the total laminar flaw shall not exceed 10% of the weld surface area and that no linear dimension of the laminar flaw area exceeds 3.0 in. (76 mm), or 10 percent of the nominal pipe circumference, whichever is greater
 - The reduction in coverage of the examination volume in Fig. 2 due to laminar flaws shall be less than 10%. The dimensions of the uninspectable volume are dependent on the coverage achieved with the angle beam examination of the overlay
 - Any uninspectable volume in the weld overlay shall be assumed to contain the largest radial planar flaw that could exist within that volume. This assumed flaw shall meet the inservice examination standards of Table IWB-3514-2, with wall thickness “tw” as defined above for planar flaws. Alternately, the assumed flaw shall be evaluated and shall meet the requirements of IWB-3640, or IWC-3640, as applicable. Both axial and circumferential planar flaws shall be assumed

Proposed Changes to N-740 (Con't)

- **Examination and Inspection -Inservice Inspection**
 - ◆ **For mitigative weld overlays, in which a qualified examination is performed and no indications are discovered, the overlaid weldment may be placed directly into the population to be examined as follows:**
 - **Weld overlay examination volumes that show no indication of crack growth or new cracking shall be placed into a population to be examined on a sample basis. Twenty-five percent of this population shall be examined once every ten years**

Proposed Changes to N-754 for an Optimized Weld Overlay

- **Optimized Weld Overlays are for Mitigation Only of Large Diameter Piping**
- **The Code Case Has Been Changed to Incorporate the Proposed Changes to N-740**
- **Structural Design and Sizing of the Overlay**
 - ◆ **An optimized structural weld overlay is an appropriate alternative to full structural overlays**
 - **The design basis flaw assumption for sizing purposes is 360° around the weld, but with a depth no less than 75% of the original pipe wall**
 - **The design basis flaw assumption for sizing purposes is an axial flaw length of 1.5 in. (38 mm), but with a depth no less than 75% of the original pipe wall**

Proposed Changes to N-754 for an Optimized Weld Overlay

- **Crack Growth for Optimized Mitigative Overlays**
 - ◆ **Requirements are the Same as for a Full Structural Overlay Per N-740**
 - ◆ **If any Cracking is found during Pre or Post Overlay Examinations, a Full Structural Overlay is Required with the Appropriate Crack Growth Evaluation for the as Found Flaw**

Conclusions

- **The Changes Proposed to the Code Cases Do Not Present a Challenge to Component Structural Integrity**
- **The Code Cases are Sufficiently Conservative Alternatives to Existing ASME BP&V Code Requirements to Provide an Acceptable Level of Quality and Safety**