Alternative Examination Coverage

ASME Code Case N711

6th International CANDU ISI Workshop/NDT in Canada
2016 Conference

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Background

- Existing ASME Section XI Code examination figures in IWB and IWC developed over 30 years ago
- Minimal to no change to these examination figures since that time
- Parameters associated with defining effective inservice inspection requirements have matured due to:
  - Accumulated operating experience (root cause analyses)
  - Advances in fracture mechanic evaluations
  - Increased material susceptibility awareness
  - Emergence of risk-informed methodologies
Background (Cont’d)

- These factors lead to a more complete understanding of piping system integrity
- The Code is now in a position to identify more informed examination requirements
- Examinations can be improved by focusing on locations and associated volumes/areas where potential degradation is most likely to occur
- Implementation of this “inspection for cause” approach ensures component reliability and improves plant safety
Current Requirements

- In the US, most plants currently implement Code Case N-460 if > 90% examination coverage is achieved thereby negating submittal of a relief request.

- In the US, in those cases where ≤ 90% examination coverage is achieved, a relief request (alternative) is submitted per 10CFR50.55a.

- Preparation and submittal of relief requests requires resources of both the power plant and the regulator.

- Seldom are additional examination requirements imposed beyond the coverage achieved and documented in the relief request.

  ➢ That is, the best effort was already expended.
Alternative Requirements

- Case N-711 provides an alternative approach to determine the acceptability of the examination even if it is less than, or different than, the “deterministic” SXI guidance.

- Case N-711 provides a prescriptive, step by step process, that enables the user to determine the Volume of Primary Interest (VPI).

- The Volume of Primary Interest (VPI) is dependent upon the component configuration and its susceptibility to degradation, as defined in the Case.

<table>
<thead>
<tr>
<th>Degradation Mechanisms</th>
<th>Criteria</th>
<th>Susceptible Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF TASCS</td>
<td></td>
<td>nozzles, branch pipe connections, safe ends, welds, heat affected zones (HAZ), base metal; and regions of stress concentration</td>
</tr>
<tr>
<td></td>
<td>piping &gt; NPS 1 (DN 25); and pipe segment has a slope &lt; 45 deg from horizontal (includes elbow or tee into a vertical pipe); and potential exists for a low flow in a pipe section connected to a component allowing mixing of hot and cold fluids, or potential exists for leakage flow past a valve (i.e., in-leakage, out-leakage, cross-leakage) allowing mixing of hot and cold fluids, or potential exists for convection heating in dead-ended pipe sections connected to a source of hot fluid, or potential exists for two phase (steam/water) flow, or potential exists for turbulent penetration into a relatively colder branch pipe connected to header piping containing hot fluid with high turbulent flow; and calculated or measured $\Delta T &gt; 50^\circ F (10^\circ C)$; and Richardson number &gt; 4.0</td>
<td></td>
</tr>
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</table>
**Alternative Requirements (Cont’d)**

- The Case enables the user to determine if the limited examination coverage achieved on that particular component, captured the Volume of Primary Interest (VPI).
- Successful examination coverage of the Volume of Primary (VPI) will ensure detection of the postulated damage mechanism, if the degradation mechanism is operative at the component.

<table>
<thead>
<tr>
<th>Degradation Mechanisms</th>
<th>Process Decision Point [Note (1)]</th>
<th>If Decision Point is “Yes”</th>
<th>If Decision Point is “No”</th>
</tr>
</thead>
<tbody>
<tr>
<td>TASCSTT</td>
<td>(c) Is the inspection location on a horizontal run to a steam generator or BWR vessel, including feedwater nozzle?</td>
<td>— see decision point (d)</td>
<td>— volume of primary interest not sufficiently examined</td>
</tr>
<tr>
<td></td>
<td>(d) Was the weld, pipe side heat affected zone and pipe side counterbore transition region captured?</td>
<td>— document examination limitation and coverage achieved and verify examination performed to the examination requirements of B-F, B-J, C-F-1, C-F-2 or R-A, as applicable</td>
<td>— coverage requirement not met</td>
</tr>
</tbody>
</table>
Alternative Requirements (Cont’d)

- If the applicable Volume of Primary Interest (VPI) is fully examined, a request to the regulatory body is not required.

- Regulatory notification (i.e. not approval) is required via submittal of Form NIS-1 or Form OAR-1 for all piping weld locations that meet the alternative examination coverage requirements of the Case.

- In those cases where the applicable Volume of Primary Interest (VPI) is NOT fully examined, a submittal would be required (e.g. 10CFR50.55a)

<table>
<thead>
<tr>
<th>FORM N-711-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT OF WELDS SATISFYING ALTERNATE EXAMINATION COVERAGE REQUIREMENTS OF CASE N-711</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examination Category</th>
<th>Weld Number</th>
<th>Weld Description</th>
<th>Percent Coverage</th>
<th>Description of Limitation</th>
</tr>
</thead>
</table>
Current Status

- Case N-711 was approved by the ASME Section XI Subcommittee on Inservice Inspection in 2006
- Case N711 has not been endorsed by USNRC in Regulatory Guide 1.147
- Case N711-1 developed to address USNRC and other stakeholder input
- Case N711-1 currently out for ballot at Section XI Standards Committee
- No substantial technical change
  - Clarifying text,
  - Additional technical bases / references
Volume of Primary Interest

- The Volumes of Primary Interest (VPI) defined in the Case are depicted in the figures that follow for each damage mechanism and component configuration combination.

- Where depicted in the applicable figures, the Volume of Primary Interest (VPI) includes the entire counterbore transition region if any portion of it is located within ½ in. of the weld fusion line.

- TASCS and TT – Figures A1, A2, B1, B2, C1 and C2

- PWSCC – Requirements governed by Owner controlled Program (e.g. 10CFR50.55a)

- IGSCC (PWR) – Figures G1, G2, H1, H2,
Degradation Mechanisms: TASCS, TT

Component Configuration:
Horizontal Run to SG or BWR Vessel

Figure A1

Figure A2
Volume of Primary Interest (Cont’d)

Degradation Mechanisms: TASCS, TT

Component Configuration:
Pipe to Component

Figure B1

Figure B2
Degradation Mechanisms: TASCS, TT

Component Configuration:
Pipe to Pipe

Figure C1

Figure C2
Degradation Mechanisms: IGSCC

Component Configuration:
Pipe to Cast Component

Ferrite/Carbon Content
within Resistant Region of Figure 1

Figure G1

Figure G2
Degradation Mechanisms: IGSCC

Component Configuration:
Pipe to Cast Component

Ferrite/Carbon Content
NOT within Resistant Region of Figure 1

Figure H1

Figure H2
Together…Shaping the Future of Electricity