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Relief Request for Reexamination Requirements of Byron Unit 2 RPVHPN Number 75 with Mitigated Alloy 600/82/182 Peened Surfaces

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Background

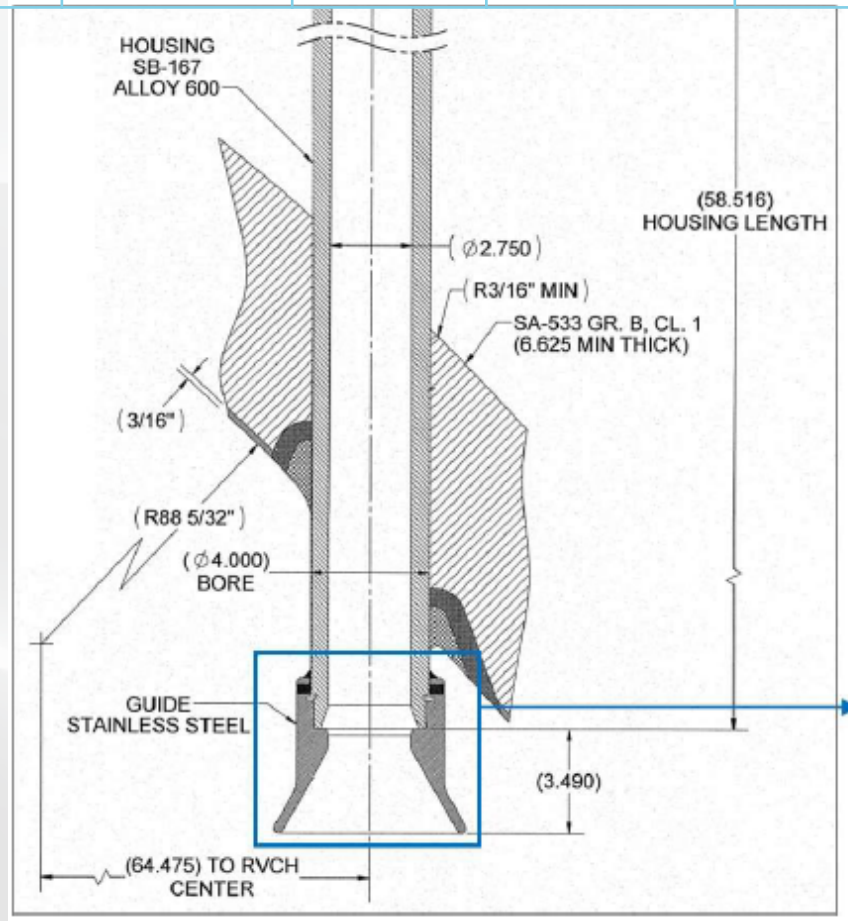
- On April 23, 2022, during the Byron Station, Unit 2, spring 2022 (B2R23) refueling outage, post-peening N+4 follow-up volumetric examinations of the Reactor Vessel Head Penetrations identified a recordable indication that did not meet the applicable acceptance on Core Exit Thermocouple (CETC) Penetration Number 75 (P-75). This indication was found within the required examination area in accordance with ASME Code Case N-729-6. No indications were identified on the rest of the penetrations, and the extent of condition was limited to P-75.

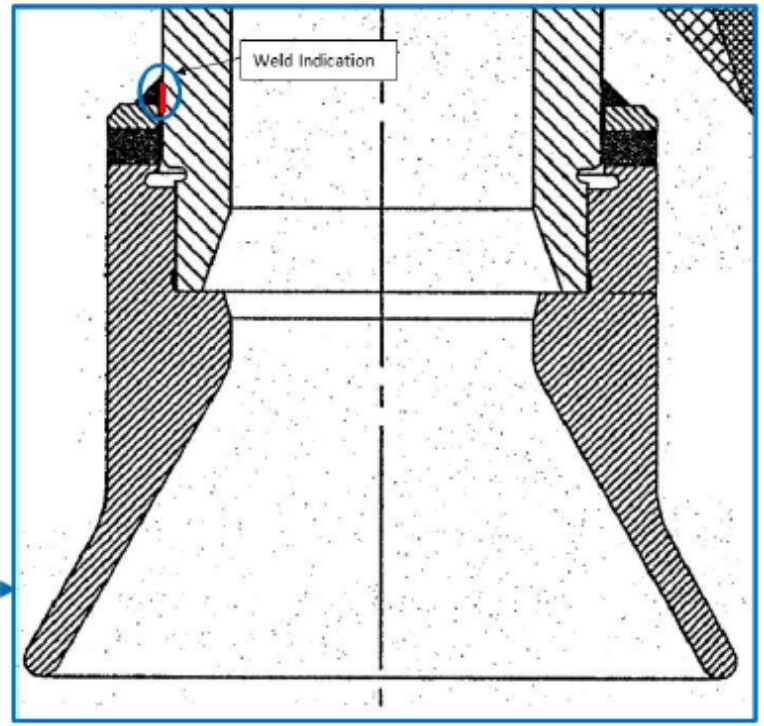
- The indication at P-75 was found outside the required peening coverage area in accordance with MRP-335, Revision 3-A. Peening had not been performed on this area due to geometry limitations where the guide funnel fillet (tack) welds, and the adjacent areas are shadowed by top of the guide funnel.

- This indication is located at 184 degrees with a length of 0.197" with a depth of 0.141" from the outer diameter (OD) surface of the CETC penetration. The indication extends from 1.498" to 1.695" from the end of the nozzle. The indication is axially oriented and is at the location of one of the guide funnel tack welds.

Indication Details

Pen. #	Nozzle OD/ID	Primary Flaw Orient.	Location (deg.)	End Point 1 from End of Nozzle. (in.)	End Point 2 from End of Nozzle. (in.)	Length, 2c (in.)	Depth, a (in.)	Depth-to-Thick., a/t	Distance between Top of Axial Flaw and Bottom of J-Groove Weld, (in.)
75	OD	Axial	184	1.498	1.695	0.197	0.141	23%	5.9





Inspection Requirements for Flaws Found Outside of the MRP-335 Revision 3-A Required Peening Area

- Since 10 CFR 50.55a(g)(6)(ii)(D), ASME Code Case N-729-6, and MRP-335, Revision 3-A are silent on any reexamination requirements for flaws found outside the MRP-335, Revision 3-A required peening coverage area, Constellation conservatively considered the entire P-75 as flawed.

- As such, P-75 has been recategorized as Item No. B4.20 (MRP-335, Revision 3-A, Table 4-3 or ASME Code Case N-729-6, Table 1) where the reexamination frequency becomes every other refueling outage until the flaw is repaired and post-repair volumetric examination is performed the following outage.

- The rest of the penetrations are identified as Item No. B4.60 based on the post-peening volumetric examination results.

Fatigue and PWSCC Flaw Growth Evaluation

- A fatigue and PWSCC flaw growth evaluation was performed using finite element analysis (FEA) to establish an acceptable period of operation based on the predicted crack growth and the acceptance criteria defined by ASME Section XI IWB-3663. The acceptability of the flaw is bounded by its axial growth direction.
  - Based on PWSCC crack growth rate of ASME Section XI, Article O-3230, the acceptable period of operation is **17.4 EFPY**.
  - Based on PWSCC crack growth rate of MRP-420, Revision 1, the acceptable period of operation is **15.3 EFPY**.
  - The minimum distance between the top of the final axial flaw length and the bottom of the J-groove weld is 3.7 inches.

Proposed Alternative

- The fatigue and PWSCC flaw growth evaluation provides technical justification to revert the reexamination requirement of Item No. B4.20 for P-75 back to Item No. B4.60 like the rest of the penetrations. As such, Constellation is requesting relief to perform the post-peening volumetric examinations of P-75 in accordance with Item No. B4.60 once per inspection interval like the rest of the penetrations.

- Performing this examination every other refueling outage as an Item No. B4.20 until the guide funnel tack weld flaw is repaired is a hardship due to person-rem exposure and increased outage complexity. Based on these factors, Constellation identified the performance of this volumetric reexamination as a hardship without a compensating increase in quality and safety in accordance with 10 CFR 50.55a(z)(2).

- This proposed alternative provides an acceptable level of quality and safety.

Previous Submittals

1) Letter from H. Welt (Constellation) to U.S. Nuclear Regulatory Commission, "LER 2022-001-00 – Byron Station Unit 2 Volumetric Examinations of Reactor Pressure Vessel Head Core Exit Thermocouple Penetration P-75 Identified an Indication Attributed to Primary Water Stress Corrosion Cracking." [NRC ADAMS Accession No. ML22173A039].

2) Letter from J. J. Kowalski (Constellation) to U.S. Nuclear Regulatory Commission, "Report Summarizing the evaluation, including inputs, methodologies, assumptions, extent of conditions, and causes of the new flaw, unacceptable flaw, or flaw growth pursuant of the Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement (MRP-335, Revision 3-A) Report." [NRC ADAMS Accession No. ML22123A219].

3) Letter from N. L. Delgado (U.S. Nuclear Regulatory Commission) to B. Hanson (Exelon Generation Company, LLC), "Byron Station, Unit No. 2 – Relief from the Requirement of the ASME Code {COVID-19] (EPID L-2020-LLR-0098)" dated September 9, 2020. Safety Evaluation by The Office Nuclear Regulation: Relief Request I4R-17 Regarding Alternative Follow-Up Inspections for Reactor Pressure Vessel Head Penetration Nozzles Exelon Generation Company, LLC Byron Station, Unit No. 2 Docket No. 50-455. [NRC ADAMS Accession No. ML20245E506].


QUESTIONS?