From: Gleaves, Billy
Sent: Monday, May 3, 2021 12:08 PM
To: Vogtle PEmails
Cc: Gleaves, Billy
Subject: FW: VEGP Unit 3 ASME Code Alternative for Containment Vessel Repair ALT-16 Presubmittal Meeting April 29, 2021
Attachments: NRC Pre-Submittal Presentation - ALT-16.pdf

This email is being forwarded to capture the SNC email transmitting the April 29, 2021 meeting presentation slides, and the slides themselves.

Billy

William (Billy) Gleaves
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From: Chapman, Nathan B. <NBCHAPMA@SOUTHERNCO.COM>
Sent: Friday, April 30, 2021 7:11 AM
To: Gleaves, Billy <Bill.Gleaves@nrc.gov>
Cc: Kellenberger, Nicholas <X2NRKELL@SOUTHERNCO.COM>
Subject: [External_Sender] ALT-16 Presubmittal Presentation

Mr. Gleaves:

Please find the attached slides presented by SNC during the Thursday (4/29) public call.

Thanks,

Nathan B. Chapman
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Remediation for Unit 3 Containment Vessel Unistrut Welding
ASME Section III Code Alternative Request
VEGP 3-ALT-16

April 29, 2021

Southern Nuclear

Overview

- Background
- Alternative Request Overview
- Fracture Toughness Requirements
- Material Compatibility
- Summary

Background

- The Unit 3 Containment Vessel (CV) is an ASME Section III, Class MC pressure vessel
- Subsequent to completion of design and construction of Unit 3 CV, and after the Structural Integrity Test (SIT) was successfully completed:
  - 6 pieces of Unistrut were welded to the CV inside diameter across 3 locations using 4'' long, 1/4'' to 3/8'' fillet welds
  - Welding was performed by a contractor that is not an N-Certificate holder

Alternative Request

- The proposed alternative requests authorization to perform remediation of Unistrut welding
- Remediation would be performed by the CV N-Certificate Holder, CB&I, according to their Section III program
  - » Mechanical methods will be used to cut the Unistrut from the welds
  - » Weld material will be ground flush with CV shell, with trace amounts of weld material remaining for the life of the plant
  - » Ultrasonic digital thickness measurements of CV shell will be taken to confirm thickness before and after removal of weld material
  - » Surface exams of the CV shell will be conducted to identify any discontinuities
  - » Supplemental vacuum box testing of remediated areas will be performed to verify no leak paths were created in the CV shell

Fracture Toughness

- **The 4" long, 1/4" to 3/8" fillet welds made on the surface of the CV are inconsequential when compared to the full penetration welds joining the 1-3/4" thick CV shell plates**
- Significantly smaller HAZ than production test plate welds
- Code-Required fracture toughness
  - ≥40 ft-lb at the lowest service metal temperature (LSMT) of -18.5º F
  - Code allows material to be impact tested at a temperature lower than LSMT
- CV Shell Plates average fracture toughness
  - 221.25 ft-lb at -58.5º F
  - >5 times the minimum Code-required value at a significantly lower temperature
- Production Test Plates average fracture toughness
  - Production Test Plates were for joining 1-3/4" thick CV shell plates
  - 237 ft-lb at -29º F
  - E9018M Weld Filler Material average fracture toughness = 92.7 ft-lb at -30º F

Fracture Toughness

- Unistrut attachment welds
  - Welded on 1-3/4'' CV shell plates with 3/32'' E7018 electrode
  - Average fracture toughness of weld filler material used = 133 ft-lb at -20º F
- Conclusion:
  - The significantly larger welds made for the production test plates yielded fracture toughness results significantly higher than the minimum Code requirements
  - Therefore, the impact of the small Unistrut attachment welds is bounded by the production test plate welds, and would also yield fracture toughness values significantly higher than the minimum Code requirements
  - It is reasonable to conclude that the HAZ created by the fillet welds will be significantly smaller than that created by the production test plate welds

Filler Metal Material Compatibility

- SA-738 Grade B CV shell plate material

- 3/32" EXCALIBUR® 7018 MR™ filler metal used for Unistrut welds
  - Falls within range, or below maximum allowed metal chemical composition of CV shell plates

Material	C (%)	Si (%)	Mn (%)	P (%)	S (%)	Cu (%)	Ni (%)	Cr (%)	Mo (%)	V (%)	Nb (%)
SA 738 Grade B	0.20	0.15-0.55	0.90-1.50	0.025	0.025	0.35	0.60	0.30	0.30	0.07	0.04
Excalibur 7018 MR	0.08	0.22	1.11	0.01	0.007	0.03	0.02	0.03	0.23	<0.01	NR

- The reported yield strength of the weld filler metal is 67 ksi, which is above the 60 ksi minimum for SA-738 Grade B, and
- The reported 84 ksi ultimate tensile strength nearly matches the 85 ksi minimum required for SA-738 Grade B

Unistrut Material Compatibility

	SA-738 B	A1011 SS Gr 33
P Number	1	1
Group Number	3	1
C %	0.2	0.25
CE %	0.48% (per CBI Spec)	0.47%

- P-number and Group Number:
  - Metals with same P-number have similar materials. In this case P-1 means they are both carbon steel.
  - A1011 SS Gr. 33 is listed as a P1 Group 1 material in ASME Section IX (QW-422) and is compatible with P1 Group 3 material, including SA-738 B
- Temporary Unistrut material attachments are not required to comply with NE-2000

Examinations

- HAZ created by the small Unistrut fillet welds made on the surface of the 1-3/4" thick CV shell plate extends only slightly below the surface
- Remediation plan includes surface exams and supplemental Vacuum box testing
  - Surface examinations verify that Unistrut welding did not introduce surface indications
  - Vacuum box testing verifies that no through-wall leakage paths were introduced to the CV shell
- No NDE can characterize the depth of the HAZ
- Volumetric Examinations are not expected to identify any indications that could not be identified through surface examinations

Summary

- Welding was performed on the CV shell by a non-Certificate Holder, after receiving the N-Certificate Stamp and after SIT had been successfully performed
- Alternative Request ALT-16 is being requested to authorize remediation plan, which includes surface examinations and supplemental Vacuum box testing
- Fracture Toughness requirements in NE-2300 are met
- Weld filler material and Unistrut material are compatible with CV shell material
- The proposed alternative along with the plan of remediation, based on evaluations performed by CB&I, provide an acceptable level of quality and safety in accordance with 10 CFR 50.55a

Questions

Questions