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Contains Proprietary Information
Pursuant to 10 CFR 2.790

Docket Number 50-346

License Number NPF-3

Serial Number 2777

April 25, 2002

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Subject: Request for Relief from American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Inservice Inspection Requirements at the Davis-Besse Nuclear Power Station – Third Ten-Year Interval (RR-A21 and RR-A22) (TAC MB3843)

Ladies and Gentlemen:

The purpose of this letter is to respond to requests for additional information (RAIs) concerning a previously requested relief (RR-A21) from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for the Davis-Besse Nuclear Power Station, Unit 1 (DBNPS) Third Ten-Year Inservice Inspection Interval as was submitted by FirstEnergy Nuclear Operating Company (FENOC) letter Serial Number 2750 (dated January 11, 2002). In addition, included in this letter is a relief request that supplements relief request RR-A20 as was transmitted by FENOC letter Serial Number 2750 and revised by letter Serial Number 2765 (dated February 26, 2002). This relief request proposes alternatives to ASME Code Section XI repair requirements to the Reactor Vessel Closure Head Control Rod Drive Mechanism nozzle penetrations based on the results of the welding procedure qualification results.

Enclosures 1 and 2 contain proprietary documents in support of responses to the RAIs. These documents are considered to be proprietary to Framatome ANP and are requested to be withheld from public disclosure. In accordance with 10 CFR 2.790, an affidavit providing the basis for withholding this information from public disclosure is provided in Attachment 3.

A001
A047

Review and approval of the attached relief requests and those transmitted by letter Serial Number 2750 is requested by May 16, 2002.

If you have any questions or require additional information, please contact Mr. David H. Lockwood, Manager-Regulatory Affairs, at (419) 321-8450.

Very truly yours,

Attachments

cc: J.E. Dyer, Regional Administrator, NRC Region III
S.P. Sands, DB-1 NRC/NRR Project Manager
C.S. Thomas, DB-1 Senior Resident Inspector
Utility Radiological Safety Board

REQUEST FOR ADDITIONAL INFORMATION
RR-A21

1. Why was the 1992 Edition of ASME Section III referenced with respect to NB-5330(b) versus the 1995 Edition?

Response:

Code Case N-416-1 is being used as an alternative to the hydrostatic pressure test required by IWA-4000 following repairs. Code Case N-416-1 specifies use of ASME III, 1992 Edition, No Addenda for nondestructive examination (NDE).

2. Provide a basis for using 1992 versus 1995 for above.

Response:

Code Case N-416-1 is being used as an alternative to the hydrostatic pressure test required by IWA-4000 following repairs. Code Case N-416-1 specifies use of ASME III 1992 Edition, No addenda for NDE.

3. Please provide any empirical or metallurgical information on the characteristics of the triple point anomaly referenced in RR-A21. Acoustic response, grain structure, impact properties and toughness for similar material should be discussed.

Response:

Acoustic Response

The effectiveness of the ultrasonic examination (UT) techniques to characterize weld defects has been qualified by demonstration on a mockup of the ambient temperature temper bead welding process involving the same materials used for repair. Notches were machined into the mockup at the triple point region to depths of 0.10 inch, 0.15 inch, and 0.25 inch in order to quantify the ability to characterize the depth of penetration into the nozzle. The depth characterization is done using tip diffraction UT techniques that have the ability to measure the depth of a reflector relative to the nozzle bore. Each of the notches in the mockup could be measured using the 45-degree transducer. During the examination, longitudinal wave angle beams of 45 degrees and 70 degrees are used. These beams are directed along the nozzle axis looking up and down. The downward looking beams are effective at detecting the anomaly because of the impedance change at the triple point. The 45-degree transducer is effective at depth

characterization by measuring the time interval to the tip of the reflector relative to the transducer contact surface. The 70-degree longitudinal wave provides additional qualitative data to support information obtained with the 45-degree transducer. Together, these transducers provide good characterization of any weld anomalies. These techniques are routinely used for examination of austenitic welds in the nuclear industry for flaw detection and sizing.

In addition to the 45- and 70-degree beam angles described above, the weld is also examined in the circumferential direction using 45-degree longitudinal waves in both the clockwise and counterclockwise directions to look for transverse fabrication flaws. A 0-degree transducer is also used to look radially outward to examine the weld and adjacent material for laminar type flaws and evidence of under bead cracking.

UT will be performed scanning from the ID surface of the weld, excluding the transition taper portion at the bottom of the weld and adjacent portion of the CRDM nozzle bore. The UT is qualified to detect flaws in the repair weld and base metal interface in the repair region, to the maximum practical extent.

The UT transducers and delivery tooling are capable of scanning from cylindrical surfaces with inside diameters near 2.75 inches. The UT equipment is not capable of scanning from the face of the taper. The scanning is performed using 0° L-wave, 45° L-wave, and 70° L-wave transducers to scan the area of interest.

Grain Structure, Impact Properties and Toughness

A series of photomacrographs, which depict the triple point anomaly, are provided in BAW-2409P. (Note: BAW-2409P was submitted to the Nuclear Regulatory Commission to the Attention of Mr. John S. Cushing on October 9, 2001.) It has been shown that the triple point occurs at the common intersection of the Alloy 600 nozzle, the Alloy 52 weld and the SA 533 Gr. B, Cl. 1 plate materials.

The fracture toughness analysis uses hypothetical crack extensions through or near the Alloy 600 tube and the Alloy 52 weld. The fracture toughness of these materials has been shown to be extremely high and thus non-ductile type fracture is not credible. The tests performed to obtain the fracture toughness of these materials are performed using elastic-plastic J_R methods. Performing impact toughness tests on materials that exhibit very high toughness would not be meaningful.

4. Please provide a drawing showing orientation and growth direction of flaws described as Path 1 and Path 2 on pages 6 and 7. Drawing should show ***a*** and ***l*** orientation of the flaw.

Response:

Path 1 and Path 2 are provided in Figures 1 and 2, respectively. Path 1 assumes either an axially oriented or a circumferentially oriented flaw (with respect to penetration) propagating radially from the triple point to the inside surface of the CRDM nozzle to form a leak path. The initial flaw size is assumed to be 0.100 inches through the weld for the axially oriented flaw and 0.100 inches through the weld, extending the entire penetration circumference, for the circumferentially oriented flaw.

Path 2 assumes a semi-circular surface flaw, located at the top of the weld, propagating axially down the penetration from the triple point to form a leak path. The initial flaw size is assumed to be 0.100 inches extending downward from the triple point with a length of 0.200 inches.

5. Provide the calculations performed under subarticles IWB-3611, -3612 and -3642 that are discussed on page 7 of 10.

Response:

Framatome ANP Documents 32-5015453-00 and 01 [Revision 0 and Revision 1, respectively], "DB CRDM Nozzle IDTB Weld Anomaly Flaw Evaluations," are provided in Enclosures 1 and 2.

6. On page 8 of 10 you discuss the residual stress field as being extremely crack tolerant when not in an aggressive environment. Does your conclusion consider boron intrusion from the top of the head, down the annulus to the triple point?

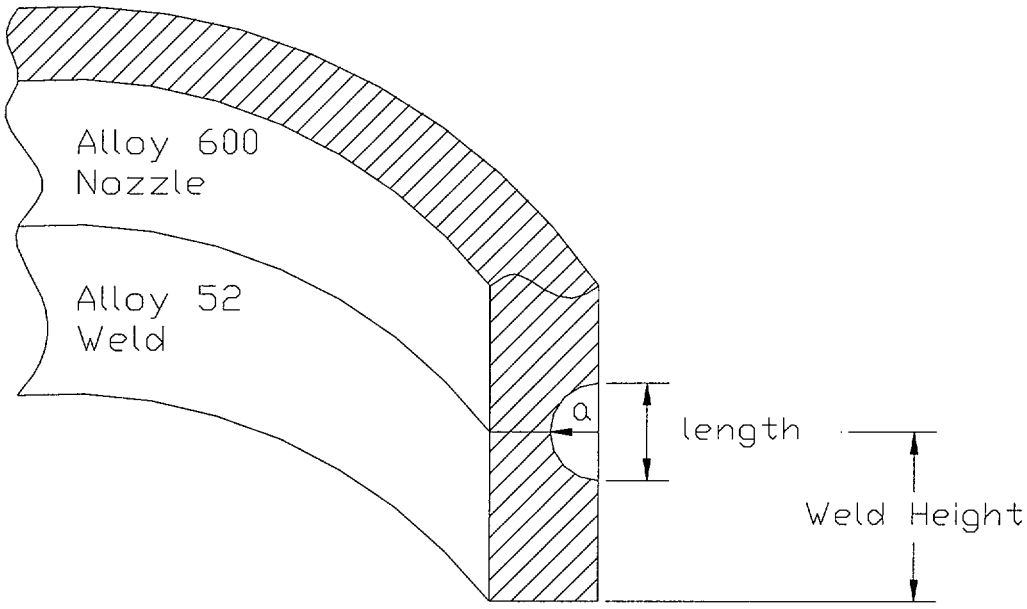
Response:

Boron intrusion from the outside surface into the annulus was considered. The Alloy 52 weld is considered not to be susceptible to Primary Water Stress Corrosion Cracking (PWSCC) so no deleterious effects would be realized.

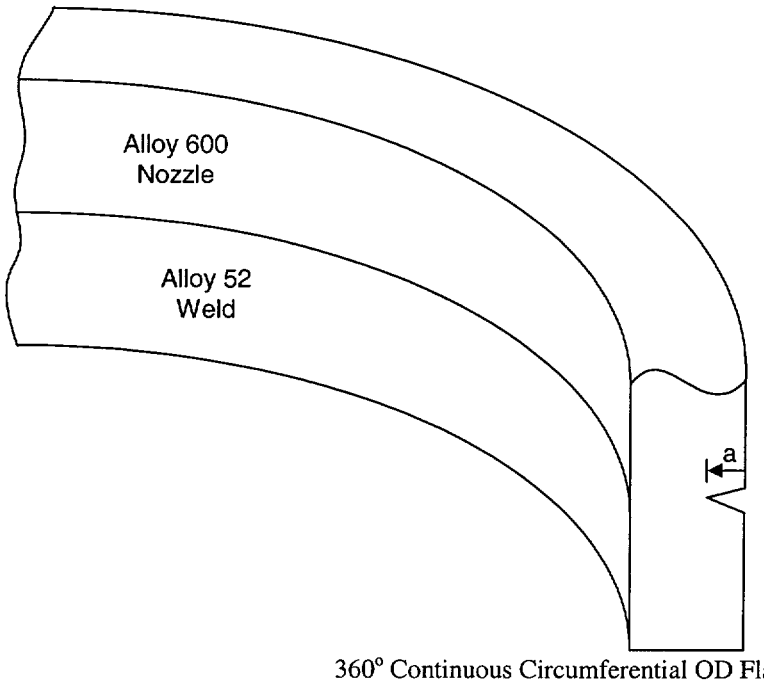
7. On page 8 of 10 you discuss removal of the triple point via weld repairs, indicating that significant dose accumulation would occur. Is this a request based on hardship? If so, explain why there would be no compensating increase in quality and safety commensurate with the dose received.

Response:

Relief is being requested in accordance with 10 CFR 50.55a(a)(3)(i) as the repair weld in its final condition will provide an acceptable level of quality and safety as the weld, with the triple point anomaly, meets the acceptance criteria of IWB-3600. The discussion regarding radiation dose accumulation is intended to provide additional basis that the principles of ALARA would not be met if a manual welding process, which is the only other currently qualified welding process, would be used to perform repairs or the entire CRDM nozzle repair weld.



Semi-Circular Axial Flaw



360° Continuous Circumferential OD Flaw

Figure 1: Path 1 Flaws

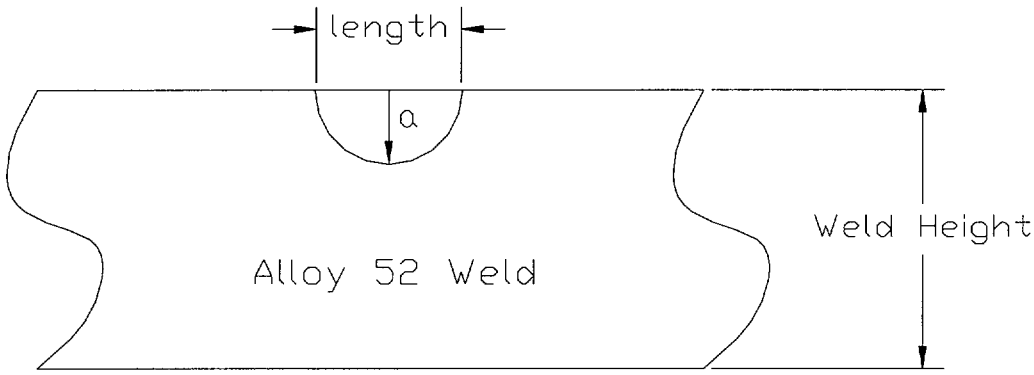


Figure 2: Path 2 Flaw

DBNPS ISI Program – Third Ten-Year Interval
Relief Request RR-A22

(3 Pages Follow)

FIRSTENERGY NUCLEAR OPERATING COMPANY
DAVIS-BESSE UNIT 1
THIRD 10-YEAR INTERVAL
RELIEF REQUEST RR-A22

System/Component(s) for Which Relief is Requested:

Reactor Vessel Closure Head (RVCH) Control Rod Drive Mechanism (CRDM) nozzle penetrations. There are 69 CRDM nozzle penetrations welded to the RVCH. The ASME Code Class is Class 1.

Code Requirement:

IWA-4610(b) of the 1995 Edition through the 1996 Addenda of ASME Section XI requires that the welding procedure and the welders or welding operators be qualified in accordance with Section IX and the additional requirements of this Subarticle. Similarly, Code Case N-638 (Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique), whose methodology is used for CRDM nozzle penetration repairs requires that the welding procedures and the welding operators be qualified in accordance with Section IX and the requirements of paragraphs 2.1 and 2.2.

IWA-4622(e) of the 1995 Edition through the 1996 Addenda of ASME Section XI requires the average of the three heat affected zone (HAZ) impact tests be equal to or greater than the average of the three base metal tests.

Code Requirement from Which Relief is Requested:

Relief is requested from the requirements of IWA-4610(b). The welding procedure does not meet the maximum interpass temperature qualification requirements of ASME Section IX in that the maximum specified interpass temperature is greater than 100°F over that used in the procedure qualification process. Per QW-256 of ASME Section IX, an increase in interpass temperature greater than 100°F is a supplementary essential variable when notch toughness tests are required.

Relief is requested from the requirements of IWA-4622(e). IWA-4622(e) does not contain the option to determine an additive temperature for base material when the Charpy-V notch lateral expansion average values of the three HAZ test specimens are less than the average value of the base material specimens. In lieu of IWA-4622(e), the requirements of NB-4335 of the 1995 Edition through the 1996 Addenda of ASME Section III will be used to verify the impact properties of the ambient temper bead welding process.

Basis for Relief:

Relief Request RR-A20 provided the requirements for performing ambient temperature temper bead welding for the repair of RVCH CRDM nozzle penetrations. The welding procedure was qualified using the interpass temperature requirements of Code Case N-638. The acceptance criterion for the HAZ impact tests contained in this relief request was also based upon Code Case N-638 and IWA-4622(e) of ASME Section XI.

The P-No. 43 to P-No. 3 welding procedure for the RVCH CRDM repairs specifies a maximum interpass temperature of 350°F. The welding procedure was qualified with an interpass temperature less than 100°F. Per QW-256 of ASME Section IX, an increase greater than 100°F is a supplementary essential variable. The procedure qualification requirements specified in Code Case N-638 impose a 150°F maximum interpass temperature during the welding of the procedure qualification. This requirement restricts base metal heating during qualification that could produce slower cooling rates that are not achievable during field applications. However, this requirement does not apply to field applications, as a 350°F maximum interpass temperature is a requirement in Section 3.0 of the Code Case N-638. The higher interpass temperature is permitted because it would only result in slower cooling rates which could be helpful in producing more ductile transformation products in the heat affected zone.

Relief is requested from IWA-4610(b) in accordance with 10 CFR 50.55a(3)(i). The use of the higher interpass temperature in accordance with the methodology of Code Case N-638 produces a quality temper bead weld and will provide an acceptable level of quality and safety.

The acceptance criterion of Code Case N-638 and IWA-4622(e) require the average values of the three HAZ impact tests be equal to or greater than the average values of the three unaffected base metal tests.

The welding procedure has been qualified in accordance with the requirements of paragraphs 2.0 and 2.1 specified in the Alternative Welding Method with the exception that the requirements of NB-4335 of the 1995 Edition through the 1996 Addenda of ASME Section III were used to verify the Charpy impact properties of the ambient temper bead welding process.

During the Charpy impact testing portion of the qualification process, the reference temperature (RT_{NDT}) was determined to be -30°F. At RT_{NDT} +60°F temperature (+30°F), the average of the HAZ absorbed energy Charpy impact tests was greater than the average of the base material. However, the average of the mils lateral expansion for the HAZ was less than the average values for the base material. Additional Charpy V-notch tests were conducted on the HAZ material as permitted by NB-4335.2 to determine an additive temperature to the RT_{NDT} temperature. The average mils lateral expansion for the HAZ at +35°F

was equivalent to the unaffected base material at +30°F. These test results require an adjustment temperature of 5°F to the RT_{NDT} temperature for base material on which welding is performed.

Based on the criteria established in BAW-10046A, Methods of Compliance with Fracture Toughness and Operational Requirements of 10 CFR 50, Appendix G, the controlling item in the closure head assembly is the reactor closure head flange forging. This value is established to be +60°F for the RT_{NDT} for the reactor closure head flange forging. The RT_{NDT} established for the reactor closure head center disc plate was +40°F. The same value was established for all the plate materials of the B&WOG plants as established in BAW-10046A. Since the welding will be done on the closure head center disc plate, the new RT_{NDT} for this item would be + 45°F which is still less than+60°F for the flange so therefore no impact on the technical specifications relevant to the closure head component will occur.

The 1995 Edition through the 1996 Addenda of ASME Section III is referenced in 10 CFR 50.55a(b)(1). No limitations or modifications regarding the use of NB-4335 are noted in 10 CFR 50.55a.

Relief is requested in accordance with 10 CFR 50.55a(3)(i). The use of NB-4335 to determine the additive temperature to the RT_{NDT} temperature when the Charpy-V notch lateral expansion average values of the three HAZ test specimens are less than the average value of the base material specimens provides an acceptable level of quality and safety.

Implementation Schedule:

This relief request is applicable to the welding of those DBNPS CRDM nozzles identified during the Third 10-Year Inservice Inspection Interval that require repair.

Framatome ANP Affidavit for
Framatome Documents 32-5015453-00 and 32-5015453-01
DB CRDM Nozzle IDTB Weld Anomaly Flaw Evaluations

(3 Pages Follow)

AFFIDAVIT

COMMONWEALTH OF VIRGINIA)
) ss.
CITY OF LYNCHBURG)

1. My name is James F. Mallay. I am Director, Regulatory Affairs, for Framatome ANP ("FRA-ANP"), and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by FRA-ANP to determine whether certain FRA-ANP information is proprietary. I am familiar with the policies established by FRA-ANP to ensure the proper application of these criteria.

3. I am familiar with the information contained in two Framatome ANP calculation summary sheets (specifically, 32-5015453-00 and 32-5015453-01) concerning a fracture mechanics evaluation of a hypothetical flaw in a CRDM nozzle. These calculation summary sheets are referred to herein as "Documents." Information contained in these Documents has been classified by FRA-ANP as proprietary in accordance with the policies established by FRA-ANP for the control and protection of proprietary and confidential information.

4. These Documents contain information of a proprietary and confidential nature and is of the type customarily held in confidence by FRA-ANP and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in these Documents as proprietary and confidential.

5. These Documents have been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in the Documents be withheld from public disclosure.

6. The following criteria are customarily applied by FRA-ANP to determine whether information should be classified as proprietary:

(a) The information reveals details of FRA-ANP's research and development plans and programs or their results.

(b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for FRA-ANP.

(d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for FRA-ANP in product optimization or marketability.

(e) The information is vital to a competitive advantage held by FRA-ANP, would be helpful to competitors to FRA-ANP, and would likely cause substantial harm to the competitive position of FRA-ANP.

7. In accordance with FRA-ANP's policies governing the protection and control of information, proprietary information contained in these Documents have been made available, on a limited basis, to others outside FRA-ANP only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. FRA-ANP policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

SUBSCRIBED before me this 16th
day of April, 2002.

Ella F. Carr-Payne
NOTARY PUBLIC, STATE OF VIRGINIA
MY COMMISSION EXPIRES: 8/31/05

ELLA F. CARR-PAYNE
Notary Public
Commonwealth of Virginia
My Commission Exps. Aug. 31, 2006

COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station (DBNPS) in this document. Any other actions discussed in the submittal represent intended or planned actions the DBNPS. They are described only for information and are not regulatory commitments. Please notify the Manager - Regulatory Affairs (419-321-8450) at the DBNPS of any questions regarding this document or associated regulatory commitments.

COMMITMENTS	DUE DATE
None	