

December 17, 2002

Mr. Lew W. Myers
Chief Operating Officer
FirstEnergy Nuclear Operating Company
Davis-Besse Nuclear Power Station
5501 North State Route 2
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1 - REQUEST FOR
RELIEF FROM AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER
AND PRESSURE VESSEL CODE REQUIREMENTS FOR THE THIRD
10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM (TAC NO. MB5849)

Dear Mr. Myers:

By letter dated September 19, 2000 (Serial Number 2672), FirstEnergy Nuclear Operating Company (FENOC) submitted the revised Inservice Inspection (ISI) program for the third 10-year ISI interval at the Davis-Besse Nuclear Power Station (DBNPS). This letter included Request for Relief No. RR-A2, which proposed alternatives to certain requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code associated with inspection of the reactor vessel head-to-flange weld on the DBNPS Reactor Vessel Closure Head (RVCH). Additional information was provided in a letter dated November 27, 2001 (Serial Number 2736). Subsequently, FENOC decided to replace the DBNPS RVCH and, by letter dated August 1, 2002, RR-A2 was revised in its entirety to reflect the planned use of the replacement RVCH.

The Nuclear Regulatory Commission (NRC) staff, with technical assistance from its contractor, the Pacific Northwest National Laboratory, has reviewed and evaluated the information provided. The staff's evaluation of Relief Request RR-A2 is enclosed.

The staff concludes that the Code-required examination is impractical to perform on the components contained in the subject request for relief. Additionally, the staff concludes that the proposed alternative provides reasonable assurance of structural integrity of the subject component. Therefore, Request for Relief No. RR-A2 is granted pursuant to 10 CFR 50.55a(g)(6)(i) until the end of the third 10-year ISI interval (September 20, 2010). Granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

L. Myers

- 2 -

This completes the staff's activities associated with TAC No. MB5849.

Sincerely,

/RA by Douglass V. Pickett for/

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure: Safety Evaluation

cc w/encl: See next page

Davis-Besse Nuclear Power Station, Unit 1

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L. Myers

- 2 -

This completes the staff's activities associated with TAC No. MB5849.

Sincerely,

/RA by Douglass V. Pickett for/

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosures: Safety Evaluation

cc w/encl: See next page

DISTRIBUTION:

PUBLIC	SBajwa	AMendiola	OGC	ACRS
PDIII-2 R/F	JHopkins	THarris	BMoroney	
SCoffin	TMcLellan	GHill(2)		
TBergman	HNieh	GGrant, RIII		

ADAMS Accession Number: ML023050104

OFFICE	PM:LPD3	LA:LPD3	SC:EMCB	OGC	SC:LPD3
NAME	BMoroney for JHopkins**	THarris**	SCoffin*	RHoeffling**	DPickett for AMendiola
DATE	10/2/02	10/4/02	09/26/02	10/10/02	12/12/02

*Memo from S. Coffin to A. Mendiola dated 9/26/02

**See Previous Concurrence

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION

REQUEST FOR RELIEF NO. RR-A2

FIRSTENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1

DOCKET NO. 50-346

1.0 INTRODUCTION

By letter dated September 19, 2000, FirstEnergy Nuclear Operating Company (the licensee) submitted Request for Relief RR-A2, which proposed alternatives to certain requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code associated with inspection of the reactor vessel head-to-flange weld on the Reactor Vessel Closure Head (RVCH) at the Davis-Besse Nuclear Power Station (DBNPS). Additional information was provided in a letter dated November 27, 2001. Subsequently, the licensee decided to replace the Davis-Besse RVCH with one from the Midland plant. By letter dated August 1, 2002, RR-A2 was revised in its entirety to reflect the planned use of the replacement RVCH.

The U.S. Nuclear Regulatory Commission (NRC) staff, with technical assistance from its contractor, Pacific Northwest National Laboratory (PNNL), has reviewed and evaluated the information provided by the licensee.

2.0 REGULATORY EVALUATION

Inservice inspection of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The

ENCLOSURE

regulations require that inservice examination of components and system pressure tests conducted during the first ten-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The Code of record for the DBNPS third 10-year ISI interval is the 1995 Edition through the 1996 Addenda of the ASME Boiler and Pressure Vessel Code.

3.0 TECHNICAL EVALUATION

Code Requirement: ASME Section XI - 1995 Edition through 1996 Addenda, Examination Category B-A, Item B1.40, requires volumetric and surface examination, as defined by Figure IWB-2500-5, of essentially 100 percent of the weld length of the reactor pressure vessel (RPV) closure head-to-flange weld. "Essentially 100 percent", as clarified by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume, or surface area, as applicable.

Licensee's Code Relief Request: In accordance with 10CFR50.55a(g)(5)(iii), the licensee requested relief from the 100 percent volumetric examination coverage requirement for RPV closure head-to-flange Weld WH-7

Licensee's Proposed Alternative Examination: (as stated)

The Reactor Vessel Head-to-Flange weld will be examined along the weld axis in two directions, but will be examined perpendicular to the weld axis in only one direction to the extent permitted by the configuration of the RVCH.

Licensee's Basis for Relief Request:

The RVCH is a carbon steel vessel with stainless steel cladding on the inside surface. Due to this cladding, the ultrasonic beam cannot be "bounced" from the inside clad surface to increase the examination coverage. Therefore, a full-V examination from one side is not possible. Radiographic examination of this weld, following its use inservice, will not be feasible due to the projected radiation levels (approximately 1-2 R/hr) at the inside surface of the head.

In addition, three lifting lugs and a directional arrow, intended for use as a reference in aligning the RVCH on the reactor vessel, cover approximately 35 inches of the weld, which limits access on approximately 7 percent of the weld area.

Staff Evaluation:

The licensee's request for relief has been reviewed by the NRC staff with the assistance of its contractor, PNNL. The Technical Letter Report (TLR) providing PNNL's evaluation of RR-A2 is attached. The staff has reviewed the TLR and adopts the evaluations and recommendations for granting relief.

For Request for Relief No. RR-A2, the staff determined that the Code-required examination is impractical to perform on the RVCH head-to-flange weld. To perform the Code-required examinations to the extent required by the Code would be a significant burden on the licensee, because the RVCH head-to-flange weld would require design modifications. The licensee obtained approximately 80 percent volumetric examination

coverage and for the surface examination the licensee obtained essentially 100 percent coverage. Therefore, the limited volumetric examination and essentially 100 percent surface examination should detect any general patterns of degradation that may occur in the areas covered, providing reasonable assurance of the continued structural integrity of the subject weld. Therefore, the licensee's proposed alternative provides reasonable assurance of structural integrity of the subject component.

4.0 CONCLUSION

The staff concludes for Request for Relief No. RR-A2 that the Code-required examination is impractical to perform on the components contained in the subject request for relief. Additionally, the staff concludes that the licensee's proposed alternative provides reasonable assurance of structural integrity of the subject component in the licensee's request for relief. Therefore, the licensee's Request for Relief No. RR-A2 is granted pursuant to 10 CFR 50.55a(g)(6)(i) until the end of the third 10-year ISI interval (September 20, 2010). Granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Principal Contributor: T. McLellan, NRR

Date: December 17, 2002

TECHNICAL LETTER REPORT
ON THE THIRD 10-YEAR INTERVAL INSERVICE INSPECTION
REQUEST FOR RELIEF NO. RR-A2
FOR
FIRSTENERGY NUCLEAR OPERATING COMPANY
DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1
DOCKET NUMBER: 50-346

1.0 INTRODUCTION

By letter dated August 1, 2002, the licensee, FirstEnergy Nuclear Operating Company, submitted revised request for relief RR-A2, seeking relief from requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*. This request is for the third 10-year inservice inspection (ISI) interval at Davis-Besse Nuclear Power Station, Unit 1 (DBNPS). The Pacific Northwest National Laboratory (PNNL) has evaluated the subject request for relief in the following section.

2.0 EVALUATION

The information provide by FirstEnergy Nuclear Operating Company in support of the request for relief from code requirements has been evaluated and the basis for disposition is documented below. The code of record for the DBNPS third 10-year interval inservice inspection program, which began on September 21, 2000, is the 1995 Edition of Section XI of the ASME Boiler and Pressure Vessel Code with the 1996 Addenda.

2.1 Request for Relief RR-A2, Examination Category B-A, Item B1.40, Pressure Retaining Welds in Reactor Vessel, Closure Head-to-Flange Weld

Code Requirement: ASME Section XI - 1995 Edition through 1996 Addenda, Examination Category B-A, Item B1.40, requires volumetric and surface examination, as defined by Figure IWB-2500-5, of essentially 100 percent of the weld length of the reactor pressure vessel (RPV) closure head-to-flange weld. "Essentially 100 percent", as clarified by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume, or surface area, as applicable.

Licensee's Code Relief Request: In accordance with 10CFR50.55a(g)(5)(iii), the licensee requested relief from the 100 percent volumetric examination coverage requirement for RPV closure head-to-flange Weld WH-7.

Licensee's Basis for Relief Request (as stated):

The ultrasonic examination of the Reactor Vessel Head-to-Flange Weld is conducted in accordance with Section XI, Appendix I of the ASME Code, 1995 Edition through the 1995 Addenda. Section XI, Appendix I states that the ultrasonic examination shall be conducted in accordance with Article 4 of Section V as supplemented by Table I-2000-1. The requirements of NRC Regulatory Guide 1.150 [*Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations*, Revision 1, February 1983.] are also applicable to this weld.

Article 4, Section V of the ASME Code, 1995 Edition, 1996 Addenda requires the weld and adjacent base metal to be examined using nominal angles of 45 and 60 degrees, (deviation is permitted if geometry limits the coverage, however, separation of angles must be at least 10 degrees) and a straight beam. Four basic scan directions are required for the angle beams; two perpendicular to the weld axis (axial scan) from opposite directions and two parallel to the weld axis (circumferential scan) from opposite directions. These requirements apply for each of the angle beams used (i.e., 45 and 60 degrees). Each of the 45 and 60 degree angle beams is required to pass through all of the weld volume in the four basic scan directions. However, the adjacent base metal [base material along each side of the weld] scanning requirements allow the two beam angles to pass through in only one direction each for the axial and circumferential scans. In addition to the Code-required examinations, the weld is also scanned with a 65 degree transducer to provide examination perpendicular to the weld/base metal interface as required by NRC Regulatory Guide 1.150.

The examination volume for the Reactor Head-to-Flange Weld is defined in Figure IWB-2500-5. The examination volume can be scanned along the weld axis from two

Element of Exam Area

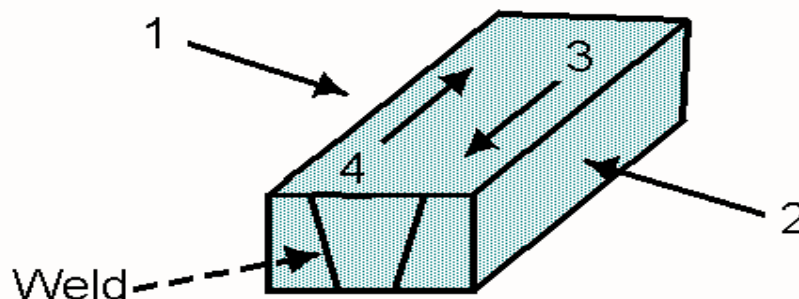


Figure 1 Sketch depicting Code-required axial (1 and 2) and circumferential (3 and 4) scanning directions.

directions. However, due to the extreme angle of the transition from the curvature of the head base material to the flange, access for scanning perpendicular to the weld axis is restricted to only the head side of the weld. From the head side of the weld, the service structure support skirt restricts scanning a portion of the examination volume with one of the two required angle beams. Scanning with the other required angle beam is not affected by the service structure support skirt.

The Reactor Vessel Closure Head (RVCH) is a carbon steel vessel with stainless steel cladding on the inside surface. Due to this cladding, the ultrasonic beam cannot be "bounced" from the inside clad surface to increase the examination coverage.

Therefore, a full-V examination from one side is not possible. Radiographic examination of this weld, following its use inservice, will not be feasible due to the projected radiation levels (approximately 1-2 R/hr) at the inside surface of the head.

In addition, three lifting lugs and a directional arrow, intended for use as a reference in aligning the RVCH on the reactor vessel, cover approximately 35 inches of the weld, which limits access on approximately 7 percent of the weld area.

Licensee's Proposed Alternative Examination (as stated):

The Reactor Vessel Head-to-Flange weld will be examined along the weld axis in two directions, but will be examined perpendicular to the weld axis in only one direction to the extent permitted by the configuration of the RVCH.

Staff Evaluation:

The Code requires essentially 100 percent volumetric coverage of RPV closure head-to-flange Weld WH-7 at DBNPS. The volumetric examinations are required to be performed by using several ultrasonic sound beams (at the proper angles within the material) that are directed both perpendicular and parallel to the weld. The *ultrasonic scans* are applied from the outside surface of the component, and should be conducted from each side of the weld, and across the surface (crown) of the weld. The intent of these requirements is to increase the likelihood of flaw detection by interrogating the component with multiple sound fields in order to find potential service-induced degradation that produces reflecting surfaces at various angular orientations relative to the weld and the heat-affected zone in the base material.

The component consists of an ASTM A-508, Class 2 forged ring (RPV bolting flange area) attached with a full penetration weld to an ASME SA-533, Class 1 forged, dome-shaped head. The cross-sectional geometry of the component at Weld WH-7 (see Figure 2) produces a high transition angle between the flange and the domed head. Scanning from the flange side may not provide the necessary angular orientation to detect flaws that are expected to initiate from the inner or outer surfaces and grow along the general orientation of the weld. In addition, the location of three closure head lifting lugs and a stamped directional marker (see Figures 3 and 4) further restrict access for ultrasonic examination. For these reasons, the component configuration does not allow the licensee to obtain the full Code-required volumetric coverage from both sides of the weld. For the licensee to achieve 100 percent volumetric coverage, the RPV closure head would have to be redesigned and modified. This would place a significant burden on the licensee, thus the Code-required 100 percent volumetric examination is impractical for Weld WH-7.

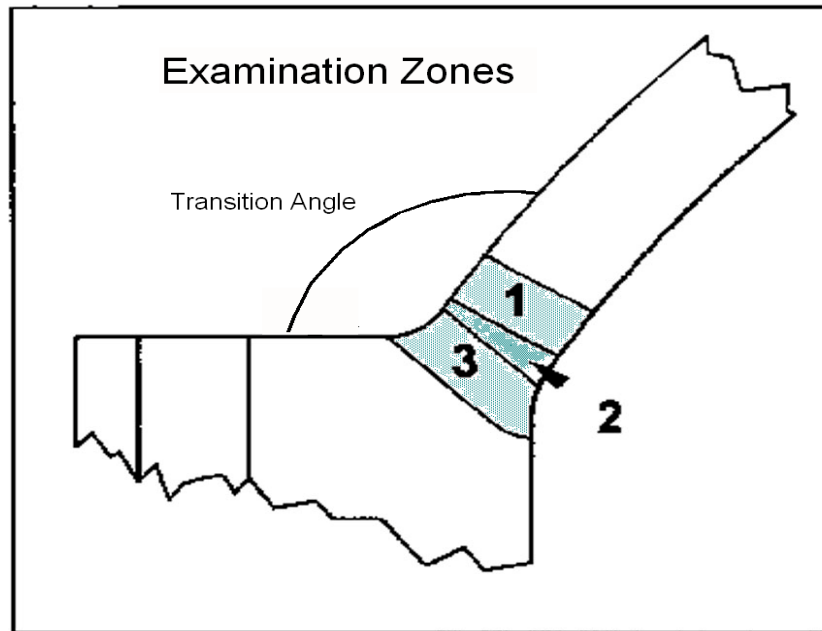


Figure 2 Cross-sectional view of Weld WH-7 showing weld area (2) and base metal examination (1 and 3) zones.

As shown on the sketches and technical descriptions provided by the licensee, a substantial amount (approximately 80 percent) of the Code-required examination volume can be obtained with the perpendicular, parallel and 0° ultrasonic scans performed from the head side of the weld. Apart from the Code volumetric examinations, the licensee also performs a separate 65° shear wave ultrasonic inspection from the head side of the weld to produce a sound field nearly perpendicular to the weld/base metal interface (in Figure 2, this is the black line between zones 1 and 2, and separating zones 2 and 3), as recommended by NRC Regulatory Guide 1.150 *Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations*, Revision 1, February 1983. In addition to the volumetric examinations of this weld, the licensee conducts the essentially 100 percent Code-required surface examinations on the outside of the component. While the licensee cannot meet the Code-required 100 percent volumetric examination coverage, the limited examinations completed should detect any general patterns of degradation that may occur in the areas covered, providing reasonable assurance of the continued structural integrity of this weld. Therefore, pursuant to 10CFR50.55a(g)(6)(i), it is recommended that relief be granted.

3.0 CONCLUSIONS

PNNL staff reviewed the licensee's submittal and concluded that the Code examination coverage requirements are impractical for the RPV closure head-to-flange weld listed in Request for Relief No. RR-A2. Further, reasonable assurance of the structural integrity of the subject components has been provided by the examinations that were performed. Therefore, for this request, it is recommended that relief be granted pursuant to 10 CFR 50.455a(g)(6)(i).



Figure 3 Photograph showing how lifting lugs limit ultrasonic scans from head side of Weld WH-7.



Figure 4 Photograph showing alignment arrow for setting head on vessel - arrow is machined into scan area of head adjacent to weld.