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SUBJECT: Requests relief from requirements of ASME Section XI Code for pre-svc & first insp interval in-svc volumetric exam of RCS branch connection welds.

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INDIANA MICHIGAN POWER

June 5, 1995

AEP:NRC:0969AH

Docket Nos.: 50-315
50-316

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Donald C. Cook Nuclear Plant Units 1 and 2
ASME SECTION XI RELIEF FOR RCS BRANCH CONNECTION WELDS

The purpose of this letter, submitted pursuant to 10 CFR 50.55a(g)(6)(i), is to request relief from the requirements of the ASME Section XI Code for the pre-service and first inspection interval in-service volumetric examination (ultrasonic) of reactor coolant system (RCS) branch connection welds. This relief request is being submitted pursuant to our discussions with NRC regional and headquarters staff on May 19, 1995.

Relief is requested for a permanent exemption from ASME Section XI 1971 Edition, including Winter 1971 Addenda, Category J, Item 4.2, for twenty pre-service volumetric examinations. Additionally, relief is requested for a permanent exemption from ASME Section XI 1974 Edition plus Addenda through Summer 1975, Table IWB-2500, Category B-J, item 4.6, for four in-service volumetric examinations from the first inspection interval for both unit one and unit two (1975-1986 and 1978-1986 respectively), as shown in Table 1 of the attachment to this letter. The ultrasonic examinations performed did not cover the required weld volume. As we are still within the second ten year inspection interval (1986-1996), we will fulfill the second interval requirements during the next outage for each unit as outlined in the attachment to this letter.

Non-destructive examinations, including dye penetrant, radiographic, and hydrostatic testing, were performed as required by the original construction code and revealed no recordable indications or leakage. The existing surveillance program includes RCS walkdowns at pressure immediately preceding and following every unit outage as well as daily RCS leak rate monitoring, which would provide evidence of weld degradation prior to failure since the material is expected to exhibit leak-before-break behavior.

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The attachment to this letter contains justification for the relief request. Included are the reasons why application of the ASME Section XI requirements regarding volumetric weld testing is considered impractical at this time. There are adequate technical bases to support the structural integrity of the branch weld connections and to conclude they are capable of performing their required safety function. As a result, it is our plan to continue operating in the present condition.

For the reasons discussed in the attachment to this letter, we believe that granting of relief from ASME Section XI pre-service and first inspection interval in-service requirements for the volumetric testing of the subject welds will not endanger life or property or the common defense and security.

Sincerely,

W. J. Smith

for E. E. Fitzpatrick
Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 5th DAY OF June 1995

Robin S. Richey
Notary Public

My Commission Expires: 3-31-97

ROBIN S. RICHEY
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 3-31-97

eh

Attachment

cc: A. A. Blind
G. Charnoff
J. B. Martin
NFEM Section Chief
NRC Resident Inspector - Bridgman
J. R. Padgett

ATTACHMENT TO AEP:NRC:0969AH

BACKGROUND INFORMATION AND JUSTIFICATION

ASME SECTION XI RELIEF

FOR VOLUMETRIC WELD TESTING

OF SELECTED RCS BRANCH CONNECTION WELDS

This attachment provides background information and justification for relief from the requirements of the ASME Section XI Code. The proposed relief would permanently exempt pre-service and first in-service inspection interval volumetric examination (ultrasonic) of selected reactor coolant system (RCS) branch connection welds.

BACKGROUND

During the review of in-service inspection volumetric examinations (ultrasonic) to prepare for the third interval ISI long term plan, it was discovered that the potential existed that the ultrasonic technique was not properly directed to examine the RCS branch connection welds during the pre-service and the first interval in-service examinations. American Electric Power Service Corporation, Indiana Michigan Power, and Southwest Research Institute personnel confirmed that, based on a review of design drawings, the weld examination coverage was not adequate to meet ASME Section XI requirements.

Table 1 "Cook Nuclear Plant - Units 1 and 2 RCS pipe branch connection welds" identifies the ten RCS branch connection welds per unit that are affected for the pre-service volumetric ultrasonic examination, and two per unit for the first interval inspection. It should be noted, however, that volumetric examinations were performed by the radiographic method, and determined to be acceptable, along with surface examinations and hydrostatic tests, per the construction code.

Six welds (three per unit) were selected for in-service examinations during the second ten-year inspection interval (unit one and unit two 1986-1996). Five of the six branch connection welds from both units have had a surface examination performed with no recordable indications. The sixth branch connection had been scheduled for surface examination during the upcoming unit two refueling outage currently scheduled for March 1996.

JUSTIFICATION

1. *Original Construction Welding and Examination*

Cook Nuclear Plant units 1 and 2 RCS piping is manufactured from centrifugally cast, ASTM A-351, grade CF8M piping which is similar to an AISI Type 316 stainless steel. Branch connection forged nozzles, composed of ASTM A-182, grade F316 stainless steel, are welded to the main RCS header by setting the nozzles on top of the header and making a multipass weldment in an orientation normal to the branch pipe axis.

The manufacturer, Southwest Fabricating and Welding (SWF&W), made the branch connection weld by using a multi-process welding procedure which specified GTAW (TIG) root passes to ensure

uniformity of the inside surface of the weldment and SMAW (Stick) welding for the fill passes. The welds were made in accordance with a qualified welding procedure by welders qualified in accordance with ASME Boiler and Pressure Vessel Code Section IX. Liquid penetrant examinations were conducted at SWF&W on the root and intermediate weld passes and all completed weld surfaces. Radiography of the shop welds was accomplished in accordance with the construction code for these welds. Finally, a shop hydrostatic test at 3,730 psig was performed. These in-process fabrication controls ensure that a high quality weld was made.

On May 23, 1995, a review of the construction radiographs of the branch connections shop welds indicated high quality welds with very few manufacturing discontinuities. Minor slag inclusions and randomly dispersed porosity, within code limits, were observed in five of the twenty welds.

2. *Material Properties*

A leak-before-break (LBB) analysis of the subject RCS piping was approved as the design basis for Cook Nuclear Plant in an NRC safety evaluation report (SER) dated November 22, 1985. The mechanistic fracture evaluation of the primary piping material performed by Westinghouse Electric Corporation is documented in WCAP-9558, Rev. 2, and the tensile and impact properties of the weld metal is documented in WCAP-9787. Both reports were reviewed and approved by the NRC.

The forged nozzle material, ASTM A-182, has similar properties as other primary piping materials analyzed in WCAP-9558, Rev. 2. Fracture toughness and tensile properties of the primary piping material and weld metal were evaluated as part of the development of the LBB methodology. Based on the results noted in the above reports, it is reasonable to conclude that the conclusions made in WCAP-9558, Rev. 2, envelope the behavior of the nozzle material and the subject weld joints will undergo LBB behavior.

3. *In-service Inspection and Testing*

Pre-service, first and second interval in-service inspection surface examinations (liquid penetrant) of these branch connections have been performed and all have yielded acceptable results, confirming good weld quality.

System leakage and hydrostatic tests have been conducted several times since construction on the RCS pressure boundary with no leaks reported. Inspections of the RCS at operating temperature and pressure following unit outages have also verified that pressure boundary leakage did not exist. Additionally, leakage monitoring requirements pursuant to technical specifications ensure that no pressure boundary leakage exists during plant operation.

4. *Industry Experience*

Our review of nuclear utility industry experience with Southwest Research Institute has not detected weld failures of these branch connections. This reinforces the belief that the stainless steel materials used in the fabrication of this piping have a high tolerance to resist the development and progression of service induced flaws.

REASON WHY APPLICATION OF CODE REQUIREMENTS IS IMPRACTICAL

It would be necessary to remove the units from power operation to perform the weld examinations, which would unnecessarily challenge and thermally cycle the unit, reduce system capacity, and provide minimal safety benefit. For this reason, we consider immediate code-type examination to be impractical.

We believe no safety benefit would be realized from performing the pre-service and first interval in-service volumetric examinations now based on the years of plant operating experience, the results of construction and in-service non-destructive examinations and hydrostatic tests, and the lack of compelling industry failure data. Volumetric examine time of ten RCS branch connection welds for one unit would require approximately 4800 man-hours for scaffolding construction, insulation removal, and examination, at a cost of 30 person-rem of exposure. The impact of this work does not include interruptions to other scheduled work during the outage while insulation is being removed from containment. If both units are to be examined, this estimate is doubled. For these reasons we consider the performance of a pre-service and first inspection interval volumetric examination of all the branch connection welds to be impractical.

COMPENSATORY MEASURES

Three branch welds for each unit will be selected and examined, using ultrasonic and liquid penetrant techniques, during the next refueling outages to satisfy Section XI requirements for the second inspection interval. These welds will be selected to represent a range of piping sizes, high ratios of calculated stress to code allowable, frequency of system usage, and accessibility. The selection of welds based on stress levels is consistent with the philosophy adopted in later code editions and will target the examinations to a more significant weld population. Additional examinations will be performed based on the outcome of these volumetric examinations in accordance with ASME Section XI criteria.

Our review of this design configuration, a forged nozzle to centrifugally cast stainless steel pipe, indicates it is unique to the RCS. These welds represent the only pipe-to-nozzle branch

connections in the ISI program requiring volumetric examination. No further compensatory measures are required for welds outside of this population.

The existing surveillance program includes technical specification required RCS leak rate monitoring on a daily basis during steady state operations. This will provide early indication of potential weld degradation. The LBB phenomenon would allow sufficient time for a safe and orderly shut down of the plant.

CONCLUSION

In conclusion, the relief request for permanent exemption from the pre-service volumetric examination for twenty welds and four first interval in-service examinations will not endanger life or property or the common defense and security. An examination of three welds per unit will be planned for the upcoming refueling outages and the outcome of these examinations will be used as a basis for future examinations.

TABLE 1 - Cook Nuclear Plant -Units 1 & 2 RCS pipe branch connection welds.

RC Loop #	Branch Connection Description	Size	Class	Exam. Category	1974 Item No. (3)	Pre-service Code Relief Request (1)	First Interval Code Relief Request (2)
1	From Resid. Heat Rem. Loop	6"	1	BJ	B4.7	Yes	No
1	From Accum. Tanks	10"	1	BJ	B4.6	Yes	Y- Unit 2
2	To Resid. Heat Rem. Loop	14"	1	BJ	B4.6	Yes	Y- Unit 1
2	From Resid. Heat Rem. Loop	6"	1	BJ	B4.7	Yes	No
2	From Resid. Heat Rem. Loop & Accum.	10"	1	BJ	B4.6	Yes	No
3	Pressurizer Surge line	14"	1	BJ	B4.6	Yes	No
3	From Resid. Heat Rem. Loop and SI	6"	1	BJ	B4.7	Yes	No
3	From Resid. Heat Rem. Loop & Accum.	10"	1	BJ	B4.6	Yes	Y- Unit 1 Y- Unit 2
4	From Resid. Heat Rem. Loop and SI	6"	1	BJ	B4.7	Yes	No
4	From Accum. Tanks	10"	1	BJ	B4.6	Yes	No

Notes:
(1) ASME Section XI, 1971 Edition through Winter 71 Addenda.
(2) ASME Section XI, 1974 Edition Through Summer 75 Addenda.
(3) Item No. for 1971 Edition is 4.2