

# CATEGORY 2

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SUBJECT: Requests relief from requirements of Section XI of ASME Code  
 for in-service insp of Unit 2 reactor vessel nozzle welds  
 for current ten year in-service insp interval ending on  
 960630.Background info & justification encl.

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June 28, 1996

AEP:NRC:0969AQ

Docket No. 50-316

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

Donald C. Cook Nuclear Plant Unit 2  
REQUEST FOR ASME CODE RELIEF--REACTOR VESSEL NOZZLE WELDS

Gentlemen:

The purpose of this letter is to request relief from the requirements of Section XI of the ASME Code for the in-service inspection of the Unit 2 reactor vessel nozzle welds for the current ten year in-service inspection interval (ISI) that ends on June 30, 1996. Following the inspection of the nozzle welds, which was conducted during the latest unit 2 refueling outage, it was discovered that an incorrect gain setting had been used during the examination and it was not practical to perform another examination at that time.

The data obtained during the last examination has been reviewed and no indications greater than a known recordable indication have been observed. We are currently conducting tests and reviewing previous data. If the tests and data review cannot adequately demonstrate that acceptable detectability was achieved for the nozzle bore examination, these nozzles will then be reexamined during the first period of the third ten year interval.

The error in the gain setting and our action plans were discussed with NRC (Region III), NRR, Idaho National Laboratory and Southwest Research Institute personnel during a conference call on April 23, 1996.

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*DFM*

The relief request, which is attached to this letter, is being submitted under the provisions of 10 CFR 50.55a(3)(1) as an alternative test that provides an acceptable level of quality and safety. If adequate detectability can be demonstrated, an amendment to this code relief request will be submitted in August 1996.

Sincerely,



E. E. Fitzpatrick,  
Vice President

llg

Attachment

cc: A. A. Blind  
G. Charnoff  
H. J. Miller  
NFEM Section Chief  
NRC Resident Inspector - Bridgman  
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J. B. Hickman, NRC - Washington, D.C. - w/attachment  
PRONET - w/attachment  
DC-N-6015.1

Attachment to AEP:NRC:0969AQ  
Background Information and Justification  
Code Relief Request for the Reactor Pressure Vessel  
to Nozzle Weld Examinations  
for Cook Nuclear Plant Unit 2  
Second ten-year Interval ISI Examination



**I System/Component for which relief is requested**

Code relief is requested to defer the examination of two of the four outlet and all four inlet reactor pressure vessel (RPV) nozzle-to-shell welds on unit 2 from the second ten-year interval to the first period of the third ten-year interval. This relief applies for the scans performed from the nozzle bore surface for reflectors oriented parallel to the weld axis. The affected welds are listed below.

<u>Cat.</u>	<u>Item</u>	<u>Description</u>
B-D	B3.90	Outlet nozzle to shell weld (2-N4-O @ 22°)
B-D	B3.90	Inlet nozzle to shell weld (2-N4-I @ 67°)
B-D	B3.90	Inlet nozzle to shell weld (2-N3-I @ 113°)
B-D	B3.90	Outlet nozzle to shell weld (2-N3-O @ 158°)
B-D	B3.90	Inlet nozzle to shell weld (2-N2-I @ 247°)
B-D	B3.90	Inlet nozzle to shell weld (2-N1-I @ 293°)

**II Code Requirements**

ASME Section XI, 1983 Edition Summer Addendum, Table IWB-2500-1, Category B-D, Item B3.90, requires volumetric examination of all RPV nozzle-to-shell welds in each ten-year interval. The ASME Section XI code requires that ultrasonic (UT) examination of these welds be performed in accordance with ASME Section V, Article 4, for reflectors oriented parallel and transverse to the weld. Paragraph T-425.3 states that scanning shall be performed at a gain setting at least two times the reference level, except that the reference level shall be used when electronic distance amplitude correction is used with automated scanning. Additionally, the supplemental requirements specified in Regulatory Guide 1.150, Revision 1, are applicable to the UT examination of RPV shell welds.

**III Basis for code relief**

The second ten-year RPV ISI examination of the nozzle-to-shell welds from the nozzle bore surface for reflectors oriented parallel to the weld is not in compliance with ASME Section V, T-425.3, and the supplemental requirements of Regulatory Guide 1.150 for gain setting. During post-examination data review, it was determined that these examinations were conducted at gain settings less than ASME Code or Regulatory Guide 1.150 requirements. These welds were not reexamined upon discovery of this error due to the



undue hardship and burden of removing the core barrel and the equipment hatch flange and unpacking and reassembling of the automated inspection equipment. We estimate that an additional seven outage days would have been required to reexamine these nozzle welds, with an estimated radiation dose of 500-700 mr without any commensurate benefits in quality and safety.

#### IV Alternate Examinations

As an alternative to the requirements of the ASME Code and Regulatory Guide 1.150, the examinations performed from the nozzle bore surface in April 1996 (second ten-year ISI RPV examination) are proposed. We can not demonstrate full compliance with ASME Section V and Regulatory Guide 1.150 for the examinations conducted in 1996. We were able to detect, however, at the lower gain setting, the same code-acceptable indication that was found during the first interval examination, and our review of the nozzle data taken at the lower gain setting revealed no other indications of greater amplitude or extent (length) than the previously characterized indication. We therefore have reasonable assurance that the nozzle-to-shell weld bore examinations conducted at the lower gain setting during the 1996 outage were capable of detecting flaws of equivalent amplitude or extent as the code-acceptable indication found during the first interval examination.

#### V Justification for Granting of Code Relief

During the unit 2 second ten-year ISI RPV examination, an incorrect gain setting was used on the eight nozzle-to-shell weld examinations conducted from the nozzle bore surface. This examination was performed in April 1996 during the last refueling outage of the second ten-year interval. Code relief is only requested for six of the eight nozzles, since two nozzles were properly examined during the first period of the second interval. The second ten-year interval ends June 30, 1996.

The incorrect gain setting was discovered while investigating a discrepancy in the data between the first and second ten-year ISI examinations, for an indication on one of the inlet nozzles. This indication was originally found during the first ten-year ISI RPV examination and was further investigated by removing a small piece of insulation from the RPV outside diameter and scanning manually. The indication was characterized as a code-acceptable slag inclusion. During the second ten-year ISI examination, this indication was also detected with the automated RPV UT equipment at the lower gain setting, but at a significantly lower amplitude than recorded during the first interval. Prior to the



discovery of the incorrect gain setting, we performed the manual examination from the outside diameter surface of the RPV to compare with the results of the first interval examination. The results of this manual examination correlated well with the results of the prior examination and demonstrated that the indication was approximately the same size as characterized during the first interval examination. It is important to note that the core barrel was reinstalled in the vessel prior to the discovery of the incorrect gain setting on the automated UT examination. We estimate that the reexamination would have resulted in an additional seven outage days and radiation exposure of 500-700 mr.

At this time, we are unable to demonstrate full compliance with ASME Section V and Regulatory Guide 1.150 for the examinations from the nozzle bore. We were able to detect, at the lower gain setting, the same code-acceptable indication that was found during the first interval examination and manual characterization of this indication from the outside surface of the vessel demonstrated that it was within acceptance standards and had not grown since the prior interval examination. We therefore have reasonable assurance that the nozzle-to-shell weld bore examinations conducted at the lower gain setting during the 1996 outage were capable of detecting flaws of equivalent or greater reflectivity as the code-acceptable indication found during the first interval examination.

The six nozzle-to-shell welds for which code relief is requested were examined in 1988 for reflectors parallel and transverse to the weld with an ASME Section V/Regulatory Guide 1.150-acceptable technique. The only relevant indication found in these nozzles during the 1988 examinations was the code-acceptable slag-line indication mentioned above. The ASME code/Regulatory Guide 1.150 compliant examinations of the nozzle-to-vessel welds from the shell side for reflectors transverse to the weld were conducted in April 1996 at the proper gain setting and no indications were found. In-service, ASME code/Regulatory Guide 1.150-acceptable examinations of outlet nozzles 2-N1-O and 2-N2-O, which are not part of this request, were conducted in the first period of the second ten-year interval, with no recordable indications. Additionally, neither Indiana Michigan Power Company personnel nor our ISI vendor is aware of any past experience with service-induced flaws on the nozzle-to-shell welds in PWRs.

We therefore believe that there are no safety or structural integrity concerns based on past examination results, industry experience on service-induced flaws in nozzle-to-shell welds, and the close review of data on the recent, second ten-year interval ISI RPV exams.



## VI Status of Additional Investigations

Since the discovery of the incorrect gain setting, Indiana Michigan Power Company and Southwest Research Institute personnel have been reviewing past data and conducting mockup testing, to better understand the detection capability of the examinations performed during April 1996. Two tests were designed to determine critical characteristics of the nozzle-to-vessel weld examinations conducted during the 1996 unit 2 second ten-year interval ISI examinations.

The first test is the 50% DAC threshold test which was designed to compare the amplitude difference between the correct gain setting and the incorrect gain setting used at Cook Nuclear Plant for the nozzle welds. This test was conducted on a test block of comparable metal path distance to the unit 2 vessel using a .079" dia. X 1" long flat bottomed hole and using the automated ultrasonic equipment employed at the for the 1996 second ten-year interval ISI vessel examinations. Data obtained from the 1996 examination have been reviewed using the 50% DAC threshold value at the lower gain setting as the recording criteria. No indications were observed with reflectivity greater than the well-documented, code-acceptable indication recorded during the past first interval examination.

The second test is the reflectivity test which will use a specially designed test block to provide additional information on the detectability of various reflectors for the large metal path distances for the unit 2 vessel. This block is designed with several surface and sub-surface planar reflectors of smaller than code-acceptable sizes. This test will be conducted utilizing the automated ultrasonic equipment used at Cook Nuclear Plant in the recent 1996 second ten-year interval ISI vessel examinations and is scheduled to start June 28, 1996, when fabrication of the block is complete.

To further increase our understanding of the results of this examination, we will reevaluate the data from past, code-acceptable examinations (preservice and first interval) to compare with the 1996 data. Additionally, we will reevaluate the code-acceptable transverse exams conducted in 1996 to further characterize indications in the weld.

A preliminary review of the available data indicates that there is sufficient basis to amend this code relief request to accept the examination performed in April 1996 as an alternate examination to satisfy the ASME Section XI second interval requirements. We expect that an amended code relief request will be submitted following the analysis of the reflectivity test results and the final data review. We



estimate this relief request will be submitted in August 1996.

VII Implementation Schedule

The second ten-year interval examination of nozzle-to-vessel welds from the nozzle bore surface will be deferred to the first period of the third interval. If vendor tests and data analysis currently scheduled in late June and early July demonstrate that acceptable detectability was achieved, this relief request will be amended.