# CATEGORY 1

REGULATO● INFORMATION DISTRIBUTION ●STEM (RIDS)

ACCESSION NBR:9707150062 DOC.DATE: 97/07/08 NOTARIZED: NO DOCKET #
FACIL:50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana M 05000316
AUTH.NAME AUTHOR AFFILIATION
FITZPATRICK,E. Indiana Michigan Power Co. (formerly Indiana & Michigan Ele
RECIP.NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Modifies 960910 relief request to include addl comments requested by NRC.Approval to use enhanced data obtained during last unit 2 ISI to meet requirements of ASME section XI requested.

DISTRIBUTION CODE: A047D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 14
TITLE: OR Submittal: Inservice/Testing/Relief from ASME Code - GL-89-04

NOTES:

| | RECIPIENT ID CODE/NAME | COPIES LTTR | COPIES ENCL | RECIPIENT ID CODE/NAME | COPIES LTTR | COPIES ENCL |
|---|---|---|---|---|---|---|
| | PD3-3 LA | 1 | 1 | PD3-3 PD | 1 | 1 |
| | HICKMAN,J | 1 | 1 | | | |
| INTERNAL: | AEOD/SPD/RAB | 1 | 1 | FILE CENTER 01 | 1 | 1 |
| | NRR/DE/EMEB | 1 | 1 | NUDOCS-ABSTRACT | 1 | 1 |
| | OGC/HDS2 | 1 | 0 | RES/DET/EIB | 1 | 1 |
| | RES/DET/EMMEB | 1 | 1 | | | |
| EXTERNAL: | LITCO ANDERSON | 1 | 1 | NOAC | 1 | 1 |
| | NRC PDR | 1 | 1 | | | |

C A T E G O R Y 1 D O C U M E N T

NOTE TO ALL "RIDS" RECIPIENTS:
PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK, ROOM OWFN 5D-5(EXT. 415-2083) TO ELIMINATE YOUR NAME FROM DISTRIBUTION LISTS FOR DOCUMENTS YOU DON'T NEED!

TOTAL NUMBER OF COPIES REQUIRED: LTTR 13 ENCL 12

Indiana Michigan
Power Company
500 Circle Drive
Buchanan, MI 49107 1395

INDIANA
MICHIGAN
POWER

July 8, 1997

AEP:NRC:0969BB

Docket No.: 50-316

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

Donald C. Cook Nuclear Plant Unit 2
MODIFIED REQUEST FOR ASME CODE RELIEF--REACTOR VESSEL NOZZLE
WELDS AND RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Gentlemen:

References:

1. Letter AEP:NRC:0969AX, "Donald C. Cook Nuclear Plant Unit 2, REQUEST FOR ASME CODE RELIEF--REACTOR VESSEL NOZZLE WELDS", dated September 10, 1996.

2. Letter, J. B. Hickman (NRC) to E. E. Fitzpatrick (I&M), "REQUEST FOR ADDITIONAL INFORMATION REGARDING THE DC COOK NUCLEAR POWER PLANT, UNIT 2 SECOND 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN REQUEST FOR RELIEF-REACTOR VESSEL NOZZLE WELDS (TAC NO. M96357)", dated February 4, 1997.

The purpose of this letter is to modify our relief request (reference 1) to include additional comments requested by the NRC staff. The modified relief request is contained in attachment 1. We are requesting approval to use enhanced data obtained during the last unit 2 inservice inspection to meet the requirements of ASME section XI.

Following the examination of the unit 2 nozzle welds, it was discovered that the gain setting of the instrument used to obtain the data was incorrect. Following the discovery, the data obtained during the test were enhanced and a further evaluation concluded that the results obtained during the examination were acceptable.

The modification to the relief request is the result of the NRC's request for additional information, transmitted in reference 2, and conversations between I&M and NRC personnel. Attachment 2 contains our response to the request for additional information. The modified relief request proposes that for indications where the percent of a ratio a/t (given in ASME section XI, table IWB-3512-1) is greater than the code-allowables, the indications will be manually sized from the outside diameter surface using code and tip-diffraction techniques. This examination will be

A047
1/1

accomplished during the unit 2 1997 refueling outage and will serve to establish whether the indications are false calls or flaws, and to obtain more accurate size estimates if flaws are confirmed.

We are requesting your approval by October 1, 1997.

Sincerely,

E. E. Fitzpatrick

E. E. Fitzpatrick
Vice President

vlb

Attachments

c: A. A. Blind
A. B. Beach
MDEQ - DW & RPD
NRC Resident Inspector
J. R. Padgett

ATTACHMENT 1 TO AEP:NRC:0969BB

# DONALD C. COOK NUCLEAR PLANT UNIT 2
# BACKGROUND INFORMATION AND JUSTIFICATION
# CODE RELIEF REQUEST FOR THE
# REACTOR PRESSURE VESSEL TO NOZZLE WELD EXAMINATIONS
# SECOND TEN YEAR INTERVAL INSERVICE INSPECTION EXAMINATION

## I. System/Component Relief is Requested For

Code relief is requested for the second ten year inservice inspection (ISI) interval from the scanning sensitivity and flaw indication sizing requirements of ASME section V, for the examination of two of the four outlet and four inlet unit 2 reactor pressure vessel (RPV) nozzle-to-shell welds. This relief applies to the scans performed from the nozzle bore surface for reflectors oriented parallel to the weld axis. The affected welds are listed below.

| Cat. | Item | Description |
|---|---|---|
| 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 scanning shall be performed at a gain setting at least two times the reference level, except the reference level shall be used when electronic distance amplitude correction is used with automated scanning. Paragraphs T-441.8.2 (b) and (c) describe data collection requirements in the through-wall and length dimension for reflectors exceeding 50% distance amplitude correction (DAC). 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, article 4, T-425.3 and T-441.8.2 (b) and (c), and the supplemental requirements of regulatory guide 1.150 for scanning gain setting and data collection for recordable indications. During post-examination data review, it was determined these examinations were conducted at gain settings less than ASME code and that, as a result, the detection and sizing requirements of ASME section XI and regulatory guide 1.150 were not met. These welds were not re-examined 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 the automated inspection equipment. We estimate that seven additional outage days would have been required to re-examine 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 ASME section XI and regulatory guide 1.150, we are planning to manually size the indications where a/t is greater than the code-allowables (table B) from the outside surface (hereafter called OD) with code and tip diffraction techniques. These are the same techniques used previously on indication 1, examination 50rr (as described in attachment 2). This examination will be accomplished during the unit 2 1997 refueling outage and will serve to: (1) establish whether the indications are false calls or flaws; and (2) obtain more accurate size estimates if flaws are confirmed. If the examination outlined above establishes these indications to be code-acceptable, it is proposed to accept the nozzle-to-vessel examinations performed in 1996, and all the data generated subsequent to the examinations as an acceptable alternative for meeting the second ten year interval ISI requirements for unit 2. If one or more of the indications does not meet the code-acceptance standards after manual sizing, actions in accordance with the code of record for the second ten year interval will be taken. The following table provides the details for the indications we will volumetrically examine during the unit 2 1997 refueling outage from the OD.

| Nozzle # | Outlet/Inlet | Exam. # | Indication # |
|---|---|---|---|
| 2-N4-O | Outlet | 44 | 1 |
| 2-N4-I | Inlet | 48a | 1 |
| 2-N4-I | Inlet | 48a | 2 |
| 2-N4-I | Inlet | 48a | 3 |
| 2-N3-I | Inlet | 49rr | 1 |

We are confident the alternative defined above provides an acceptable level of quality and safety. We do not expect the additional costs, equipment risks, and radiation exposure resulting from the removal of the core barrel, the installation of the examination device, and performance of the automated examination from the inside diameter (ID) surface on the six nozzle to vessel welds would provide additional assurance over the alternative provided above. This action is prudent, responsible, and consistent with good as low as reasonably achievable (ALARA) practices.

## V. Justification for Granting of Code Relief

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 conservatively chose to size this indication again during the second ten year interval examination to compare with the results of the first interval examination, although there was no code requirement to perform these examinations. The results of this manual ultrasonic 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 the core barrel was reinstalled in the vessel prior to the discovery of the incorrect gain setting on the automated UT examination. We estimate the re-examination would have resulted in an additional seven outage days, and radiation exposure of 500-700 mr.

The vendor's final report (attachment 2 of letter AEP:NRC:0969AX, dated September 10, 1996) details the evaluation of the enhanced data acquisition system (EDAS) data gathered at the incorrect pulser gain setting during the unit 2 examinations. The EDAS data from the 1996 unit 2 examinations were compared with the data obtained from previous examinations of these nozzles (preservice and the first ten year interval inservice examinations). It was established through these evaluations that there are no indications greater in length than the one code-acceptable indication detected at the lower gain setting and characterized manually from the OD of the vessel during the 1996 unit 2 second and first interval examinations.

Several tests were developed by our ISI contractor to validate both qualitatively and quantitatively the results of the 1996 unit 2 examinations. An empirical approach was used to determine the equivalent 50% DAC and 20% DAC thresholds for each channel used during the 1996 examinations after the examination system was fully calibrated, normalized to the configuration used at Cook Nuclear Plant, and verified. The EDAS used in the examination of these nozzles records ten bits of data, but only the upper seven bits are normally used for data analysis. The lower three bits were used for the evaluation of the 1996 nozzle bore examinations. Effectively, the ISI contractor was able to review the detection data as if it were only 2 dB cold. This review identified eleven signals that exceeded 50% DAC, all detected in the outer 75% of the wall, and no signals greater than 20% DAC were detected in the inner 25% of the wall. Amplitude based sizing was done at code scanning increments (0.60") that are larger than code sizing increments (0.25"), which increases the conservatism of indication sizing in the length direction. The sizing data is presented in the vendor's final report (attachment 2 of letter AEP:NRC:0969AX, dated September 10, 1996), and the results show that the size of any indications associated with these signals would be expected to be significantly less than that of the known flaw. It can be concluded from this analysis that acceptable detectability was achieved during the unit 2 examinations at the required 50% DAC and 20% DAC sensitivities. It also can be concluded it is unlikely a defect exists in the welds that exceed the length of the known flaw that is code-acceptable.

Construction records were reviewed for all unit 2 RPV nozzles in an attempt to verify the nature and geometry of the indications detected during the 1996 unit 2 examinations. Twelve indications were identified and characterized both by radiographic and ultrasonic techniques. Two boat samples were removed at that time and were determined by metallurgical analysis to be slag inclusions. All twelve slag inclusions were weld repaired followed by non-destructive testing, confirming their removal. There was little, if any, correlation with the 1996 examination data that further supports the conclusion the signals produced during the 1996 examination were either not relevant (i.e., geometry, beam redirection, surface lift-off, etc.), or were produced by reflectors within code acceptable limits.

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 compliant technique. The only relevant indication found in these nozzles during the 1988 examinations was the code-acceptable slag indication previously mentioned. 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. Inservice, 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 we, nor our ISI vendor, is aware of any past experience with service-induced flaws on the nozzle-to-shell welds in pressurized water reactors.

There is significant data to support the conclusion that the most common type of indication in the nozzle to shell welds of RPVs is slag inclusion defects. Our ISI vendor has over twenty years of experience examining RPV nozzle welds, and has confirmed the indications found are typically slag inclusions due to construction practices and processes used at that time. It is reasonable to conclude, from the construction records and industry history, that the only relevant indications in the nozzle-to-shell welds are slag inclusions that are within code-acceptable size limits.

We are confident 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. Additionally, the alternative examination from the OD surface proposed on the five indications to be completed during the unit 2 1997 refueling outage will provide further assurance of safe operation.

ATTACHMENT 2 TO AEP:NRC:0969BB

DONALD C. COOK NUCLEAR PLANT UNIT 2
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
SECOND TEN YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN
REQUEST FOR RELIEF-REACTOR VESSEL NOZZLE WELDS (TAC NO. M96357)

The following information is provided in response to the NRC request for additional information regarding Cook Nuclear Plant unit 2, second ten year interval inservice inspection program plan request for relief-reactor vessel nozzle welds (TAC No. M96357), dated February 4, 1997.

NRC Question No. 2.1

"Provide the percentage of Code-required volumetric coverage that was obtained for each of the subject nozzle-to-shell welds."

Response to Question No. 2.1

The percentage of code-required volumetric coverage for parallel flaws obtained from the nozzle bore examinations is 100%. This coverage is obtained by using a combination of search units, 45 and 6 degrees for the inlet nozzles, and 45 and 10 degrees for the outlet nozzles.

In addition to the examinations performed from the bore, an examination for transverse flaws was performed using ASME section XI, appendix VIII, performance demonstration initiative-qualified techniques applied from the vessel inside surface. The outlet nozzle transverse examination is limited to approximately 39% of the code-required volume due to the configuration of the nozzle integral extension, but the inlet nozzles received 100% transverse coverage.

The following table provides the individual coverages obtained on each nozzle examined during the 1996 unit 2 refueling outage.

| Weld # | Description | Examination Transducer Angle | Examination Type | Beam Direction | Code Coverage % |
|---|---|---|---|---|---|
| 2-N1-I | Inlet Nozzle to Shell @ 293° | 6, 45<br>55, SLIC 40 | Parallel<br>Transverse | 1 direction<br>2 directions<br>Average | 100%<br>100%<br>100% |
| 2-N2-I | Inlet Nozzle to Shell @ 247° | 6, 45<br>55, SLIC 40 | Parallel<br>Transverse | 1 direction<br>2 directions<br>Average | 100%<br>100% |
| 2-N3-I | Inlet Nozzle to Shell @ 113° | 6, 45<br>55, SLIC 40 | Parallel<br>Transverse | 1 direction<br>2 directions<br>Average | 100%<br>100%<br>100% |
| 2-N4-I | Inlet Nozzle to Shell @ 67° | 6, 45<br>55, SLIC 40 | Parallel<br>Transverse | 1 direction<br>2 directions<br>Average | 100%<br>100%<br>100% |
| 2-N3-0 | Outlet Nozzle to Shell @ 158° | 10, 45<br>55, SLIC 40 | Parallel<br>Transverse | 1 direction<br>2 directions<br>Average | 100%<br>39%<br>70% |
| 2-N4-O | Outlet Nozzle to Shell @ 22° | 10, 45<br>55, SLIC 40 | Parallel<br>Transverse | 1 direction<br>2 directions<br>Average | 100%<br>39%<br>70% |

NRC Question No. 2.2

"The licensee has stated that the one recordable flaw (Indication 1, Examination Number 50rr, dispositioned as acceptable) detected during the first interval examinations was again detected in the second interval. A data evaluation report by Southwest Research Institute dated August 1996 is included with the licensee's September 10, 1996, submittal. This report discusses this indication, which was determined to be unacceptable based on the initial evaluation results. It is further stated that this indication was sized in 1988 and again in 1990 using a tip-diffraction technique from the outside surface of the vessel and determined to be a Code-acceptable flaw. What was the requirement for confirming the flaw size in two separate outages?

Based on the review of the Detection Evaluation/Correlation Of Previous Data, Table A, it appears that this indication was first detected in 1977 below the Code recording threshold. Considering the information provided, it appears that the indication has developed from a nonrecordable flaw to a recordable flaw that has been monitored. Discuss the reason for concluding that the subject flaw is stable."

Response to Question No. 2.2

The indication identified as indication 1, examination 50rr, was initially detected slightly above the code recording and evaluation threshold (50% distance amplitude correction [DAC]) during the inservice examination conducted in 1988. Based upon code-prescribed, amplitude-based sizing methods, the indication was initially determined to be unacceptable when sized from the nozzle bore. A review of the preservice examination (PSI) data revealed the indication was recorded during the PSI at an amplitude slightly below the evaluation threshold. Due to previous experience with this type of nozzle-to-shell weld indication, the variability of amplitude-based sizing methods, the location of the indication relative to the outside surface (hereafter called OD) of the vessel, and the available access for that location, it was determined that the best approach for size determination would be using manual techniques from the OD. The sizing effort was conducted using both code and tip-diffraction sizing techniques. While the tip-diffracted sizing information was slightly more conservative (measured a larger indication), there was good correlation between both approaches. Based on this sizing effort, the flaw was accepted according to IWB-3500. Although there was no requirement to subsequently re-evaluate the indication, we conservatively decided to again perform the sizing effort from the vessel OD during the 1990 outage to ascertain whether any growth was detectable. The tip-diffraction technique was again used because of better reliability and the more conservative results obtained in 1988 when compared with the code sizing approach. The results obtained during 1990 were consistent with the 1988 results, indicating the flaw was stable. Prior to the automated examinations performed in 1996 from the nozzle bore, we again elected to perform the tip-diffraction technique from the vessel OD in order to obtain a consistent evaluation for possible flaw growth. Once again, the results were consistent with the 1988 and 1990 measurements indicating continued flaw stability.

The following information is submitted to further support our disposition of this indication with tip-diffraction techniques. Ultrasonic indication amplitude is highly dependent upon transducer location and orientation. When manual examinations are conducted, it is possible to maximize indication amplitude by very fine transducer manipulation, and a comparison of amplitude from different examinations can be of some use. During automated detection scanning, however, it is virtually impossible to maximize the amplitude reading because transducer skew is fixed and scanning is accomplished at distinct scan increments. The actual scan locations can vary somewhat from examination to examination due to minor equipment position tolerance. During detection scanning (conducted at relatively large increments), it is not uncommon for borderline indications to be observed above a threshold during one examination and below the same threshold during a subsequent examination. To obtain reasonable amplitude comparisons with automated examinations, it is necessary for scanning to be conducted at fairly fine scan increments. For this reason, regulatory guide 1.150 requires scanning for the purpose of sizing to be conducted at 0.25" increments.

In the case of indication 1, examination 50rr, the manual evaluations performed from the vessel OD using tip-diffracted information offer a reliable and repeatable indicator of flaw stability.

<u>NRC Question No. 2.3</u>

"The 1996 ISI Sizing Evaluation, Table B, identifies ten recorded flaws. Based on a review of the table, it appears that five of the recorded flaws exceed the "a/t" allowable by Code. Provide the disposition and basis for disposition for these indications.

For flaws exceeding the acceptance criteria of Table IWB-3512-1, analytical evaluation of the flaws may provide a basis for acceptance. Has fracture analysis been performed on any of the subject flaws? Has manual sizing of other recorded indications included in Table A been performed? It should be noted that flaws found acceptable by fracture analysis for Class 1 components require additional examinations for three successive periods."

<u>Response to Question No. 2.3</u>

Table B identifies ten indications that exceeded the "equivalent 50% threshold" after enhancement of the original detection data. These indications may or may not represent actual flaws. Because the original examinations were performed at a lower gain setting, these indications were not selected for investigation or evaluation in accordance with normal procedure based on the observed amplitude. Due to the normal probability of false calls, had the indications been completely evaluated at the proper calibration sensitivity, it is likely that most, particularly those that could not be correlated with previous data, would have been determined to be nonrelevant (e.g., caused by transducer lift off). This is supported by the fact that only one of the ten indications included in table B (indication 1, examination 49rr) was consistently observed during both previous examinations.

While comparisons of signal amplitude are not totally dependable due to a number of variables, confidence in the enhanced detection data is supported by the comparison of the signal amplitudes observed for indication 1, examination 50rr, using the 1988 detection data (57% DAC) taken at code sensitivity, and the 1996 detection data after enhancement (143% DAC). Although the indication revealed no change based on the sizing measurements taken from the OD, it appeared at a higher amplitude when viewed with the 1996 enhanced detection data. This suggests the 1996

detection data after enhancement is slightly more conservative than the 1988 detection data taken at normal code sensitivity.

The information in table B was derived from the enhanced detection scan data that, like other "detection" data, is intended to flag indications for further evaluation, rather than provide specific quantitative sizing information. In this case, the table was generated to provide a relationship between the known acceptable flaw and the ten indications exceeding the code-equivalent 50% threshold during the analysis of the enhanced data. Based on the relationships established in table B using the rules of ASME article 4 of section V, the ten indications are lesser in significance than the known acceptable flaw. Although the enhanced data is not considered appropriate for specific size measurements, it should be useful for a qualitative evaluation of general relationships. The primary characteristics (2a, $\ell$, and a/t%) of the ten indications determined from the enhanced detection data are all less significant than the same characteristics for indication 1, examination 50rr, when determined in the same manner. The raw (not enhanced) 1996 detection data also supports the same relationship. Prior to the enhancement, the signal amplitude of indication 1, examination 50rr, was observed at 14% DAC, while indication 1, examination 48a, was observed at 12% DAC, and the other nine indications were all below 10% DAC. The relationship formed between indication 1, examination 50rr, and the other ten less significant indications, together with the OD examination results showing indication 1, examination 50rr, to be stable and code-acceptable, formed the basis for considering the ten indications to be acceptable.

We reviewed construction records from the Westinghouse sponsored "Investigation of Nozzle Weld Repairs on the AMP Reactor Pressure Vessel" report, dated October 11, 1972. The report contained a step machining investigation that revealed twelve recordable indications. The indications were located on the weld prep on either the plate or nozzle side and characterized as flat planar slag/non-fusion flaws. Each of these indications was located 2-5" from the OD of the nozzle. Recordable indications, whether or not code-rejectable, were subsequently repaired and examined in accordance with the code of record. It was noted non-recordable indications were also detected without any further mention during this investigation. With the exception of indication 1, examination 50rr, no other indications have been detected during subsequent examinations that exceeded IWA-3500 limits. This indication is located approximately 2-3" from the OD, and, therefore, in the same general area as the indications found in the 1972 investigation. The other indications detected through the enhanced data analysis in 1996, listed in table B, are located between the mid-wall to OD region where slag inclusions were known to have existed. Based on the conservatism built into the 1996 enhanced analysis method, we have full confidence the recordable indications reported in table B are either false calls or the non-recordable indications left in the nozzle welds during construction. Additionally, there are no reported incidents of service-induced flaw growth of flat planar slag inclusions in the mid-wall to OD region of the nozzle-to-vessel weld in the nuclear power industry.

Fracture mechanics analyses have not been performed, nor have additional manual sizing activities been performed for reasons presented in the code relief request (letter AEP:NRC:0969AX, dated

September 10, 1996). Because none of the indications exceeded the signal amplitude or extent of indication 1, examination 50rr, and this indication was found acceptable after manual sizing, it is reasonable to conclude that the other indications in table B are also acceptable.

We are proposing planning efforts to manually size the indications that are reasonably accessible, where a/t is greater than the code-allowables (table B) from the OD with code and tip-diffraction techniques as employed on indication 1, examination 50rr. This examination will be accomplished during the unit 2 1997 refueling outage and will serve to: (1) establish whether the indications are false calls or flaws; and (2) obtain more accurate size estimates if flaws are confirmed. If the examination establishes these indications to be code-acceptable, it is proposed to accept the nozzle-to-vessel examinations performed in 1996, and all the data generated subsequent to the examinations, as an acceptable alternative for us to meet the second ten year interval ISI requirements. If one or more of the indications do not meet the code-acceptance standards after manual sizing, actions in accordance with the code of record for the second ten year interval will be taken. The following table provides the details for the indications we will volumetrically examine during the unit 2 1997 refueling outage from the OD.

| Nozzle # | Outlet/Inlet | Exam.# | Indication # |
|---|---|---|---|
| 2-N4-0 | Outlet | 44 | 1 |
| 2-N4-I | Inlet | 48a | 1 |
| 2-N4-I | Inlet | 48a | 2 |
| 2-N4-I | Inlet | 48a | 3 |
| 2-N3-I | Inlet | 49rr | 1 |

We believe the alternative defined above provides an acceptable level of quality and safety. We do not expect the additional costs, equipment risks, and radiation exposure resulting from the removal of the core barrel, the installation of the examination device and performance of the automated examination from the ID surface on the six nozzle to vessel welds would provide additional assurance over the alternative provided above. We believe this action is prudent, responsible, and consistent with good ALARA practices.

<u>NRC Question No. 2.4</u>

"The licensee has stated that the type of flaws recorded for the nozzle-to-shell weld examinations are typical of slag inclusions. The licensee further stated that Indication 1, Examination Number 50rr, was found acceptable by a tip-diffraction sizing technique. Tip-diffraction sizing techniques are typically applied to crack-type indications. Signal characteristics of slag inclusions may differ from crack-like reflectors. Therefore, provide the basis for concluding that the data obtained for sizing the subject flaw indicates the true flaw size."

<u>Response to Question No. 2.4</u>

While the subject indications in the nozzle-to-shell welds have been characterized as "typical of slag inclusions", this does not necessarily mean they are volumetric (rounded)-type flaws. The fabrication shop inspection report by Chicago Bridge and Iron, "Investigation of Nozzle Weld Repairs On AMP Reactor Pressure

Vessel", dated October 11, 1972, identifies the presence of flat-faced, planar slag/lack of fusion flaws in the nozzle-to-shell welds that were repaired or left "as is", based on the ultrasonic reported size. Our review of the fabrication welding practices identifies flat surfaced inclusions with lack of bonding as the credible flaw character for these welds. Based on the flaw locations and welding process, it is believed these flaws exist primarily in a single plane parallel to the weld plane. Tip-diffraction ultrasonic techniques are widely accepted and qualified for sizing of planar flaws regardless of flaw type. The lack of fusion/slag flaws was included in the PDI blocks and used during the reactor pressure vessel examination qualifications. According to the EPRI NDE Center, sizing performance on these flaws was acceptable and consistent with the performance on crack-type planar flaws.