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INDIANA MICHIGAN POWER

January 20, 2005

AEP:NRC:5054-03
10 CFR 2.202

Docket No: 50-315

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Unit 1
REQUEST FOR RELAXATION FROM NUCLEAR REGULATORY COMMISSION REVISED ORDER ESTABLISHING INTERIM INSPECTION REQUIREMENTS FOR REACTOR PRESSURE VESSEL HEADS AT PRESSURIZED WATER REACTORS – UNIT 1

References: 1) Revised Nuclear Regulatory Commission Order EA-03-009, "Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," dated February 20, 2004.

2) Letter from J. N. Jensen, Indiana Michigan Power Company, to Document Control Desk, U. S. Nuclear Regulatory Commission, "Supplement to Request for Relaxation from Nuclear Regulatory Commission Revised Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," AEP:NRC:4054-06, dated June 24, 2004.

3) Electric Power Research Institute Document MRP-55, "Materials Reliability Program (MRP) Crack Growth Rates for Evaluating Primary Water Stress Corrosion Cracking (PWSCC) of Thick-Wall Alloy 600 Materials," Revision 1, dated November 2002.

This letter transmits a request for relaxation of requirements contained in the revised Nuclear Regulatory Commission (NRC) Order (Reference 1) regarding

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inspection of reactor pressure vessel (RPV) heads at pressurized water reactors. This request applies to Donald C. Cook Nuclear Plant (CNP) Unit 1.

By Reference 1, the NRC revised its previous order establishing interim inspection requirements for RPV heads at pressurized water reactors. Section IV.F of the revised order states that licensees proposing to deviate from requirements contained in the order may request that the Director, NRC Office of Nuclear Reactor Regulation, relax those requirements. As permitted by Section IV.F of the revised order, Indiana Michigan Power Company (I&M) is requesting relaxation of requirements regarding the length of RPV head penetration nozzle below the J-groove attachment weld that is required to undergo nondestructive examination during the upcoming Unit 1 refueling outage. For some nozzles, compliance with these requirements would result in hardship or unusual difficulty. Since I&M plans to replace the Unit 1 RPV head during the subsequent refueling outage (Fall 2006), the remaining service life of the nozzles is only one fuel cycle. Consequently, compliance with the requirement would not provide an increase in the level of quality and safety that compensates for the hardship or unusual difficulty. The requested relaxation is presented in the attachment to this letter.

As noted in the attachment, the requested relaxation is supported by crack growth curves contained in WCAP-14118-P, Revision 7, which was transmitted to the NRC by Reference 2. The crack growth rate used in WCAP-14118-P, Revision 7 is that recommended in industry report MRP-55 (Reference 3). The NRC has not made a final assessment regarding the acceptability of that report. In relaxations from the original and revised NRC Order EA-03-009, I&M and other licensees accepted a condition specifying actions to be taken if the NRC finds the crack growth formula in MRP-55 to be unacceptable. I&M accepts the same condition with respect to the relaxation from the revised order proposed in the attachment to this letter. This condition is as follows:

> If the NRC staff finds that the crack growth formula in industry report MRP-55 is unacceptable, the licensee shall revise its analysis that justifies relaxation of the Order within 30 days after the NRC informs the licensee of an NRC-approved crack growth formula. If the licensee's revised analysis shows that the crack growth acceptance criteria are exceeded prior to the end of the current operating cycle, this relaxation is rescinded and the licensee shall, within 72 hours, submit to the NRC written justification for continued operation. If the revised analysis shows that the crack growth acceptance criteria are exceeded during the subsequent operating cycle, the licensee shall, within 30 days, submit the revised analysis for NRC review. If the revised analysis shows that the crack growth acceptance criteria are not exceeded during either the current operating cycle or the subsequent operating cycle, the

licensee shall, within 30 days, submit a letter to the NRC confirming that its analysis has been revised. Any future crack growth analyses performed for this and future cycles for RPV head penetrations must be based on an acceptable crack growth rate formula.

I&M requests approval of the proposed alternative by March 23, 2005, to support implementation during the Spring 2005 Unit 1 refueling outage.

This letter contains no new regulatory commitments. Should you have any questions, please contact Mr. John A. Zwolinski, Safety Assurance Director, at (269) 466-2428.

Sincerely,

Daniel P. Fadel
Engineering Vice President

JW/rdw

Attachment:

Proposed Alternative to Revised U. S. Nuclear Regulatory Commission (NRC) Order EA-03-009 Regarding Requirements for Nondestructive Examination of Nozzles Below the J-Groove Weld – Unit 1

c: J. L. Caldwell - NRC Region III
K. D. Curry - AEP Ft. Wayne, w/o attachment
Director, Office of Nuclear Reactor Regulation
J. T. King - MPSC, w/o attachment
C. F. Lyon - NRC Washington DC
MDEQ - WHMD/HWRPS, w/o attachment
NRC Resident Inspector

AFFIRMATION

I, Daniel P. Fadel, being duly sworn, state that I am Engineering Vice President of Indiana Michigan Power Company (I&M), that I am authorized to sign and file this request with the Nuclear Regulatory Commission on behalf of I&M, and that the statements made and the matters set forth herein pertaining to I&M are true and correct to the best of my knowledge, information, and belief.

Indiana Michigan Power Company

Daniel P. Fadel
Engineering Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 20th DAY OF January, 2005

Notary Public

My Commission Expires 6/10/2007

ATTACHMENT TO AEP:NRC:5054-03

PROPOSED ALTERNATIVE TO REVISED U. S. NUCLEAR
REGULATORY COMMISSION (NRC) ORDER EA-03-009
REGARDING REQUIREMENTS FOR NONDESTRUCTIVE EXAMINATION
OF NOZZLES BELOW THE J-GROOVE WELD – UNIT 1

Submitted in accordance with Revised NRC Order EA-03-009, Section IV.F, Criterion (2): Compliance with the Order for Specific Nozzles Would Result in Hardship or Unusual Difficulty Without a Compensating Increase in the Level of Quality and Safety

References for this attachment are identified in Section 8 below.

1. **Components Affected**

   Donald C. Cook Nuclear Plant (CNP) Unit 1 reactor pressure vessel (RPV) head control rod drive mechanism (CRDM) penetrations (79 penetrations).

2. **Applicable Document**

   Revised NRC Order EA-03-009 (Reference 1).

3. **Applicable Requirement**

   The CNP Unit 1 RPV head is in the moderate susceptibility category as defined in Sections IV.A and IV.B of Revised NRC Order, EA-03-009. Pursuant to Section IV.C(2) of the revised order, the Unit 1 RPV head penetration nozzles must undergo nondestructive examination in accordance with Section IV.C(5)(b) of the revised order during the Spring 2005, Cycle 20 refueling outage. In accordance with Section IV.C(5)(b) of the revised order, the nondestructive examination consists of ultrasonic testing, eddy current, or dye penetrant testing of RPV head penetration nozzle base material and J-groove weld that attaches the nozzle base material to the underside of the head.

   The required extent of the ultrasonic testing is stated in Section IV.C(5)(b)(i) of the revised order, which provides the following two options:

   > Ultrasonic testing of the RPV head penetration nozzle volume (i.e., nozzle base material) from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches [see Figure IV-1] [of the revised order]);
   >
   > OR
   >
   > from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the

J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater (see Figure IV-2) [of the revised order]. ...

The required extent of the eddy current and dye penetrant testing is stated in Section IV.C(5)(b)(ii) of the revised order, which provides the following two options:

Eddy current testing or dye penetrant testing of the entire wetted surface of the J-groove weld and the wetted surface of the RPV head penetration nozzle base material from at least 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches [see Figure IV-3] [of the revised order]);

OR

from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater (see Figure IV-4) [of the revised order].

4. **Reason for Request**

Indiana Michigan Power Company (I&M) is proposing an alternative to the above requirements for the upcoming Unit 1 Cycle 20 refueling outage because, for certain CRDM nozzles, compliance with the revised order would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

As shown on the sketch included in this attachment, the outside surface of the bottom of all CRDM nozzles is threaded with a relief at the top of the threads. The threads and relief extend for approximately 0.75 inches above the bottom of the nozzle. To reduce personnel radiation exposure, the nozzles are typically inspected using remotely operated ultrasonic and eddy current testing equipment. Ultrasonic testing of the threaded portions of the nozzle is not practical, since it could produce multiple reflections and tip diffraction signals, resulting in scans that are difficult or impossible to read. To the best of I&M's knowledge, an ultrasonic probe capable of obtaining readable scans of threaded portions of the nozzle is not available. The eddy current probe used for nozzle inspections is not capable of examining the threaded surfaces. Development, qualification, and implementation of an eddy current probe capable of examining the threaded surfaces would result in a significant testing period and significant expense.

Although dye penetrant testing of threaded surfaces is possible, it would require that personnel be located under the RPV head to manually perform the surface cleaning and penetrant testing operations. I&M estimates that dye penetrant testing threaded surfaces would result in a personnel radiation exposure of approximately 300 to 700 person-millirem per nozzle. Therefore, the portion of the nozzle below the J-groove weld that can be inspected without significant radiation exposure to personnel is that portion from the bottom of the J-groove weld (including the toe of the weld) to the top of the threads and relief. This distance is referred to as the remotely inspectable distance in the following discussions.

Due to the geometry involved in the vertical nozzles penetrating the hemispherical RPV head, the minimum remotely inspectable distance occurs on the "downhill" side of each nozzle, i.e., the side opposite the RPV vertical centerline. The table included in this attachment provides dimensional data for the downhill and uphill sides of the nozzles. This data is based on the results of a previous inspection, performed prior to issuance of the original NRC order. The data is a best estimate by personnel reviewing ultrasonic scan recordings. As shown in the table:

- Dimensional data is available for 64 of the 79 CRDM penetrations.

- For 44 of the 64 nozzles that have dimensional data available, the remotely inspectable distance on the downhill side of the nozzle is less than the criterion of 1.0 inch plus the distance that the nozzle has an operating stress level of 20 ksi tension and greater, as specified in the second options of Section IV.C(5)(b)(i) and Section IV.C(5)(b)(ii) of the revised order.

- The minimum remotely inspectable distance for the 44 nozzles that have dimensional data available but have a remotely inspectable distance less than the criteria specified in the order is 0.369 inches. This occurs on Penetration 63. The remotely inspectable distance for the remainder of those 44 nozzles is greater than 0.6 inches.

- There is no reliable dimensional data available for 15 of the 79 nozzles. These nozzles were previously inspected using eddy current testing, which does not provide reliable data regarding the location of the tip of the J-groove weld.

I&M plans to replace the Unit 1 RPV vessel head during the Fall 2006 refueling outage, which is the next outage following the upcoming Cycle 20 refueling outage. As described below, the expenditure of outage time, resources, and personnel radiation exposure to inspect threaded areas of the nozzle in order to comply with the 1.0 inch plus 20 ksi criterion specified in the second options of Section IV.C(5)(b)(i) and Section IV.C(5)(b)(ii) of the revised order would not provide a compensating increase in the level of quality and safety for the one fuel cycle of remaining RPV service life.

5. Proposed Alternative and Basis

I&M proposes that the extent of RPV penetration nozzle inspections below the J-groove weld specified in Sections IV.C(5)(b)(i) and IV.C(5)(b)(i) of the revised order be as follows:

> All CRDM nozzles shall be inspected to the maximum extent possible by remote ultrasonic and/or eddy current testing below the J-groove weld, i.e., down to the top of the thread relief. For the 15 nozzles for which dimensional data is not available, inspection shall extend to at least 0.5 inches below the lowest point on the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis).

Basis

CNP specific calculations demonstrate that a postulated 100 percent through-wall axial flaw, with its upper tip at the bottom of the inspection area specified in the proposed alternative, would not propagate to the toe of the J-groove weld prior to replacement of the Unit 1 RPV head. These calculations are illustrated by the crack growth curves in Figures 6-12 through 6-20 of WCAP-14118-P, Revision 7, which was transmitted to the NRC by Reference 2. These crack growth curves support the proposed alternative as follows.

As shown in the table included in this attachment, the minimum remotely inspectable distance for the 64 nozzles for which dimensional data is available is 0.369 inches. This occurs on the downhill side of Penetration 63, which is located in the row with a head angle of 38.6 degrees. Figure 6-16 of WCAP-14118-P, Revision 7, shows that a flaw located with its upper tip at 0.369 inches below the toe of the J-groove weld on the downhill side of Penetration 63 would take approximately 2.1 effective full power years (EFPY) to reach the weld. I&M expects the existing RPV head to be in service for no more than 1.38 EFPY following the Cycle 20 refueling outage inspection. Therefore, the proposed alternative would provide over 0.7 EFPY of margin against flaw propagation to the toe of the J-groove weld for Penetration 63. The margin for the remaining 63 nozzles would be significantly greater.

Figure 6-14 of WCAP-14118-P, Revision 7, is the crack growth curve for the downhill side of the row of nozzles having a head angle of 26.2 degrees. This is likely the most limiting row, or close to the most limiting row of nozzles with respect to crack growth. The crack growth curve of Figure 6-14 shows that a flaw located with its upper tip at 0.5 inches below the toe of the J-groove weld would take approximately 4.1 EFPY to reach the weld. Therefore, an inspection that extends 0.5 inches below the toe of the J-groove weld would likely provide over 2.7 EFPY of margin against flaw propagation to the weld for any row in which there are nozzles without available dimensional data.

Duration of the Proposed Alternative

The proposed alternative will apply during Unit 1 Fuel Cycle 20.

7. Precedents

The reason for this request, the proposed alternative, and its basis are similar to those for relaxations approved for CNP Unit 2 (Reference 3), Salem Nuclear Generating Station Unit 1 (Reference 4), and San Onofre Nuclear Generating Station Units 2 and 3 (Reference 5).

8. References

1. Revised NRC Order EA-03-009, "Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," dated February 20, 2004.

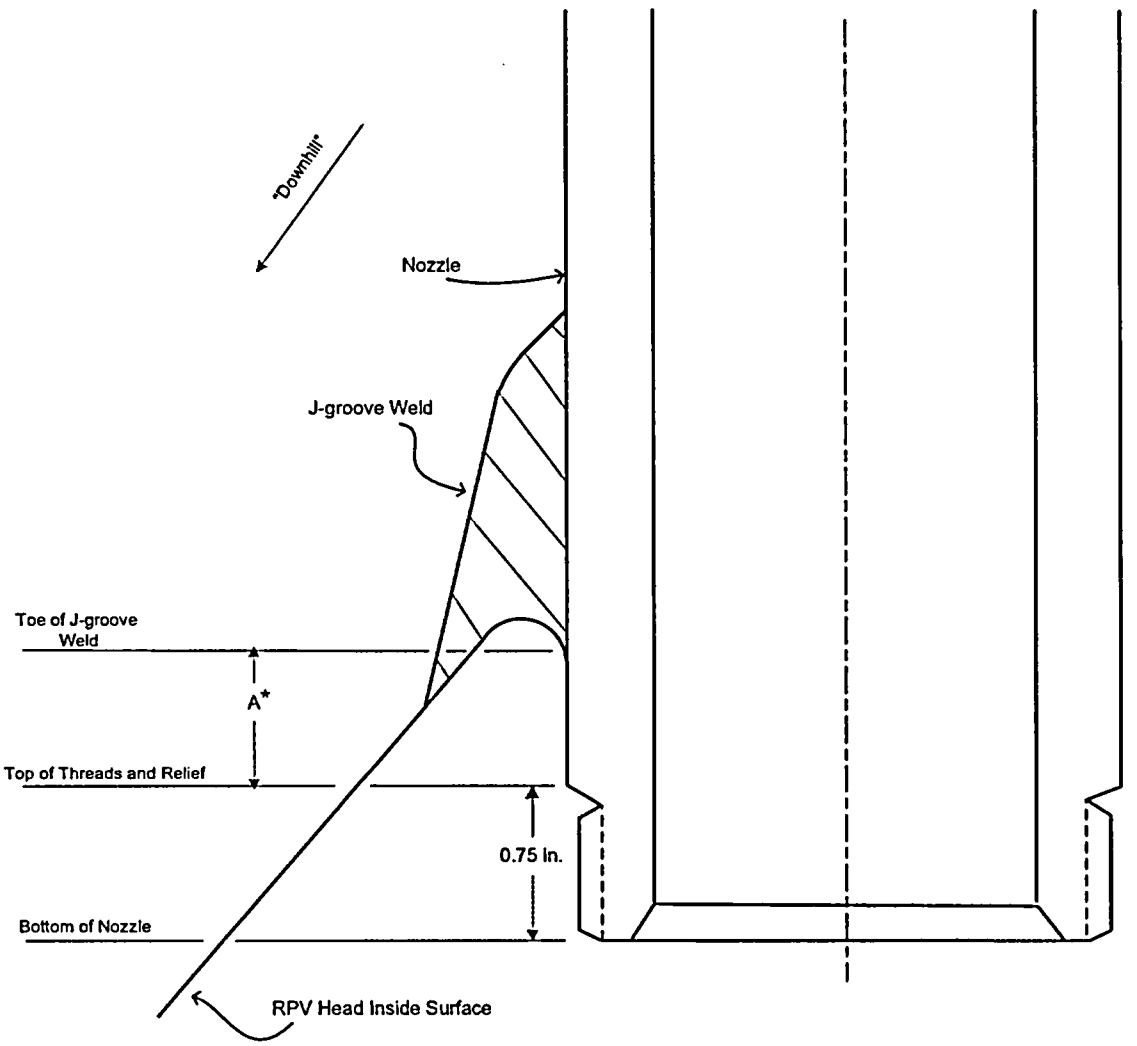
2. Letter from J. N. Jensen, I&M, to Secretary, Office of the Secretary of the Commission, NRC, "Supplement to Request for Relaxation from Nuclear Regulatory Commission Revised Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," AEP:NRC:4054-06, dated June 24, 2004.

3. Letter from R. H. Ruland, NRC, to M. K. Nazar, I&M, "Donald C. Cook Nuclear Plant, Unit 2 - Relaxation of the Requirements of First Revised Order (EA-03-009) Regarding Reactor Pressure Vessel Head Inspections Dated February 20, 2004 (TAC no. MC3074)," dated September 27, 2004 (ML042510444).

4. Letter from C. F. Holden, NRC, to R. A. Andersen, PSEG Nuclear, "Salem Nuclear Generating Station, Unit No. 1 - Evaluation of Relaxation Request No. S1-RR-13-B21, Re: First Revised Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized-Water Reactors (TAC No. MC0967)," dated May 5, 2004 (ML041190161).

5. Letter from H. N. Berkow, NRC, to H. B. Ray, Southern California Edison Company, "Relaxation of the Requirements of Order EA-03-009 Regarding Reactor Pressure Vessel Head Inspections, San Onofre Nuclear Generating Station (SONGS), Units 2 and 3 (TAC Nos. MC1542 and MC1543)," dated March 19, 2004 (ML040840128).

Bottom of Unit 1 Reactor Vessel Head Penetration Nozzle
(Not to Scale)



*Dimension "A" represents the remotely inspectable distance below J-groove weld. Available values for dimension "A" for each nozzle are provided in the table following this sketch.

Donald C. Cook Unit 1 Reactor Vessel Head Penetration Nozzle Data					
Penetration No.	Head Angle Degrees	Downhill Remotely Inspectable Distance (Dimension "A" on Sketch) Inches	Uphill Remotely Inspectable Distance Inches	Distance Below J-groove Weld to 20 ksi, Inches	Remotely Inspectable Distance Meets 1 inch + 20 ksi Criterion? Yes/No
1	0	Not Available	Not Available	1.08*	-
2	8.0	1.39	2.192	Assume 1.08 based on distance for 0 degree row.	Yes
3	8.0	1.44	2.233		Yes
4	8.0	1.47	2.170		Yes
5	8.0	1.32	2.016		Yes
6	11.4	Not Available	Not Available		-
7	11.4	Not Available	Not Available		-
8	11.4	Not Available	Not Available		-
9	11.4	Not Available	Not Available		-
10	16.2	Not Available	Not Available		-
11	16.2	Not Available	Not Available		-
12	16.2	Not Available	Not Available		-
13	16.2	Not Available	Not Available		-
14	18.2	Not Available	Not Available		-
15	18.2	1.08	2.649		Yes
16	18.2	Not Available	Not Available		-
17	18.2	1.16	2.689		Yes
18	18.2	Not Available	Not Available		-
19	18.2	1.47	2.939		Yes
20	18.2	Not Available	Not Available		-
21	18.2	1.08	2.744		Yes
22	23.3	1.16	3.092		Yes
23	23.3	1.16	3.023		Yes
24	23.3	0.689	2.958		No
25	23.3	1.119	3.004		Yes
26	24.8	0.919	3.219		No
27	24.8	1.039	3.214		No
28	24.8	1.239	3.277		Yes
29	24.8	0.649	3.179		No
30	26.2	0.809	3.076	0.831*	No
31	26.2	1.16	3.210		Yes

Donald C. Cook Unit 1 Reactor Vessel Head Penetration Nozzle Data					
Penetration No.	Head Angle Degrees	Downhill Remotely Inspectable Distance (Dimension "A" on Sketch) Inches	Uphill Remotely Inspectable Distance Inches	Distance Below J-groove Weld to 20 ksi, Inches	Remotely Inspectable Distance Meets 1 inch + 20 ksi Criterion? Yes/No
32	26.2	0.959	3.350	0.831*	No
33	26.2	0.689	3.197		No
34	26.2	1.319	3.277		Yes
35	26.2	1.159	3.607		Yes
36	26.2	1.079	3.489		Yes
37	26.2	0.919	3.431		No
38	30.2	0.839	3.561	Assume 0.831 based on distance for 26.2 degree row.	No
39	30.2	0.839	3.876		No
40	30.2	0.879	3.359		No
41	30.2	0.879	3.606		No
42	30.2	0.999	3.741		No
43	30.2	0.959	3.799		No
44	30.2	0.809	3.618		No
45	30.2	0.809	3.709		No
46	33.9	0.769	3.878		No
47	33.9	0.769	3.886		No
48	33.9	0.879	4.116		No
49	33.9	0.809	3.985		No
50	35.5	0.609	4.038		No
51	35.5	0.689	4.114		No
52	35.5	Not Available	Not Available		-
53	35.1	0.649	3.899		No
54	35.1	0.879	4.112		No
55	35.1	0.919	4.067		No
56	35.1	0.799	3.960		No
57	35.1	0.879	3.994		No
58	36.3	0.689	4.142		No
59	36.3	0.729	4.039		No
60	36.3	1.039	4.327		Yes
61	36.3	0.959	4.191		No

Donald C. Cook Unit 1 Reactor Vessel Head Penetration Nozzle Data					
Penetration No.	Head Angle Degrees	Downhill Remotely Inspectable Distance (Dimension "A" on Sketch) Inches	Uphill Remotely Inspectable Distance Inches	Distance Below J-groove Weld to 20 ksi, Inches	Remotely Inspectable Distance Meets 1 inch + 20 ksi Criterion? Yes/No
62	38.6	0.809	4.193	0.529*	No
63	38.6	0.369	3.954		No
64	38.6	0.809	4.389		No
65	38.6	0.749	4.299		No
66	38.6	0.569	4.369		No
67	38.6	1.119	4.597		Yes
68	38.6	0.689	4.387		No
69	38.6	0.879	4.314		No
70	44.3	Not Available	Not Available	0.508*	-
71	44.3	0.609	4.733		No
72	44.3	0.999	5.191		No
73	44.3	0.769	5.069		No
74	48.7	0.819	5.979	0.515*	No
75	48.7	0.819	6.259		No
76	48.7	0.699	5.739		No
77	48.7	0.819	6.099		No
78	48.7	1.019	6.059		Yes
79	48.7	1.059	6.179		Yes

* Based on Figures B-1 through B-9 of WCAP-14118-P, Revision 7.