Indiana Michigan
Power Company
Cook Nuclear Plant
500 Circle Drive
Buchanan, MI 49107
616-465-5901

INDIANA MICHIGAN POWER

July 3, 2002

AEP:NRC:2054-03
10 CFR 50.54(f)

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
RESPONSE TO
NUCLEAR REGULATORY COMMISSION BULLETIN 2002-01
REACTOR PRESSURE VESSEL HEAD DEGRADATION AND
REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY

Reference:

1. Nuclear Regulatory Commission Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," dated March 18, 2002

2. Letter from J. E. Pollock, Indiana Michigan Power Company, to Nuclear Regulatory Commission Document Control Desk, "Donald C. Cook Nuclear Plant Units 1 and 2, Response To Nuclear Regulatory Commission Bulletin 2002-01, Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," submittal AEP:NRC:2054-01, dated April 1, 2002

3. Letter from J. E. Pollock, Indiana Michigan Power Company, to Nuclear Regulatory Commission Document Control Desk, "Donald C. Cook Nuclear Plant Units 1 and 2, Sixty Day Response To Nuclear Regulatory Commission Bulletin 2002-01, Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," submittal AEP:NRC:2054-02, dated May 17, 2002

In Reference 1, the Nuclear Regulatory Commission requested pressurized-water reactor licensees to provide information related to the integrity of the reactor coolant pressure boundary, including the reactor pressure vessel head, and the extent to which inspections have been undertaken to satisfy applicable regulatory requirements. The bulletin also requested that licensees provide the basis for

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concluding that their plants satisfy applicable regulatory requirements related to the structural integrity of the reactor coolant pressure boundary, and that future inspections will ensure continued compliance with applicable regulatory requirements. The bulletin required that responses be provided within 15 days of the bulletin, within 30 days after restart following the completion of vessel head examinations, and within 60 days of the date of the bulletin. Indiana Michigan Power Company (I&M) provided information regarding the reactor pressure vessel head in Reference 2. Reference 2 contained information about a Unit 2 examination that was completed during the Unit 2 Cycle 13 refueling outage, and contained a commitment to examine the Unit 1 reactor vessel head during the Unit 1 Cycle 18 refueling outage. Additionally, I&M provided information regarding reactor coolant system integrity for both units in Reference 3.

This letter responds to the request to provide the results of the Unit 1 reactor vessel head inspections within 30 days after restart following the vessel head examination that was performed during the Cycle 18 refueling outage. Attachment 1 provides a summary of the results, and Attachment 2 provides a detailed report of the non-destructive examinations that were conducted.

There are no new commitments in this letter. Should you have any questions, please contact Mr. Gordon P. Arent, Manager of Regulatory Affairs, at (616) 697-5553.

Sincerely,

J. E. Pollock
Site Vice President

RV/bjb

Attachment

c: K. D. Curry, w/o attachment
J. E. Dyer
MDEQ – DW & RPD, w/o attachment
NRC Resident Inspector
R. Whale, w/o attachment

AFFIRMATION

I, Joseph E. Pollock, being duly sworn, state that I am Site 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

J E Pollock

J. E. Pollock
Site Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 3 DAY OF July, 2002

Jennifer L Kernosky
Notary Public

My Commission Expires 5/24/05

bc: G. P. Arent, w/o attachment
A. C. Bakken
G. F. Borlodan/C. R. Lane/R. E. Hall
P. B. Cowan, w/o attachment
E. D. Forbis
D. J. Garner
S. A. Greenlee
S. B. Haggerty
D. W. Jenkins, w/o attachment
J. A. Kobyra, w/o attachment
T. P. Noonan/M. R. Hill
J. E. Pollock, w/o attachment
T. R. Satyan-Sharma
R. J. Sieber
J. F. Stang, Jr. - NRC Washington, DC
T. R. Stephens
T. K. Woods, w/o attachment

RESPONSE TO NUCLEAR REGULATORY COMMISSION BULLETIN 2002-01, "REACTOR PRESSURE VESSEL HEAD DEGRADATION AND REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY"

Nuclear Regulatory Commission (NRC) Bulletin 2002-01, requested pressurized water reactor licensees to provide information related to the integrity of the reactor coolant pressure boundary, including the reactor pressure vessel head, and the extent to which inspections have been undertaken to satisfy applicable regulatory requirements. The bulletin also requested that licensees provide the basis for concluding that their plants satisfy applicable regulatory requirements related to the structural integrity of the reactor coolant pressure boundary, and that future inspections will ensure continued compliance with applicable regulatory requirements. The bulletin required that responses be provided within 15 days of the bulletin, 30 days after restart following the completion of vessel head examinations, and 60 days of the date of the bulletin. This letter addresses the 30-day requirement to provide the results of the reactor vessel head inspection.

<u>NRC Request</u>

2A. the inspection scope (if different than that provided in response to Item 1.D) and the results, including the location, size, and nature of any degradation detected.

<u>Indiana Michigan Power Company (I&M) Response</u>

A letter from J. E. Pollock to NRC Document Control Desk, dated April 1, 2002, provided the 15-day response to the bulletin. As part of the response to item 1.D, I&M committed to perform the following on the Unit 1 reactor vessel head:

> A 100% bare metal inspection.
>
> A surface examination (eddy current testing or liquid penetrant) of the wetted surfaces on and near the J-groove weld on the outside and inside diameter, supplemented by ultrasonic testing as necessary for weld locations that are not accessible by eddy current probes, or
>
> An ultrasonic test from the inside diameter of the penetration capable of detecting circumferential cracks on the outside diameter above in the vicinity of the J-groove weld.

One Hundred Per Cent Bare Metal Inspection

<u>Inspection Methodology</u>

The examination was accomplished using a remote crawler that was capable of observing 360 degrees (°) around each vessel head penetration (VHP). In areas where the crawler could not gain access, manually operated remote video probes were used, again viewing 360° around each penetration. Qualified ASME Section XI, Level II VT-2 examiners, with additional familiarization about recent industry experience with primary water stress corrosion cracking (PWSCC) were used to perform the actual inspection of the vessel head and each penetration.

Inspection Results

No evidence of active or previous leakage from the penetrations or degradation of the vessel head was observed. Indications of small trails of boric acid judged to be from previous venting or leakage from the control rod drive mechanisms' (CRDM) canopy seals were evident on the vessel head penetration (VHP) tubes above the reactor vessel head. There were minor accumulations of boric acid observed on the vessel head. This accumulation coincided with leakage from canopy seals. The area around penetration numbers 4, 12, 28 and 34 required cleaning to examine the bare metal. Vacuuming and wire brushing were used. After cleaning an additional inspection was performed of the area. Only minor surface rusting was observed. Some debris was observed and subsequently removed.

In addition to the visual examination for boric acids leakage, an external examination was conducted on penetration 76 based on visual examination results from a 1994 inspection. During a review of the videotapes from the 1994 inspection, the penetration appeared to have a gouge that could not be fully dispositioned due to interference of the head insulation with the camera angle. A re-examination was conducted after removal of the insulation, and the inspection results showed the indication was a grind mark about 2.74 inches long 1/16 inch wide and 1/64 inches at the deepest part. Based on these results, the indication was considered acceptable for continued use-as-is without any repair.

Nondestructive Examinations

Inspection Methodology

Seventy-nine VHPs were examined using eddy current (ET), ultrasonic (UT) or liquid penetrant (PT) techniques or a combination of those.

Inspection Results

There were no cracks, or crack-like defects observed in any of the seventy-nine penetrations. Based on the results of a time of flight diffraction UT PCS24 circumferential probe examination, ten penetrations (4, 38, 43, 48, 49, 52, 61, 62, 67, 73) required supplemental examinations. Seven of the penetrations' (4, 38, 43, 48, 52, 61 and 67) J-groove welds were examined with ET and no indications were identified. Additional UT probes and techniques were used to examine penetrations 49, 62 and 73. No evidence of PWSCC was identified.

Penetration 62 contained 21 separate circumferentially oriented indications on the inside diameter of the tube above and below the J-groove weld. The depth of the indications ranged from less than 1 millimeter (0.039 inch) to 1.5 millimeter (0.059 inch). The circumferential extent ranged from 26° - 297°. Thirteen of the indications were located above the weld and were less than 1mm in depth with a circumferential extent ranging from 26° - 58°. Eight indications were located below the weld with the depth at one spot of 1.5 millimeter (all other indications are 1 millimeter), with a circumferential extent ranging from 111° - 297°. The indications appeared to have relative uniform spacing between them (see Attachment 2, Page 12). There was no loss of back wall signal or crack tips identified for any of these indications. These indications were dispositioned as being results of the original fabrication process.

A detailed report of the non-destructive examination is provided in Attachment 2.

Overall Conclusions

There was no evidence of PWSCC observed. All of the penetrations were determined to be acceptable for continued service.

For those penetrations examined by ET and PT, reasonable assurance exists that primary water did not penetrate the VHP base material or J-groove weld. The UT examinations provide reasonable assurance that circumferential cracking caused by PWSCC at and above the J-groove weld is not present.

NRC Request

2B. The corrective actions taken and the root cause of any degradation detected.

I&M Response

This item is not applicable as no degradation was identified.

ATTACHMENT 2 TO AEP:NRC:2054-03

D. C. COOK 1
REACTOR VESSEL HEAD PENETRATION INSPECTION
FINAL REPORT

D.C. Cook 1
Reactor Vessel Head Penetration Inspection
Final Report

July 1, 2002

Author: [signature] /DH

Verifier: [signature]

D.C. Cook 1
Reactor Vessel Head Penetration Inspection
Final Report

1.0 DISCUSSION

During the D.C. Cook Unit 1 May 2002 outage, Westinghouse performed nondestructive examinations of all 79-reactor vessel head penetrations (RVHP). The inspections were performed in accordance with the following field service nondestructive examination procedures:

ISI-UT-002, Rev. 1 – "Time of Flight Ultrasonic Inspection of Reactor Vessel Head Penetrations'

ISI-UT-003, Rev. 0 – "Ultrasonic Inspection of Reactor Vessel Head Penetrations Using Pulse Echo Techniques"

ISI-ET-001, Rev. 2 – "Eddy Current Inspection of J-Groove Welds in Vessel Head Penetrations"

ISI-ET-002, Rev. 2 – "Eddy Current Procedure for Detection of Cracks in Vessel Head Penetrations With or Without Thermal Sleeves – Differential Gap Probe"

WDI-UT-008, Rev. 0 – "Intraspect Time of Flight Ultrasonic Inspection of Reactor Vessel Head Penetrations"

WDI-UT-009, Rev. 0 – "IntraSpect Ultrasonic Procedure for Detection of Circumferential Indications in Reactor Vessel Head Penetration Welds – 0 Degree to 20 Degree Probes"

WDI-ET-003, Rev. 0- "IntraSpect Eddy Current Imaging Procedure for Inspection of Reactor Vessel Head Penetrations"

The vessel head penetrations were dispositioned based on an assessment of 1) results from the ultrasonic and eddy current examinations presented herein, 2) results from visual examinations of 100% of the penetrations from the top of the head, and 3) results from supplementary liquid penetrant examinations.

2.0 SCOPE OF WORK

The RVHP examination scope at D.C. Cook Unit 1 was based on a commitment to perform:

1) An under the insulation bare-metal exam, and
2) Surface examinations of the penetration wetted surfaces, or

3) Volumetric examinations to identify the presence of circumferentially oriented primary water stress corrosion cracking (PWSCC) on the OD surfaces of the penetrations above the J-Groove welds attaching the penetrations to the reactor vessel head.

The delivery system used for the vessel head penetration inspections at D.C. Cook Unit 1 was the Westinghouse DERI 700 manipulator. The DERI 700 is a multi-purpose robot that can access all head penetrations without repositioning and provides a common platform for all reactor vessel head penetration inspection end effectors. The manipulator consists of a central leg, mounted on a carriage, which in turn is mounted onto a guide rail. The manipulator arm, with elbow and removable wrist, is mounted onto the carriage, which travels vertically along the manipulator leg. The DERI 700 was used to deliver the 7010 open housing scanner for eddy current and ultrasonic examinations of six thermocouple column locations and the ultrasonic gap scanner for ultrasonic time-of-flight examinations of fifty-seven penetrations. The eddy current gap scanner and Grooveman end effector were used for eddy current examinations of the inside diameter surfaces, J-Groove welds and outside diameter surfaces of sixteen penetrations.

The 7010 open housing scanner delivers a probe assembly containing ultrasonic and eddy current probes to the ID surface of open reactor vessel head penetrations. The scanning motion is in the axial direction and the probe is indexed in the circumferential direction.

The eddy current and ultrasonic gap scanners are designed to position and guide "sword" probes into the annulus between the ID surface of the reactor vessel head penetration tube and the OD surface of the thermal sleeve and to manipulate the probe to provide the desired coverage. The nominal annulus size is 0.125". The sword probe design utilizes a flexible metal "sword" on which a pair of eddy current or ultrasonic probes are mounted in a spring configuration that enables the probes to ride on the ID surface of the penetration tubes. The scanning motion is in a vertical direction moving from a specified height above the weld toward the lower end of the penetration and the probes are indexed in the circumferential direction. The gap scanners consist of a probe tilt and drive unit to advance and reverse the probe in the tube/thermal sleeve annulus, a turntable to rotate the probe drive around the axis of the penetration, a lifting cylinder to raise and lower the tilt and drive unit and a centering device consisting of two clamping arms. The ultrasonic gapscanner also has a couplant delivery system.

The Grooveman end effector is designed deliver eddy current probes for examination of the surface of the J-Groove weld and the penetration nozzle OD surface. The eddy current probe holders are designed to conform to the geometry of the J-Groove welds and penetration OD surfaces which allow the probes to follow the contour of the assembly. Continuous positional and video feedback is provided to the operator to assist in examining the full surface of the weld and the penetration tube. Scanning of the penetration OD surfaces is conducted in a vertical direction and the probes are indexed in the circumferential direction. For scanning of the J-Groove welds, scanning is conducted in the circumferential direction, along the welds, and the index is in a direction perpendicular to the welds.

2.1 Time-of-Flight Ultrasonic Examinations with the UT Gapscanner

Fifty-seven penetrations were examined using time-of-flight diffraction ultrasonic techniques with PCS24 probes demonstrated capable of detecting circumferentially oriented reflectors on the tube OD surfaces above the elevation of the J-Groove weld. These examinations were conducted with PCS24 probes directed along the tube axis in accordance with ISI-UT-002, Rev. 1; "Time of Flight Ultrasonic Inspection of Reactor Vessel Head Penetrations". These examinations were conducted with PCS24 TOFD 6.0 MHz ultrasonic transducers.

2.2 Eddy Current Inspection of Penetration ID Surfaces with the ECT Gapscanner

The inside diameter surfaces of sixteen penetrations were inspected with eddy current techniques in accordance with ISI-ET-002, Rev. 2; "Eddy Current Procedure for Detection of Cracks in Vessel Head Penetrations With or Without Thermal Sleeves – Differential Gap Probe". These penetration locations were identified for eddy current inspection because they could not be completely examined with the time-of-flight diffraction ultrasonic technique. Centering buttons on the penetration thermal sleeves at thirteen of these locations were at elevations that would not permit the ultrasonic probe to reach the desired height above the weld. At three locations difficulty was encountered with the ability of the TOFD probe to access the penetration through the gap created by the thermal sleeve and the penetration tube ID.

These inspections were performed using a pair of differentially connected pancake coils positioned at 45 degrees to one and other. The inspection frequencies were 600, 280 and 100 kHz in both the absolute and differential modes. The prime frequency was 600 kHz in the differential mode.

2.3 Eddy Current Inspection of J-Groove Welds and Penetration OD Surfaces

The J-Groove welds and OD surfaces at sixteen penetration locations were inspected with eddy current techniques in accordance with ISI-ET-001, Rev. 2; "Eddy Current Inspection of J-Groove Welds in Vessel Head Penetrations". These penetration locations were identified for eddy current inspection because they could not be completely examined with the time-of-flight diffraction ultrasonic technique. Centering buttons on the penetration thermal sleeves at thirteen of these locations were at elevations that would not permit the ultrasonic probe to reach the desired height above the weld. At three locations difficulty was encountered with the ability of the TOFD probe to access the penetration through the gap created by the thermal sleeve and the penetration tube ID.

These inspections were performed using a 3mm diameter, x-wound coil in a driver-pickup configuration. The inspection frequencies were 400 and 450 kHz.

Penetrations #73 and 70 could not be inspected over their entire length, due to the acute angle between the vessel head and the penetration tube J-weld. These locations were subject to supplementary liquid penetrant examinations.

2.4 Rotating Probe Examinations

Rotating probe examinations were conducted on the six-thermocouple column locations. These examinations included:

1) TOFD ultrasonic techniques demonstrated capable of detecting axial and circumferential reflectors on the tube OD surfaces with 5.0 MHz PCS24 probes in accordance with WDI-UT-008, Rev. 0; "Intraspect Time of Flight Ultrasonic Inspection of Reactor Vessel Head Penetrations",

2) eddy current examinations using crosswound coils operated at 400 kHz demonstrated capable of detecting axial and circumferential degradation on the tube ID surface in accordance with WDI-ET-003, Rev. 0; "IntraSpect Eddy Current Imaging Procedure for Inspection of Reactor Vessel Head Penetrations", and

3) 0°, 2.25 MHz and 5.0 MHz longitudinal wave examinations of the J-Groove welds in accordance with WDI-UT-009, Rev. 0; "IntraSpect Ultrasonic Procedure for Detection of Circumferential Indications in Reactor Vessel Head Penetration Welds – 0 Degree to 20 Degree Probes".

2.5 Summary of All RVHP NDE Inspections at D.C. Cook Unit 1

The following table provides a summary of all RVHP nondestructive inspections performed at D.C. Cook Unit 1 during the May 2002 refueling outage.

Penetration	ECT of J-Groove Weld and Penetration OD Surfaces	ECT of Penetration ID Surfaces	TOFD UT PCS24 Ax.	Rotating Probe	Qualified Visual (VT-2)	Liquid Penetrant (PT)
1	x	x				
2			x			
3			x			
4	Supplemental		x			
5			x			
6	x	x				
7	x	x				
8	x	x				
9	x	x				
10	x	x			x	
11	x	x			x	
12	x	x			x	
13	x	x			x	
14	x	x			x	
15			x		x	
16	x	x			x	
17			x		x	
18	x	x			x	

Penetration	ECT of J-Groove Weld and Penetration OD Surfaces	ECT of Penetration ID Surfaces	TOFD UT PCS24 Ax.	Rotating Probe	Qualified Visual (VT-2)	Liquid Penetrant (PT)
19			x		x	
20	x	x			x	
21			x		x	
22			x		x	
23			x		x	
24			x		x	
25			x		x	
26			x		x	
27			x		x	
28			x		x	
29			x		x	
30			x		x	
31			x		x	
32			x		x	
33			x		x	
34			x		x	
35			x		x	
36			x		x	
37			x		x	
38	Supplemental		x		x	
39			x		x	
40			x		x	
41			x		x	
42			x		x	
43	Supplemental		x		x	
44			x		x	
45			x		x	
46			x		x	
47			x		x	
48	Supplemental		x		x	
49			x		x	
50			x		x	
51			x		x	
52	Supplemental		x		x	
53			x		x	
54			x		x	
55			x		x	
56			x		x	
57			x		x	
58			x		x	
59			x		x	
60			x		x	
61	Supplemental		x		x	

Penetration	ECT of J-Groove Weld and Penetration OD Surfaces	ECT of Penetration ID Surfaces	TOFD UT PCS24 Ax.	Rotating Probe	Qualified Visual (VT-2)	Liquid Penetrant (PT)
62			x		x	
63			x		x	
64			x		x	
65			x		x	
66			x		x	
67	Supplemental		x		x	
68			x		x	
69	x	x			x	
70	x	x			x	x
71			x		x	
72			x		x	
73	x	x			x	x
74				x	x	
75				x	x	
76				x	x	
77				x	x	
78				x	x	
79				x	x	

3.0 EDDY CURRENT AND ULTRASONIC INSPECTION RESULTS

3.1 Time-of-Flight Ultrasonic Examinations with the UT Gapscanner

Fifty-seven penetrations were examined using time-of-flight diffraction ultrasonic techniques with PCS24 probes.

Ten of those penetrations were identified for additional investigation. Investigations were conducted on seven of those locations; #4, 38, 43, 48, 52, 61, and 67, using eddy current techniques in accordance with ISI-ET-001, Rev. 2; "Eddy Current Inspection of J-Groove Welds in Vessel Head Penetrations". Penetrations #62 and 73 were investigated with 45 degree techniques in accordance with ISI-UT-003, Rev. 0 – "Ultrasonic Inspection of Reactor Vessel Head Penetrations Using Pulse Echo Techniques" and penetrations #49 and 62 were investigated with PCS10 TOFD circ probes in accordance with ISI-UT-002, Rev. 1; "Time of Flight Ultrasonic Inspection of Reactor Vessel Head Penetrations".

3.2 Eddy Current Inspection of Penetration ID Surfaces with the ECT Gapscanner

Eddy current examinations of sixteen penetration tube ID surfaces were conducted with the eddy current gapscanner. No detectable degradation (NDD) was identified in any of the penetrations. Inspection coverage and a summary of results are found in the following table.

Penetration Number	Inspection Results
1	NDD
6	NDD
7	NDD
8	NDD
9	NDD
10	NDD
11	NDD
12	NDD
13	NDD
14	NDD
16	NDD
18	NDD
20	NDD
69	NDD
70	NDD
73	NDD

3.3 Eddy Current Inspection of J-Groove Welds and Penetration OD Surfaces

Eddy current inspections of sixteen J-Groove welds and penetration tube OD surfaces were conducted to the extent possible. All weld surfaces were prepared by grinding to a smooth finish. For this examination, penetrations were classified as containing no reportable indications (NRI), recordable indications, or reportable indications. Criteria for these classifications are found in the Analysis Logic Chart in ISI-ET-001, Rev.2, "Eddy Current Inspection of J-Groove Welds in Vessel Head Penetrations". Reportable indications are those exhibiting phase angles of $90° \pm 15°$ (circumferential) or $270° \pm 15°$ (axial), signal-to-noise ratios greater than 2:1, and lengths 9 mm or greater.

Penetration Number	Inspection Results Penetration OD Surface	Inspection Results J-Groove Weld
1	NRI	NRI
6	NRI	NRI
7	NRI	NRI
8	NRI	NRI
9	NRI	NRI
10	NRI	NRI
11	NRI	NRI
12	NRI	NRI

Penetration Number	Inspection Results Penetration OD Surface	Inspection Results J-Groove Weld
13	NRI	NRI
14	NRI	NRI
16	NRI	NRI
18	NRI	NRI
20	NRI	NRI
69	NRI	NRI
70*	NRI	NRI
73*	NRI	NRI

- Coverage limited to 70° to 285°, supplementary penetrant testing performed

There were no reportable or recordable indications identified in any of the J-Groove weld or penetration OD surface inspections. Penetrations #70 and #73 were also inspected with liquid penetrant techniques in areas not accessible with the J-Groove eddy current inspection tooling.

3.4 Rotating Probe Examinations

A summary of results from the rotating probe examinations of six thermocouple column locations is provided in the following table:

Penetration Number	PCS24 Axial	PCS24 Circumferential	0 Degree Longitudinal 2.25 MHz	20 Degree Longitudinal 5.0 MHz	Eddy Current
74	NDD	NDD	NDD	NDD	NDD
75	NDD	NDD	NDD	NDD	NDD
76	NDD	NDD	NDD	NDD	NDD
77	NDD	NDD	NDD	NDD	NDD
78	NDD	NDD	NDD	NDD	NDD
79	NDD	NDD	NDD	NDD	NDD

4.0 DISCUSSION OF RESULTS

A total of 10 penetrations were identified for further investigation based on results from the PCS24 sword probe examinations.

Investigations were conducted on seven of those locations; #4, 38, 43, 48, 52, 61, and 67, using eddy current techniques in accordance with ISI-ET-001, Rev. 2; "Eddy Current Inspection of J-Groove Welds in Vessel Head Penetrations". Penetrations #62 and 73 were investigated with 45 degree techniques in accordance with ISI-UT-003, Rev. 0 – "Ultrasonic Inspection of Reactor Vessel Head Penetrations Using Pulse Echo Techniques" and penetrations #49 and 62 were investigated with PCS10 TOFD circ probes in accordance with ISI-UT-002, Rev. 1; "Time of Flight Ultrasonic Inspection of Reactor Vessel Head Penetrations".

Results of these supplementary examinations indicate no evidence of primary water stress corrosion cracking in any of the 79 reactor vessel head penetrations. One penetration, #62, has indications on the penetration tube inside diameter surface that appear to be associated with the manufacturing process. These indications are circumferential in orientation and most have depths less than 1.0 mm.

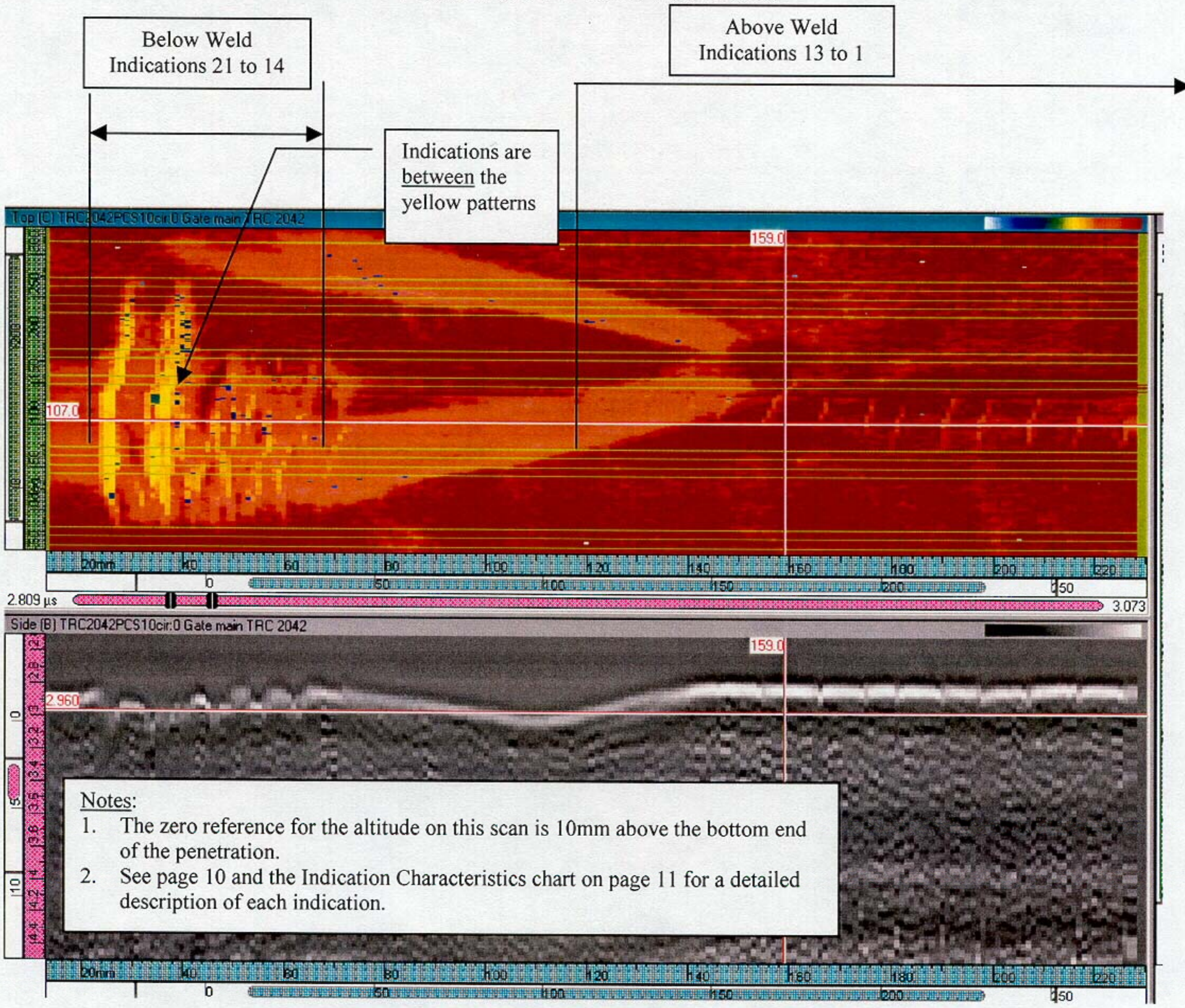
The characteristics of the indications are listed in the following table and shown in the attached graphic. The indications do not appear to be crack-like, but likely a result of the manufactuing process.

Penetration #62 – Indication Characteristics

Indication No.	Top Side azimuth (deg.)	Top Altitude (mm)	Bottom Side azimuth (deg.)	Bottom Altitude (mm)	Depth (mm)	Angular Span (deg.)	Length (approx.) (mm)
Above Weld							
1	133	236	82	235	<<1	51	31
2	137	218	79	226	<<1	58	35
3	138	219	81	217	<<1	57	35
4	138	209	85	207	<<1	53	32
5	138	202	83	200	<<1	55	34
6	128	192	93	190	<<1	35	21
7	138	186	93	185	<<1	45	27
8	138	177	104	175	<<1	34	21
9	158	171	106	165	<<1	52	32
10	150	160	110	156	<<1	40	24
11	145	153	119	150	<<1	26	16
12	149	144	119	141	<<1	30	18
13	147	128	119	128	<<1	28	17
Below Weld							
14	159	77	48	same	1	111	68
15	178	71	44	same	1	134	82
16	164	65	14	same	1	150	91
17	191	61	-7	same	1	198	121
18	174	58	-17	same	1	191	116
19	180	55	-19	same	1	199	121
20	193	51	-11	same	1	204	124
21	274	41	-23	same	1.5	297	181

Notes:
1. Altitudes are from bottom of penetration.
2. Each indication below the weld is at a constant elevation.

Penetration #62 PCS10 Circ Results



Notes:

1. The zero reference for the altitude on this scan is 10mm above the bottom end of the penetration.
2. See page 10 and the Indication Characteristics chart on page 11 for a detailed description of each indication.

C01