Commonwealth Edison
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August 6, 1990

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTN: Document Control Desk

Subject: Quad Cities Nuclear Power Station Unit 2
Intergranular Stress Corrosion Cracking
(IGSCC) Susceptible Piping Inspection
NRC Docket No. 50-265

Reference: R. Stols to T.E. Murley letter dated
June 13, 1990.

Dr. Murley:

The referenced letter transmitted the final report for the Spring, 1990 IGSCC Inspection which was performed on Unit 2 IGSCC susceptible piping. In that letter, Commonwealth Edison committed to provide the results of the metallurgical examination of the "boat" sample which consisted of the flaw indication detected in weld 02J-S3 overlay material. The attached provides the report of that Metallsurgical examination.

The metallurgical examination revealed no evidence of defects, porosity or slag. Based on the analysis and conversations with inspection personnel, the flaw which was reported to be in the weld overlay was not found and therefore it is believed that the indication was over-sized during UT examination.

If there are any questions, please contact me at (708) 515-7283.

Very truly yours,

R. Stols
Nuclear Licensing Administrator

cc: A.B. Davis, Regional Administrator - Region III
L.N. Olshan, Project Manager - NRR
W. Koo, NRR Technical Staff
T. Taylor, Senior Resident Inspector

Enclosure: System Materials Analysis Department Report
on 02J-S3 Riser Weld Overlay Boat Sample from
Quad Cities Station Unit 2

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SYSTEM MATERIALS ANALYSIS DEPARTMENT REPORT ON O2J-S3 RISER WELD OVERLAY BOAT SAMPLE FROM QUAD CITIES STATION UNIT 2

During the R10 outage of Quad Cities Station Unit 2, an ultrasonic inspection of the overlay on O2J-S3 riser weld, elbow side, revealed axial cracks extending into the overlay. As a result of the apparent crack extension into the overlay, a boat sample was removed which captured the deepest crack penetration into the overlay. This boat sample was metallurgically examined to verify the depth of crack penetration into the overlay and to identify the mechanism of cracking. Based on this analysis, no crack penetration into the weld overlay occurred. Evidently, the UT sizing of the crack (remaining ligament) was overly conservative. One axially oriented IGSCC type crack was observed which terminated at the base metal-weld metal overlay interface.

NDE Inspection Background

During the R9 outage in 1988, GAPCo applied an overlay to the O2J-S3 riser weld due to an axial crack indication. The overlay thickness was approximately 0.3". Upon completion of the overlay a baseline UT inspection, performed by General Electric, revealed two axial indications terminating at or near the fusion line of the overlay. Reinspection of the overlay during the R10 outage by Lambert, McGill and Thomas (LMT) revealed two axial indications. One of the axial indications was reported to have a remaining ligament of 0.12". The other indication had a remaining ligament of 0.45". SMAD NDE personnel also inspected the overlay and

reported two axial flaws approximately 1/2" apart with the deepest penetration resulting in a remaining ligament between 0.11" to 0.25". The other axial indication was not in the overlay. Both LMT and SMAD personnel located and marked the area where the thinnest ligament (deepest crack penetration into the overlay) was observed. This area was then captured in a boat sample for further analysis.

Metallugrical Analysis

The as-received boat sample was visually examined. Two punch marks approximately 1/2" apart were on the boat sample. The NDE personnel reported the thinnest remaining ligament was located between the two punch marks. The boat was approximately 3" long, 3/4" wide and 0.383" deep.

Based on the location of the punch marks, five different cross sections through the boat sample were metallographically prepared and examined. The deepest crack observed was in the first cross section examined. An intergranular crack was observed in the base metal directly beneath the fusion line of the overlay. The crack was in the center of the material captured by the sample. Figure 1 is a photomicrograph of the crack. Note that the crack stops at the fusion line and does not penetrate into the weld metal overlay. Figure 2 is a closer view of the crack which terminates at the fusion line. Examination of the other cross sections showed the crack to be either further from the fusion line or not present. This indicates that the deepest crack penetration (which is synonymous with the thinnest remaining ligament) did not penetrate into the weld overlay. The measured remaining ligament was 0.27", the thickness of the overlay at that location. In other cross sections, the overlay was measured to be as thick as 0.35".

Metallographic examination of the weld metal was performed in the unetched and etched conditions. This was done to identify any possible sources of a UT reflector. No evidence of any welding related defect was observed. Figure 3 is a photomicrograph of the weld metal microstructure. The delta ferrite content of the weld was determined with the aid of a computer enhanced image analyzer. The average delta ferrite content was 12.7%.

Conclusion

Based on this analysis and conversations with the inspection personnel, the flaw which was reported to be in the weld overlay was not found and implies the indication was over-sized. The determination of the remaining ligament was overly conservative. No evidence of defects such as, cracks, lack of fusion, porosity, or slag were found. The thinnest remaining ligament which should have been measured was 0.27", the minimum thickness of the overlay at that location.

Approved by: _____ Reported by: _____

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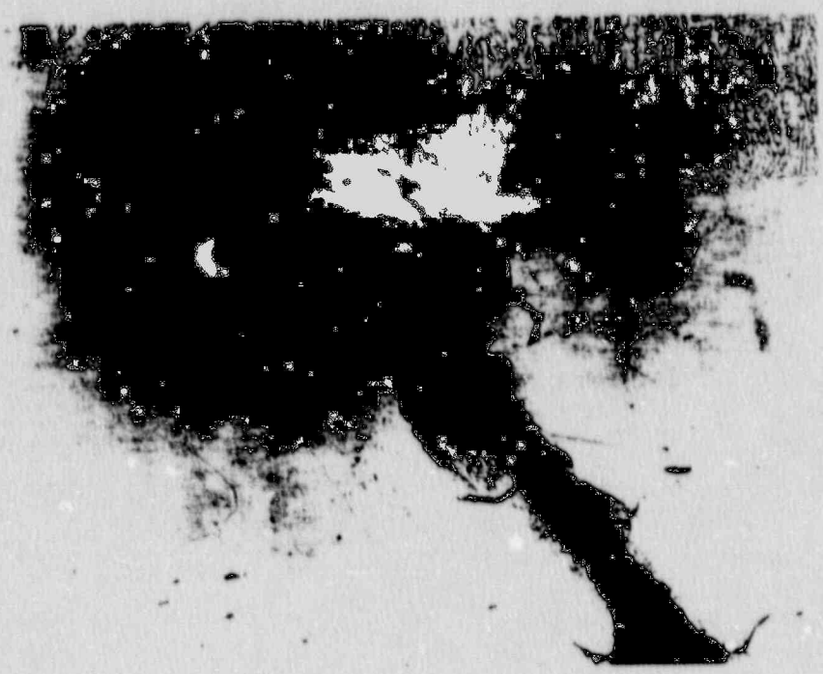
12.1.2

2937M-3

11.25X Magnification

10% Oxalic Acid
Electrolytic

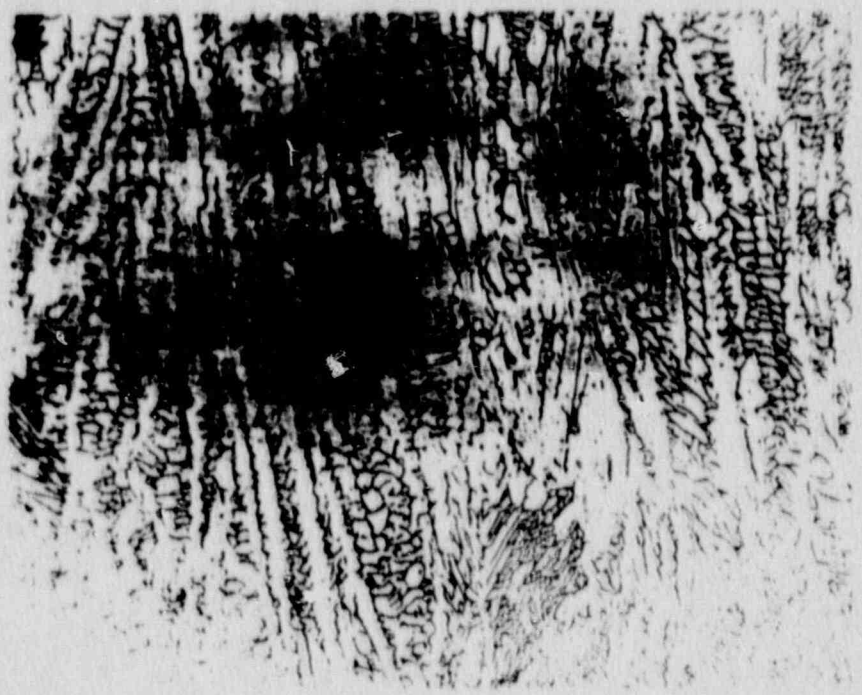
Figure 1. Boat sample cross section showing the crack terminating at the fusion line of the overlay.



150X Magnification

10% Oxalic Acid
Electrolytic

Figure 2. Magnified view of the crack in Figure 1. Note that the crack extends to the fusion line but does not progress any further.



300X Magnification

10% Oxalic Acid
Electrolytic

Figure 3. The typical weld metal microstructure. The delta ferrite content of the weld was determined to be 12.7% using a computer enhanced image analyzer.