U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-277/278/88-29

Docket Nos. 50-277/278

License Nos. DPR-44 Priority - Category C
DPR-56

Licensee: Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Facility Name: Peach Bottom 2 & 3

Inspection At: Delta, Pennsylvania

Inspection Conducted: August 5, 1988 and August 8-12, 1988

Inspector: for H. J. Kaplan, Senior Reactor Engineer — 9/19/88 date

Approved by: Jack Strosnider, Chief, Materials and Processes Section — 9/19/88 date

Inspection Summary: Inspection on August 5, 1988, August 8-12, 1988
(Report No. 50-277/278/88-29)

Areas Inspected: An unannounced inspection of the following areas was conducted: (1) replacement of Unit 2 and Unit 3 Emergency Water Systems; (2) erosion-corrosion program in Unit 2 and 3; (3) radiographic condition of Unit 3 recirculation pump to pipe weld; and, (4) ultrasonic inspection of shroud access cover plate weld joints in Units 2 and 3.

Results: No violations, deviations or deficiencies were found in areas (1), (2) and (3). Significant ultrasonic indications were found in the shroud access cover plate weld joints in Unit 3. The Unit 2 access cover plate weld joints were previously inspected and found free of defects.

1. Individuals Contacted

Philadelphia Electric Company

R. Zong, Sr. Metallurgical Engineer
P. Lyons, Construction Site Head
J. Stanley, ISI-1
T. Hinkle, Maintenance ISI
C. Fisher, Maintenance
*F. Cook, Nuclear Engineer
*A. P. Bazzani, Project Manager
*G. J. Hanson, Regulatory

U.S. Nuclear Regulatory Commission

*T. Johnson, Sr. Resident Inspector
*L. Myers, Resident Inspector

*denotes those attending exit interview

2. Inspection Purpose and Scope

The purpose of this inspection was to review and evaluate four areas involving (1) Unit 2 and Unit 3 Emergency Water Systems (EWS) replacement; (2) erosion-corrosion program in Unit 2 and Unit 3; (3) radiographic condition of a recirculation pump to pipe weld in Unit 3; and, (4) ultrasonic inspection of shroud access cover plate weld joints in Unit 2 and Unit 3.

3. Replacement of Emergency Water Systems in Unit 2 and Unit 3

The inspector reviewed and evaluated the adequacy of the Emergency Water System (EWS) replacement program currently in progress for Unit 2 and Unit 3.

The program consisted of replacing the old corroded carbon steel piping systems with new carbon steel piping in accordance with ASME Section III, Class 3 (1980 Edition with addenda thru Winter 1981) and ANSI B31.1. The construction modifications for Unit 2 and Unit 3 were identified as No. 2371 and No. 2106, respectively. The installer for Units 2 and 3 EWS was United Engineers Catalytic Company. The inspector was informed that replacement of the small bore piping was completed for Unit 2. Replacement of the large bore piping for Unit 2 will be completed in the next refueling outage. Replacement for Unit 3 is in progress and scheduled for completion in November 1988.

Because the installed piping in Unit 2 was covered with insulation the inspection was limited to a review of QA records. The inspector selected Weld W801 as specified on drawing FSK M-444 SHT-10 -Rev. 8 for review. The records showed that Weld 801 consisted of socket welding SA 106 GrB pipe (ht. 286842) to a SA 105 flange (ht. AMWQ) using carbon steel filler wire (lots 21860 and 421T4511). The welding procedure used was a Section XI qualified Tungsten Inert Gas (TIG) Catalytic procedure (CS-2101 Rev. 2). The weld was made by a Section XI qualified welder P-198. Appropriate qualification records and certified mill test reports (CMTRs) representing the above items were provided to the inspector. No deviations were observed. Welding Record Number 17 indicated that QA had verified fit up (1/16" pull back) and final visual and liquid penetrant inspections.

The inspector inspected partially welded pipe to valve butt welds for the RHR system in Unit 3 which were being welded by Catalytic in their fabrication shop. The welds were identified as 5-912 and 5-913 on drawing FSK-M-3033 SHT-5 Rev. 10. The welding wire being employed was Linde 65 wire of ht. 0650 58 with qualified TIG welding procedure CS-2101 Rev. 2. The inspector verified that the amperage (80) and voltage (10) were within the ranges specified in procedure CS-201. A Union Carbide Certified Test Report and procedure qualification record were provided for the inspector's review. No discrepancies were noted. The incomplete welds were visually inspected. The welds were found to be free of discernable defects with good fusion along the side wall. The inspector also visually inspected an installed carbon steel 1/4" fillet weld for hanger H3 as detailed on drawing FSK-M-3033 Sht 27. The welding records showed that the weld was made by qualified welder P554 using the manual metal arc process in accordance with Welding Procedure CS-2101. The heat of electrodes used was identified as E7018-heat 422K 1581 and found to be traceable to an appropriate Allory Rods CTMR.

The inspector reviewed two PE Audit Reports (OP-407 and OP-400) and five PE Surveillance Reports (for 88-PB-006; SS-88-08, SS-88-09, SS-88-10, and CD-9-1-15). The activities revealed seven nonconforming conditions, all of which were satisfactorily corrected or resolved.

4. Erosion Corrosion Program Units 2 and 3

The inspector reviewed the status and adequacy of PE's Erosion/Corrosion program to detect wall thinning in single or two phase flow applications. PE reported that an inspection plan had been in place for two phase systems since 1981. More recently, due to piping failures at other utilities, the program was formalized and expanded in March 1987 to include single phase systems. The inspector verified that the PE program was essentially in agreement with INPO SOER 87-03, "Pipe Failures in High Energy Systems due to Erosion/Corrosion" and I.E. Bulletin 87-01 "Thinning of Pipe Walls in Nuclear Power Plants." The guidance provided in these

documents included (a) performing a comprehensive engineering review of susceptible systems based on materials, water chemistry (oxygen & pH), temperature, component configuration and hydrodynamics; (b) performing ultrasonic and visual inspections; (c) establishing acceptance criteria and alarm points to ensure components satisfy Code requirements; and, (d) replacing pipe with new materials more resistant to erosion-corrosion. The licensee formally responded to NRC with regard to IE Bulletin 87-01 in August 1987.

The inspector reviewed the inspection results generated at the end of Fuel Cycle 7 for Unit 2 that covered nineteen areas. The results from Unit 3 have not been collated. The data was found to be well organized with numerous thickness readings identified by part and location. The inspector verified by review of Maintenance Requests that carbon steel piping and fittings were replaced with chromium-molyldenum alloy steel material in three areas designated as having low readings. These areas were identified as No. 7 (Reactor Core Isolation Cooling); No. 8 (feedwater); and No. 12 (Extraction Steam Drains). The inspector also witnessed verification of the UT data recently generated in Area 9 involving an RFP elbow at two locations identified as 8A and 9K. The specified wall thickness was .334". The reading, witnessed by the inspector on August 10, 1988, ranged between .350"-.665" which compared very closely with the readings determined on May 10, 1988. The licensee examiner conformed to Philadelphia Electric Procedure ISI-SP-3 which included calibration checks utilizing thickness gauges before and after testing.

5. Recirculation Pump to Pipe Weld - Unit 3

The inspector reviewed the sequence of events concerning the Unit 3 loop B Recirculation Pump to pipe weld (RHB-055). After completing the weld between the new type 316L stainless pipe and the existing pump nozzle, a linear liquid penetrant indication was found on the OD, approximately 1/2" from the fusion line of the new weld, in a portion of the original SA-351 Gr 316 stainless casting. The inspector verified the licensee's evaluation that the defect was associated with acceptable shrinkage type defects as revealed in the original radiographs furnished by GE 6, Schnectady in 1969. The same defect was also found in the radiographs of the initial installation weld in 1972. The area containing the liquid penetrant indication was ground to provide a .38" deep x 1.5" long cavity with a portion of the defect remaining in the cavity. The pump nozzle was repaired by seal welding the cavity and restoring the nozzle to its original dimensions.

Radiography of the subject area after repair welding disclosed remnants of the original casting defect. The defect measured .38" long in the thru wall direction (as compared to .75" in its original cast condition) and 1 3/8" long in its axial direction. The wall thickness of the nozzle

is 1.36". The inboard tip of the defect was located approximately 1/2" from the fusion line of the weld. It is noted that final radiography of the subject weld also revealed several acceptable shrink type casting defects at location No. 8, but unlike the defect in location No. 72, they did not protrude to the O.D. surface. The defects were approximately 1/8" round and were located 1/8" from the fusion line of the weld.

The inspector concurred with PE's conclusion that the final condition of weld 18HB-055 was acceptable for the following reasons: (a) the defects falls within the acceptance standards of the original material specification for SA-351 type 316 stainless steel as permitted by ASME Section XI 3518.1 par(a); (b) the size of the defect at location No. 72 was significantly reduced by grinding and weld repair; and, (c) stress analysis of the defect at location No. 72 using the criteria specified in ASME Section XI - IWB-3641.3 indicated its acceptance.

6. Ultrasonic Inspection of Unit 2 and Unit 3 Reactor Vessel Shroud Access Hole Cover Plate Welds

As reported in IR-88-08, January 1988, GE performed a remote, ultrasonic examination of two Inconel 600 shroud access hole cover plate welds (see figure 1) in the Unit 3 reactor vessel which were suspected of having intergranular stress corrosion cracking. The 21" diameter cover plates were welded to the shroud support plates with a "J" grove configuration (see figure 1) that resulted in a crevice in the weld joint. The UT examination which employed the GE Ultra Imager III instrument for data acquisition disclosed significant indications which GE interpreted to be due to integranular stress corrosion cracks. The licensee questioned the validity of the test and requested that GE repeat the examination.

Before repeating the examination in Unit 3, the cover plate welds in Unit 2 were examined using the Ultra Image instrument in accordance with GE Procedure UT-57 Rev 3. The examination which was performed under close scrutiny by the licensee. The procedure utilized both 45° shear and 55° refracted longitudinal search units. The calibration UT block employed for the examination was machined with a crevice to simulate the production joint and notches ranging in depth between 10%-80%. The UT examination of 0° and 180° shroud access cover plate welds in Unit 2 did not reveal any evidence of crack indications.

On August 6, 7 and 10, 1988, GE reexamined the 0° and 180° cover plate welds in Unit 3 using the same procedure and personnel employed in the examination of Unit 2. The inspector witnessed the calibration phase of the examination and found it to be in agreement with Procedure UT-57. The examination revealed significant indications located on the vertical fusion line along the shroud support side of the weld (see figure 2). The 0° cover plate weld indications were present 360° intermittently with an

average of 40% thru wall depth and with some areas showing 80% thru wall. The 180 cover plate weld showed indications intermittently 25% around the cover with an average of 20% thru wall depth and with areas showing up to 40% thru wall. The indications were confirmed by GE using a focused 65 refracted longitudinal search unit from the shroud side of the weld whereas the initial examination was performed from the access cover side.

The inspector and two regional inspectors reviewed the video tapes of the data and concurred with GE's findings with regard to the presence and location of the indications. Although GE stated that these indications are typical of intergranular stress corrosion cracks, the inspector and PE were of the opinion that the indications may also be related to other conditions such as cracking originating from root defects or lack of fusion along the side wall. The welds were reportedly made by the manual Tungsten Inert Gas process using Inconel 82 (ER NiCr-3) filler wire.

The licensee expressed the opinion that the Unit 2 and Unit 3 conditions with regard to the presence of defects in the latter, but not the former is due to differences in water chemistry and, as suggested above, welding conditions. Unit 2 is reported to have had better oxygen control than Unit 3. Differences in welding may be related to fit up or welding technique. Welding conditions could have played a large role in the formation of the defects.

In anticipation of repairing the defective cover plate welds in Unit 3, the inspector reviewed a proposed GE repair procedure consisting of cutting out the existing cover plates and replacing them with new cover plates using a bolted connection. Other repair procedures are being considered by PE such as welding a strong back over the existing cover plates.

7. Conclusion

No violations, deviations, or deficiences observed in the inspector's review of the replacement of the EWS systems, erosion corrosion program, and the radiographic condition of Unit 3 recirculation pump to pipe weld. The presence of UT indications in the Unit 3 shroud access cover plate welds were confirmed by the inspector.

8. Management Meetings

The licensee management was informed of the scope and purpose of this inspection at an entrance meeting conducted on August 8, 1988. The findings of the inspection were discussed with the licensee representatives during the course of this inspection. An exit meeting was conducted on August 12, 1988 (see paragraph 1.0 for attendees) at which time the findings of the inspection were presented.

At no time during this inspection was written material concerning inspection findings provided to the licensee. The licensee did not indicate that any proprietary information was involved within the scope of this inspection.

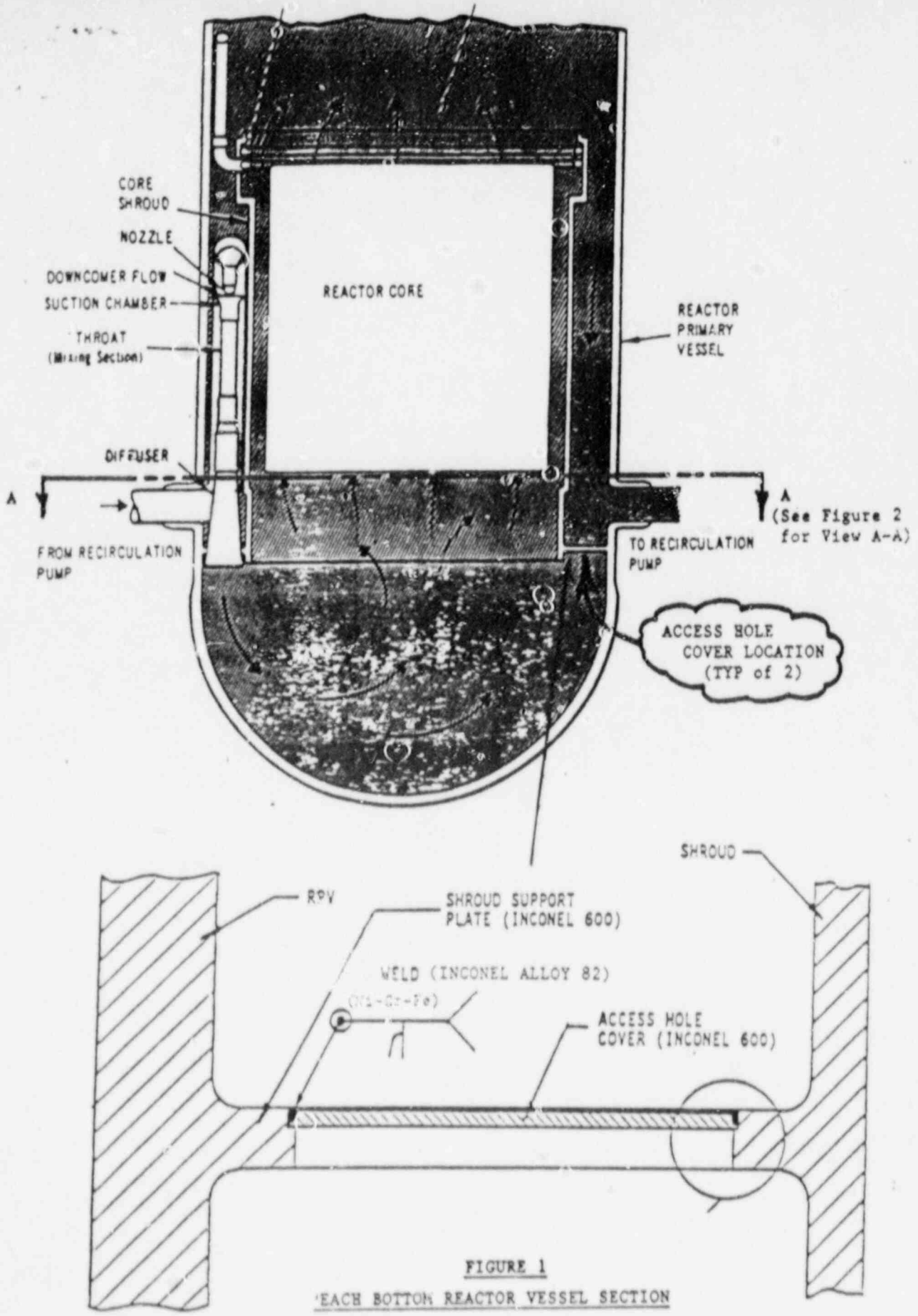

FIGURE 1

EACH BOTTOM REACTOR VESSEL SECTION

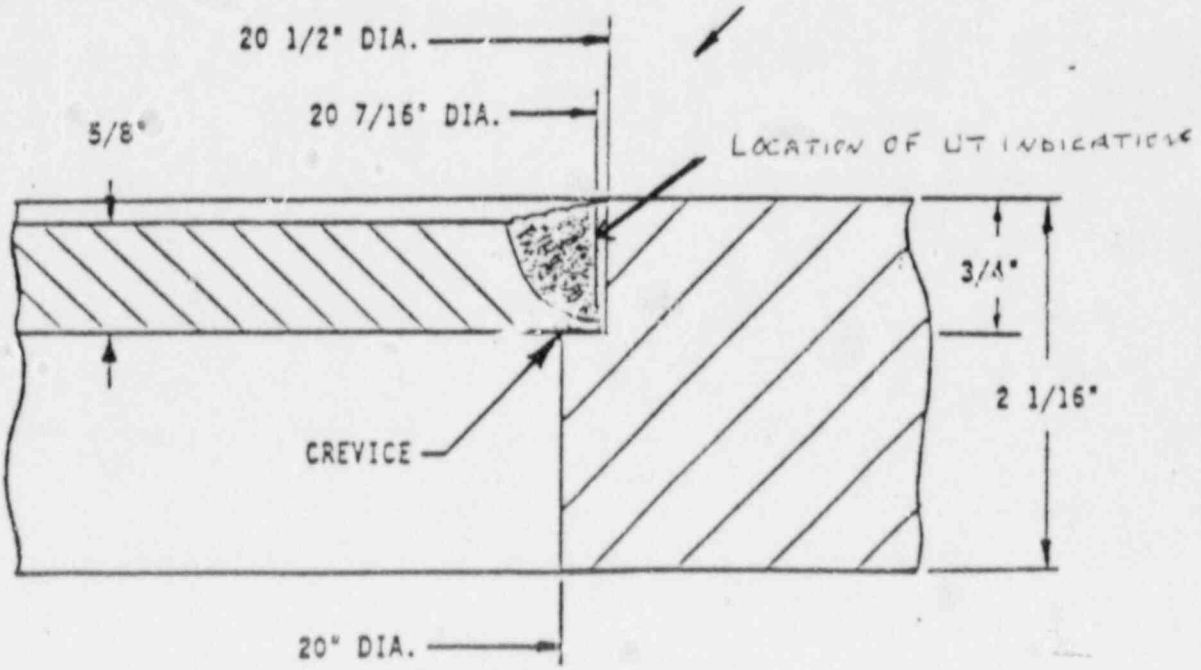

FIGURE 2

PEACH BOTTOM RPV ACCESS HOLE COVER DETAILS
(Showing location of Unit 3 cracking)