

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-286/89-09

Docket No. 50-286

License No. DPR-64

Licensee: Power Authority of the State of New York
123 Main Street
White Plains, New York 10601

Facility Name: Indian Point Nuclear Generating Station, Unit 3

Inspection At: Buchanan, New York

Inspection Conducted: April 3-7 and April 18-21, 1989

Inspectors: H. J. Kaplan
H. J. Kaplan, Senior Reactor Engineer, MPS
EB, DRS, Region I

6/1/89
date

C. D. Sellers/HK
C. D. Sellers, NRR, EMTB

6/1/89
date

Approved by: S. K. Chaudhary
S. K. Chaudhary, Chief, MPS, EB, DRS,
Region I

6/1/89
date

Inspection Summary: Routine unannounced inspection on April 3-7 and April 18-21, 1989 (Report No. 50-286/89-08)

Areas Inspected: The inspection included review of the status for replacing the Indian Point Unit 3 steam generators, observation of the welding activities, review of metallurgical studies of welding development program, and investigation of two allegations.

Results: The inspectors determined that the initial activities involving welding of the new steam generator channel head nozzles to the existing elbows were being performed in a controlled and satisfactory manner. An independent welding consultant concurred with these findings except for several deficiencies which were immediately corrected by the licensee.

No violations or deviations were identified. Two allegations were investigated and were found to have been satisfactorily dispositioned by the licensee. The concern addressed in the allegations had been brought to the attention of the licensee prior to their submittal.

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DETAILS

1.0 Persons Contacted

Power Authority State of New York

- *L. Hill, Manager, Steam Generator Replacement
- *W. Josiger, Resident Manager, Indian Point Unit 3
- *H. Morgan, Welding Engineer
- *M. Peckham, Assistant to the Resident Manager
- *R. Schmitt, Quality Assurance Supervisor
- *S. Schoenwiesner, Licensing Engineer

Brookhaven National Laboratory

- *M. H. Schuster, Welding Engineer

United States Nuclear Regulatory Commission

- P. Koltay, Sr. Resident Inspector, Indian Point Unit 3
- *G. Hunegs, Resident Inspector, Indian Point Unit 3

*Denotes those attending the exit meeting.

The inspectors also contacted other administrative and technical personnel during the inspection.

2.0 Purpose and Scope

The purpose of this inspection was to review the licensee's status of the installation of four new steam generators in the Indian Point Unit 3 nuclear power plant and to investigate several allegations.

3.0 References/Requirements

The following requirements, industry standards and licensee commitments are applicable to the steam generator replacement project:

- ASME Boiler and Pressure Vessel Code, Section XI, 1974 Edition, Summer 1975 Addenda
- ANSI B31.1, Power Piping Code, 1974 Edition
- Quality Assurance Plan for Steam Generator Replacement, Revision 1
- USAS B31.7, Nuclear Piping, 1969 Edition

4.0 Steam Generator Replacement Program-Modification 88-03-013

4.1 Background

During a previous NRC inspection (IR #89-01), covering the period of January 23-27, 1989, the inspectors determined that the licensee had developed a comprehensive program for the installation of four new Westinghouse steam generators (SG) including both engineering and quality assurance coverage throughout all phases of the project. During Inspection 89-01 the inspectors observed several mock-ups, referred to as JAP 1, 2, and 3 being welded using the Automatic Tungsten Inert Gas process for joining the hot and cold channel head nozzles to the existing pipe elbows. The inspectors verified that the Bechtel welding procedure P8-I-Ag (MAN/MAC) and welders were qualified in accordance with ASME Section IX requirements. The JAP mockups had been prepared to duplicate the conditions of the nozzles in the SG channel heads by the same company that fabricated the heads. The nozzle safe end preps, as delivered, were buttered with type 309/308 stainless weld metal deposited by the flux core process. The purpose of the JAP mockup was to: (a) refine the welding parameters of the automatic Tungsten Inert Gas (TIG) process, (b) provide additional training for the welders, and (c) verify the weldability of the flux core weld deposit as affected by the adjoining materials and geometric factors involved in the hot and cold SG nozzle to elbow installation welds.

4.2 Findings

On April 3, 1989 the inspectors met with the licensee's principal engineering and welding personnel and were informed that the licensee was not able to consistently produce sound welds in the JAP mockups even though welding was performed under tight supervision by PCI (Power Cutting Incorporated), a subcontractor to Bechtel. As experienced with the steam generator replacement at D.C. Cook Unit 2, where identical materials were employed, the licensee experienced difficulties in the flux core stainless buttered nozzle end preps when "tie-ing in" the adjacent weld beads. The replacement SG's at both sites were fabricated by the same manufacturer. The difficulty was found to be due to lack of fusion that occurred in the middle 1/3 of the thickness, above the change in joint bevel. The licensee presented to the inspector a metallurgical report, prepared by Lucius Pitkin Laboratories, showing the lack of fusion in a mockup cut from JAP-3 that was readily found by radiography. Macroscopic and microscopic examination of sections cut from the mockup showed that the lack of fusion occurred at the interface between the TIG deposited type 308L stainless weld metal and the flux core type 308L stainless buttered layer as shown in the photograph in Figure 1. The report also included the results of Energy Dispersive Spectroscopy (EDS) which revealed significant quantities of calcium, silicon, and a lesser amount of aluminum in the defect, all of which were considered

to be impurities (oxides) generally found in weld fluxes. It was concluded that in all likelihood, these impurities in the weld metal contributed to the lack of fusion. As the result of this experience with the JAP mockups and the experience at D.C. Cook the licensee elected to butter ("seal") the as delivered nozzle weld end preps with three layers of "clean" type 308L stainless weld metal using the automatic TIG process prior to making the nozzle to elbow weld. The licensee proceeded to weld JAP 4 mockup utilizing three layers of TIG deposited 308 L. Radiography and metallographic sectioning, as shown in Figure 2, revealed a sound joint free of defects. (See Figure 2). In addition, the safe end weld joint bevel was modified from 30°, 15°, and 5° to 30° and 19°. The inspector reviewed the documentation covering the TIG buttering operation and found no reported problems except as discussed in Allegation No. RI-89-A-0031 page 6.

The inspector reviewed the records covering a problem encountered in portions of the first layer in the cold leg of SG-31 as the result of TIG welding on the as-delivered flux core deposited weld preps. The records showed that the defective areas (presumably due to the entrapped oxides "opening-up") were excavated and successfully repaired. Liquid penetrant inspection was performed before and after repair. No similar problems were experienced in the remaining seven nozzles.

On April 7, 1989 production welding was initiated on SG-31. The inspector visually examined portions of the manually deposited TIG root pass in both the hot and cold nozzles. Good fusion was observed in all areas of the root layers.

The inspector reviewed a sample of the radiographs of the full size JAP nozzle to pipe joint mockups. In general, the mockups appeared to be free of imperfections except for the lack of fusion that had been found and investigated in JAP-3 which was quite obvious. None of the mockups had been examined ultrasonically, but the licensee stated that some of the remaining fragments of the mockup would be ultrasonically examined.

At various times, inspectors observed movement and preparation for movement of the replacement steam generators. The trailer, upon which the steam generator is mounted, has 12 pairs of wheel sets with four wheels each. The trailer was towed by a Euclid power unit and was restrained by another Euclid power unit behind on the hill coming down from the storage building. Speed was a rather slow walk permitting a trailer brake operator to have easy access to his controls. The steam generator, in its cribbing, was slid from the trailer on track through the equipment hatch into the containment. It was then up ended on a sand bag pile and lowered into position by the polar crane.

4.3 Summary

At the end of the first inspection period (April 3-7) the inspectors concluded that the initial welding activities involving the SG channel head nozzle to elbow welds were, being performed in a controlled and satisfactory manner. As of May 3, 1989, the licensee reported the following status:

	<u>HOT LEG</u>	<u>COLD LEG</u>	<u>REPAIRS</u>
SG-31	Welding complete *NDE-OK	Welding complete NDE-OK	Shallow cracks on OD of cold leg - repaired OK
SG-32	Welding complete NDE-OK	Welding complete NDE-OK	
SG-33	Welding complete NDE-OK	Welding complete NDE-OK	
SG-34	Welding almost complete	Welding complete NDE-OK	Lack of fusion found at 1/3 X-ray of hot leg - repaired OK

*Does not include liquid penetrant examination of I.D. surface - presently in progress. See Inspection Report 50-286/89-81 for further details.

5.0 Consultant Audit

On April 19-21 Mr. M. H. Schuster of Brookhaven National Laboratory, performed an independent in-depth audit of the licensee's welding activities currently in progress. Mr. Schuster found no violations or deviations, but observed the following deficiencies which were immediately brought to the licensee's attention. These were: (a) practice of depositing single beads to fill-in grooves between layers not described in weld procedure; (b) grinding of elbow caused particles of tape to possibly contaminate nozzle to elbow weld; (c) acid etching residue not removed; and, (d) possible inadequate OD buildup to assure complete UT coverage.

The licensee indicated that these deficiencies would be immediately corrected. Mr. Schuster also reviewed in-process radiographs and documentation covering in-process repairs of cold leg nozzle of SG-31 and hot leg nozzle of SG-34 and reported no deficiencies.

6.0 Investigations of Two Allegations

Two allegations received by the NRC were investigated by the inspectors. The first allegation, No. RI-89-A-0031 was received from a welder that raised a concern about the quality of the new Westinghouse steam

generator nozzles. The welder observed "defects" surfacing when depositing the first three layers of stainless steel weld metal during buttering of the as-delivered weld preps in the cold leg nozzle of SG-31 prior to final installation. As discussed in Section 4.0 the buttering operation of eight nozzles in SGs 31, 32, 33 and 34 was prompted by the experiences at D.C. Cook, and during the licensee's welding development program. In these instances, the as-delivered weld preps, that had been machined from weld deposited flux core metal, tended to "open up". The defects were believed to be due to inherent impurities in the flux core deposits. The buttering operation was intended to seal any defects in the original weld preps and provide sound weld metal for ultimately joining the nozzles to the existing pipe elbows. In this regard, the allerger was correct in recognizing the apparent weakness in the as-delivered weld preps, but failed to mention that the defective areas in SG-31 had been removed and successfully repaired, and that no similar problems were experienced in the remaining seven nozzles. The inspector reviewed the appropriate QA documentation and ascertained that the repair was treated as a major repair rather than an in-process repair and consequently received a complete review cycle involving the licensee, Westinghouse, and Bechtel. The inspector noted that the repair procedure was precise and employed liquid penetrant inspection after excavating the defective area and after welding. The allerger's concern about the inability of the liquid penetrant to detect subsurface defects was allayed after being informed that the completed weld including the buttered layers were scheduled for volumetric inspection by radiography and ultrasonics.

The second allegation, No. RI-89-A-0028 received from a QA engineer expressed three concerns. The first two involved a weld used to cap RTD lines. The weld had been accepted by Bechtel QC even though it was not flush as had been indicated by a weld symbol on the Westinghouse (W) drawing. The second was that the crown of the weld, in combination with the slope of an adjacent reducer constituted a notch. With regard to the weld not being ground flush the inspector concluded that the problem was basically one of interpretation and intent of the weld symbol on the drawing. Did the symbol mean that (a) grinding flush was required; or that, (b) grinding and leaving a crown were also acceptable? The licensee concluded that after discussing the problem with W, that although the original intent was to require the weld to be ground flush as indicated by the weld symbol, the 1/16" crown (reinforcement) observed by the allerger was acceptable. W also indicated that the notch created by the crown was acceptable. These items were documented in a W memorandum dated March 23, 1989. The third concern involved initiating welding (buttering of the SG nozzle end preps) without a controlled procedure stemmed from Bechtel's practice of using procedures stamped as "Information Only." In this case the stamp did not mean that the procedure could not be used for production, but that the copy bearing this stamp would not be recorded or

updated. The licensee indicated that consideration was being given by Bechtel to mark such procedures as "Interim Controlled Document". In the case of all three concerns the licensee agreed that even though immediate action had been taken to evaluate and resolve the problems, the alleged had not been informed of the appropriate dispositions in a timely manner. The licensee indicated that communication in this area would be improved.

Conclusion

Allegations RI-89-A-0028 and RI-89-A-0031 are closed.

7.0 Management Meetings

Licensee management was informed of the scope and purpose of the inspection at the entrance interview on April 3, 1989. The findings of the inspection were discussed with licensee representatives during the course of the inspection and presented to licensee management at the April 21, 1989 exit interview (see paragraph 1 for attendees).

At no time during the inspection was written material provided to the licensee by the inspector.

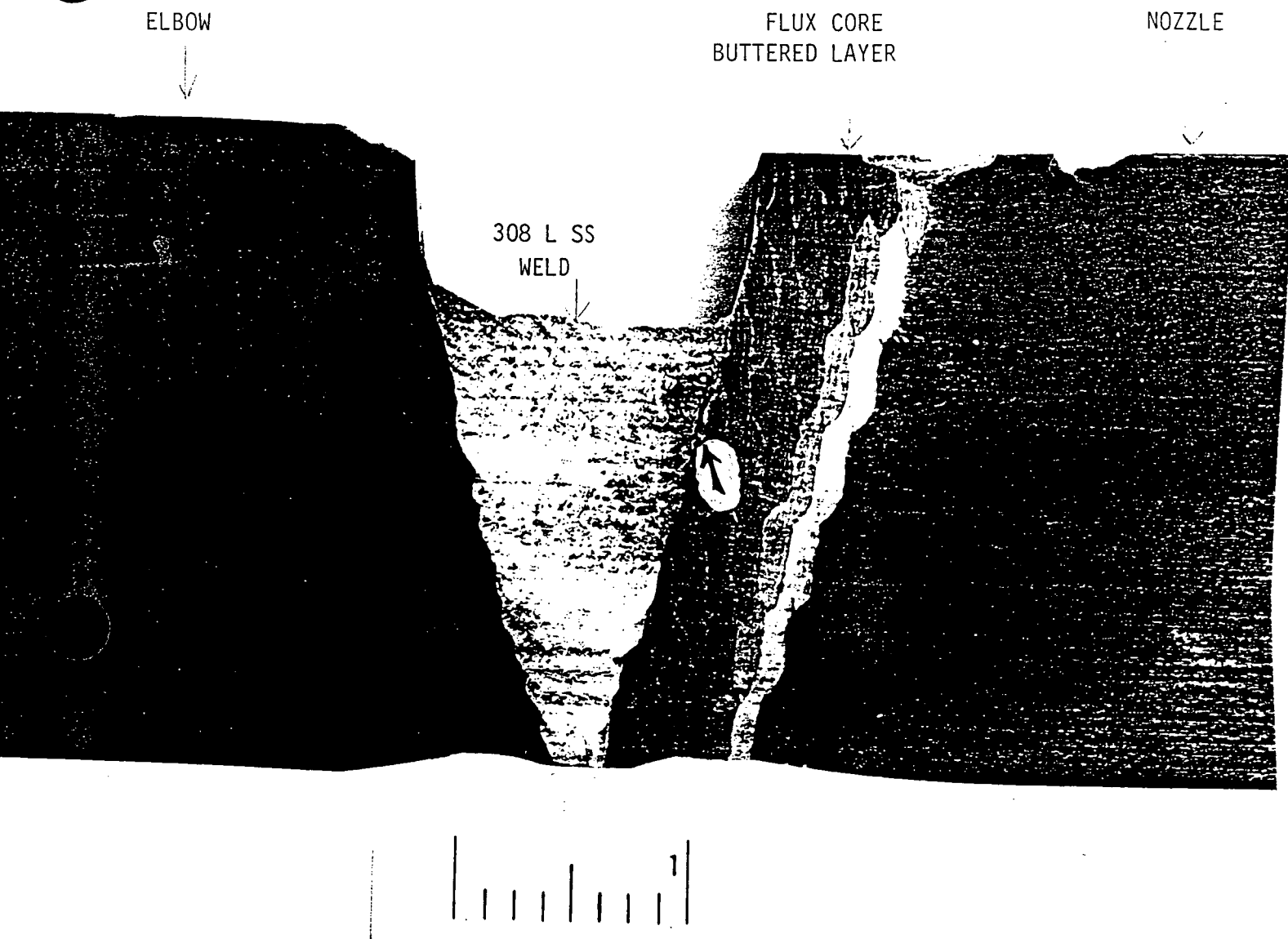


Figure 1 - Shows cross sectional of transverse macrosection cut from JAP-3 simulated nozzle-elbow mockup. Arrow depicts lack of fusion defect along fusion line between weld and flux core buttered layer.

FLUX CORE
BUTTERED LAYER

TIG
BUTTERED LAYER

NOZZLE

WELD

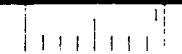
ELBOW

A

C

B

D



LUCIUS PITKIN, INC.

Figure 2 - Shows four transverse macrosections cut from JAP-4 simulated nozzle-elbow mockup. Nozzle portion was buttered with flux core stainless followed by TIG deposited stainless prior to welding to elbow. No defects were observed.