UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos : 50-325/90-47 and 50-324/90-47

Licensee: Carolina Power and Light Company
P. O. Box 1551
Raleigh, NC 27602

Docket Nos.: 50-325 and 50-324 License Nos.: DPR-71 and DPR-62

Facility Name: Brunswick 1 and 2

Inspection Conducted: November 13-16 and 26-30, 1990

Inspector: N. Economos 1/8/91
N. Economos Date Signed

Approved by: J. O. Blake 1/8/91
J. O. Blake, Chief Date Signed
Materials and Processes Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection was performed in order to observe recirculation pipe replacement activities in Unit 1. This included removal of existing risers, safe-ends and corrosion resistant cladding, machining of nozzles and replacement components, welding, thermal treatment and testing. Engineering specifications, work procedures, material and personnel certification and quality control records were reviewed and evaluated.

Results:

By observation, document review and through discussions with personnel at the management, supervision and craft levels, the inspector ascertained that the licensee working with the contractor, General Electric Nuclear Energy, has made significant programatic improvements which is allowing the project to proceed without the difficulties encountered in the previous unit. Work completion was ahead of schedule meaning that at the closing of this inspection, preparations were underway to weld/fit-up the first safe-ends on recirc nozzles 2A and 2B. In the areas inspected, violations or deviations were not identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*K. B. Atman, Regulatory Compliance Manager
D. Baker, Shift Coordinator/Welding Specialist
*M. R. Foss, Supervisor - Regulatory Compliance
E. Betz, Level III Examiner Corporate
*J. E. Gates, Jr., Mechanical Engineer, Nuclear Engineering Design (NED)
*J. H. Gee, Design Control Engineer
*T. W. Gillman, Mechanical Engineer, NED
*J. L. Harness, General Manager Brunswick Nuclear Project (BNP)
*R. E. Helme, Manager, Technical Support
J. R. Holder, Manager Outages and Modifications
*R. R. Johnson, Project Manager Recirculation Pipe Replacement (RPR)
*T. Pitchford, Lead Engineer, PRP
*R. B. Starkey, Jr., Vice President BNP

Other licensee employees contacted during this inspection included craftsmen, engineers, operators, mechanics, security force members, technicians, and administrative personnel.

Other Organizations

General Electric Nuclear Energy

*R. Cameron, Project QC Supervisor
W. S. Fingerudt, Welding Engineer
A. Ketcham, Assistant Project Manager
R. Markling, Shift Supervisor
P. Radovich, Shift Supervisor
*P. Roeder, Project Manager

NRC Resident Inspectors

*W. Levis, Resident Inspector
*D. Nelson, Resident Inspector

*Attended exit interview

2. Replacement of BWR Recirculation Piping Unit - 1 (2512/13)

a. Facility Design Changes and Modification (37700)

Design Changes and Modification Program

This inspection was performed as a followup effort to that documented in Report 90-22 in order to observe work activities that were in progress during this time. These activities included the following:

Recirculation Pipe Replacement

- Cut and remove risers
- Cut safe-ends and thermal sleeves
- Remove Inconel nozzle butter
- Apply nozzle stainless steel butter
- Machine nozzle final weld prep

Core Spray Pipe Replacement

- Cut and remove pipe
- Cut safe-ends and thermal sleeves
- Remove Inconel nozzle butter
- Apply nozzle stainless steel butter

These activities were controlled by Specification 248-158, Rev. 1, Field Replacement of Reactor Coolant Recirculation System Inlet Safe-Ends, Piping and Core Spray System Safe-Ends and Piping. To support field specific activities, GE issued and the licensee approved the following procedures. These procedures were reviewed for technical content and adequacy.

CPL	WT-Q Rev. 3	Welding Training and Qualification
CPL	2.0 Rev. 1	Material and Processes
CPL	3.0 Rev. 1	Arc Strike Removal
CPL	4.0 Rev. 1	Etching Procedure
CPL	5.0 Rev. 1	Cleanliness Control Procedure
CPL	8.0 Rev. 1	Material Handling and Storage

CPL 9.0	Rev. 2	Control of Measuring and Testing Equipment
CPL 10.0	Rev. 2	Thermal Cutting
CPL 11.0	Rev. 6	Recirc inlet Safe-End Replacement
CPL 13.0	Rev. 7	Recirc Riser Piping Replacement and Sweepolet/Reducer Modification
CPL 15.0	Rev. 5	Preheat and Postweld heat Treatment of Low Alloy Steel
CPL 24.0	Rev. 1	Core Spray Inlet Safe-End and Transition Piece Replacement
CPL 25.0	Rev. 3	General Visual Examination
CPL 26.0	Rev. 3	General Liquid Penetrant Examination
CPL 27.0	Rev. 2	Radiographic Examination of Welds
CPL 28.0	Rev. 1	Magnetic Particle Examination
CPL 29.0	Rev. 2	Purging of Piping Joints and Control of Gases
CPL 30.0	Rev. 2	Calibration of Measuring and Testing Equipment
CPL 31.0	Rev. 3	Weld Overlay Removal
CPL 32.0	Rev.	Sacrificial Ring Fabrication

GE has generated a package of travelers for each nozzle. These travelers are used to implement production control, document every milestone in the replacement process and to provide a detail record of fabrication activities. These activities would include dimensional measurements, NDE inspections, hold points by QC and the ANII, and field generated nonconformance reports. As stated in Report 90-22 the applicable ASME/ANSI codes and standards including code case(s) invoked for these modifications are as follows:

- ASME B&PV Code, Section III, 1986 Edition with 1988 Addenda
- ASME B&PV Code, Section IX, Latest Edition and Addenda at time of procedure and performance qualification
- ASME B&PV Code, Section XI, 1980 through W81 Addenda, with Code Case N-432

- AWS D1.1 - 1988 Edition

- ANSI N45.2.1-1980 Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants

Authorized nuclear inservice inspection (ANII) services are provided by Hartford Steam Boiler Inspection Co. (Hartford). During the first part of this inspection the inspector found that all but one of the risers had been cut and removed, removal of the safe-ends and overlay material were also in progress. The inspector toured the drywell and observed the cutting of the safe-end and thermal sleeve on N2C nozzle. This activity continued throughout the inspection period which ended on November 16, 1990. During this time-frame the safe-ends and associated thermal sleeves were mechanically cut from recirculation nozzles N2A, N2B, N2C and N2E. A parallel effort was in progress to cut and remove piping and transition pieces from core spray nozzles N5A and N5B. Field travelers for these nozzles were reviewed to verify completeness, accuracy and compliance with applicable procedures. Also during this inspection, the inspector discussed, with the licensee's RPR project managers, the organizational structure of this project with emphasis on design engineering and technical support. Basically the licensee has two engineers on site dedicated to handling generic and project specific design concerns. Both individuals report to nuclear engineering department (NED), Raleigh through the principle engineer. Generic design issues for Brunswick are handled by these individuals in consultation with Brunswick Engineering Support group located in Raleigh. This group is directly controlled by NED Raleigh. As was the case during the Unit 2 PRP project, the licensee has again retained the services of Structural Integrity Associates Inc. of San Jose, California for the handling of stress analysis calculations. Under the present arrangement, all questions requiring stress analysis calculations are reviewed by site NED and they are subsequently directed to Structural Integrity for computer analysis. This direct line of communication helps to expedite the resolution of design questions and effectively minimizes delays in project completion.

b. Welding (55050)

Programmatic aspects and administrative controls on welding activities were discussed in Report 90-22. The applicable code for this activity has been discussed earlier in this report.

Welding Procedure Specifications (WPS) applicable to this project were selected at random for review and comparison with applicable code and project requirements - these were as follows:

WPS	Process	Application
3.3.1 W	GTAW (man)	Recirculation or Core-Spray nozzle base metal repairs
8.3.11 WA	GTAW (mach./CRC)	Recirculation and Core-Spray nozzle Butter/Clad Installation
8.3.5 WA	GTAW (mach./Butter)	Recirculation and Core-Spray nozzle Butter/Clad Installation
8.8.13 W	GTAQ (man.)	Recirculation and Core-Spray Butter/Clad Repair
8.8.6 W	GTAW (mach. Safe-End)	Recirculation Nozzle Safe-End Thermal Sleeve and Purge Ports
8.8.1 W	GTAW (man.)	Repair, Consumable Insert
8.43.3W	GTAW (man.)	Repair open root

*GTAW - Gas Tungsten Arc Welding Process

The above WPSs and their supporting Procedure Qualification records (PQRs) were reviewed to ascertain whether essential supplementary and/or nonessential variables, including thermal treatment, were consistent with Code requirements; whether the WPSs were properly qualified and their supporting PQRs were accurate and retrievable; whether all mechanical tests had been performed and the results met the minimum requirements; whether the PQRs had been reviewed and certified by appropriate personnel; and whether any revisions and/or changes to nonessential variables were noted.

Discussions with the cognizant welding engineer disclosed that GE had 55 welders on board, 53 of which had taken and had passed all the required code and project weld tests outlined in the Welding Training and Qualification Procedure, CPL-WT-Q Rev. 3 with attachment I, and the attached GE memorandum entitled, Brunswick Unit 1 . . . Welder/Operator Qualification Program September 25, 1990. To verify compliance with applicable code and subject procedural requirements, the inspector selected at random the following welders for a review of performance qualification records.

Welder/ Operator	WPS 8.8.3W*	WPS 8.3.11WA	WPS 8.8.6W	WPS 8.4.3W*	WPS 8.8.1W*
T-8942	!	!	!	!	
H-4254	!	!	!		
B-0565		!	!		
S-0692		!	!	!	
H-5992	!	!	!		!
S-8892	!	!	!		
H-1034	!	!	!	!	!
F-2691	!	!	!		!

* -- Manual Gas Tungsten Arc Process

All of the above WPS(s) were qualified with GTAW automatic machine except where indicated by (*). Producing an acceptable weld coupon with WPS 8.8.6W without retesting was a condition for employment. In addition each welder/operator was required to produce an acceptable weld coupon with WPS 8.3.11WA. The initial test involved a consumable insert groove weld test while the latter required the production of an acceptable corrosion resistant clad (CRC) weld test. Following these qualifications, welder/operators were required to pass proficiency qualification tests. These tests were designed to simulate actual field production welds on actual weld joint geometries and materials which were the same as or equivalent to production as practical.

During the second part of this inspection, which was conducted between November 26 through 29, 1990, the inspector noted that major RPR project activities included the application/welding of stainless steel buttering to the subject nozzles, machining of weld preps on the ring header sweepolets, machining of final weld preps on recirculation nozzles N2A, N2B and N2C and weld repairs on recirculation nozzles N2D and N2G. The inspector observed welding on nozzles N2A, N2C, N2E and M2E indirectly through TV monitors and directly inside the dry well at the nozzle being welded. This effort was performed to assure that production parameters were consistent with those used in weld procedure qualifications and the controlling specification. In addition the inspector observed weld bead appearance, starts and stops, bead width, rate of disposition, heat input and filler metal/wire thickness. All production welds were made with automatic orbital GTAW equipment using remote control aided by video equipment.

Weld Repairs

Two recirculation nozzles, N2D and N2G, exhibited indications in the base metal. These indications had been identified previously during inservice inspections and required a layer of clad overlay material to be welded over the suspect areas as a temporary corrective measure. Location of these indications was confirmed by radiography

which was performed following removal of the clad overlay in preparation for the pipe replacement. As required by the pipe replacement program, GE issued nonconformance reports which described the location of the indications and the corrective action(s) required. In the case of both nozzles the defects were excavated to sound metal and checked by NDE. The resulting cavities were subsequently tested and welded in accordance with a weld repair procedure, qualified for this purpose. The inspector followed certain steps of the repair activity, reviewed NDE reports, nonconformance report(s) and weld repair procedures.

c. Radiographic Review (57090)

Sacrificial rings made of mild steel pipe were used to facilitate weld butter build-up on the face of the recirculation nozzles. These rings were machined, welded, prepped and radiographed at the GE facility in King of Prussia, Pennsylvania. The inspector reviewed these radiographs and others taken following the deposition of weld buttering on the face of the nozzles. Radiographs reviewed were as follows:

- Sacrificial Rings
  1A, 1B, 2A, 2B, 3A and 3B

- Buttering on Nozzles
  N2A, N2B, N2C and N5B

These radiographs were taken using radiographic procedure CPL-27 Rev. 2 which was written to comply with ASME Code Sections III 1986 Edition and Section XI 1980 Edition with 1981 Addenda.

d. Thermal Treatment of Welds (55050)

Deposition of weld buttering on the nozzles required the controlled application of heat prior to, during, and following the weld buttering application. This was the only weld where thermal treatment was required. Basically, prior to welding, each nozzle was preheated with resistance heated coils, connected to a power supply unit. Nozzle temperatures were monitored through the use of thermocouples attached to each nozzle at strategic locations or zones. Specific temperatures for preheat, soak following welding and post-weld heat treatment (PWHT) were controlled by the applicable, specification and weld procedure qualification. Stresses generated by the PWHT were analyzed by Structural Integrity Associates Inc. and documented in a report entitled, "BSEP Unit 1 N2 and N5 Nozzle Safe-End Replacement, Local PWHT Analysis." The report was dated February 2, 1990. Strip chart recorders using digital technology for temperature tracking/recording purposes were used to monitor nozzle temperatures.

- High density heaters with the capability of controlling metal temperature to a ± 20°F were being used for power supply. Administrative controls for thermal treatment were provided through procedure CPL-15.0 Rev. 5. The inspector discussed this activity with contractor, Global Heat Inc., personnel, reviewed preheat and postweld heat-treat strip charts of selected nozzles to verify completeness accuracy and adherence to specification requirements.

- Material Quality Records Review

  The controlling document for material procured for the pipe replacement project was the licensee's specification CPL 248-153 which referenced ASME Code Section III, 1986 Edition as the governing code of record. As such the replacement risers were procured as Class 1, seamless stainless steel bent piping, 12 inch diameter schedule 80 thickness, while the safe-ends were procured as forgings 16 3/8" outside diameter and 17" long produced in accordance with SA 182 F, 316NG requirements. The core spray transition pieces were produced from SA 350, GR.LF_2 material.

Within these areas the inspector reviewed vendor inspection reports, receipt inspection reports, certified material test reports with particular emphasis on chemical and mechanical properties, processing, thermal treatment, testing for sensitization, NDE and hydro testing as applicable. Components selected for this review were as follows:

Heat No./ Certification	Lot No. Risers	Pce. No.	Cert. No.
D021605	4080	1	0YYD2871
	4082	2	0YYD2871
D020803	4083	1	0YYD2870
	4085	2	0YYD2870
	4084	3	0YYD2870
	4080	4	0YYD2870
	4081	5	0YYD2870
D020903	4083	0	0YYD2870
	4085	7	0YYD2870
	4084	8	0YYD2870
	4081	1	0YYD2872

Recirculation Pipe Safe-Ends

Ht No. - 21916	Eleven pieces, all produced from the same heat of material	469SNE

Core Spray Safe Ends

Ht No. - 21916	Three pieces, all produced from the same heat of material	469SNE

Core Spray Transition pces.

Ht No. - 667SNB	Three pieces, all produced from the same heat of material	N536/A

In addition to the above the inspector reviewed filler metal quality records to verify compliance with code and specification requirements. Materials whose records were reviewed were as follows:

Material	Size(s)	PO No.
ER70S6	1/8" dia. and .045" dia.	548675C-AV
E8018C3	1/8" dia. and .093" dia.	559003C
ER308L	.035" dia.	S8A2688
IN309L	1/8"x5/32"	4781T309L

Within the areas inspected violations or deviations were not identified.

3. Exit Interview

The inspection scope and results were summarized on November 30, 1990, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed below. Although reviewed during this inspection, proprietary information is not contained in this report. Dissenting comments were not received from the licensee.